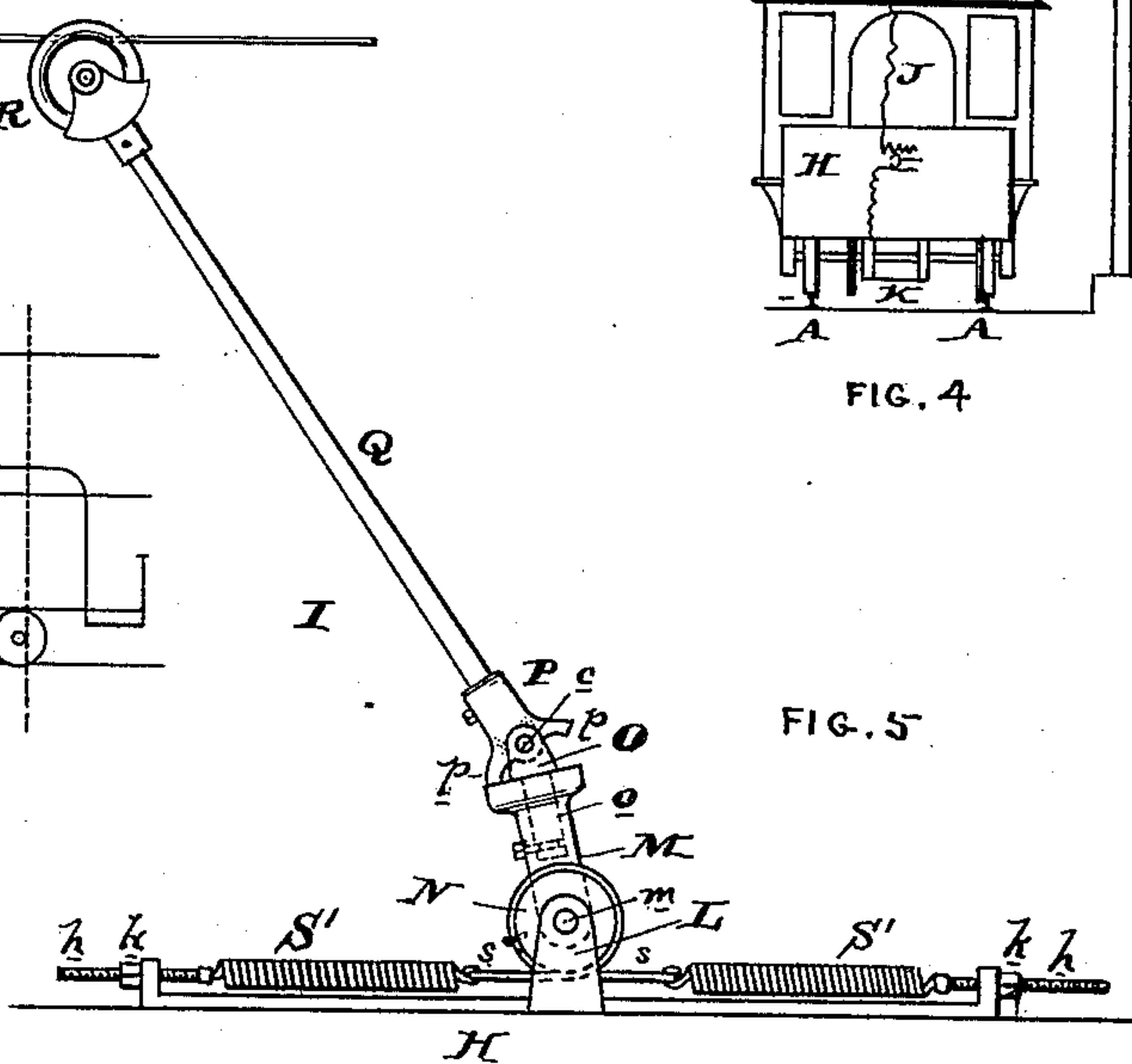
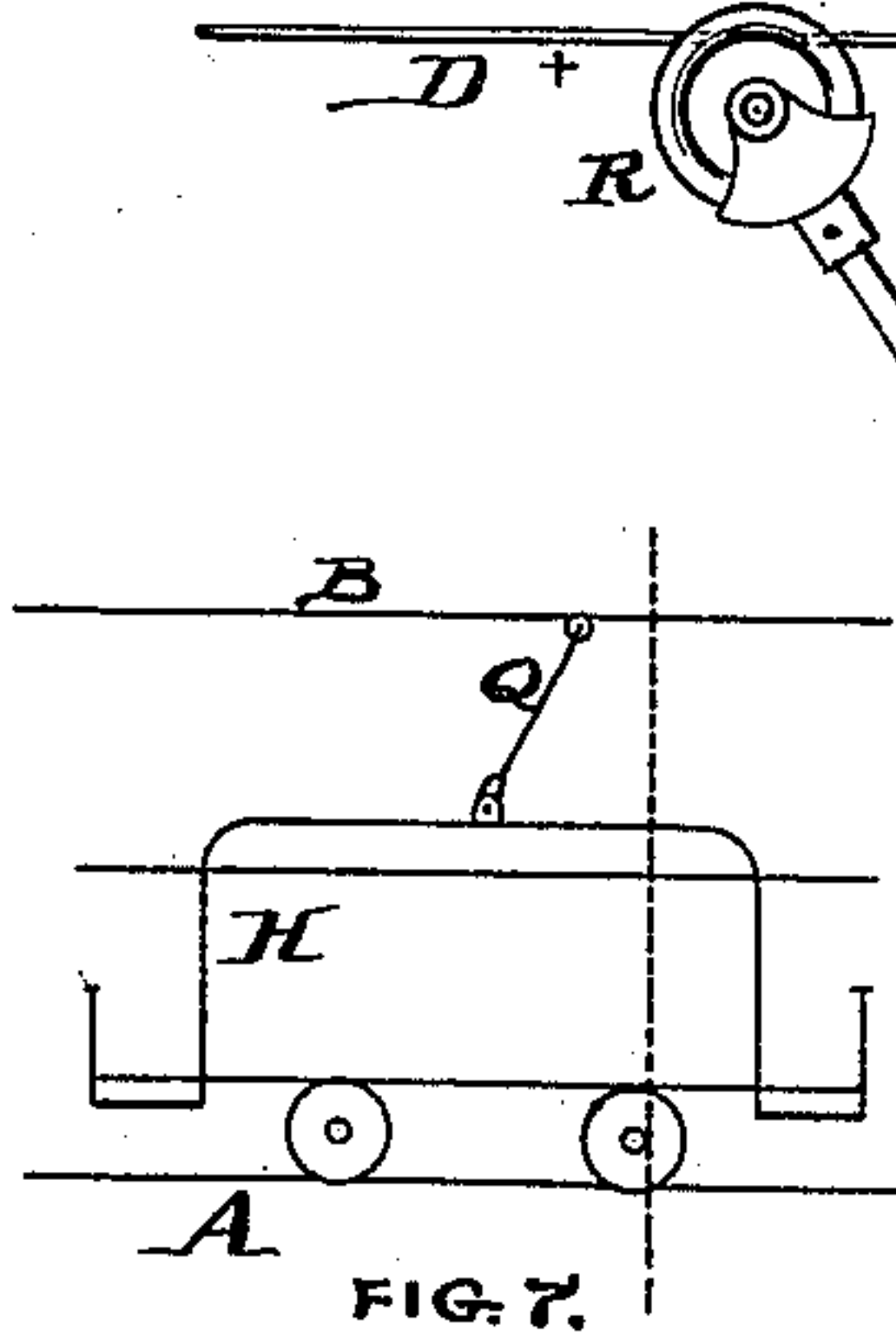
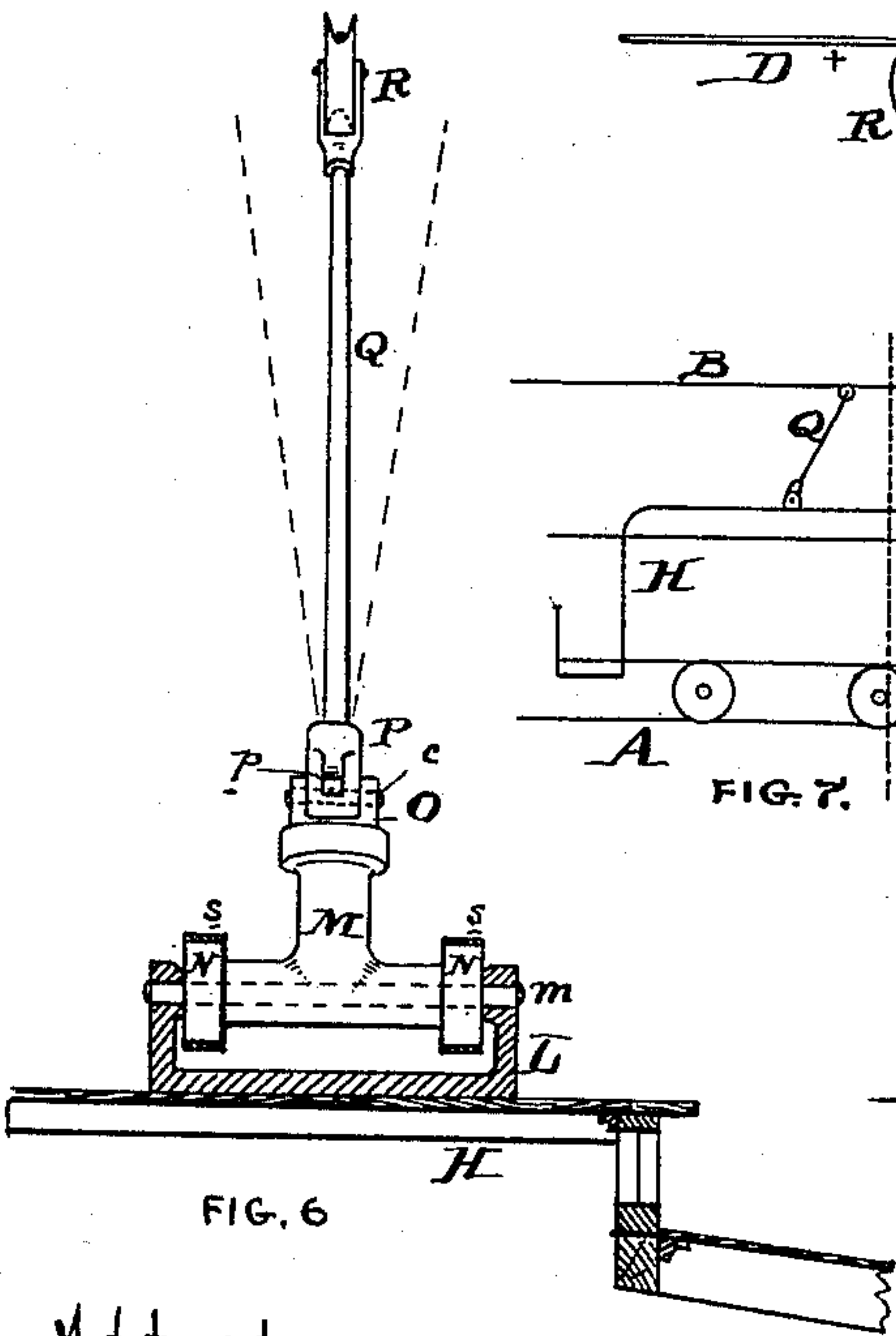
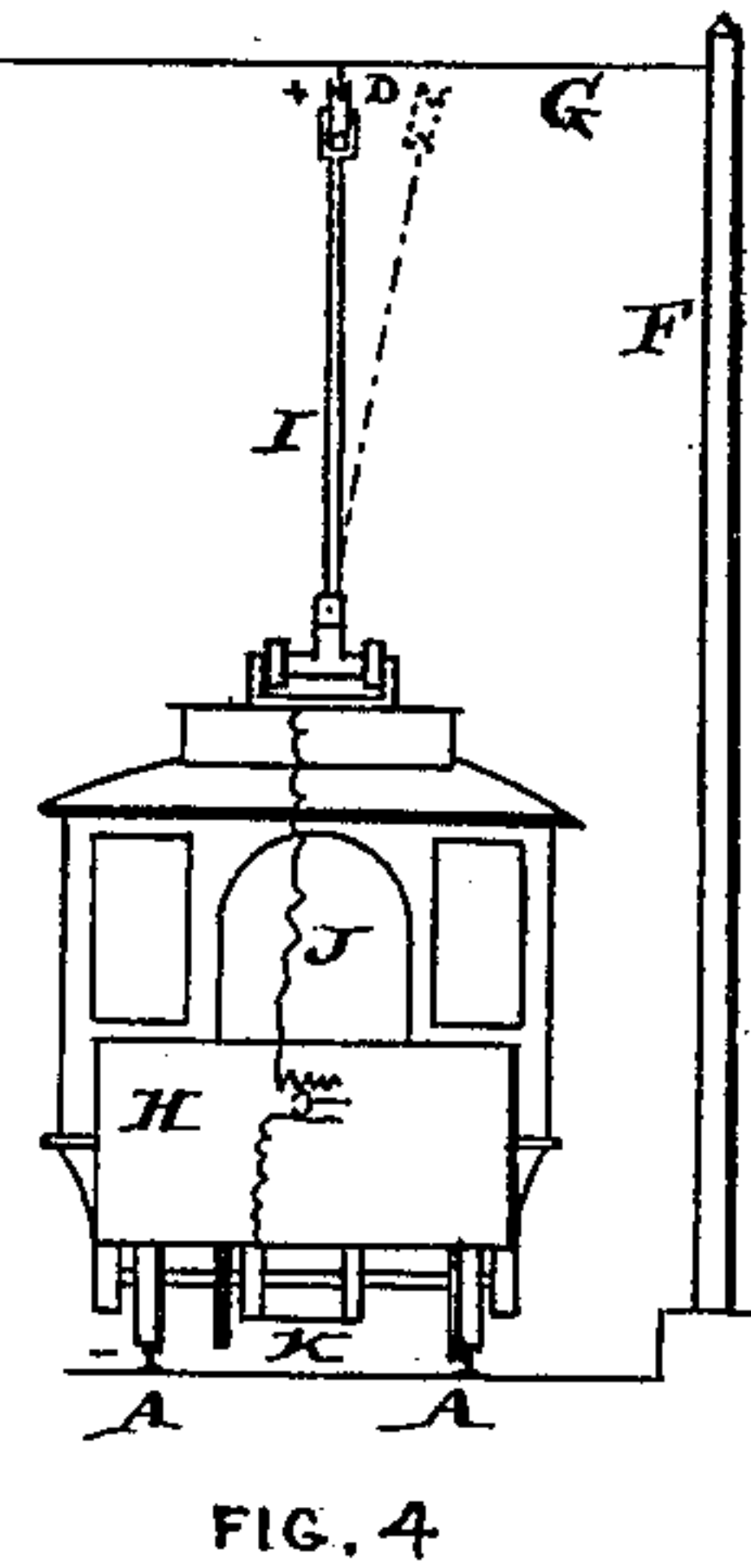
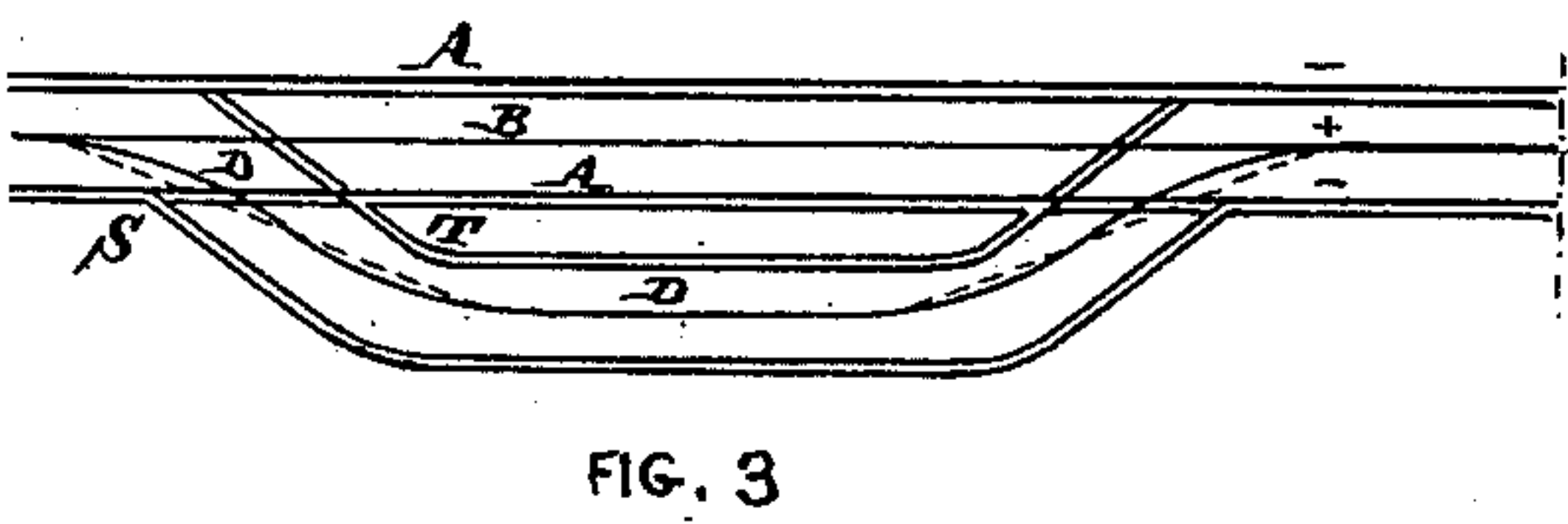
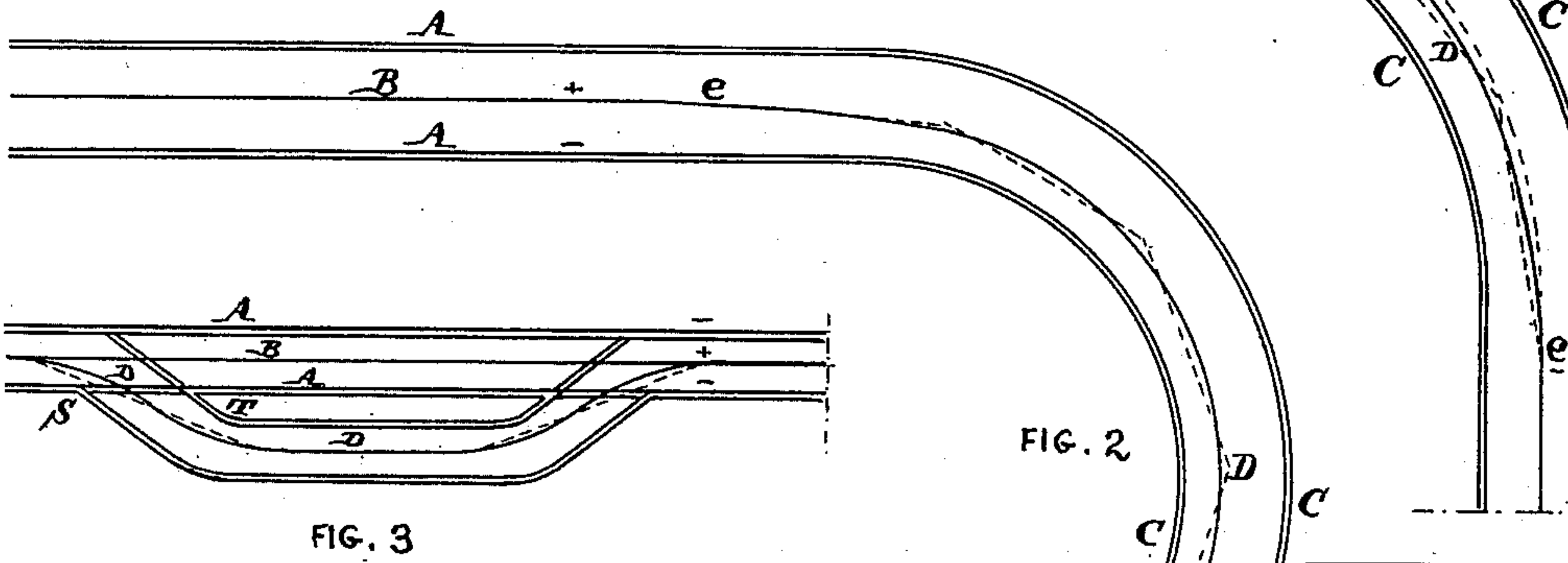
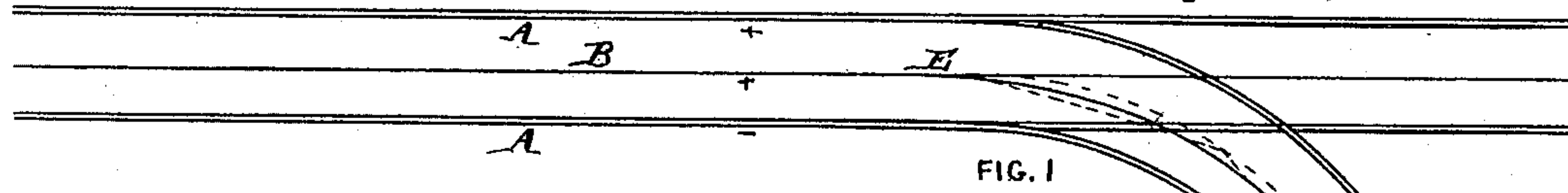


(No Model.)

R. M. HUNTER.  
ELECTRIC RAILWAY.

No. 451,402.

Patented Apr. 28, 1891.



Attest:  
S. T. Yerkes.

John A. Bramley

Inventor

*R. M. Hunter*



# UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO  
THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

## ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 451,402, dated April 28, 1891.

Application filed December 2, 1890. Serial No. 373,284. (No model.)

*To all whom it may concern:*

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia, in the State of Pennsylvania, have invented an Improvement in Electric Railways, of which the following is a specification.

My invention has reference to electric railways; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

This application (Case 187) relates to certain improvements applicable to railways employing a suspended working-conductor and an upwardly-extending current-collecting device carried by the car making a traveling contact preferably with the under side of the suspended conductor.

One part of my invention consists in arranging the conductor or conductors at an elevation above the railway track or tracks and at the curves, bringing the suspended conductor or conductors closer to the inner rail than the relative position occupied by the same conductor or conductors on the straight portions of the railway. This improvement is applicable to cases where a branch leaves the main track, where a single track is looped, where a track passes around a corner of a street, and where a turn-out or siding is arranged upon the main track. The suspended conductor may be supported in any suitable manner upon posts or cross-wires. Connection is made with the suspended conductor by an upwardly-extending current-collector arm having a contact device at its free end and connected to the car with provision for lateral movement. As the car passes about the curves the car-body is naturally shifted toward the center of the radius of said curve, and to compensate for this and not have too much tendency for the collector to leave the conductor the suspended conductor is also arranged more toward the center of the radius or inner rail at the curved portions of the railway to correspond to and compensate for the lateral shifting of the car-body relative to the center line of the railway. As on curves it is impossible in ordinary practice to accurately curve or locate the suspended conductor, it becomes

necessary to have provision for lateral movement of the free end of the current-collector. It is evident that if from any cause the suspended conductor were placed to one side of both rails of the track the curved portion of the suspended conductor would be moved farther from the inner rail if it is adjacent to the said inner rail, or if adjacent to the outer rail it would approach the outer rail. A fundamental rule is that the conductor is brought nearer the center of curvature of the track than it would occupy if not shifted from its relative position with the rails on the straight portions of the track. The upwardly and rearwardly extending current-collecting arm has its contact-wheel or part that moves in contact with the suspended conductor arranged to preferably travel forward of a vertical plane through the rear axle. The current-collector consists, essentially, of a frame secured to the car, and to which is journaled on a transverse axis a movable frame having an upwardly-extending journal portion held upright by the action of springs. On this journal portion is carried a pivot-piece with provision for rotary motion about an axis arranged in the place of travel of the car, and to this pivot-piece is journaled on a transverse axis a socket-piece carrying the long upwardly-extending arm, upon the free end of which is secured the contact device, preferably formed of a grooved roller. The socket-piece is permitted to have some movement upon its axis, so as to permit the arm to trail backward. This construction, while pressing the contact device upwardly with a spring action, also permits the said arm to move laterally at its free end by swinging about the axis of the pivot-piece on the transversely-journaled spring-actuated frame.

Referring to the drawings, Figure 1 is a plan view of a railway having a branch track embodying my invention. Fig. 2 is a similar view of a looped track embodying my invention. Fig. 3 is a similar view of a main track and turn-out embodying my invention. Fig. 4 is a cross-section of a railway, showing a car having a current-collecting device and embodying my invention. Fig. 5 is a side elevation of a current-collecting device embody-



ing my invention. Fig. 6 is a cross-section of same. Fig. 7 is a side elevation of a car and current-collector.

A A are the track-rails, and ordinarily are the return-conductors of the system.

B are the suspended positive working-conductors. Usually the conductors B on the straight portions of the track would be arranged above the middle of the track; but this is not essential.

C C represent the curved portions of the tracks, and D is the curved positive conductor continued from the conductors B, with which junction is made at *e* E. Where a branch or turn-out occurs, the point E or place of junction of conductors B and D would be furnished with a switch of any suitable or well-known construction. The curved portions D of the suspended conductor are arranged closer to the inner rail of the track than is the case with the conductor B with reference to the continuation of the same rail on the straight portion of the track. The curved portion D of the suspended conductor is thus bodily brought nearer to the center of curvature at the curved portion of the track than it would occupy if continued around the curve, maintaining the same relative position which it occupies in the straight portion of the track. The curved dotted line in Fig. 1 indicates on the curve the position the curved conductor would occupy if continued around the curve, maintaining the same relative position with the rails occupied by the part B. The solid line D shows how the conductor is shifted to the inner side of the curve.

In the case of the siding shown in Fig. 3 there is a reverse curve; but the same general features are carried out. The conductor D is relatively nearer the inner parts S T of the track-curve than the outer parts. The suspended conductors D B are supported in any suitable manner, but preferably so as to expose the under side for continuous contact. As shown in Fig. 4, the conductor is suspended from a cross-wire G, secured to the upper ends of posts F. The particular method of support is immaterial to my invention. In practice the curve of the suspended conductor is obtained by connecting short straight portions meeting each other at an angle, as indicated in dotted lines in Figs. 1, 2, and 3.

H is the electrically-propelled car, and is supported upon wheels in the usual ways, either upon four wheels or upon two trucks. I is an upwardly-extending current-collecting device connected to the roof of the car, with provision for vertical and lateral movement.

J is a motor-circuit carried on the car and leading current from the collector to the motor. The motor-circuit may have the usual current-regulator in it for controlling the speed and power of the motor.

The current-collector arm is preferably so constructed and arranged upon the car that the contact part or wheel which runs against the under side of the suspended conductor

shall come over or in front of a vertical plane through the rear axle, as indicated in Fig. 7. The nearer the contact-wheel of the collector is above the center of the wheel-base of the car the greater will be the displacement of the suspended conductor on the curve toward the center of curvature of the track. This current-collector I will now describe in detail.

To the roof of the car H is secured a plate L having journals, in which is supported a transverse axle or shaft *m*. Upon this shaft *m* is journaled a movable frame M, having an upwardly-extending journal-socket *o*. This frame M is also provided with wheels N N, about which steel bands *s s* pass in opposite directions, one end of each band being secured to the respective wheels and the other ends to springs S', the tension of which may be adjusted by screws *h* and nuts *k*. When one of these springs is acting on the frame M, the other is out of action, or at least has no material effect upon the movements of the trolley. Journaled in the journal-socket *o* is the pivot-piece O, to which is journaled on a transverse axis *c* the socket-piece P, having the feet or arms *p p* to limit its rocking motion by striking upon the frame M.

Q is an upwardly-extending arm secured at its lower end in the socket-piece P and carrying at its upper or free end the grooved roller-contact R. By the construction shown the arm Q will extend rearwardly and will always assume an angle to the central line of the journal of the pivot-piece O, which imparts to it the capacity for lateral movement about the said central line as an axis. By the pivot *c* the arm Q may be thrown forward or backward and have a trailing position with respect to either end of the car.

I do not limit myself to the details of construction of the current-collecting device, as they may be modified in various ways without departing from my invention.

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

1. In an electric railway, a railway-track having straight and curved portions, in combination with a conductor arranged along the railway and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway.

2. In an electric railway, a railway-track having straight and curved portions, in combination with supporting-poles and a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway and presenting an unobstructed under



surface and supports from the poles to the upper part of the conductor.

3. In an electric railway, a railway-track having straight and curved portions, in combination with a conductor arranged along the railway and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device carried by the car and making a traveling contact with the conductor.

4. In an electric railway, a railway-track having straight and curved portions, in combination with a conductor arranged along the railway and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device connected to the car with provision for lateral movement and making a traveling contact with the conductor.

5. In an electric railway, a railway-track having straight and curved portions, in combination with supporting-poles, a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the under surface of the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway and presenting an unobstructed under surface, supports from the poles to the upper parts of the conductor, an electrically-propelled car, and an upwardly-extending current-collecting device arranged above the roof of the car and making a traveling connection with the under surface of the suspended conductor.

6. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway and having its under surface unobstructed, an electrically-propelled car, and an upwardly-extending and laterally-movable current-collecting device arranged above the roof of the car and making a traveling connection with the under surface of the suspended conductor.

7. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track

than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device making an underrunning contact with the conductor, consisting of an upwardly-extending arm movably connected with the car so as to extend above its roof, and movable both vertically and laterally, and provided upon its free end with a contact device which presses against the under side of the conductor.

8. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device carried by the car, consisting of a long upwardly and rearwardly extending spring-actuated arm capable of lateral movement and making a traveling contact with the suspended conductor.

9. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device carried by the car, consisting of a long upwardly and rearwardly extending spring-actuated arm capable of lateral movement and provided with a grooved roller upon its free end making a traveling contact with the under side of the suspended conductor.

10. In an electric railway, the combination of the track-rails, a suspended conductor arranged along said track-rails, but out of parallel at one or more places with respect to said track-rails, an electrically-propelled car, and an upwardly-extending current-collecting device connected to the car with provision for lateral movement and making an under running contact with the conductor.

11. In an electric railway, the combination of the track-rails, a suspended conductor arranged along said track-rails, but out of parallel at one or more places with respect to said track-rails, an electrically-propelled car, and an upwardly-extending current-collecting device connected to the car with provision for both vertical and lateral movement and making an under running contact with the conductor.

12. The combination of a railway, a suspended conductor extending along the railway, a car, and a current-collecting device



carried by the car and making a traveling contact with the suspended conductor, consisting of a spring-actuated frame having a transverse axis by which it is connected to the car, and an upwardly-extending arm having a contact part at its upper end and connected at its lower end to the spring-actuated frame on an axis arranged at an angle to the transverse axis of said frame.

13. The combination of a railway, a suspended conductor extending along the railway, a car, and a current-collecting device carried by the car and making a traveling contact with the suspended conductor, consisting of a spring-actuated frame having a transverse axis by which it is connected to the car, a pivot-piece supported by the spring-actuated frame on an axis arranged at an angle to the transverse axis of said frame, and an upwardly-extending arm having a contact part at its upper end and connected at its lower end to the pivot-piece.

14. The combination of a railway, a suspended conductor extending along the railway, a car, and a current-collecting device carried by the car and making a traveling contact with the suspended conductor, consisting of a spring-actuated frame having a transverse axis by which it is connected to the car, a pivot-piece supported by the spring-actuated frame on an axis arranged at an angle to the transverse axis of said frame, and an upwardly-extending arm having a contact part at its upper end and connected at its lower end to the pivot-piece on a transverse axis.

15. The combination of the supporting-plate L, having the shaft or axis *m*, the spring-actuated frame M, supported on said axis *m*, the pivot-piece O, supported by the frame M and movable on an axis arranged at right angles to the axis *m*, and an upwardly-extending arm Q, having a contact part at its free end and hinged at its lower end to the pivot-piece O on a transverse axis *c* and provided with stops to limit its motion on the axis *c*.

16. A trolley for an electrically-propelled car, consisting of a primary part having a transverse axis by which it is hinged to the car, combined with a secondary part hinged to the primary part on an axis in the plane of travel of the car and at an angle to the transverse axis, and a tertiary part hinged to the secondary part on a transverse axis and carrying at its free end a contact part.

17. A trolley for an electrically-propelled car, consisting of a primary part having a transverse axis by which it is hinged to the car on a transverse axis, combined with a secondary part hinged to the primary part on an axis in the plane of travel of the car and at an angle to the transverse axis, a tertiary part having a transverse axis by which it is hinged to the secondary part and carrying at its free end a contact part, and a spring to move the primary part about its transverse

axis and press the tertiary part upwardly at its free end.

18. The combination of a railway, a suspended conductor extending along the railway, a car, and a current-collecting device carried by the car and making a traveling contact with the suspended conductor, consisting of a spring-actuated frame having a transverse axis by which it is connected to the car and an upwardly-extending arm having a contact part at its upper end and having at its lower end a transverse axis, and a pivot-piece to which the transverse axis of the arm is connected, in turn supported by the spring-actuated frame on an axis arranged at an angle to the transverse axis of said frame, and in which the contact part of the arm shall normally be at or forward of a vertical line through the rear axle.

19. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device carried by the car, consisting of a long upwardly and rearwardly extending spring-actuated arm capable of lateral movement and provided with a grooved roller upon its free end making a traveling contact with the under side of the suspended conductor, and in which the grooved roller of the arm is normally at or forward of a vertical line through the rear axle.

20. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track than what would result if it were continued around the curve with the same relative position to the rails it occupies on the straight portions of the railway, an electrically-propelled car, and a current-collecting device making an underrunning contact with the conductor, consisting of an upwardly-extending arm movably connected with the car so as to extend above its roof, and movable both vertically and laterally, and provided on its free end with a contact device which presses against the under side of the conductor, and in which the contact part of the arm shall normally be at or forward of a vertical line through the rear axle.

21. In an electric railway, a railway-track having straight and curved portions, in combination with a suspended conductor arranged along the railway at an elevation above the track and having its curved portion arranged closer to the center of curvature of the track



than what would result if it were continued  
around the curve with the same relative posi-  
tion to the rails it occupies on the straight  
portions of the railway, an electrically-pro-  
5 pelled car, and a current-collecting device  
carried by the car, consisting of a long up-  
wardly and rearwardly extending spring-  
actuated arm capable of lateral movement  
and making a traveling contact with the sus-  
10 pended conductor, and in which the contact  
part of the arm shall normally be at or for-  
ward of a vertical line through the rear axle.

22. In an electric railway, a railway-track  
having straight and curved portions, in com-  
15 bination with a suspended conductor arranged  
along the railway at an elevation above the  
track and having its curved portion arranged  
closer to the center of curvature of the track  
than what would result if it were continued  
20 around the curve with the same relative posi-  
tion to the rails it occupies on the straight  
portions of the railway, an electrically-pro-  
pelled car, and an upwardly-extending and  
laterally-movable current-collecting device  
25 arranged above the roof of the car and mak-  
ing a traveling connection with the suspended  
conductor, and in which the contact part of  
the arm shall normally be at or forward of a  
vertical line through the rear axle.

30 23. In an electric railway, a railway-track  
having straight and curved portions, in com-  
bination with a suspended conductor arranged  
along the railway at an elevation above the  
track and having its curved portion arranged

closer to the center of curvature of the track 35  
than what would result if it were continued  
around the curve with the same relative posi-  
tion to the rails it occupies on the straight  
portions of the railway, an electrically-pro-  
40 pelled car, and an upwardly-extending cur-  
rent-collecting device arranged above the roof  
of the car and making a traveling connection  
with the suspended conductor, and in which  
the contact part of the arm shall normally be  
at or forward of a vertical line through the 45  
rear axle.

24. In an electric railway, a railway-track  
having straight and curved portions, in com-  
bination with a conductor arranged along the  
railway and having its curved portion ar- 50  
ranged closer to the center of curvature of  
the track than what would result if it were  
continued around the curve with the same  
relative position to the rails it occupies on the  
straight portions of the railway, an electri- 55  
cally-propelled car, and a current-collecting  
device connected to the car with provision for  
lateral movement and making a traveling con-  
tact with the conductor, and in which the con-  
tact part of the arm shall normally be at or 60  
forward of a vertical line through the rear  
axle.

In testimony of which invention I have here-  
unto set my hand.

R. M. HUNTER.

Witnesses:

ERNEST HOWARD HUNTER,  
JOHN A. BRAMLEY.