(No Model.)

C. S. BRADLEY.

ELECTRIC CAR MOTOR.

No. 570,119. Patented Oct. 27, 1896.

Fig 1.

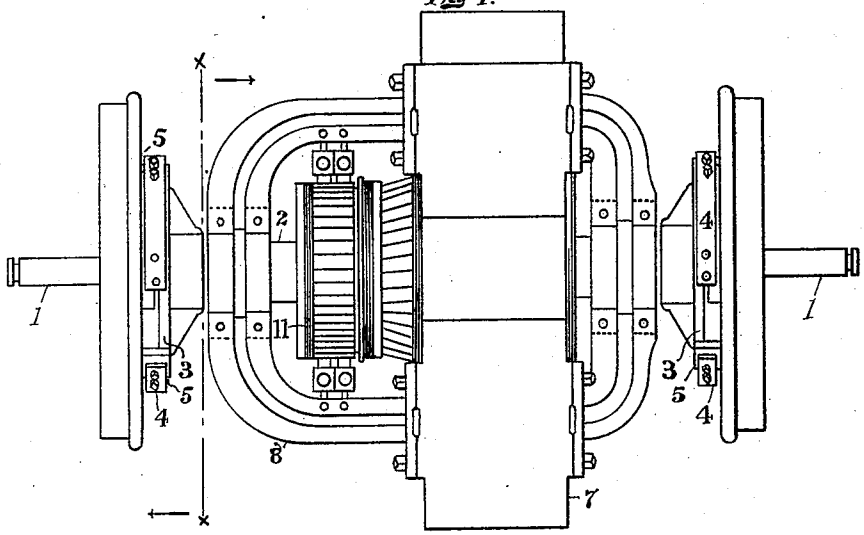


Fig. 2.

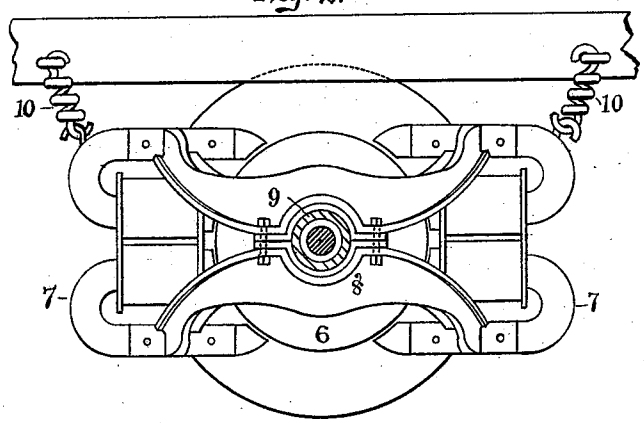
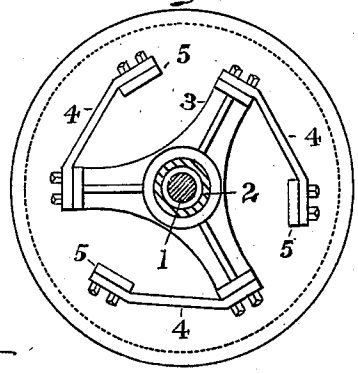


Fig. 3.



WITNESSES:

C. L. Belcher

G. H. Stockbridge

INVENTOR

Charles S. Bradley

BY Ross Hand

his ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES S. BRADLEY, OF AVON, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

ELECTRIC CAR-MOTOR.

SPECIFICATION forming part of Letters Patent No. 570,119, dated October 27, 1896.

Application filed March 30, 1896. Serial No. 585,312. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. BRADLEY, a citizen of the United States, and a resident of Avon, in the county of Livingston and State of New York, have invented certain new and useful Improvements in Electric Car-Motors, of which the following is a specification.

This invention relates to the application of an electric motor to a car axle or truck, the design being to so construct and mount the motor that it will be free from certain practical difficulties which arise.

By reason of the great weight of an electric motor special provisions must be made for supporting it on the car truck or axle so as to dampen the vibration and reduce the shock upon the axle produced by the heavy armature or other parts during service. A difficulty arises in developing sufficient torque to drive the car and creating a counter electromotive force high enough to prevent burning out of the armature at reasonable speeds, or when the motor is starting from a state of rest. With bipolar motors, which is the type ordinarily used in practice, the counter electromotive force developed at low speeds is insufficient to prevent heating of the armature-conductors. It is therefore necessary to drive the armature at very high speeds, and as a result of this incident gearing must be used to lower the wheel velocity to a sufficient degree to suit a commercial speed of locomotion. Multipolar motors have been produced and used for operating cars, and by reason of the high counter electromotive force developed at low speeds the armature may be attached directly to the driving-axle; but the field-magnet system of such motors occupies so much space ordinarily as to necessitate undue elevation of the car-floor. My invention is addressed more particularly to overcoming these difficulties.

The invention comprises an armature elastically supported from the car-wheels upon tangentially-arranged springs. It comprises also a multipolar field-magnet system adapted to occupy little room vertically and therefore permit of the use of multipolar motors for traction.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view of a motor embodying my invention, showing the car wheels and axles connected therewith. Fig. 2 is a sectional elevation on the plane indicated at $x\,x$, looking toward the right; and Fig. 3 is a similar sectional elevation of Fig. 1, looking toward the left, showing the means for supporting the armature-sleeve.

Reference being had first to Fig. 3, 1 represents the car-axle. Surrounding this, but out of contact therewith, is a steel or other suitable metallic tube 2, upon which is rigidly mounted at each end a spider 3. The spider may have any desired number of radial arms. Three are shown in the drawings, each of which is connected by means of a stout band-spring 4 with the car-wheel, upon which integral lugs 5 are cast, the springs being bolted to the lugs and the arms of the spider. Any other suitable mode of connecting the springs with the wheel might be used. That illustrated is preferred, however, for reasons hereinafter stated.

The armature 6 is mounted upon the sleeve 2, as indicated in Figs. 1 and 2, and the field-magnets 7 are supported by means of cast-iron yokes 8 and non-magnetic boxes 9 upon the sleeve. The sleeve is free to rotate within the boxes 9 to prevent the field-magnet system from displacement. Links 10 or other equivalent steadying devices are connected with a fixed portion of the truck or car-body.

The field-magnet system of the motor is composed of two horseshoe-magnets at each side of the armature, the polarizing-coils being wound upon the adjacent legs of the magnets and the supporting-frame being connected to the outer legs. The armature and field-magnet cores are so proportioned that the outer legs of the magnet will lie with their upper edges about tangential to the vertical diameter of the armature. The field-magnet poles are so distributed, as indicated in Fig. 2, that the eight poles will occupy the angular positions which they should in a ten-pole field, the two pieces thus being omitted at the top and bottom in order to bring the motor within a small horizontal compass. The ar-

mature is wound for ten poles, the winding being preferably a closed-coil winding of the type described in patent to Muller, No. 331,726, of December 1, 1885. The commutator is indicated at 11. It will thus be seen that I am able to provide a multipolar motor of eight field-magnet poles without occupying more vertical room than would be necessary for an ordinary bipolar motor, and as four times as many poles are used an equivalent counter electromotive force may be developed at one-fourth the ordinary speed. The armature will therefore have a sufficient velocity to drive the car at a commercial rate of speed although operating directly on the axle, and dispensing with gearing is rendered possible. From the supporting structure described it will be understood that any shock to which the car-wheels may, by reason of irregularities in the track, be subjected, or any strains due to the inertia of the parts of the motors, will be completely absorbed by the supporting-springs 4, and as these springs are supported upon the car-wheels absolutely no strain is thrown upon the axle, and tendency to crystallize or break the latter is avoided. The strain comes upon that portion of the car-support which is best able to stand it, namely, the car-wheels. By setting the supporting-springs 4 tangentially, as indicated in Fig. 3, an elastic seat is provided for the tube, and yet but little vibration can occur, as a tendency to yield in any direction will be resisted by some one of the three springs upon which the strain will be pulling almost in its line of greatest resistance or tensile strength.

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

1. The combination with the wheel and axle of a car-truck, of an electric motor mounted upon a sleeve surrounding the axle, said sleeve being supported by the car-wheels upon tangentially-arranged springs.

2. A car-motor consisting of an armature tending to produce direct rotation of the axle, and a multipolar field-magnet having its pole-pieces lying within substantially horizontal planes at the extremities of the vertical diameter of the armature, the armature being wound to develop a greater number of poles than are used in the field-magnet, the omitted poles of the field-magnet being at the top and bottom of the armature.

3. A car-motor consisting of an armature tending to produce direct rotation of the axle, and a multipolar field-magnet having its pole-pieces less in number than the armature-poles and arranged at the sides of the armature, thereby dispensing with the vertical pole-pieces of the field-magnet and bringing the motor substantially within the vertical space occupied by its armature.

4. A car-motor comprising a multipolar armature tending to directly rotate the axle, and a multipolar field-magnet having its pole-pieces lying substantially within horizontal planes at the extremities of the vertical diameter of the armature, the space between adjacent pole-pieces at the top and bottom being at least twice as great as the space between adjacent pole-pieces at the sides.

In testimony whereof I have hereunto subscribed my name this 18th day of March, A. D. 1896.

CHARLES S. BRADLEY.

Witnesses:
ROBT. H. READ,
LAVINIA JACKSON.