(No Model.)

2 Sheets—Sheet 1.

# C. J. VAN DEPOELE.

## ELECTRIC RAILWAY MOTOR.

No. 462,751. Patented Nov. 10, 1891.

Fig. 1.

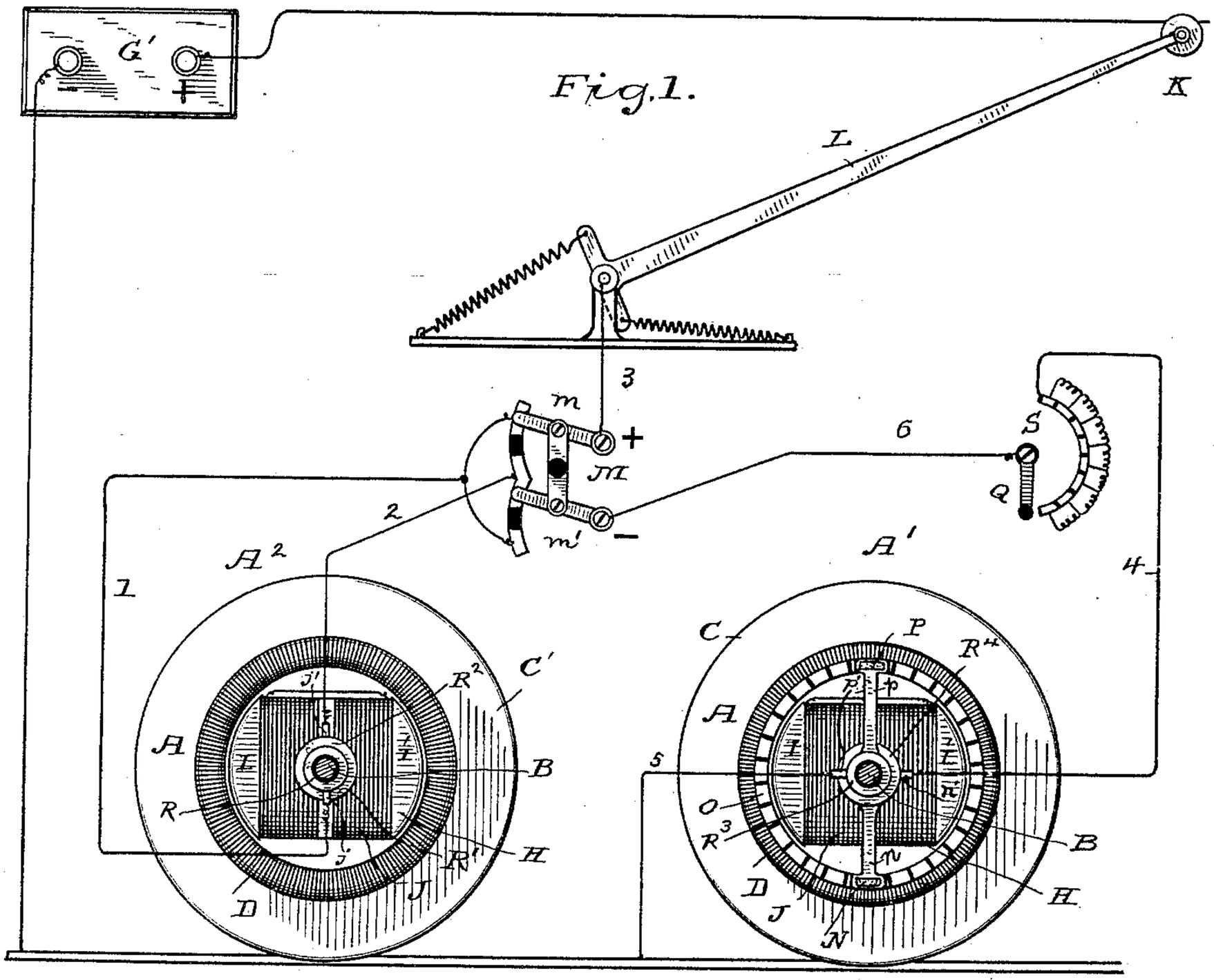
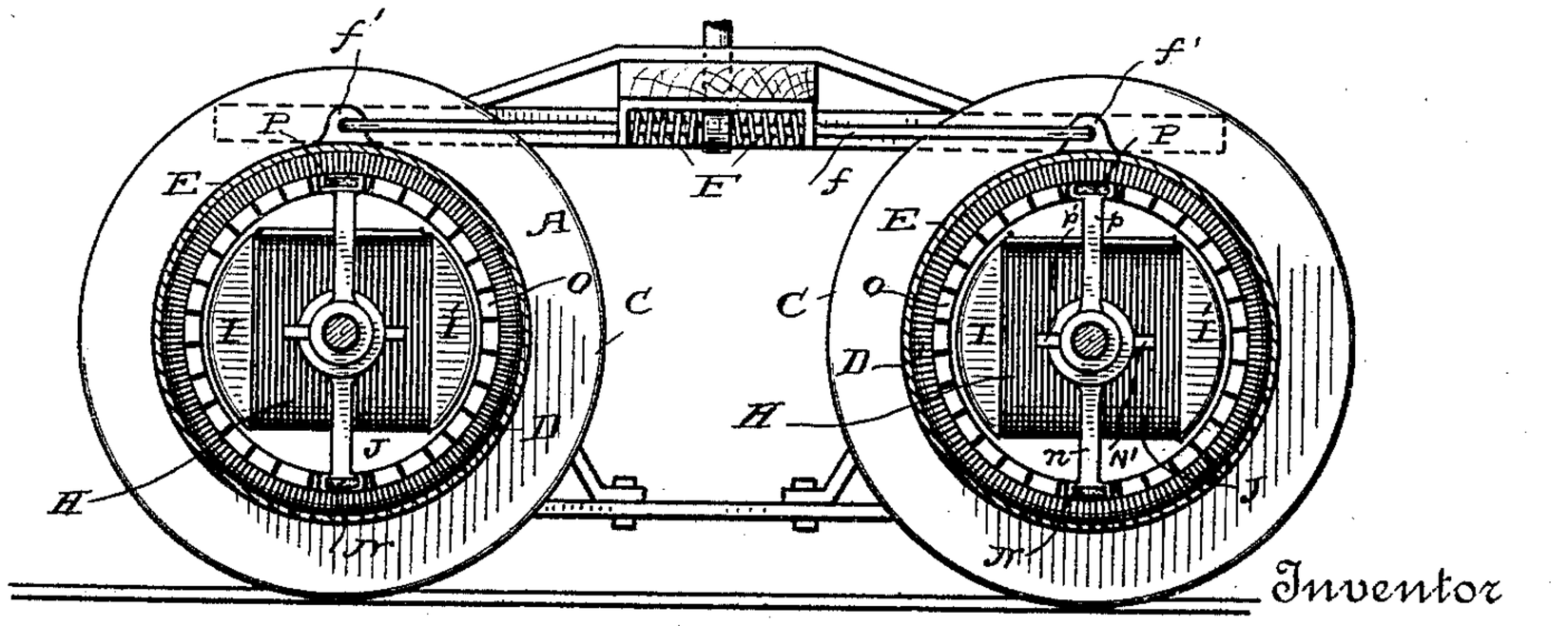



Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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## ELECTRIC RAILWAY MOTOR.

No. 462,751. Patented Nov. 10, 1891.

Fig. 4.

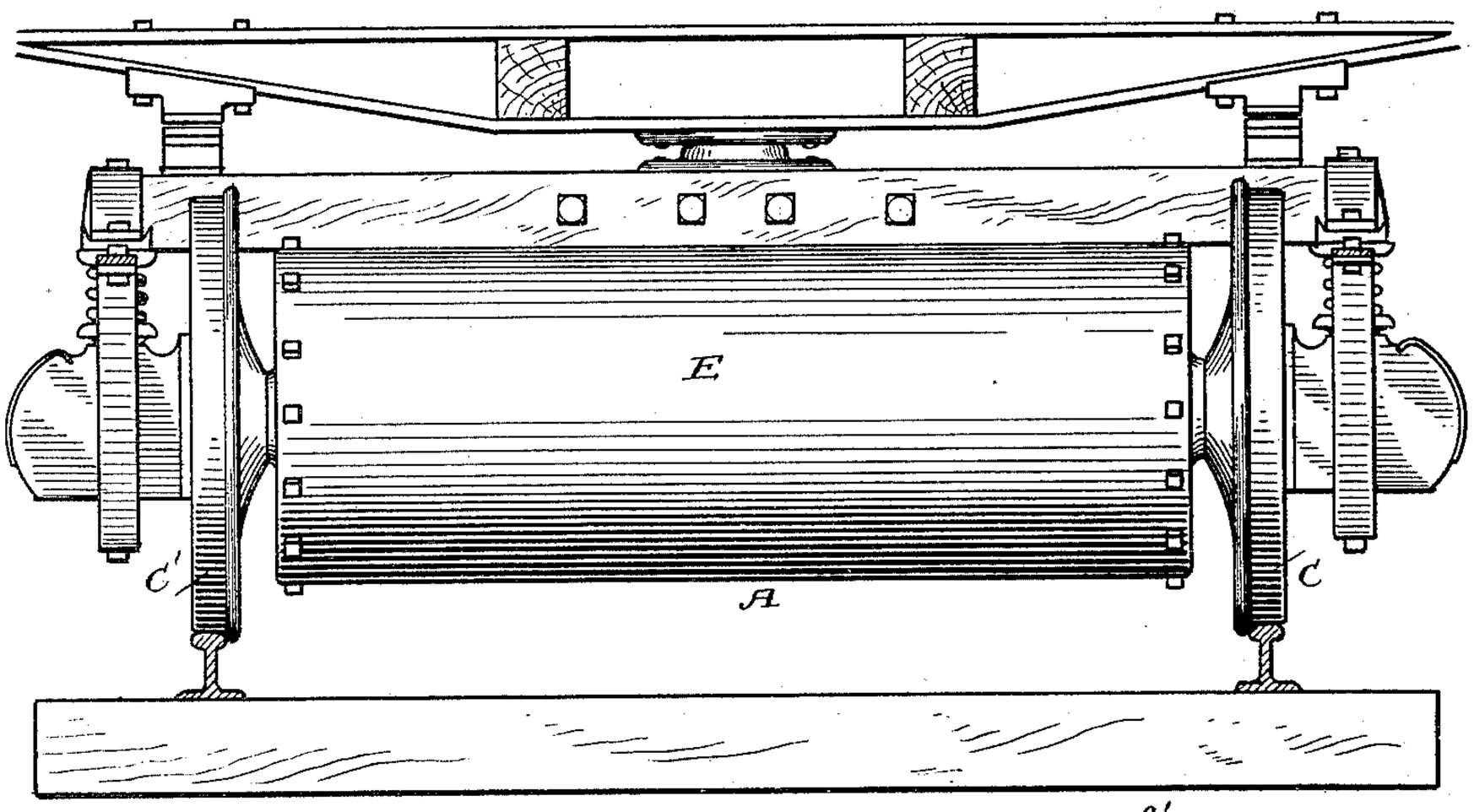



Fig 5

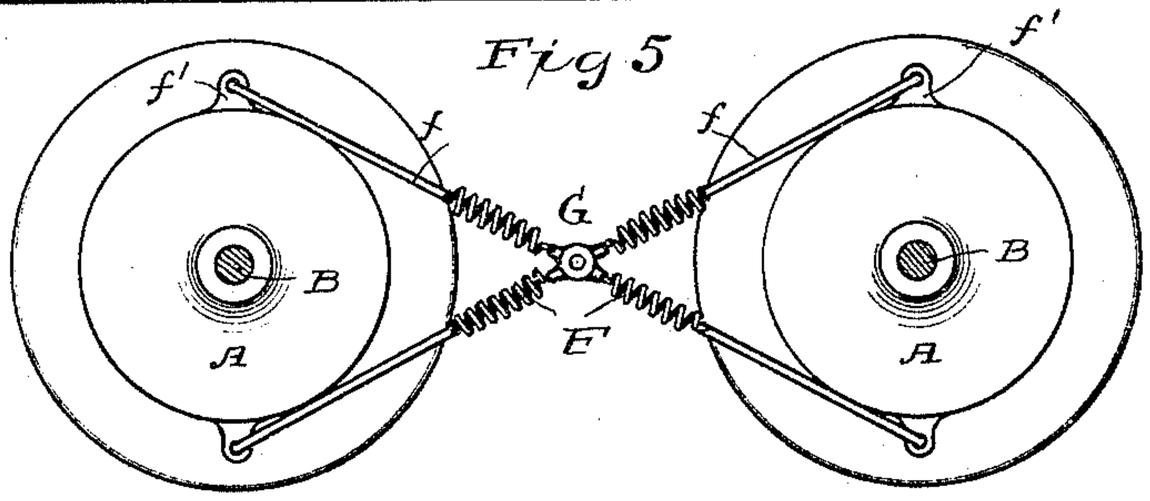
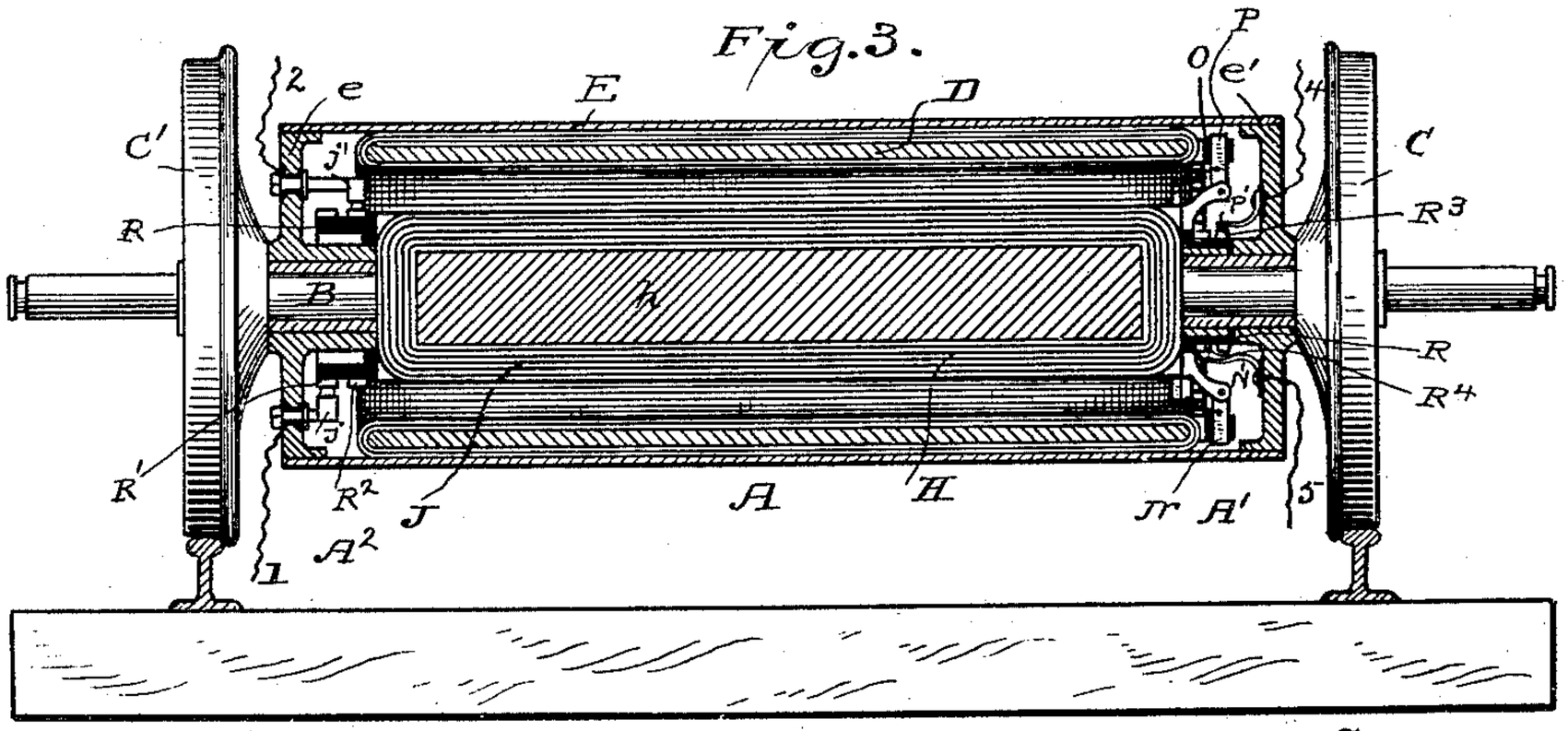



Fig. 3.

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# UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

## ELECTRIC-RAILWAY MOTOR.

SPECIFICATION forming part of Letters Patent No. 462,751, dated November 10, 1891.

Application filed December 20, 1890. Serial No. 375,308. (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 Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Railway Motors, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to improvements in electric motors for railway-cars, together with various details of construction and arrangement entering into and forming part of the present improved method of propulsion.

The invention comprises a form of motor which is carried directly upon the axle to be driven, all intermediate power connections being dispensed with. As hereinafter set forth, my improved motor is of the continuous-current type, and is supplied in any desired manner with current collected by a traveling contact device upon the vehicle from a conductor or conductors suspended or otherwise disposed along the line of way. As shown in the drawings, each axle to be driven is provided with its separate motor, and any desired number of the axles of the vehicle or vehicles may be so provided with motors, according to circumstances.

In the drawings, Figure 1 is a diagrammatic view, partly in side elevation, showing the two axles of a car-truck, each with one of its driving-wheels removed, and two motors, one on each axle, together with the electrical circuits and connections for supplying current thereto. Fig. 2 is a side elevation of an electric-railway car-truck equipped with motors embodying the invention, parts of the truck being omitted for convenience of illustration. Fig. 3 is an end view of a car-axle and its wheels, showing also one of my improved motors in longitudinal sectional elevation. Fig. 4 is an end view of an electric-railway car-truck equipped with my improved motors. Fig. 5 is a detail showing the buffer-springs and connections to the non-rotating parts of the motor.

In the drawings, A represents a motor, which is constructed in cylindrical form and supported upon the axle B to be driven.

C C′ are car-wheels fixed upon the axle B and arranged to run upon suitable tracks.

The motors A are cylindrical in form, and, as indicated in Figs. 3 and 4, may be of such length as to inclose all that part of the axle B between the wheels C C′.

The motor A comprises an exterior non-rotating field-magnet D, which is a Gramme ring elongated into the form of a cylinder and contained within an exterior metallic envelope or casing or drum E. The drum E is provided with metallic heads *e e′*, which are sleeved upon the axle B so as to sustain the field-magnet D concentric therewith, and should of course be provided with suitable bearings upon said axle to permit it to rotate freely and without undue friction. The drum E and field-magnet are prevented from rotating by a buffer-spring F, which bears against some stationary part of the truck and is connected with the drum E by a thrust-rod *f*, secured in a suitable lug *f′* upon the drum.

As indicated in Fig. 5, a double set of springs F and thrust-rods *f* may be employed, if desired, the said thrust-rods and springs converging to a central point G, which has a rigid bearing upon the truck. By these means a spring-controlled oscillating movement is allowed to the drum and field-magnet, which will relieve the strain and prevent or diminish jerking on stopping or starting the load.

Within the field-magnet D and secured directly to the axle B is an armature H, which, as here shown, is of the shuttle-wound type, sometimes called a "Siemens" H, although, of course, any desired form of winding which will have the desired effect may be substituted for that here shown. The armature H has a central core *h* and enlarged pole-pieces I I′, between which the energizing-coils J are wound. The core of the armature H is fitted upon or secured to the axle B in any suitable manner and so as to be rotatable within the field-magnet with its poles in close proximity to the interior thereof.

The armature H is constantly energized by the supply-current and is in circuit therewith through conductors 1 and 2, which connect with the contact-brushes *j j′*, which are carried by the head *e* and sustained in operative position upon separate insulated contact-

rings R′ R², which are disposed between one end of the armature H and the head *e* and carried upon an insulating-support R, which is mechanically connected with the core or pole-pieces of the armature, so as to be securely sustained and to rotate therewith.

The two motors seen in Fig. 1 are alike in all their parts; but for convenience of illustration the end marked A′ in Fig. 3 is shown on one motor, while the opposite end (marked A²) is shown on the other one. The contact brushes and rings just referred to are shown on the end of the motor marked A². In said Fig. 1, G′ is the generator, from the positive and negative binding-posts of which extend line-conductors plus and minus, and these conductors may be arranged as is convenient. As shown, however, the minus conductor is connected with the track upon which the wheels C C′ move, while the plus conductor is suspended above the line of way in position to be engaged by a traveling contact K, carried by an upwardly-spring-pressed trolley-pole L. From the conductor carried by the pole L the current passes by conductor 3 to a double-pole-reversing switch M. The conductors 1 and 2 are connected with separate insulated parts of the switch, so that, as shown, current from conductor 3 passes through switch-arm *m*, thence by conductor 1 to contact *j*, to ring R′, thence into the armature, traversing the coils thereof and issuing through ring R², contact *j*′, and thence by conductor 2 to a separate insulated switch-contact, upon which rests switch-arm *m*′, completing the armature-circuit.

The end A′ of the motor is provided with contact devices, these serving to convey currents to the coils of the field-magnet D. The said field-magnet is provided with a ring of insulated contacts or a commutator O at its extremity, said contacts being connected by suitable loops, each with the desired number of turns of the field-magnet winding, and current is supplied to the field-magnet at points at right angles to the poles of the armature by contact-brushes N P, carried by arms *n p*, secured to the axis of the armature, but insulated therefrom. Current is supplied to the brush P by conductor 4, which is connected through the head *e*′ to a contact *p*′, which engages a ring R³, carried upon an insulating-support R, which moves with the armature. The support R also carries a second separate contact-ring R⁴, upon which bears the contact *n*′, which is sustained by the head *e*′ and connected to a conductor 5, thus completing the field-magnet circuit through the stationary contacts *p*′ *n*′, rotating rings R³ R⁴, rotating arms *p n*, and their brushes P N, which are moved about the commutator O by the rotation of the armature. The conductor 2, leading from the armature-circuit, is, as shown, connected by a switch-arm *m*′ and conductor 6 with the moving terminal Q of a rheostat S, to the extremity of which the conductor 4 is connected. Conductor 5 is connected with the return-circuit. It will therefore be apparent that the current after traversing the coils of the armature H passes thence to the field-magnet circuit through any desired portion of the resistance S, and that the direction of rotation of the armature may readily be reversed by means of the switch M.

It will be understood that a counter-electro-motive-force device may be substituted for the resistance S, and also that the field-magnet and armature-coils may be connected in multiple arc instead of in series, as just described, or, in fact, in any other desired relation. It will be noted that the circuits shown in Fig. 1 are that of but one motor, the opposite ends of which are shown. Ordinarily two motors will be used on one truck and the connections of Fig. 1 be duplicated. Suitable openings may be provided in the ends of extremities of the drum E to give access to the contact-brushes, and various minor modifications may be made in the details of the structure without departing from the spirit or nature thereof.

While I consider the present invention an important one, and the particular motor hereinbefore described as a great advance in the art of propulsion of vehicles by electric power, it will be seen by reference to my patent, No. 286,093, of October 2, 1883, that the broad features of the invention have been already disclosed by me, and I therefore do not claim the same, except in connection with a moving vehicle, in combination with which the invention possesses advantages and features of improvement not set forth in my said prior patent.

It will be understood that an obvious modification of the foregoing would be to reverse the relationship of the parts; in other words, to arrange the commutated part or member upon the armature instead of the field-magnet. Furthermore, that while I have described the moving contact devices extending between one member and the other as being at right angles, that this is with the object of securing absolutely equal action whichever way the armature is caused to rotate, although it is quite evident that the moving brushes might be displaced considerably in either direction without preventing the operation of the machine, although when so displaced its action would be more effective in one direction than in the other.

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

1. In an electric locomotive, the combination, with the driving-axle and wheels fixed thereto, of an armature fixed upon and carried by said axle, a circular field-magnet surrounding said armature, also carried by the axle and journaled thereon, and means carried by the armature for shifting the polarity of the field in advance of the poles of said armature.

2. In an electric locomotive, the combination, with the driving-axle thereof, of an armature fixed thereto, a circular field-magnet surrounding said armature and carried by said axle, a commutator upon the end of the field-coils, and contacts upon the armature rotating therewith for shifting the field of force of the field-magnet in advance of the fixed poles of the armature.

3. In an electric motor, the combination, with the driving-axle thereof, of an armature fixed thereto, a circular field-magnet surrounding said armature, a cylindrical shield to which said field-magnet is fixed, and heads for said cylindrical shield journaled upon the driving-axle.

4. In an electric locomotive, the combination, with the driving-axles thereof, of a pair of motors having their armatures fixed upon said axles, field-magnets surrounding said armatures, cylindrical drums surrounding said field-magnets and adapted to support them upon the axles, and diagonal connections between the upper and lower peripheries of said drums, whereby they are prevented from rotating.

5. In an electric locomotive, the combination, with the driving-axle and wheels fixed thereto, of a armature fixed upon and carried by said axle, a circular field-magnet surrounding said armature, a drum surrounding the field-magnet and supporting it upon the axle, and flexible supports between the periphery of the drum and the locomotive-truck, said supports preventing rotation of the field-magnet and drum.

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

CHARLES J. VAN DEPOELE.

Witnesses:

JOHN W. GIBBONEY,

CHAS. H. OLIN.