No. 768,357. PATENTED AUG. 23, 1904.

F. B. COREY.

ELECTRIC TRACK BRAKE.

APPLICATION FILED SEPT. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 3.

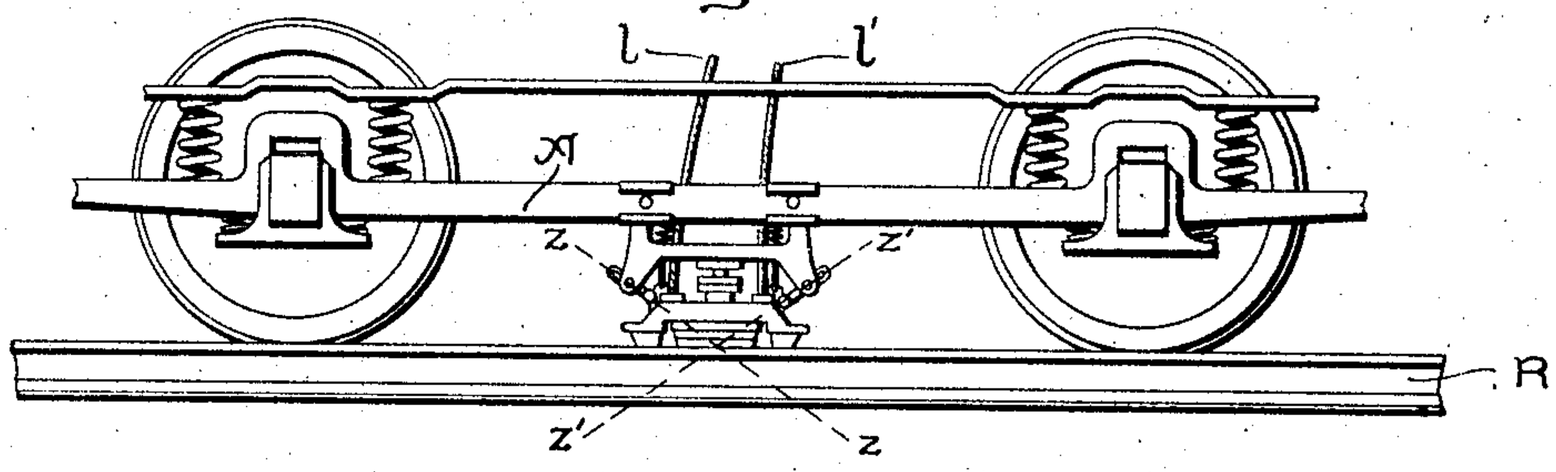


Fig. 2.

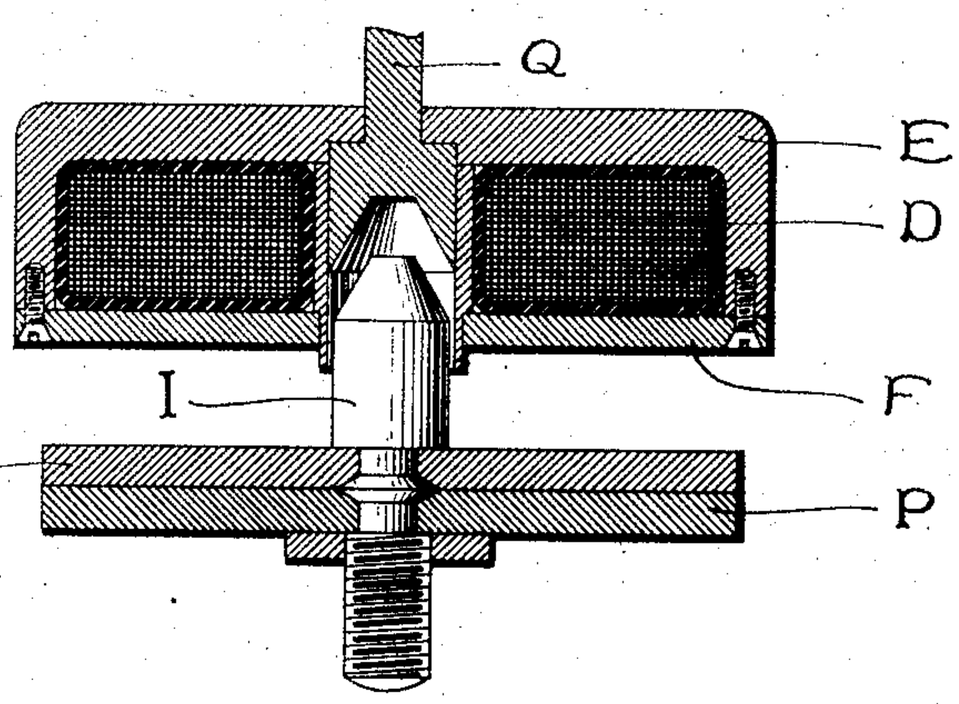
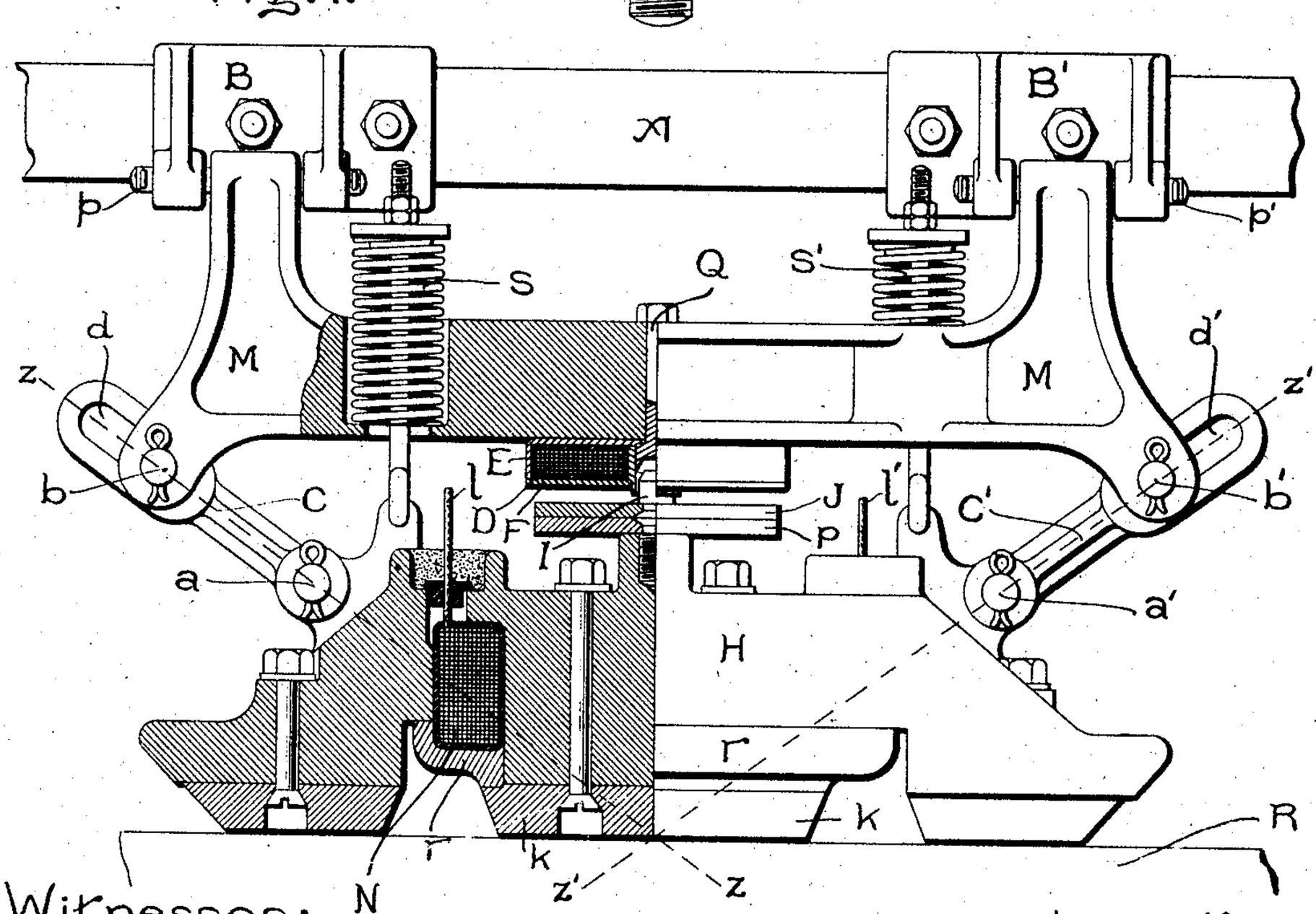


Fig. 1.



Witnesses:
George A. Thornton.
Helen Orford

Inventor:
Fred B. Corey
by Albert G. Davis
Atty.

No. 768,357. PATENTED AUG. 23, 1904.

F. B. COREY.

ELECTRIC TRACK BRAKE.

APPLICATION FILED SEPT. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 2.

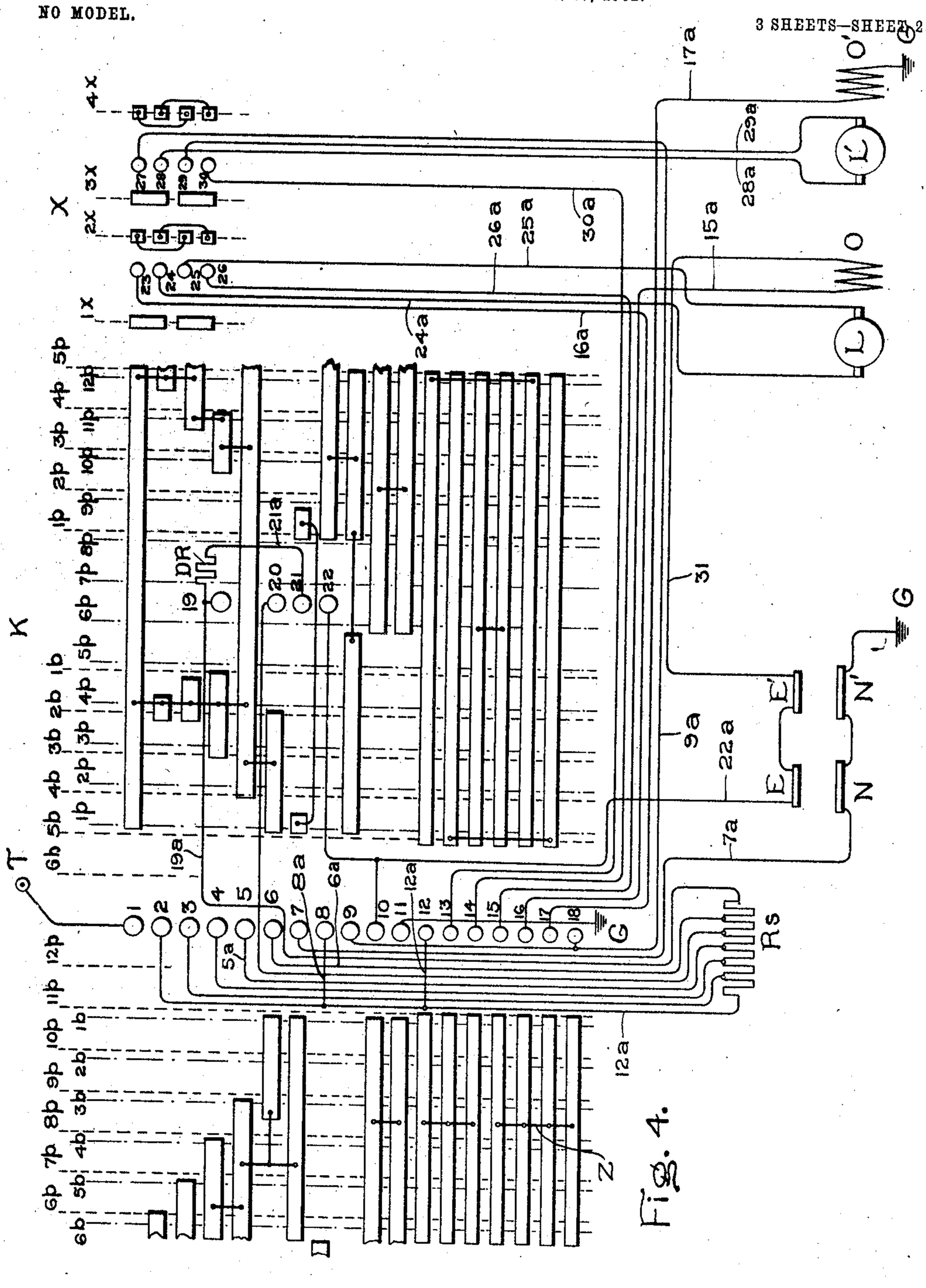


Fig. 4.

Witnesses:
George A. Thornton.
Helen Orford

Inventor:
Fred B. Corey,
by Albert G. Davis
Atty.

No. 768,357. PATENTED AUG. 23, 1904.

F. B. COREY.

ELECTRIC TRACK BRAKE.

APPLICATION FILED SEPT. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

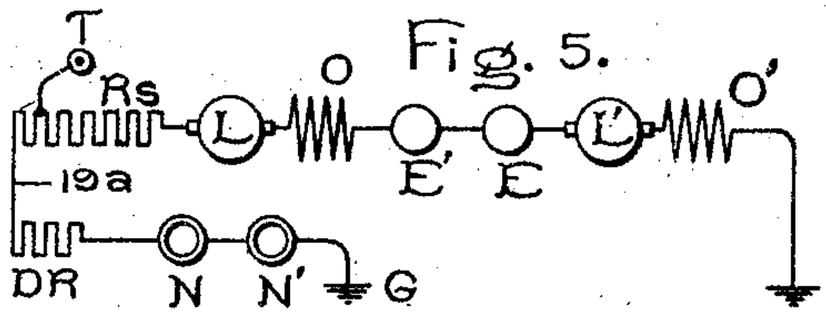


Fig. 14.

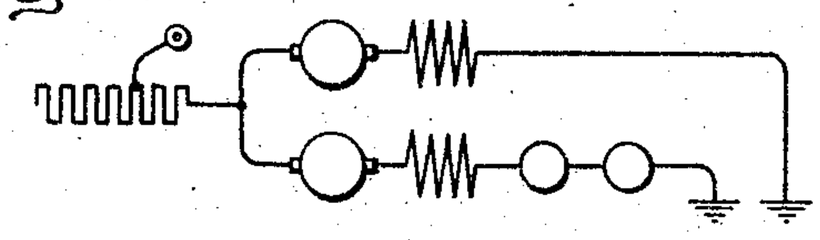


Fig. 6.

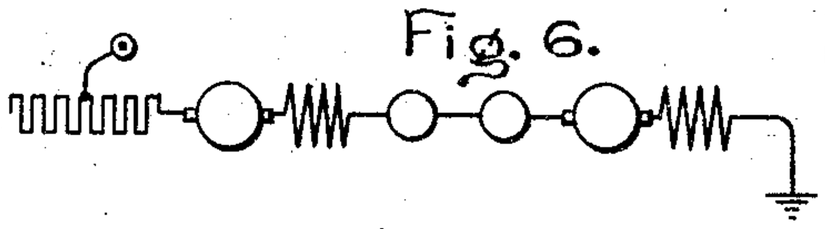


Fig. 15.

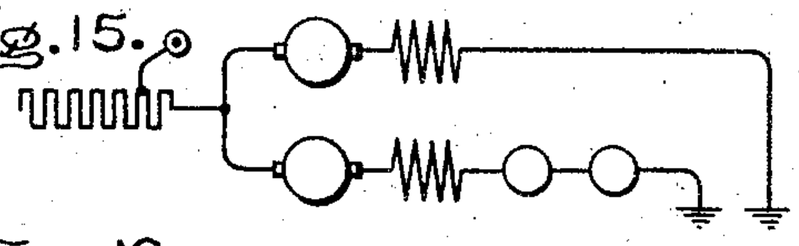


Fig. 7.

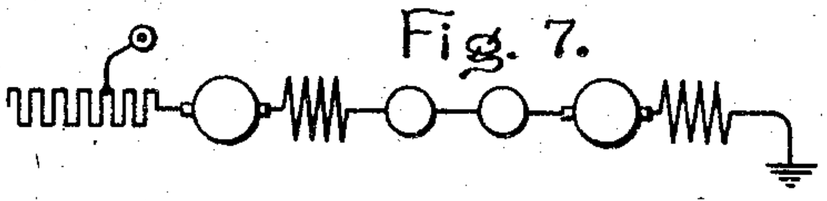


Fig. 16.

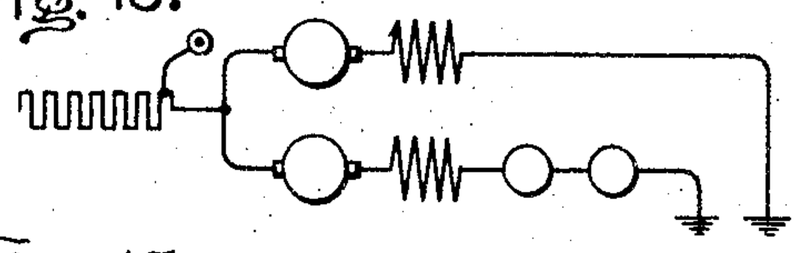


Fig. 8.

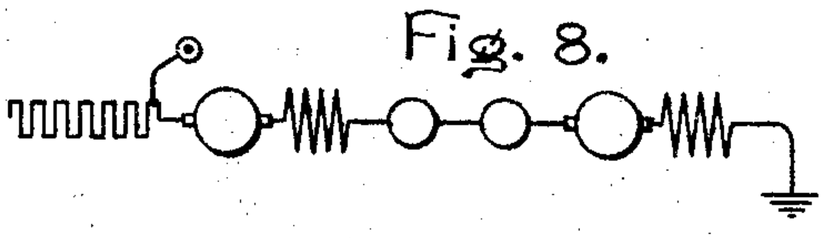


Fig. 17.

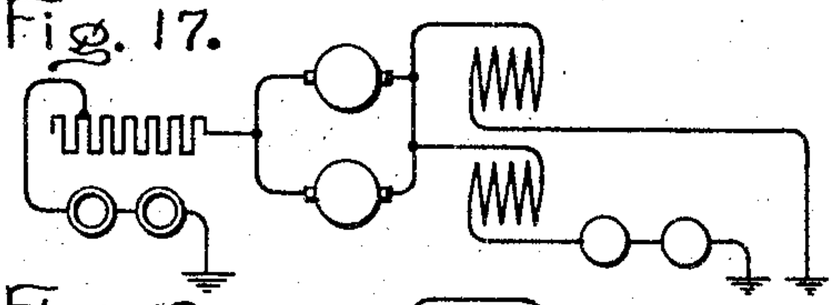


Fig. 9.

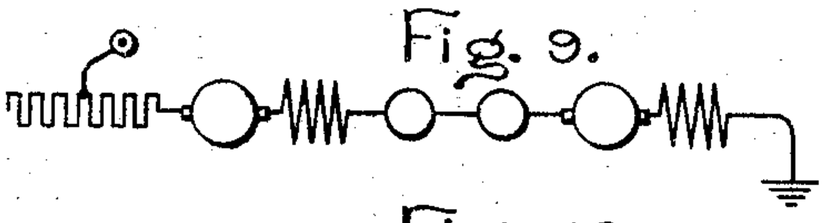


Fig. 18.

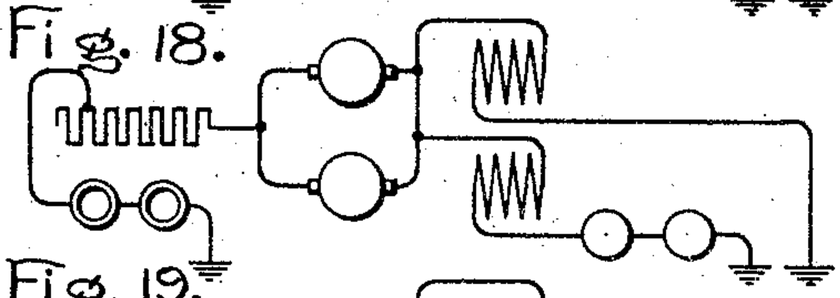


Fig. 10

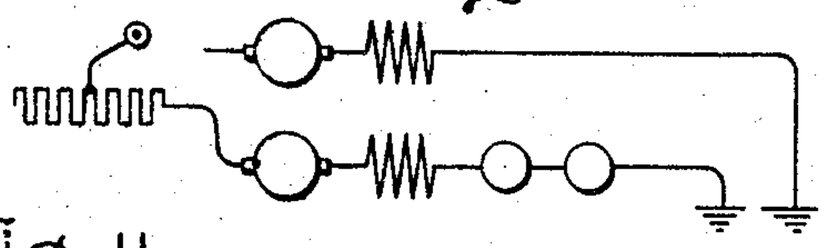


Fig. 19.

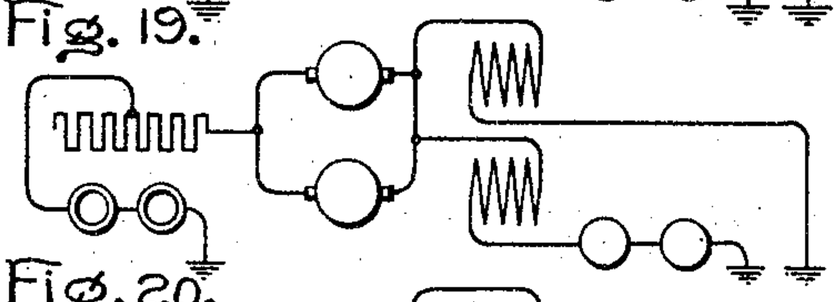


Fig. 11.

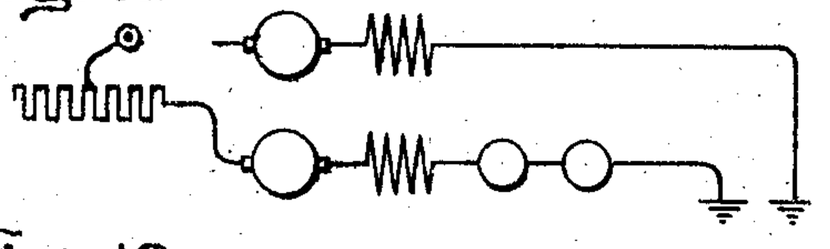


Fig. 20.

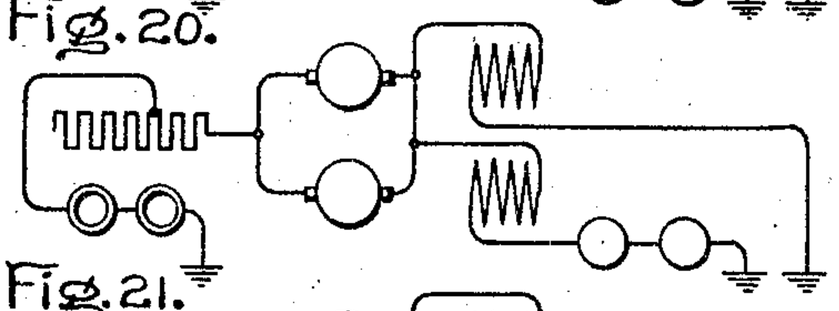


Fig. 12.

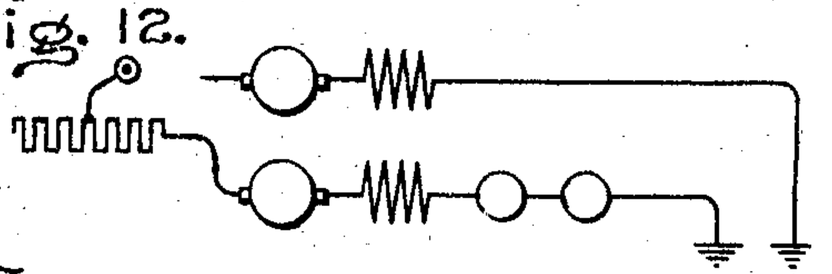


Fig. 21.

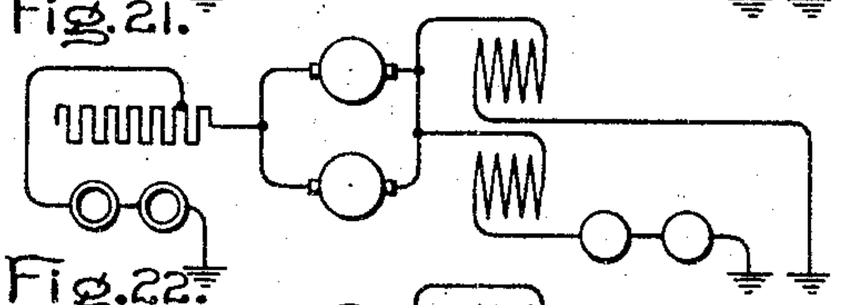


Fig. 13.

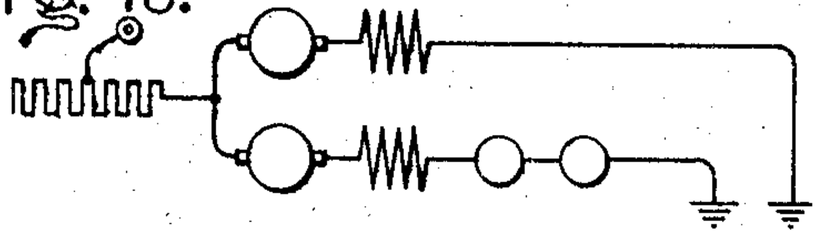
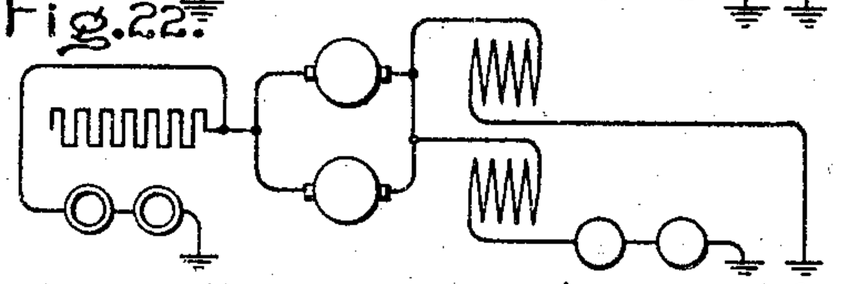


Fig. 22.



Witnesses:
Helen Orford
Chas. E. Lord

Inventor:
Fred B. Corey,
by Albert G. Davis
Atty.

No. 768,357. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

FRED B. COREY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC TRACK-BRAKE.

SPECIFICATION forming part of Letters Patent No. 768,357, dated August 23, 1904.

Application filed September 27, 1902. Serial No. 125,027. (No model.)

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Track-Brakes, of which the following is a specification.

This invention relates to electric track-brakes for railway-cars; and one of its objects is the provision of a brake which will readily adjust itself to various conditions of the track, such as depressions or elevations or where the position of the track changes with relation to the car, as is the case on curves, and since each of a plurality of shoes upon a car may require different adjustments at the same time I make them independently movable in order that this object may be completely realized.

It is a further object of my invention to render brakes as described compact and readily removable, and to this end I provide a brake which is self-contained and supported in such a manner as to be readily attached or detached whenever desired.

In service where the cars run at high speeds it is necessary to secure reasonable wear of the brake-shoes that they be elevated from the track when the car is running and the brakes out of service. To accomplish this, lifting means are provided. In order that the desired flexibility of movement of the shoe with relation to its lifting means may be secured, flexible connections are provided between them; and it is a further object of my invention to provide a connection which is especially adapted to this class of work.

In a brake equipment of the character described it is necessary to good operation that the shoe be lifted from the track at all times when the car is being propelled by its motors; and it is a further object of my invention to so connect means employed for this purpose that they will be operated by motor-current—that is, current which flows through the motor—and therefore will operate to lift the shoes whenever power is supplied to the motors. Further, I have found that to secure the maximum braking effect and life of the shoe the line of action of the car upon the shoe—that is, the line of action of the force applied to the shoe due to the momentum of the car when the shoe is in contact with the rail—should pass through the center of the braking-face of the shoe; and it is a further object of my invention to so construct and arrange the parts that this will be approximately accomplished.

Referring to the accompanying drawings, in which I have illustrated my invention in what I consider its best application, Figure 1 is an elevation, partly in section, of my improved brake. Fig. 2 is a sectional view, on a larger scale, of my improved lifting-solenoid and connection. Fig. 3 is an elevation of the running-gear of a car, showing how my improved brake may be secured thereto. Fig. 4 is a diagram illustrating the connections of a system of control which may be employed on a car to which my invention is applied; and Figs. 5 to 22 show the electrical connections for the various positions of the controller, in which the lifting-coils are represented by the single and the main brake-coils by the double small circles.

I will first describe the construction of my track-brake, reference being had to Figs. 1, 2, and 3. A is a portion of the car-body or running-gear, to which the brake may be suitably secured. Secured to A are brackets B and B′, to which are hinged by pins *p* and *p′* the laterally-swinging supporting member M for brake-shoe H. Shoe H is spring-suspended from member M by springs S and S′. It is also flexibly connected thereto by the "braking-arms" C and C′, so called, since it is through those arms that the retarding action of the brake is transmitted to the car. They are flexibly secured to both the shoe and member M by means of the pins *a* and *a′*, which pass through cylindrical holes in both the arms and shoe H, and also by pins *b* and *b′*, which pass through circular holes in member M and the slots *d* and *d′*, this arrangement giving the desired flexibility of movement to the shoe H. The main body of the brake-shoe H, which may be made of any magnetizable material, has within it a channel into

which is fitted the main brake-coil N, which is secured in place by the non-magnetizable shield *r*, this shield being in turn held in position by means of a removable braking-face *k*, which is bolted to the main body of the brake. Other portions of the shoe which would be subject to wear from contact with the rail R are also supplied with braking-faces which are similarly bolted to the main body of the brake. Connected to coil N are conductors *l* and *l'*, which pass through openings in the top of the brake-shoe, which openings are then sealed with insulating washers and compound, as shown. Secured to the member M by bolt Q is a lifting-coil D, inclosed in a magnetic casing E, to the bottom of which casing is secured the non-magnetizable piece F. Adapted to be attracted by solenoid D is plunger I, which is adapted to enter solenoid D and to which the plate J is secured. The plate P, adapted to be magnetically secured to plate J, may be attached to any device which it is desired to actuate. In this case it is rigidly secured to the magnetizable mass of shoe H. This flexible connection permits transverse movement of the shoe, which would not be possible were the plunger I directly connected to shoe H, and permits a smaller lifting-solenoid to be used than would be possible if the plunger I were omitted, the cause of the latter being the large air-gap which it is necessary for solenoid D to overcome in establishing a magnetic circuit through plate P. With the device shown the desired flexibility of movement of the shoe H with regard to member I is obtained by the sliding of plates J and P on each other, and this whether they are magnetized or not.

The brake is so constructed and arranged that the line of action of the car upon the brake-shoe when that shoe is upon the rail passes through the center of the braking-face of the shoe, as indicated by the dotted lines *z z* and *z' z'* of Figs. 1 and 3. With a given adjustment irregularities in the tracks may cause small departures from this condition; but the standard of track construction is such that it will be approximately maintained and near enough for practical purposes.

Referring to Figs. 4 to 22, inclusive, in Fig. 4 the apparatus connections are shown in diagram, the controller-cylinders being represented as developed upon a plane surface, their contacts being shown as rectangles, while the stationary contacts are shown as circles, as is customary in such illustrations. K is the main controller, X the reversing-switch, L and L' the armatures of the motors, and O and O' their respective fields. E and E' are the lifting-solenoids of the brakes, while N and N' are the main brake-coils for securing adhesion to the track. Ground is represented throughout in the usual manner and designated by G. The movable contacts of cylinder K extend from one side of the row of stationary contacts 1 to 18 around the cylinder to the opposite side of said row of contacts. Those movable contacts which extend across the dividing-line between those shown on the left and those shown on the right of the row of stationary contacts are represented as broken at their left and right ends, respectively. The various contact positions of the contacts or segments of the controller-cylinder with the two stationary rows of contacts 1 to 18 and 19 to 22 are represented by the dotted lines passing from top to bottom of the controller. The lower row of numerals 1^p to 12^p, inclusive, represent the power-contact positions for stationary contacts 1 to 18, while the upper row of numerals 1^p to 12^p indicate the power-contact positions of rows of stationary contacts 19 to 22, inclusive. In a similar manner lower row of numerals 1^b to 6^b represent the brake-contact positions of stationary contacts 1 to 18, inclusive, while upper row of numerals 1^b to 6^b, inclusive, represent the brake-contact positions of the stationary contacts 19 to 22, inclusive. The contact positions of reversing-switch X are represented by the lines 1^x, 2^x, 3^x, and 4^x. The controller being in the "off" position, as shown, the movable contacts of reversing-switch X may be moved to the right, thus bringing stationary contacts 23 to 26, inclusive, and 27 to 30, inclusive, in contact positions represented by lines 1^x and 3^x, respectively. If now it is desired to apply power to propel the car, the movable contacts of controller K may be moved to the left until stationary contacts 1 to 18, inclusive, will occupy the contact position represented by the vertical line 1^p of the lower row of numerals, while the row of stationary contacts 19 to 22, inclusive, will occupy the contact position represented by vertical line 1^p of the upper row of numerals. Circuits can now be traced from trolley T through stationary contacts 1 and 6 and conductor 6^a to resistance R^s. Here the circuit divides into two paths, one going through one part of the resistance RS, conductor 19^a, resistance DR, conductor 21^a, stationary contact 21, stationary contact 7, conductor 7^a, and main brake-coils N and N' to ground. The other path may be traced through the remainder of resistance R^s, conductor 12^a, stationary contact 12, stationary contact 16, conductor 16^a, stationary contact 23, stationary contact 24, conductor 24^a, armature L, conductor 25^a, stationary contact 25, stationary contact 26, conductor 26^a, stationary contact 14, stationary contact 15, conductor 15^a, field O, conductor 31, lifting-coils E' and E, conductor 22^a, stationary contact 22, stationary contact 9, conductor 9^a, stationary contact 27, stationary contact 28, conductor 28^a, armature L', conductor 29^a, stationary contact 29, stationary contact 30, conductor 30^a, stationary contact 13. stationary

contact 17, conductor 17^a, and field O′ to ground. The apparatus is then connected as shown in Fig. 5, the main brake-coils N and N′ being temporarily connected for the purpose of removing any magnetism which they may retain, and thus secure their release from the rails. The next position of controller K is represented by the lines 2^p of the upper and lower rows of numerals, and in this position circuits may be traced from trolley T through stationary contact 5, conductor 5^a, a portion of resistance RS less than that included in circuit in the previous position, conductor 12^a, stationary contact 12, stationary contact 16, conductor 16^a, stationary contact 23, stationary contact 24, conductor 24^a, armature L, conductor 25^a, stationary contact 25, stationary contact 26, conductor 26^a, stationary contact 14, stationary contact 15, conductor 15^a, field O, conductor 31, lifting-coils E′ and E, conductor 22^a, stationary contact 22, contact 9, conductor 9^a, contact 27, contact 28, conductor 28^a, armature L′, conductor 29^a, contact 29, contact 30, conductor 30^a, contact 13, contact 17, conductor 17^a, and field O′ to ground. The connections now being as shown in Fig. 6, it will be noted that the main brake-coils N N′ as well as a portion of the resistance R^s in series with the motors have been cut out. The next position of the controller K is represented by the lines 3^p in both upper and lower rows of numerals, when circuit may be traced as in the next previous position, the only difference being that less of the resistance R^s is included in the motor-circuit. The connections of the apparatus in this position are shown in Fig. 7. In the next position of the controller (designated by the lines 4^p in both rows of numerals) circuits may be traced as in the last two positions, the resistance R^s in this position being entirely cut out. The positions of the controller indicated by lines 5^p, 6^p, 7^p, and 8^p of both rows of numerals are transition positions, the relative connection of apparatus being as shown in Figs. 9, 10, 11, and 12, and it will be noted that throughout this transition period one of the motors is always in circuit, the other being temporarily disconnected, and the lifting-coils are in series with that motor which is never disconnected. This is an advantageous condition, since if the coils were connected in series with the other motor they would become deënergized during the transition period, and thus allow the brake to fall upon the track to be lifted again when the multiple running positions were reached, which is obviously undesirable. The positions of the controller K indicated by the lines 9^p of both rows of numerals is the first multiple running position, and circuits may now be traced as follows: from trolley T through stationary contact 1, stationary contact 5, conductor 5^a, portion of resistance R^s to conductor 12^a, after which the current divides, a portion passing through conductor 8^a, contact 8, contact 9, conductor 9^a, contact 27, contact 28, conductor 28^a, armature L′, conductor 29^a, contact 29, contact 30, conductor 30^a, contact 13, contact 17, conductor 17^a, and field O′ to ground. The other path leads from conductor 12^a through contact 12, contact 16, conductor 16^a, contact 23, contact 24, conductor 24^a, armature L, conductor 25^a, contact 25, contact 26, conductor 26^a, contact 14, contact 15, conductor 15^a, field O, conductor 31, lifting-coils E′ and E, conductor 22^a, contact 10, and contact 11 to ground. The connections of apparatus in this position are shown in Fig. 13. The position of controller K indicated by lines 10^p, 11^p, and 12^p of both rows of numerals operate to successively cut out resistance R^s until in the last-named position this resistance is entirely cut out, the connections in the last three power positions indicated by lines 10^p, 11^p, and 12^p being as shown in Figs. 14, 15, and 16, respectively, the lifting-coils E and E′ in the multiple positions being connected in series with that one of the propelling-motors, as described in connection with the transition positions. The controller is now full on and the car running under maximum power. If now it be desired to apply the brakes, it is first necessary to bring the controller to the off position, as shown in Fig. 4. Then by a continuation of the movement of the controller in this direction the braking positions will be reached. In the first of these, represented by the lines 1^b of both rows of numerals, circuits may be traced from ground through main brake-coils N′ and N, conductor 7^a, contact 7, contact 6, portion of resistance R^s, conductor 12^a, to contact 12. Here the circuit divides into two paths, one of which may be traced through contact 13, conductor 30^a, contact 30, contact 29, conductor 29^a, armature L′, conductor 28^a, contact 28, contact 27, conductor 9^a, contact 18, contact 17, conductor 17^a, and field O′ to ground. The other path can be traced from contact 13 through contact 14, conductor 26^a, contact 26, contact 25, conductor 25^a, armature L, conductor 24^a, contact 24, contact 23, conductor 16^a, contact 16, contact 15, conductor 15^a, field O, conductor 31, lifting-coils E′ and E, conductor 22^a, contact 10, and contact 11 to ground. The apparatus is now connected as shown in Fig. 17, in which it will be seen that the propelling-motors are connected in parallel, the lifting-coils being connected in series with one of them and the circuit of the motors closed through a resistance in series with the main brake-coils N′ and N. The motors now operate as generators driven by the momentum of the car, and in accordance with the well-understood practice in connection with generators of this character an equalizer Z is supplied, this equalizer being established by connecting together the movable contacts which

are in contact with the stationary contacts 15 to 18. Further movement of the controller into the position indicated by the lines 2^b to 6^b of both rows of numerals operates to successively cut out resistance R^s, as shown in the Figs. 18 to 22, which correspond to the successive positions, respectively. In the last of these positions the resistance S is entirely cut out, as shown in Fig. 22. When it is desired to remove the brake, the cylinder K is returned to the off position, as shown in Fig. 4. It will be noted that in the braking position the relation of fields and armatures are reversed from those which exist in the power positions. Since the power required to lift the brake-shoe H from the track is very small, due to the manner in which said brake-shoe is supported on the springs S from the pivoted member M, the force exerted by the solenoid D is negligible as compared with the great force exerted by the solenoid N when the brake is in operation. Therefore the solenoid D is allowed to remain in circuit with at least one of the motors, as above described, in all positions of the controller. By throwing the switch X in the opposite position to that described—that is, so that the lines 2^x and 4^x will cover the rows of stationary contacts 23 to 26 and 27 to 30, respectively—a reversed operation of the motors will be obtained because of the change of relative connections of the armatures and fields of the motor in a manner which is well known in the control of motors.

My invention may have numerous applications and may suffer various modifications. I do not, therefore, wish to be limited to the means or applications shown in the drawings.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a car and a track-brake having a laterally-swinging support, and a shoe yieldingly supported by said swinging support.

2. A track-brake having a laterally-swinging support, and a shoe-spring suspended therefrom.

3. A track-brake having a laterally-swinging support, a shoe-spring suspended therefrom, and braking-arms flexibly connecting said shoe to said support.

4. The combination of a track-brake shoe, a laterally-swinging support therefor, and a lifting means for said shoe mounted upon said support.

5. The combination of a track-brake shoe, a laterally-swinging support therefor, and a solenoid mounted upon said support and adapted to lift said shoe.

6. In a track-brake, a shoe, a solenoid for lifting said shoe, a plunger for said solenoid, and a plurality of magnetically-joined parts securing said plunger to said shoe.

7. The combination of a track-brake shoe, a laterally-swinging support therefor, a solenoid for lifting said shoe mounted upon said support, and flexible means through which said solenoid acts upon said shoe.

8. The combination of a car, rails therefor, a plurality of independently-movable brake-shoes upon said car adapted to engage with said rails, electromagnetic means for lifting said shoes, and flexible connections through which said electromagnetic means acts upon said brake-shoes.

9. In a track-brake, a brake-shoe, a solenoid for lifting said shoe, a plunger for said solenoid, a plate secured to said plunger, and a similar plate secured to said brake-shoe, said plates being adapted to be magnetically secured together.

10. In a track-brake, a brake-shoe, a solenoid for lifting said shoe, a plunger for said solenoid, a plate secured to said plunger, and a similar plate secured to said brake-shoe, said plates being adapted to be secured together by the magnetism of said solenoid.

11. In a track-brake, a brake-shoe, a solenoid for lifting said shoe, a plurality of members through which said solenoid acts on said shoe, certain of said members being plates adapted to be magnetically secured together.

12. The combination of a car, propelling-motors therefor, and a track-brake thereon having a brake-shoe, means for lifting said shoe, and circuit connections by which said means is energized by motor-current.

13. The combination of a car, propelling-motors therefor, and a track-brake thereon having a brake-shoe, a solenoid for lifting said shoe, and circuit connections by which said solenoid is energized by motor-current.

14. The combination of a car, propelling-motors therefor, a track-brake thereon having a brake-shoe, a solenoid for lifting said shoe, and circuit connections by which said solenoid is energized by motor-current derived from the circuit of a motor which is in circuit whenever power is supplied to the car.

15. The combination of a car, propelling-motors therefor, a track-brake having a shoe, a solenoid for lifting said shoe, and circuit connections whereby said solenoid is placed in series with a motor which is in circuit whenever power is supplied to said car.

16. The combination of a railway-car, rails therefor, a track-brake having a laterally-swinging supporting member, a brake-shoe spring suspended therefrom, brake-arms flexibly connecting said shoe and said supporting member, a solenoid mounted upon said supporting member to lift said shoe, a plunger for said solenoid, a plate secured to said plunger, a similar plate secured to said brake-shoe, said plates being adapted to be secured together by the magnetism of said solenoid, a magnetizing-coil in said brake-shoe adapted to set up attraction between one of said rails and said

shoe, connections for energizing said solenoid and said coil, and means for controlling said connections.

17. The combination of a solenoid, a plunger therefor, a plate secured to said plunger, a member actuated by said solenoid, and a plate secured to said member, said plates being secured together by the magnetism of said solenoid.

18. The combination with a solenoid, and a plunger therefor, of a device actuated by said solenoid, and means whereby said device may be moved laterally relatively to said plunger but still be maintained in operative relationship therewith by the magnetism of said solenoid.

In witness whereof I have hereunto set my hand this 25th day of September, 1902.

FRED B. COREY.

Witnesses:

HELEN ORFORD,

G. C. HOLLISTER.