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PATENTED NOV. 10, 1903.

J. WETZLER & A. GREEN.
BRAKE FOR STREET RAILWAY CARS.

APPLICATION FILED NOV. 1, 1902.

NO MODEL.

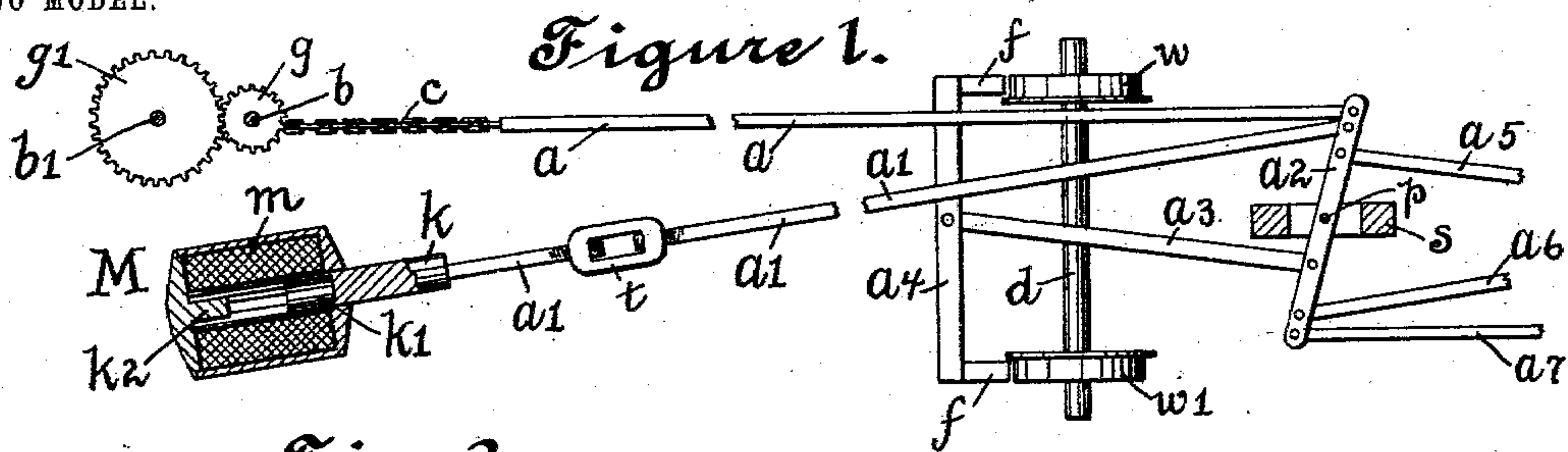


Fig. 2.

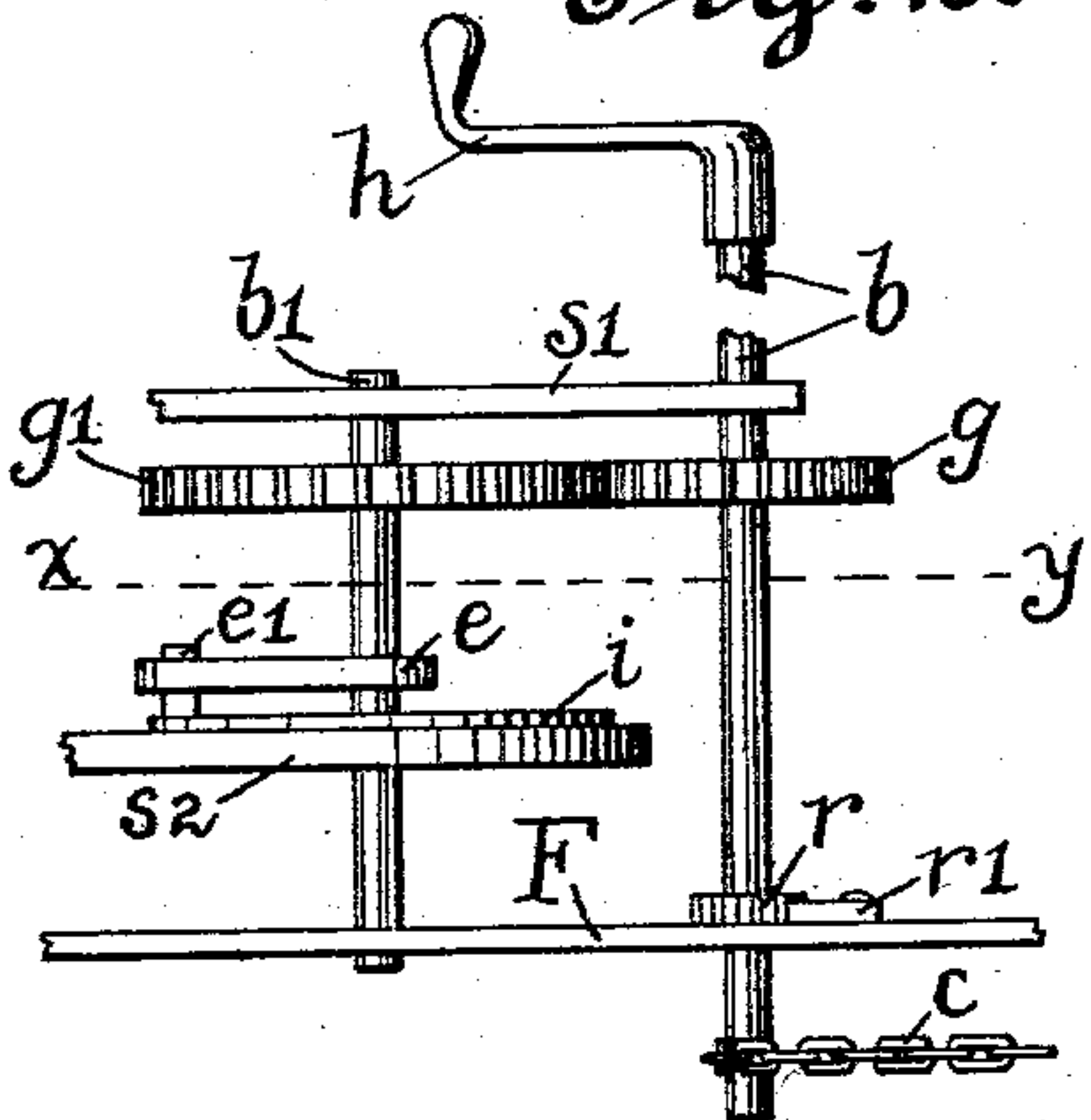


Fig. 3.

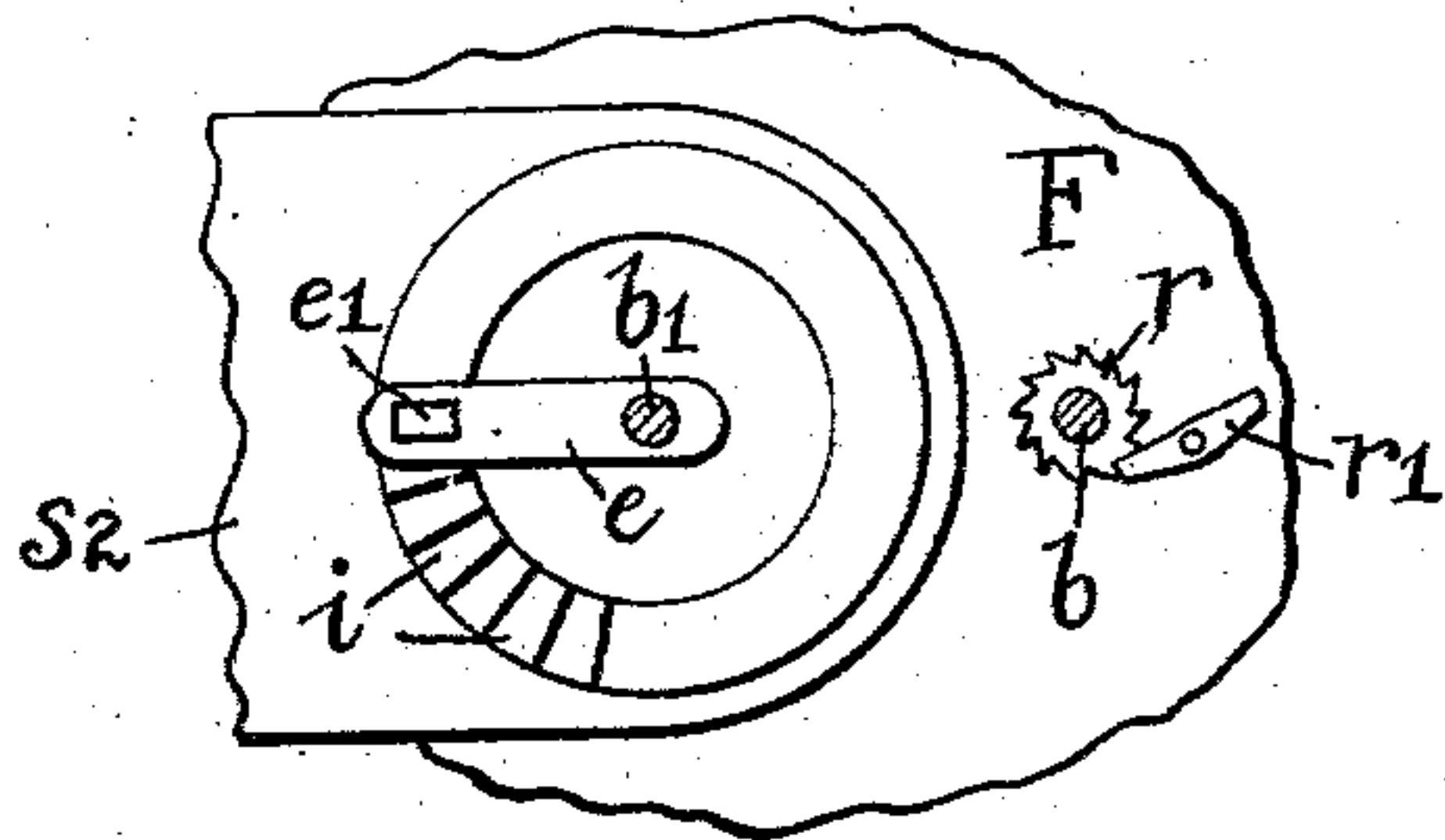


Fig. 4.

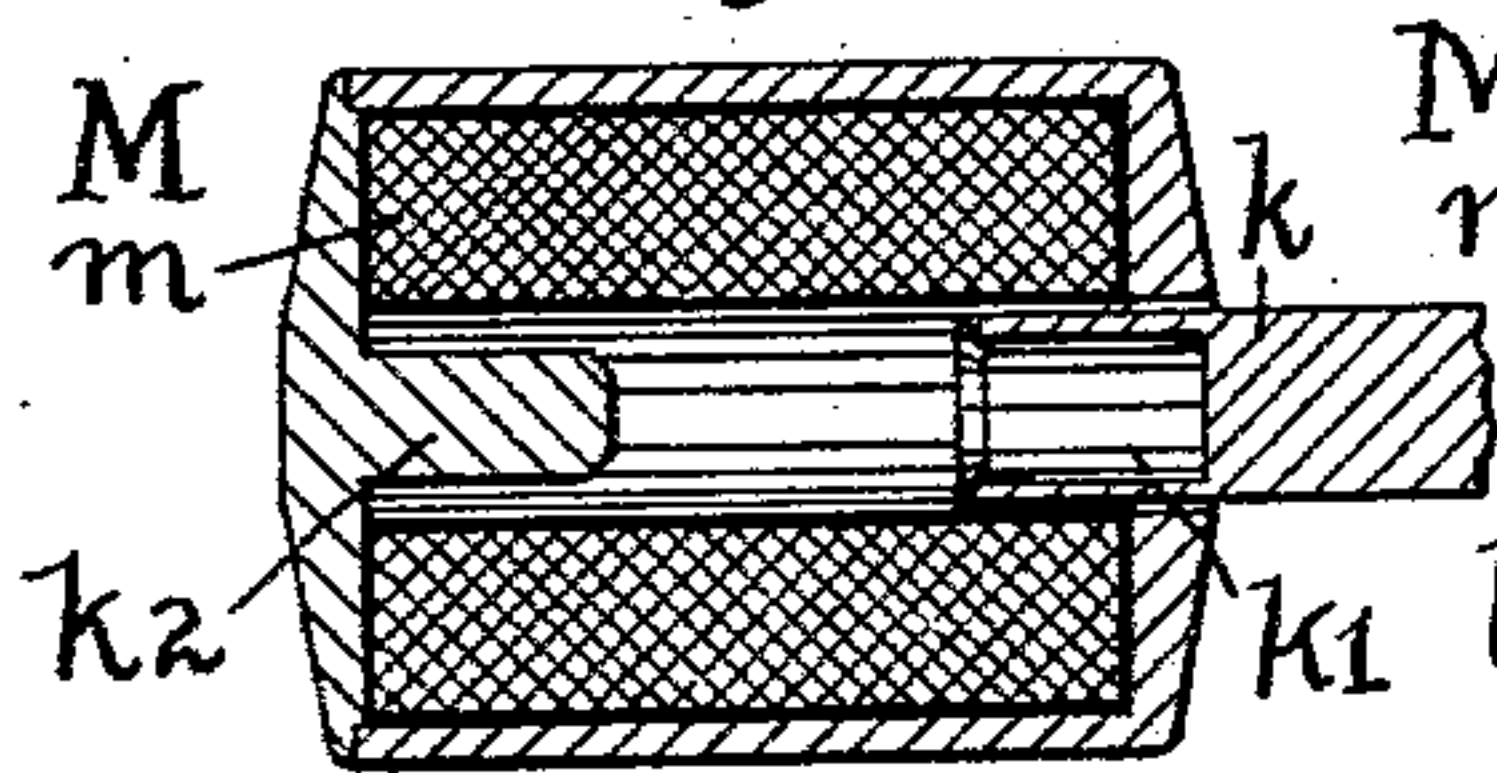


Fig. 5.

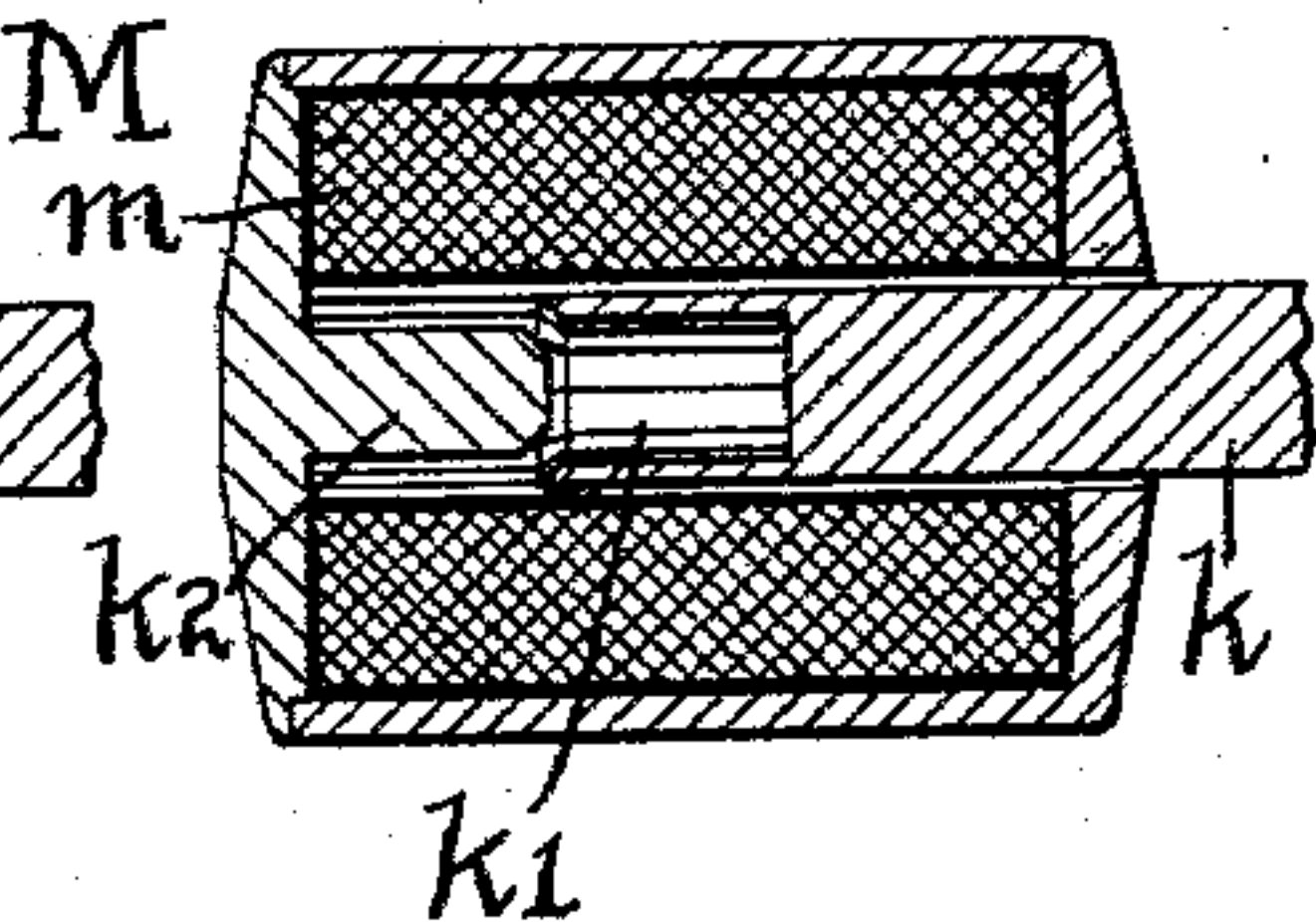


Fig. 6.

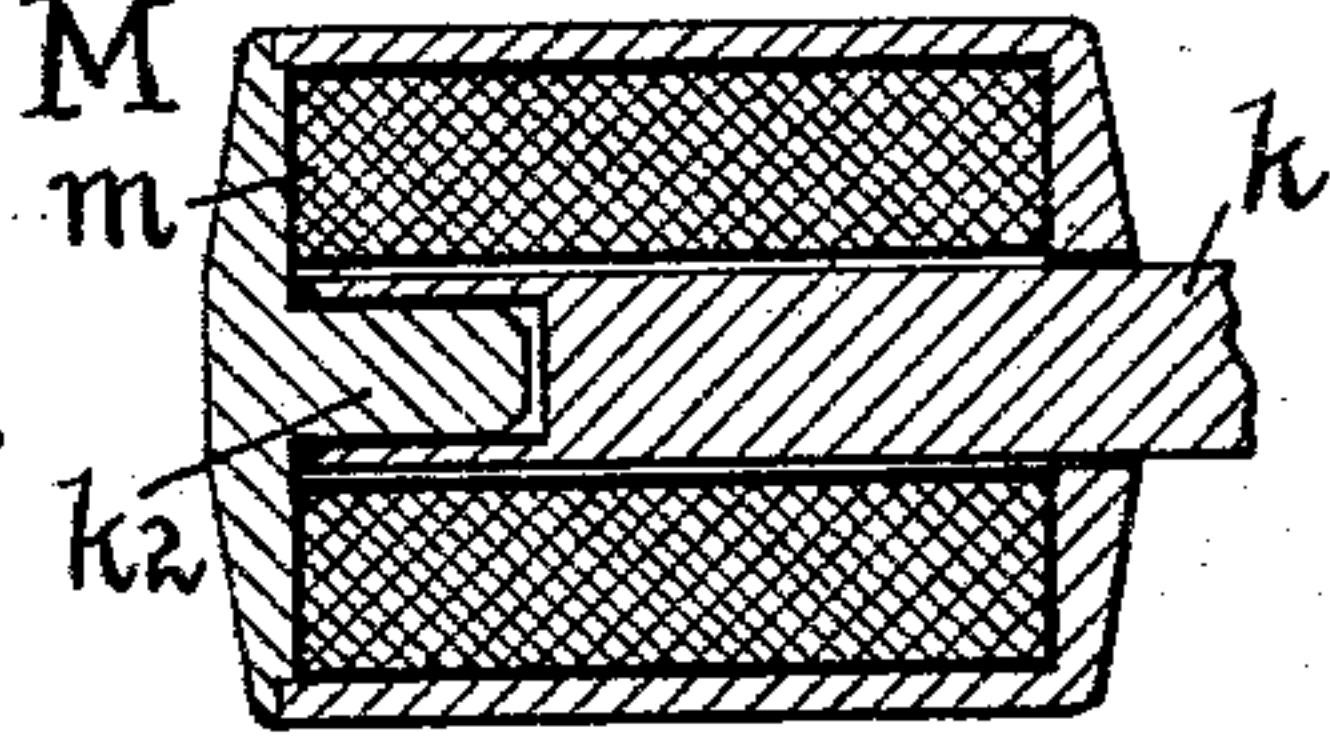
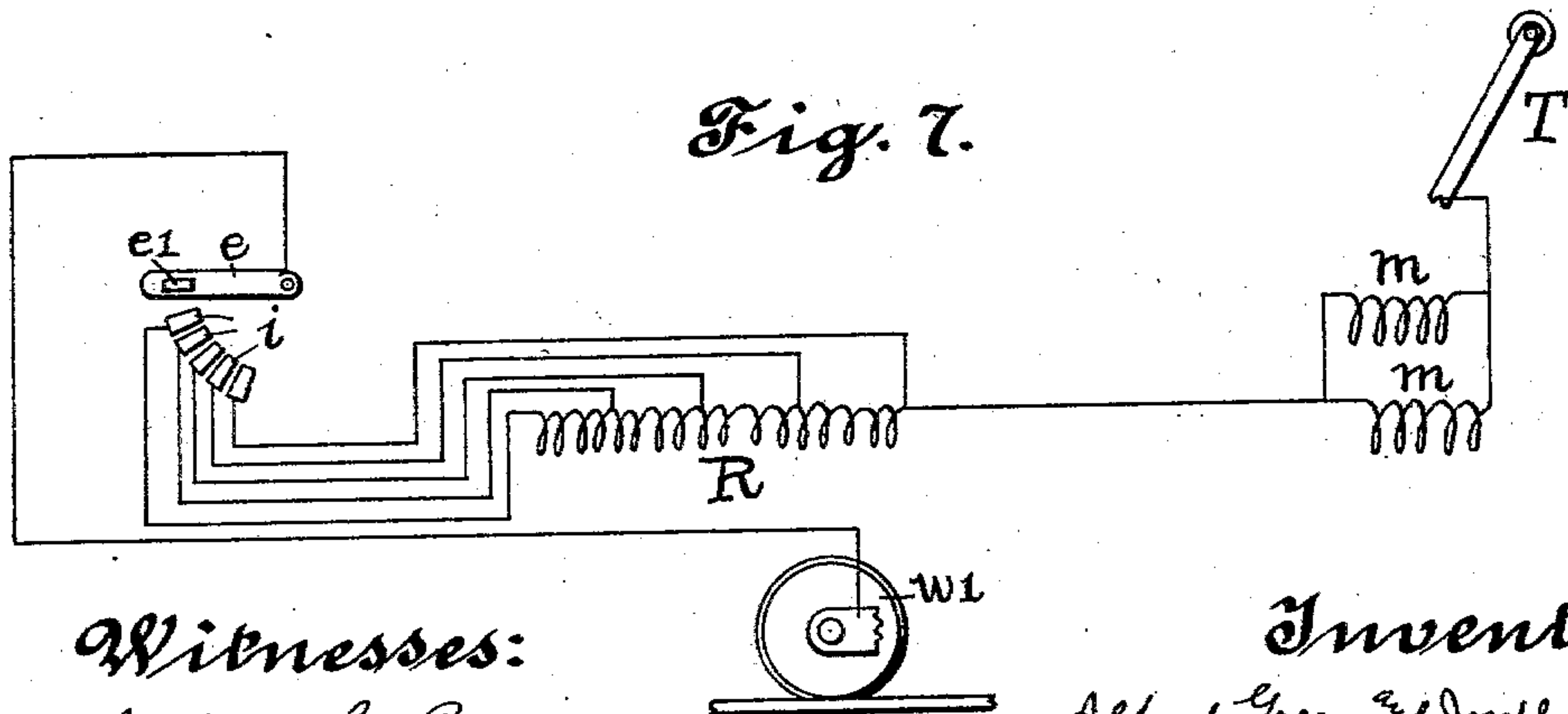


Fig. 7.



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UNITED STATES PATENT OFFICE.

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BRAKE FOR STREET-RAILWAY CARS.

SPECIFICATION forming part of Letters Patent No. 743,966, dated November 10, 1903.

Application filed November 1, 1902. Serial No. 129,697. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH WETZLER, residing at New York city, in the county of New York, and ALFRED GREEN, residing at Rochester, in the county of Monroe, State of New York, citizens of the United States, have invented an Improvement in Brakes for Street-Railway Cars and other Vehicles, of which the following is a specification.

This invention relates to electric brakes, and more especially to the electrically-controlled mechanism for actuating the brakes.

The object of our invention is to provide means for overcoming the difficulty in electric brakes as usually constructed attendant upon the slack and lost motion which results from the wear of the brake-shoes and other mechanism between the braking-surfaces and the electrically-actuated mechanism.

In magnets as ordinarily constructed with a single coil the effort which can be secured at a sufficient distance or over a sufficient air-gap to provide means for taking up the increased slack requires the use of an excessive magnetomotive force and an excessively large magnet. These difficulties we overcome by means of the arrangement shown in the accompanying drawings, thus providing a means for increasing the initial effort of the magnet and at a greatly-increased range, or, in other words, by our arrangement a given initial effort may be secured at a much greater distance from that point in the path of the movable member where that member ultimately contacts, or nearly so, with its other cooperating member of the magnetic system.

The essential features of our invention are illustrated and described in the accompanying drawings and specification and enumerated in the claims annexed hereto.

The drawings are as follows: Figure 1 is a diagrammatic top view of one braking-magnet and parts connected therewith to apply the brakes to one pair of wheels of the car. Fig. 2 is a side view of brake-staff *b* and the rod *b'* and parts carried thereby. Fig. 3 is a top view of the parts seen in Fig. 2 with all above the horizontal plane passing through line *x y* removed. Figs. 4, 5, and 6 are de-

tail views of the magnet *M*, showing the core *k* in its initial, middle, and final position, respectively, when applying the brakes. Fig. 7 is a diagrammatic view of the circuits.

Similar letters refer to similar parts throughout the several views.

Referring to Figs. 1, 2, and 3, the brake-staff *b* is of the usual construction and is operated by the handle *h*. Ratchet-wheel *r* and pawl *r'*, secured to the floor *F* of the car, are provided, and a chain *c* is arranged to be wound on staff *b* when the brakes are set by hand. The right-hand end of chain *c* is connected by the rod *a* to the upper end of the equalizing-bar *a*², pivoted at *p* to a support *s*, secured to the floor of the car. This bar *a*² is connected, as indicated, by link *a*³ with brake-beam *a*⁴, carrying brake-shoes *f f*, arranged to bear upon the wheels *w w'* when braking the car. The brake-staff *b* also carries a gear *g*, meshing with a similar but larger gear *g'* on rod *b'*. Rod *b'* carries a brush-arm *e*, which in turn carries a brush *e'*, arranged to sweep over the contacts *i* when brush-arm *e* is rotated to the left. The contacts *i* are supported by and suitably insulated from each other on the base *s*². As seen in Fig. 1, there is also secured to the upper end of bar *a*² a link *a'*, the left-hand end of which is attached to the core *k* of a magnet *M*, having a coil *m*. This core *k* is recessed, as shown at *k'*, so as to inclose a stationary core *k*², as shown in Fig. 6. An important result of this construction is that at the start, as seen in Fig. 4, the attraction between core *k*² and the thin tubular end of core *k* is sufficient to move the core from the position shown in Fig. 4 to that shown in Fig. 5. This action is of course aided a little by the attraction between the core *k*² and the body of the core *k*, and the motion just described is sufficient to bring the shoes *f f* up firmly to the wheels *w w'* and apply but little braking effort. By the time the core *k* reaches the position shown in Fig. 5 the pull between core *k*² and the tubular portion of core *k* has become very small; but the pull between the core *k*² and the body of core *k* has become sufficient to move the core *k* from that point

to the position shown in Fig. 6, and thereby to set the brakes completely. A turnbuckle t is provided in rod a' , so that the brakes may be so adjusted that the core k will not quite bottom when the maximum braking effort is applied. Preferably two magnets of the type described are used, one on either end of the car, and are operated in parallel, as seen in Fig. 7. Other links a^7 , a^8 , and a^9 are also pivoted to bar a^2 and perform the same functions for the other end of the car as links a , a' , and a^3 perform, respectively, for the end of the car indicated in the drawings.

As seen in Fig. 7, the trolley T is connected to one terminal of each of magnet-coils $m m$, the other terminals of which are connected together and to one end of resistance R , from several points of which connections are made to the contacts i . Brush-arm e is connected to the wheel w' and thence to the rail.

The operation of our mechanism is as follows: To brake the car, the handle h is rotated to the right and begins to wind the chain c upon staff b . At the same time by means of gears g and g' and rod b' brush-arm e , with brush e' thereon, is rotated to the left and makes contact with the first contact i , by which action the magnet-coils $m m$ are connected between the trolley T and wheel w' in series with such a resistance R that a moderate current results in coils $m m$. As brush e' is advanced over contacts i section after section of resistance R is cut out of circuit, until on the last contact i the full potential of the supply-circuit is impressed upon the coils $m m$ and the maximum braking effort is secured. If for any reason the electric braking mechanism does not operate properly, the brakes may be set in the usual manner by continuing the rotation of handle h to the right and using the ratchet and pawl r and r' .

Of course in using the electric brake any degree of braking is secured by moving the operating-handle h only so far as is necessary to increase the current in the coils $m m$ to the amount required to effect the desired degree of braking.

It will of course be understood that the thin tubular extension k' of core k constitutes but a very restricted path for the lines of force between cores k^2 and k , so that when the core k^2 is well within the tubular extension k' on core k the main path for the magnetic lines is from core k^2 to core k through the air-gap between them and in a direction nearly or quite parallel with the direction of travel of core k , whereby the main pull or effort exerted between the cores is not materially reduced by this thin tubular extension k' .

We have found it advisable to bevel the ends of the core k^2 and tubular extension k' , as indicated in the drawings.

What we claim is—

1. In a braking system, in combination with

the two elements of an electromagnet and the energizing-coil therefor, one of such elements movable, connections between such movable element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, the elements of such magnet carrying projections arranged to overlap each other at or about the time when the brake-shoes are brought into contact with their braking-surfaces, such overlapping projections constituting means for shortening the air-gap at the initial point in the motion of the movable element of such electromagnet and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of the movable element of such magnet, from that point onward in its motion when such projections overlap each other.

2. In a braking system, in combination with the two elements of an electromagnet and the energizing-coil therefor, one of such elements movable, connections between such movable element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, one of the elements of such magnet carrying a prismatic projection arranged to pass within a suitable opening therefor in a larger and hollow prismatic projection on the other element at or about the time when the brake-shoes are brought into contact with their braking-surfaces, such overlapping projections constituting means for shortening the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable element, from that point onward in its motion when such projections overlap each other.

3. In a braking system, in combination with the two elements of an electromagnet and the energizing-coil therefor, one of such elements movable, connections between such movable element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, one of the elements of such magnet carrying a cylindrical projection arranged to pass within the opening therefor in a hollow and larger cylindrical projection on the other element at or about the time when the brake-shoes are brought into contact with their braking-surfaces, such overlapping projections constituting means for shortening the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable element, from that point onward in its motion when such projections overlap each other.

4. In a braking system, in combination with the two elements of an electromagnet and the energizing-coil therefor, one of such elements movable, connections between such movable

element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, the elements of such magnet carrying projections arranged to overlap
 5 each other at a point between the two extreme relative positions of such elements, such overlapping projections constituting means for shortening the air-gap at the initial point in the motion of the movable element
 10 of such electromagnet and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of the movable element of such magnet, from that
 15 point onward in its motion when such projections overlap each other.

5. In a braking system, in combination with the two elements of an electromagnet and the energizing-coil therefor, one of such elements
 20 movable, connections between such movable element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, one of the elements of such magnet carrying a prismatic projection ar-
 25 ranged to pass within a suitable opening therefor in a larger and hollow prismatic projection on the other element at a point between the two extreme relative positions of such elements, such overlapping projections con-
 30 stituting means for shortening the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable ele-
 35 ment, from that point onward in its motion when such projections overlap each other.

6. In a braking system, in combination with the two elements of an electromagnet and the
 40 energizing-coil therefor, one of such elements movable, connections between such movable element and the brakes, a source of electric energy and means for supplying energy therefrom to such coil, one of the elements of such
 45 magnet carrying a cylindrical projection arranged to pass within the opening therefor in a hollow and larger cylindrical projection on the other element at a point between the two extreme relative positions of such elements, such overlapping projections constituting
 50 means for shortening the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable element, from that point onward in its motion when
 55 such projections overlap each other.

7. In combination with the two elements
 60 of an electromagnet and an energizing-coil therefor and a source of electric energy and means for supplying energy therefrom to such coil, one of the elements of such electromag-

net movable relatively to the other, such elements carrying projections arranged to over- 65
 lap each other at a point between the two extreme relative positions of such elements, such overlapping projections constituting means for shortening the air-gap at the initial point in the movement of such movable 70
 element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable element, from that point onward in its motion when 75
 such projections overlap each other.

8. In combination with the two elements of an electromagnet and an energizing-coil therefor and a source of electric energy and means for supplying energy therefrom to such 80
 coil, one of the elements of such electromagnet movable relatively to the other, one of the elements of such magnet carrying a prismatic projection arranged to pass within a suitable opening therefor in a larger and hol- 85
 low prismatic projection on the other element at a point between the two extreme relative positions of such elements, such overlapping projections constituting means for shorten- 90
 ing the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion of such movable element, from that point on- 95
 ward in its motion when such projections overlap each other.

9. In combination with the two elements of an electromagnet and an energizing-coil therefor and a source of electric energy and 100
 means for supplying energy therefrom to such coil, one of the elements of such electromagnet movable relatively to the other, one of the elements of such magnet carrying a cy- 105
 lindrical projection arranged to pass within the opening therefor in a hollow and larger cylindrical projection on the other element at a point between the two extreme relative positions of such elements, such overlapping projections constituting means for shorten- 110
 ing the air-gap at the initial point in the motion of such movable element and constituting also but a restricted path for the magnetic lines of force, in a direction at right angles or nearly so to the direction of motion 115
 of such movable element, from that point onward in its motion when such projections overlap each other.

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