(No Model.)

2 Sheets—Sheet 1.

W. M. SCHLESINGER.

ELECTRIC CAR BRAKE.

No. 370,894. Patented Oct. 4, 1887.

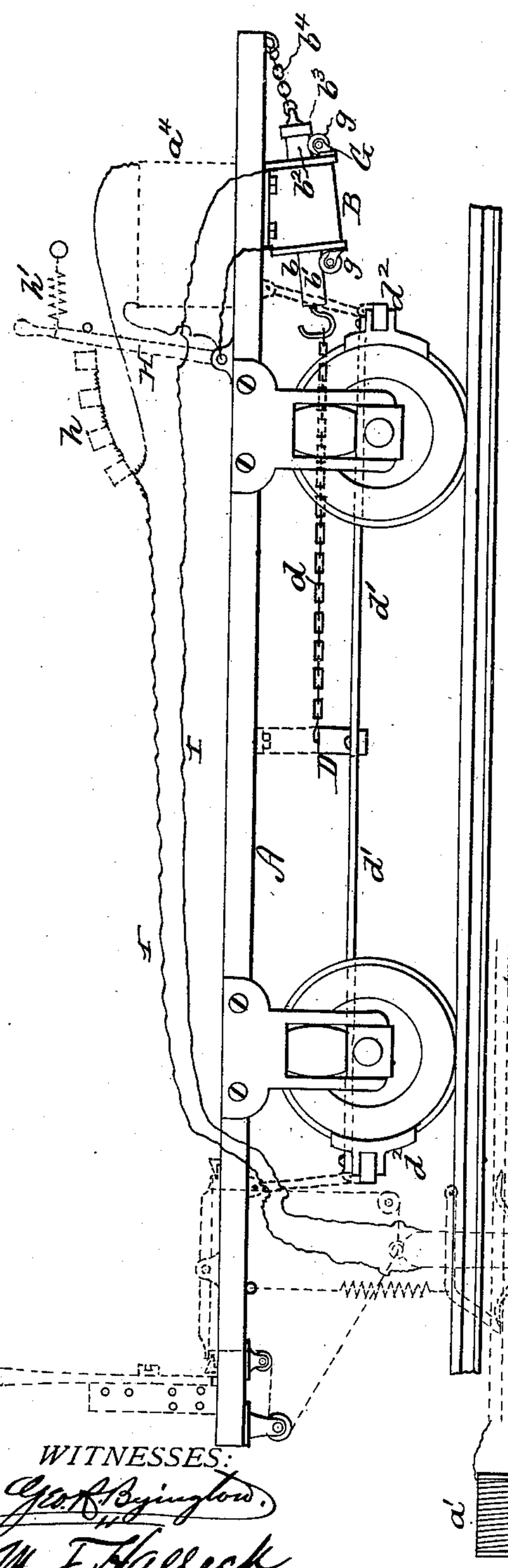

Fig. 1

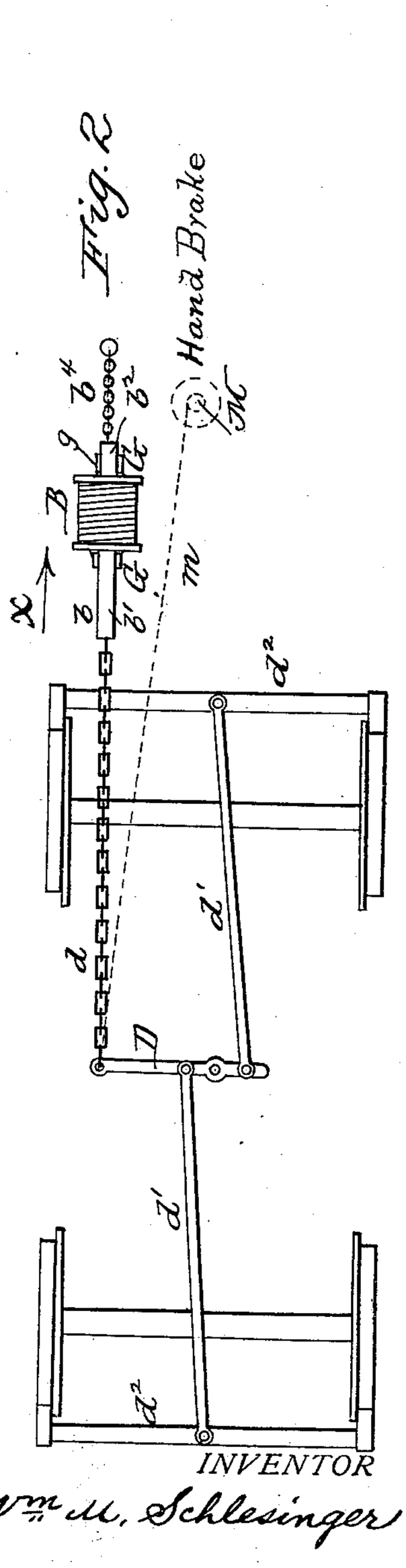

Fig. 2

WITNESSES:

Geo. F. Bjingtow.

M. F. Halleck

INVENTOR

Wm. M. Schlesinger

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(No Model.)

2 Sheets—Sheet 2.

W. M. SCHLESINGER.

ELECTRIC CAR BRAKE.

No. 370,894. Patented Oct. 4, 1887.

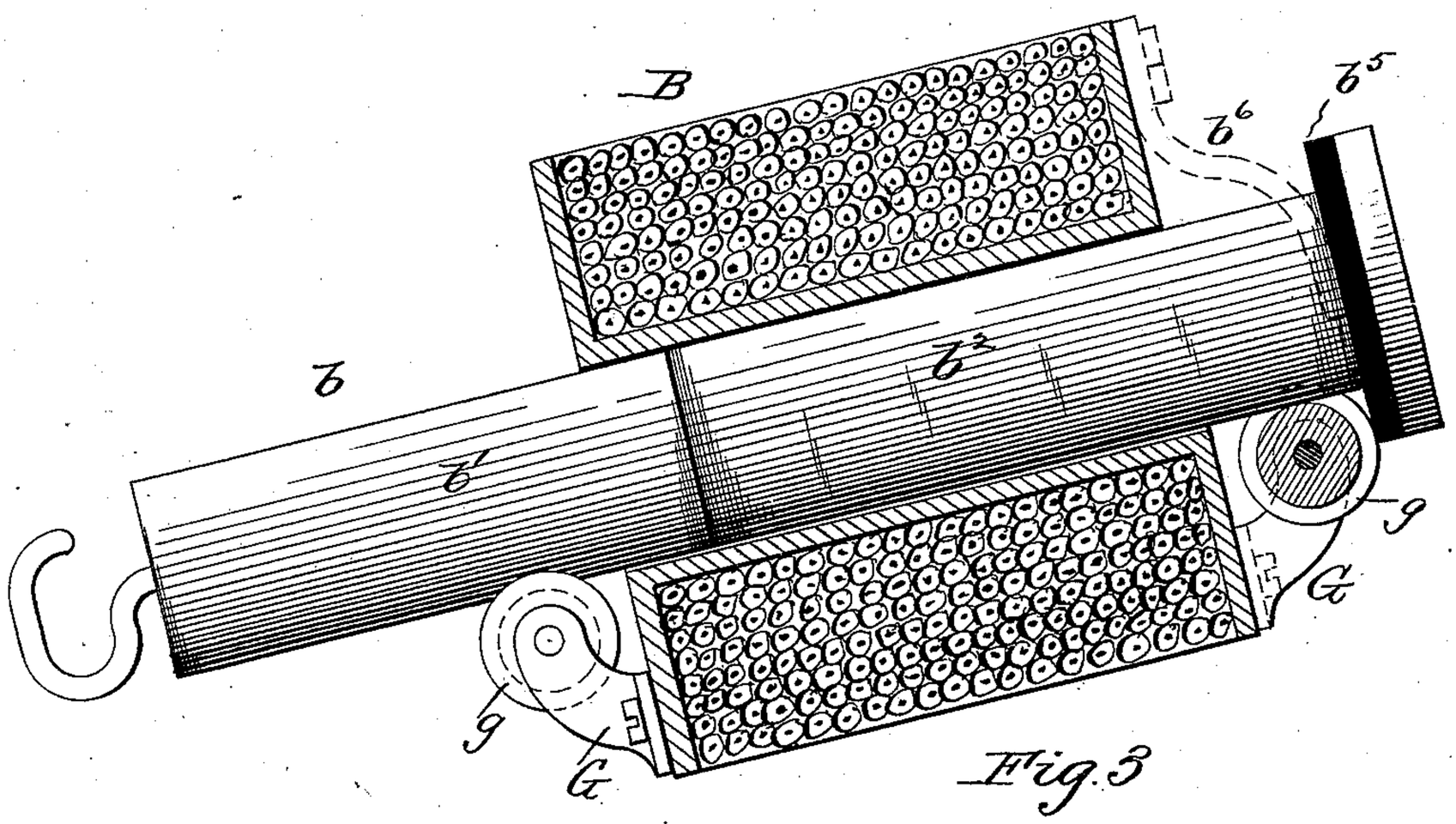

Fig. 3

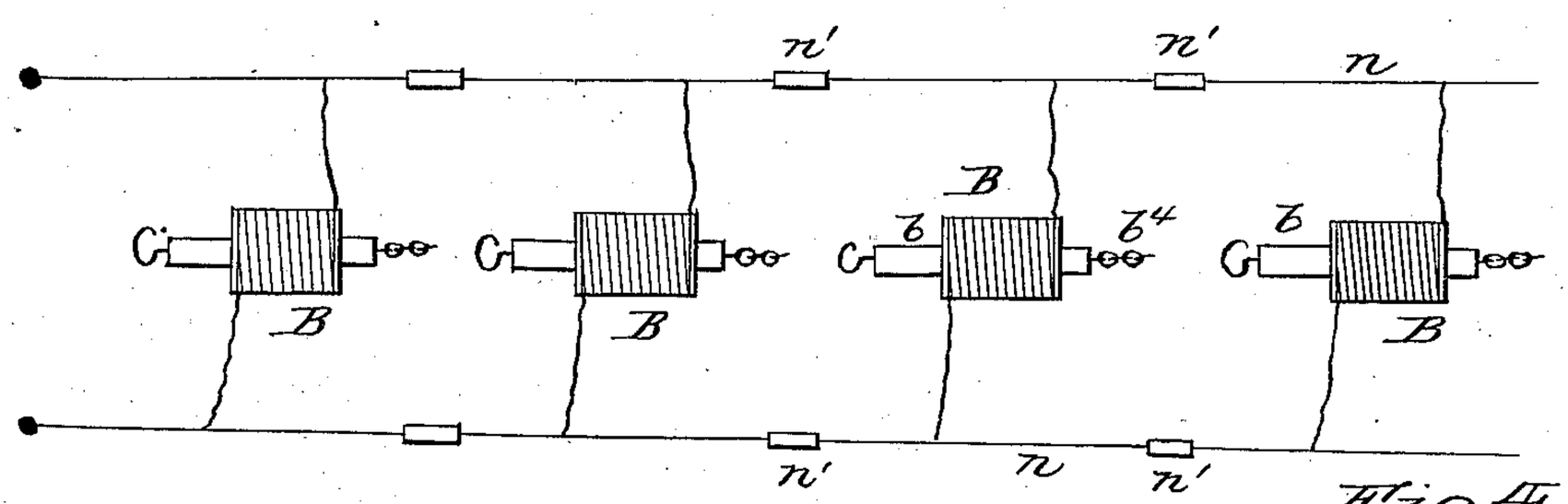

Fig. 4

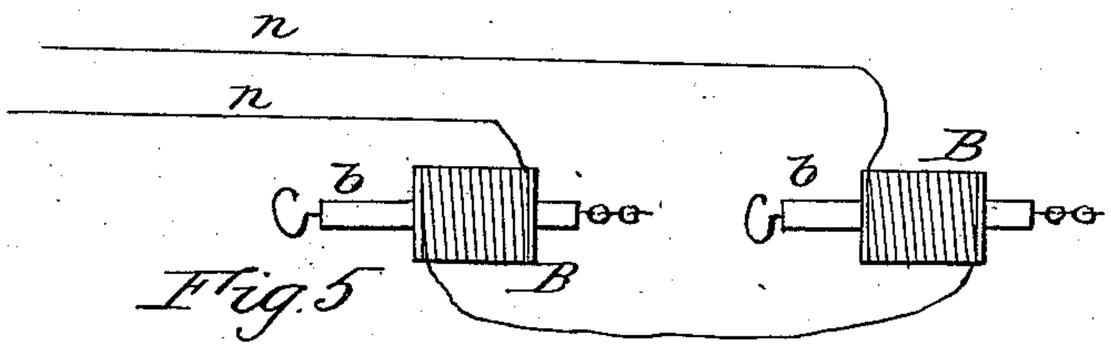

Fig. 5

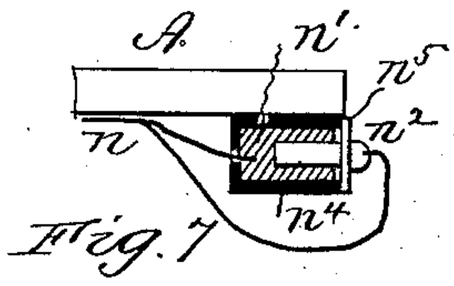

Fig. 7

WITNESSES:

Geo. R. Byington

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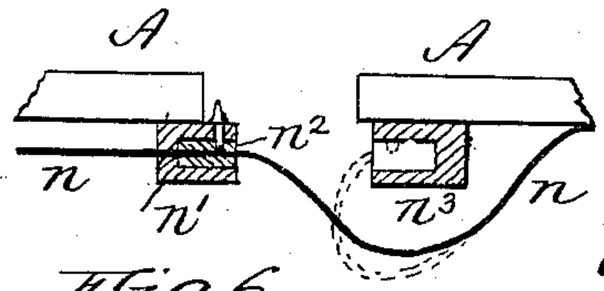

Fig. 6

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UNITED STATES PATENT OFFICE.

WILLIAM M. SCHLESINGER, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 370,894, dated October 4, 1887.

Application filed November 19, 1886. Serial No. 219,362. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. SCHLESINGER, a subject of the Queen of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Car-Brakes, of which the following is a specification, reference being had therein to the accompanying drawings, wherein—

Figure 1 is an elevation showing a part of a car and my improvements. Fig. 2 is a plan of brake mechanism embodying my improvements. Fig. 3 is a longitudinal section, partly in elevation, of the solenoid for operating the brakes, drawn to an enlarged scale. Fig. 4 is a diagram showing electric circuit for the solenoids of the cars of a train in multiple arc and couplings for the electric connections of each car. Fig. 5 is a diagram showing the solenoids for a car in series relation. Fig. 6 is a detail view showing coupling devices for the electric circuits or wires of the cars of a train, and Fig. 7 is a like view of a modified form of same.

My invention has relation to electric car-brakes in which a solenoid or its equivalent is used for applying the brakes, and it has for its objects to obtain any desired movement of the core of the solenoid compatible with its size for operating the brakes of a car or of a train of cars, whereby the solenoid can be used, in conjunction with the usual brake-levers now employed, to prevent wear of the walls or sides of the bore of the solenoid by the movement of its core, and to reduce the friction or contact between the core and the bore of the solenoid.

In carrying my invention into practice the current for the solenoid may be obtained from a storage-battery or other suitable generator on the car or train, or else by way of a traveling collector and a line of conductors suitably located and fed by a generator or generators located at suitable points along the line of way.

My invention accordingly consists of the combination, construction, and arrangement of parts, as hereinafter described and claimed, having reference particularly to a solenoid having a core provided at one end with a diamagnetic extension or supplementary core, which is normally in the bore of the solenoid, whereby the pull or attractive force on the magnetic part of the core of the solenoid is wholly at one end of the same from the beginning to the end of its movement, and whereby the greatest possible extent of movement of the core compatible with the size of the solenoid is obtained, and to a solenoid-core having anti-friction-roller bearings to avoid wear of the walls or sides of the bore of the solenoid. These anti-friction rollers have bearings secured to the ends of the solenoid or to any other suitable fixture adjacent to the solenoid, as desired; to a chain, buffer, or other equivalent devices for limiting the return movement of the solenoid-core, and to a manual or the usual brake handle or rod for operating the brakes independently of the electro-magnetic devices for the same.

In the drawings, A represents a car which, as shown in Fig. 1, may be adapted for electric railways having a line of conductors, a, fed by a generator or generators, a', suitably located along the line of way, and a traveling collector, a^2, for supplying electric energy to a solenoid, B, by way of connections 1 1; or a storage-battery or other generator, a^4, upon the car, may be substituted therefor. The solenoid is preferably located horizontally in a slightly-inclined position, so that its core will by gravity normally assume the position shown in Fig. 1, or, in other words, automatically return to its normal position after having been attracted and moved into and along the bore of the solenoid. This core b is made in two parts, b' and b^2, the former of which is of soft iron or other magnetic material, and the latter of brass or other suitable diamagnetic material, and these parts or sections are so connected that the part b^2 is supplementary to or an extension of the part b', and when in their normal positions only one end of part b' and nearly the entire length of the part b^2 are within the bore of the solenoid, so that when the latter is energized its attractive force is exerted wholly upon one or the inner end of the part b' during its entire movement into and along the bore of the solenoid, and as no portion of the part b', when moved to the extent of its limit of motion, need pass out of that end of the solenoid toward which said part b' is moving, it has a quick and a long extent of motion in

the bore of the solenoid corresponding or proportionate to the length of the latter. The core *b*, having this increased movement, can be applied to or connected to brake-levers for operating or applying the brake-shoes instead of applying it directly to the brake-shoe beams, as heretofore has usually been attempted. In Figs. 1 and 2 I have shown this application, wherein the core *b* has a chain or other connection, *d*, with pivoted lever D, which in turn has link-connections *d'* with the brake-shoe beams d^2.

Any suitable brake-lever mechanism or arrangement of same may be employed in conjunction with the solenoid. One of the latter may be used for all the brake-beams of a car or truck, or each may have its separate electro-magnetic operating devices.

I preferably support the core *b* upon anti-friction rollers *g*, having bearings in brackets G, preferably secured to the ends of the solenoid, as shown; but they may be otherwise located, as desired. The use of these anti-friction rollers reduces the frictional contact between the core and the bore of the solenoid, so that the core moves more quickly when the solenoid is active and also prevents contact of the core with the walls or sides of the bore of the solenoid, and hence there is no danger of the core gradually wearing its way through said wall and destroying the insulation on the helix or helices of the solenoid.

To prevent the core *b* passing out of the bore of the solenoid when returning to its normal position, the outer ends of the diamagnetic part or section b^2 may have a collar, b^3, which is of a larger diameter than that of the bore of the solenoid, and to prevent the collar b^3 striking the anti-friction roller or the end of the solenoid a chain, b^4, may be attached to the collar end of core *b* to stop or limit its return movement; or a rubber or metal spring-buffer may be substituted for chain b^4 to take up the shocks of concussion of said collar, as indicated, respectively, at b^5 and b^6, Fig. 3. When the solenoid is energized, it attracts the magnetic part *b'* of core *b* to move the latter in its bore in the direction of arrow *x*, Fig. 2, to oscillate lever D to apply the brakes, which remain applied as long as the solenoid continues active. As soon as it ceases to be so the brakes release themselves in the usual manner and return the core *b* to its normal position, and this return movement is facilitated by reason of the inclined position of the solenoid; but as this position is not essential I do not limit myself thereto.

To prevent too sudden application of the brakes, or to provide for a graduated braking-pressure, suitable adjustable resistances, *h*, with operating-lever H, are inserted in the circuit for the solenoid or solenoids, as shown in Fig. 1. The lever H has a reaction-spring, *h'*, to automatically return the lever to its normal position to cut out the resistance and release the brake in case the brakeman or attendant fails to do so.

By attaching the chain or connection *m* of the usual or ordinary hand-brake rod, M, to lever D the brakes are susceptible of being manually operated independently of the electro-magnetic or solenoid devices, which hand-brake is preferably provided as a reserve in case of non-operation of the electric devices, or both may be simultaneously operated, if desired.

In applying my improvements to a train of cars, or a car having more than one solenoid, they are preferably in multiple-arc relation, as shown in Fig. 4, to maintain the difference of potential at the terminals of the solenoids constant, no matter whether one or more is being used, so that all the brake-shoes of the cars of the train are equally effectively applied; but upon single cars, as in street-railways, the solenoids may, if desired, be in series relation, as indicated in Fig. 5.

Any suitable couplings for the electric circuits or wires of each car may be used. In Fig. 6 I have shown one form of same, in which one set of ends of the wires *n* of each car terminate in or are secured to metal cups or sockets *n'*, and the remaining ends of said set of wires have spring or other plugs, n^2, for insertion in said sockets, so that the couplings for the wires of two meeting cars are made by simply inserting the plugs n^2 at the end of one of said cars into the sockets at the end of the other car. When uncoupled, the plugs n^2 of the cars are inserted into separate sockets or openings n^3 on the cars, to prevent accident or impairment to said plugs and to have them in position suitable for making quick coupling-connection when a train is made up. I prefer, however, the coupling shown in Fig. 7, wherein the sockets *n'* are incased in insulation n^4 and the ends of the car-wires are divided, one part being connected to the socket *n'* and the other to the plug n^2, each of which has a collar, n^5, to close the socket-opening and exclude dust when inserted therein when uncoupled. In coupling up with this form of coupling the plugs n^2 are both withdrawn from their respective sockets, and one of the plugs is inserted in the socket of the meeting car, the other plug being allowed to hang down or is inserted in a separate socket, n^3, as above described.

From the foregoing it will be observed that the movement of the solenoid is quickly made and that such movement is of considerable extent or corresponds or is proportionate to the length of the solenoid, consequently the brakes are susceptible of being quickly applied to stop the car within usual desirable distance; that the use of the usual brake-levers or operating devices therefor admits of the employment of much smaller size of solenoid to obtain the requisite or a powerful braking force and permits me to dispense with unduly large or cumbersome electro-magnets heretofore deemed essential; that the solenoid or the insulation on its coil is fully protected against wear or short-circuiting due to the movement

of its core in its bore, and that the brakes can be applied independently of the electric appliances employed.

What I claim is—

1. In combination with a railway-car and its brake-shoe mechanism, an inclined actuating-solenoid having a core composed of sections of magnetic and diamagnetic material, connection between said core and brake-shoe mechanism, and anti-friction-roller bearings for said core, substantially as set forth.

2. The combination, with a railway-car and its brake-shoe mechanism, of a solenoid having a core composed of sections of magnetic and diamagnetic material in engagement with the brake-shoe mechanism, anti-friction-roller bearings for said core, and devices for limiting its forward movement, substantially as set forth.

3. The inclined solenoid B, having a core of diamagnetic and magnetic material, a hook at one end of said core, a chain or flexible connection for the opposite end of the core for limiting its forward movement, and anti-friction-roller bearings for the core secured to the frame or spool of the solenoid, substantially as set forth.

4. A railway-car having an operating-lever for the brake-beams, a horizontally-inclined solenoid having a core provided with a chain or connection with said brake-lever, anti-friction-roller bearings for said core, and a source of power for said solenoid, substantially as set forth.

5. A railway-car having brake-lever mechanism, an inclined actuating-solenoid having a core composed of a section of magnetic and a section of diamagnetic material for operating the brake-lever mechanism to apply the brake-shoes, substantially as set forth.

6. The combination, with a railway-car and its brake-shoe mechanism, of a solenoid the core of which engages with said brake-shoe mechanism and actuates the latter to apply the brake-shoes, and circuit-connections, including adjustable resistances for the solenoid, substantially as set forth.

7. In combination with a railway-car and its brake-shoe mechanism, a solenoid having its core connected at one end to the brake-shoe mechanism by a flexible connection and operating to apply the brake-shoes, substantially as set forth.

8. In combination with a railway-car, its brake-shoe-actuating lever D, and its hand rod or lever, a solenoid having its core in engagement with lever D, and actuating to apply the shoes, substantially as set forth.

9. The combination, with the brake-shoe-actuating levers D of a train of railway-cars, of a solenoid for each car having a core provided with a connection with levers D, and circuit-connections, including adjustable resistances for the solenoids, for controlling the power or energy of the solenoids for operating levers D to apply the brake-shoes, substantially as set forth.

10. A railway-car having couplings for electric conductors, consisting of a wire divided at its end, a socket in circuit or connected to one of said ends, and a plug having circuit-connection with the other of said ends for insertion into said socket when uncoupled, and for insertion into a corresponding socket on another car for coupling the conductors of two cars together, substantially as set forth.

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

WILLIAM M. SCHLESINGER.

Witnesses:

CHAS. F. VAN HORN,

S. J. VAN STAVOREN.