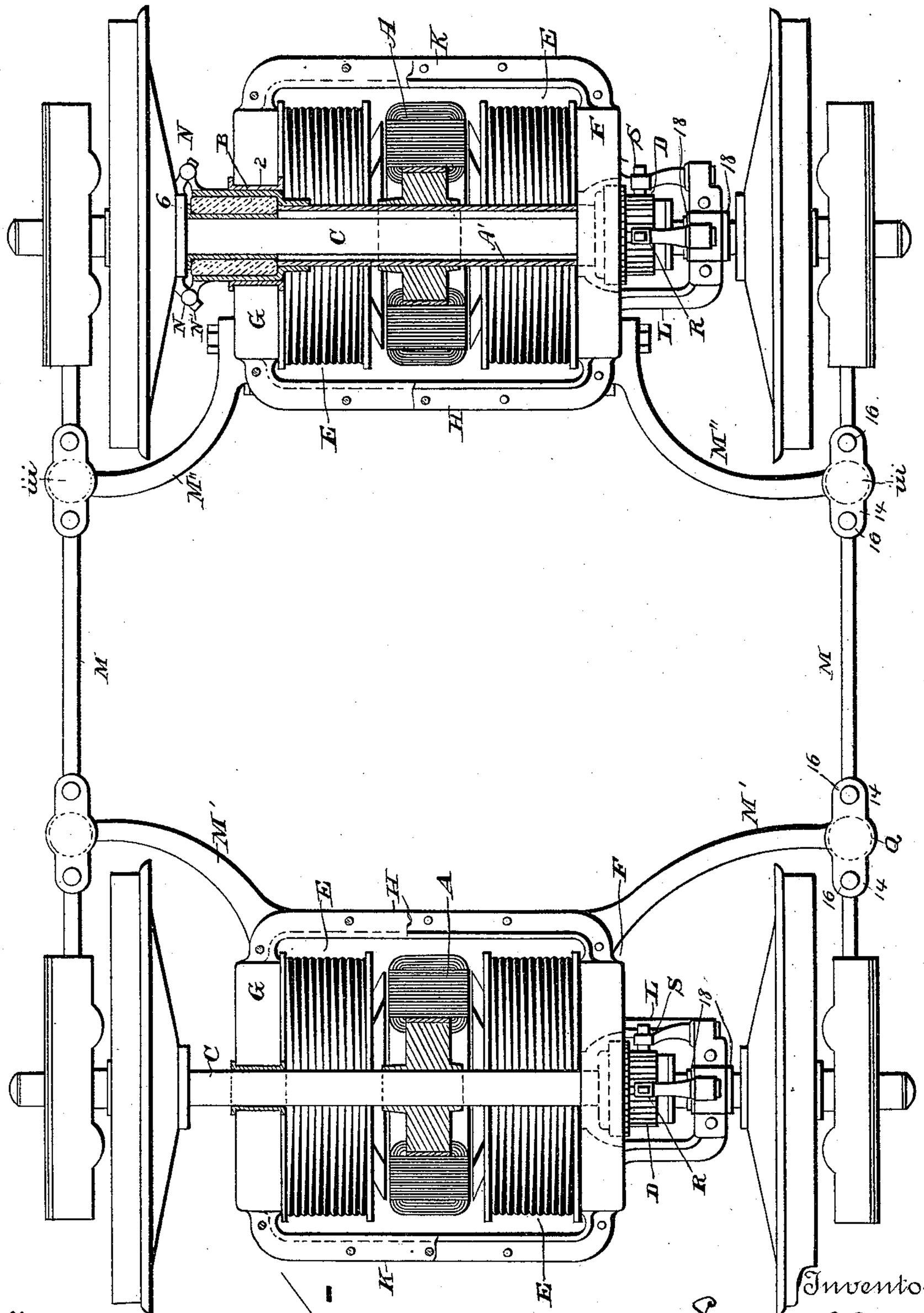
(No Model.) 3 Sheets—Sheet 1.

S. H. SHORT.

MOUNTING FOR ELECTRIC CAR MOTORS.

No. 451,981. Patented May 12, 1891.



(No Model.) 3 Sheets—Sheet 2.

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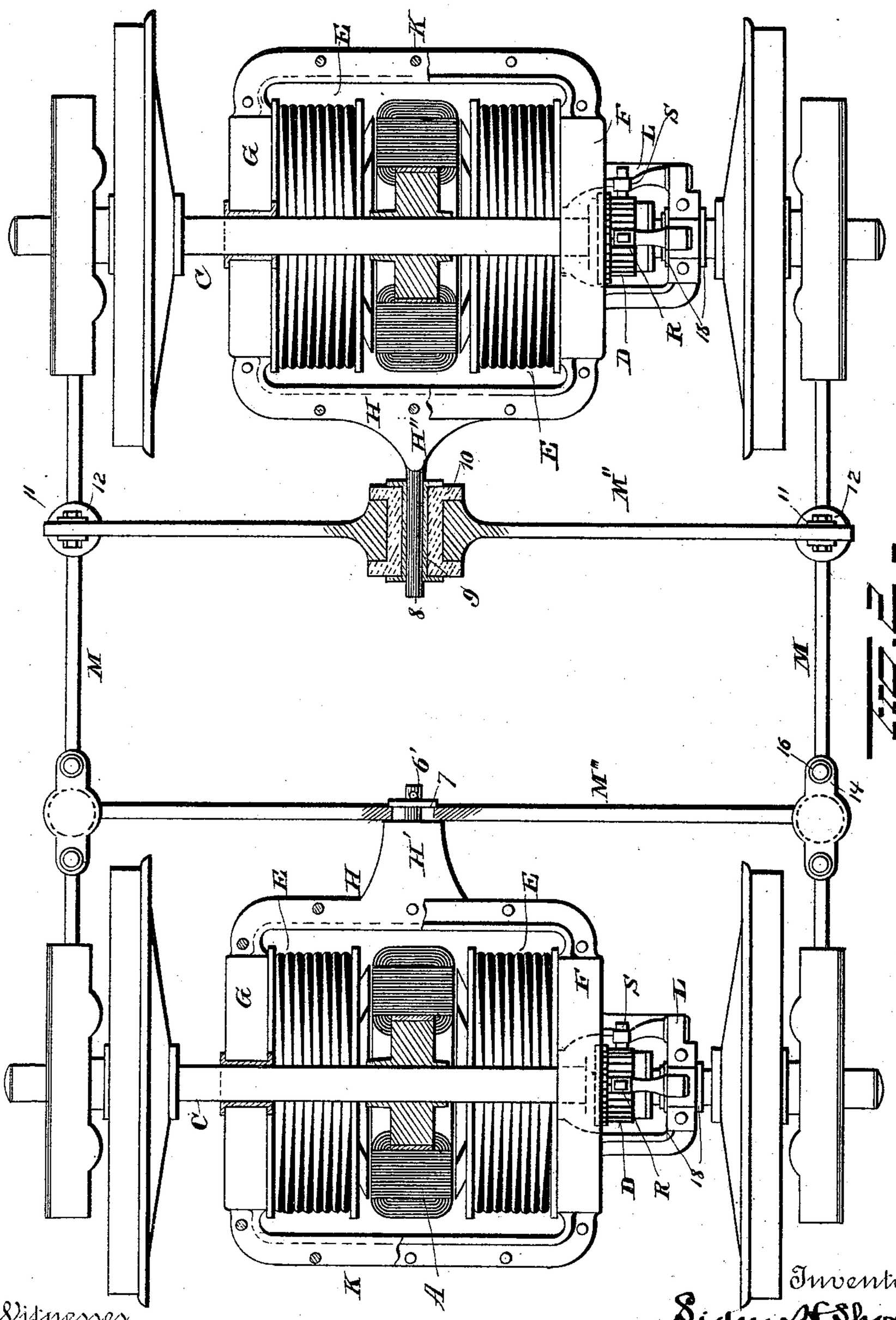

Witnesses
C. M. Cunningham
Albert Popkins

Inventor
Sidney H. Short.

By his Attorney
H. A. Seymour.

(No Model.) 3 Sheets—Sheet 3.

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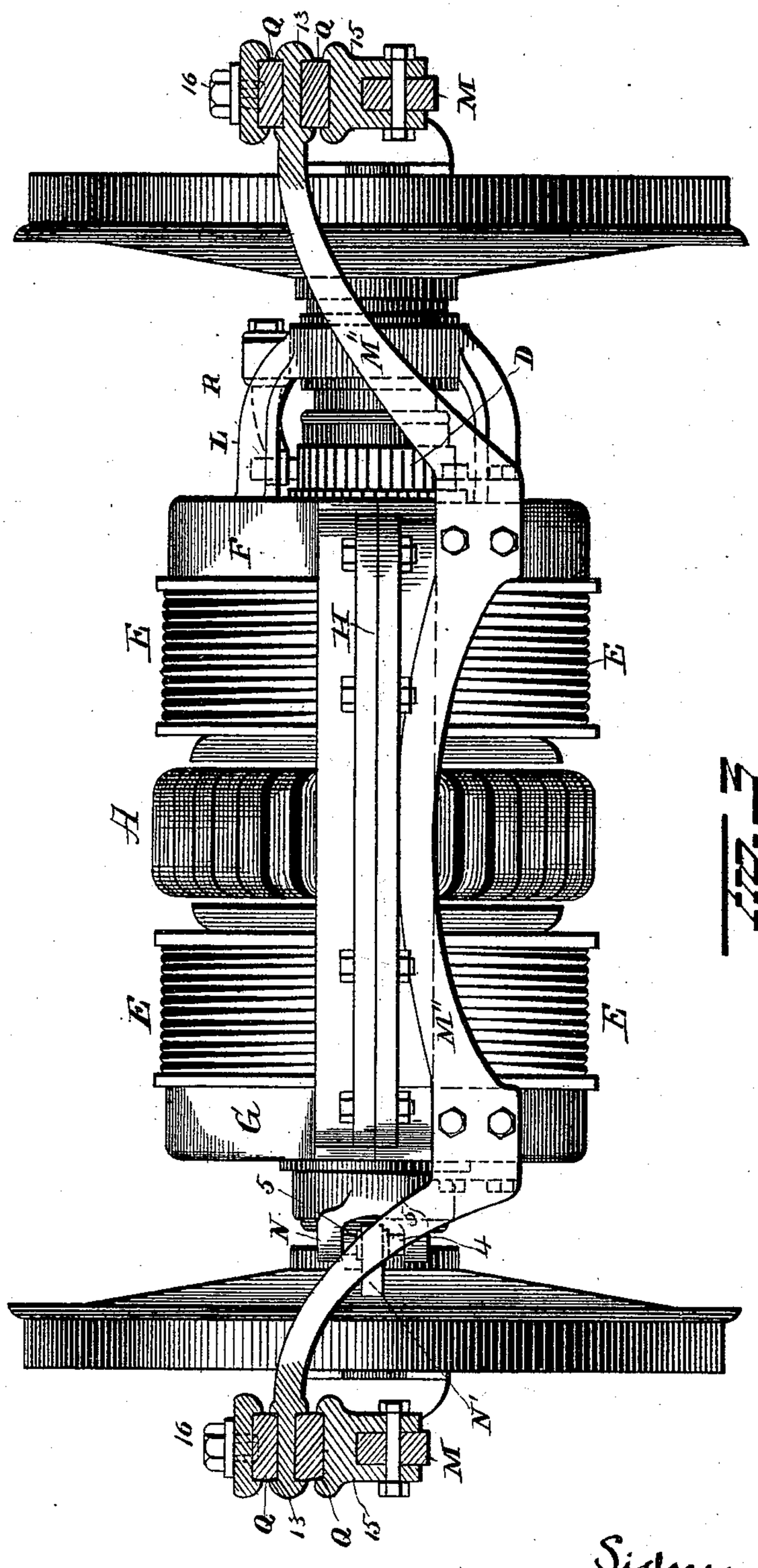

Fig. 2.

Witnesses
E. M. Wrightman
Albert Popkins

Inventor
Sidney H. Short.
By his Attorney
H. A. Seymour.

UNITED STATES PATENT OFFICE.

SIDNEY H. SHORT, OF CLEVELAND, OHIO, ASSIGNOR TO THE SHORT ELECTRIC RAILWAY COMPANY, OF SAME PLACE.

MOUNTING FOR ELECTRIC-CAR MOTORS.

SPECIFICATION forming part of Letters Patent No. 451,981, dated May 12, 1891.

Application filed December 1, 1890. Serial No. 373,125. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY H. SHORT, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mounting for Electric-Car Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the mounting for electric-car motors which have their armatures axially placed with reference to the driving-axles and directly connected with the same. By "axially placed" is to be understood that the axes of the armature and driving-axle are coincident, or nearly so, and this axial position is best attained by mounting the armature on the car-axle, such mounting being specially included in the term, although the latter is also of more general signification. By "directly connected" is to be understood that the driving-axle makes one revolution to each revolution of the armature.

In accordance with the present invention, the axially-placed and directly-connected armature is combined with field-magnets mounted on the driving-axle through journal-bearings and held from rotation by means of a connection with a truck-frame or some part of or attachment to the same, or more generally with a frame under the car-body extending between the car-axles or otherwise. The term "truck-frame" as used in this specification comprises all the truck except the wheels and axles and the truck comprising the parts of the car below the car-body.

It is customary in the truck-frames of cars to employ side bars which connect with each other the pedestals and journal-boxes on the same side of the car. While the present invention extends to a connection with a truck-frame or a frame under the car-body in general, it specially includes a connection with side bars connecting the pedestals and journal-boxes of two car-axles. These side-bars may be secured to the pedestals so as to move up and down with the car-body, or they may be secured to the journal-boxes so as to be independent of the vertical movements of the car-body. They may rest on springs or buffers separate from the car-springs, or on the main car-springs. Side bars of any of these different forms or modifications may serve for use in the present invention for the connection of the field-magnets therewith. The armature is preferably mounted on the car-axle, so that no journal-bearings are required therefor, and it may be so mounted with or without the interposition of springs or buffers. The anti-rotative connection for the field-magnets may be made, through springs or buffers, with the truck-frame or other frame, which may itself be supported with springs or buffers, or said connection may be made without the interposition of springs; further, the motor may be insulated from the axle on which it is mounted and also from the frame with which the anti-rotative connection for the field-magnets is made. This mode of mounting and connecting is included generally in the invention irrespective of the precise form of motor. The invention, however, covers special features in regard to this—that is to say, first, the field-magnets are arranged symmetrically with reference to the car-axle, so that they balance themselves thereon; second, the field-magnets are arranged horizontally; third, the field-magnets are placed above (or not materially below) the lowest part of the armature; fourth, the field-magnets are placed at the sides of the armature parallel with the said axle; fifth, multipolar field-magnets are employed, the armature being adapted to use with such a field as by means of cross-connections at the commutator; sixth, the field-magnets of the multipolar field are so arranged that the two lowest magnets are equidistant from the lowest part of the armature, one in front and one in rear of same. In this position the field-magnets may project somewhat beyond the periphery of the armature and still be above its lowest point.

Although it is designed to use all these features in connection with one another, yet it is obvious that one or more of them may be used without the others, and the invention extends to such use.

In the accompanying drawings, which form part of this specification, Figures 1 and 2 are each a plan view, partly in section, of a car-

truck having a motor for each axle mounted in accordance with the invention, and Fig. 3 is a section on line *i i i* of Fig. 1.

In Figs. 1 and 2 somewhat different mountings are shown for the two motors. This is done for the purpose of saving illustration, as practically the motors on both axles would be made as nearly identical as possible, although they might of course be different, as shown.

In all the motors shown the armature A is composed of a soft-iron strip wound upon itself and provided with bobbins of insulated wire wrapped about the ring so made in notches in the edges thereof. The bobbins are connected in closed series, and from the junction wires are led to the strips of a commutator D. The armature A is not only axially placed with reference to the car-axle C, but is mounted thereon so as to turn therewith without requiring any journal-bearings. In the motor, at the right of Fig. 1, the armature is fast on a hollow shaft A′, which surrounds the car-axle C, springs or buffers B of, say, soft vulcanized rubber, being interposed between a bushing on the car-axle and sockets 2 at the ends of the hollow shaft. In all the other motors the armature is shown as fast on the car-axle C. The armature in all the motors is directly connected with the car-axle. In the motor at the right of Fig. 1 direct driving connection is made by forks N on the shaft A′ engaging arms N′ projecting from a collar 3, which is fast on a hub of a car-wheel P. Spring-pads 4, of, say, soft vulcanized rubber, are interposed between the forks N and the arms N′, the ends of the pads being protected by metal caps 5. In the other motors the driving connection is through the key or other mechanical means by which the armature is made fast on the car-axle. The field-magnets E are in all the motors shown arranged symmetrically in a horizontal position above (or not materially below) the lowest point of the armature, at the sides of the armature parallel with the car-axle. These are (as represented) eight in number, to form a multipolar field of four poles, each pole being constituted by two magnets in line with each other on opposite sides of the armature. These field-magnets are so arranged that the four lowermost magnets are equidistant from the lowest point of the armature, the magnets of one polarity being in front and those of the other sign in the rear of said lowest point. The magnets E project from yokes F G, which are mounted on the car-axle C, through journal-bearings formed in the yoke G and bracket L on the yoke F, said bearings embracing journals on car-axle C, Fig. 2 and left half of Fig. 1, or on the hollow armature-shaft A′, as in the right half of Fig. 1. The yokes F G are connected together by arms H K.

To facilitate the application to the car-axle, the yokes F G, bracket L, and arms H K are divided horizontally through the journal-bearings. The field-magnets are held from rotating by means of a connection with a frame M under the car-body between the axles. Such frame, as shown, is the truck-frame of the car and is supported by the ordinary journals of the car-axles. In the left-hand motor of Fig. 1 the connection is made through arms M′, cast or made integral with the lower half of the yokes F G and connecting-arms H K. For the right-hand motor of Fig. 1 (shown also in Fig. 3) there is a cross-bar M″, bolted to yokes F G and underlying the arm H. It is evident that the middle part of cross-bar M″ could be omitted. In the motor at the left of Fig. 2 the lower half of arm H is provided with a projection H′, with a pivot-pin 6′ fixed therein, which pin works in a horizontal slot 7 in the cross-bar M‴. In the motor at the right of Fig. 2 a journal-pin 8, in the projection H″ from the lower half of connecting-arm H, plays in a metal sleeve 9 in the opening in the cross-bar M⁗, a spring or buffer 10, of, say, soft vulcanized rubber, being interposed between said sleeve 9 and the wall of said opening. The hollow armature-shaft A′ of the right-hand motor of Fig. 1 could of course be used in combination with each of the connections M′ M‴ M⁗ of the other motors, and similarly the connection M″ of the said right-hand motor could be used without the shaft A′ and its springs or buffers B. The arms or cross-bars M′ M″ M‴ M⁗ may be secured to the holding-frame M (or truck-bars) with or without the interposition of springs or buffers. In the right-hand motor of Fig. 2 each end of the cross-bar M⁗ is shown as pivoted between ears 11 on a plate or head 12, which is fastened to one of the bars M. In all the other motors an enlargement 13 on the arms or cross-bars is interposed between springs or buffers Q, of, say, soft vulcanized rubber, which are confined between heads or plates 14 and 15 by means of retaining-bolts 16. The lower plates or heads 15 have each a fork which straddles the bar M and is pivoted thereto, or other means of fastening may be used. If the motor be insulated from the car-axle by way of the mounting and driving connection, as is the case in the right-hand motor of Fig. 1 through the interposition of soft-rubber springs or buffers B and spring-pads 4, it will be completely insulated if any of the forms of connection shown be used between the yokes F G and truck-frame M. In all the motors the field-magnets are held in place on the car-axle by means of collars 18, which permit the position of the field-magnets to be adjusted lengthwise of the armature-axis. The commutator D is fast on the car-axle C or the armature-shaft A′, and rotates in contact with the brushes R and S, which are placed ninety degrees apart for the four-pole field shown. The current is supplied to and cut off from the motor in any known or suitable way.

In the foregoing description the armature has been described as rotating with the car-

axle and the field-magnets as non-rotative. It is evident that this might be reversed, the field-magnets being allowed to rotate, and being connected directly with the car-axle to turn the same, and the armature being held from rotation. It will be understood that this reversed arrangement is included in the invention as a substitute for that particularly described without further specification herein.

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

1. The combination, with a car, of a propelling-motor comprising an armature mounted on or placed axially with reference to a car-axle and directly connected with the said axle, and field-magnets directly journaled on said axle, and a connection with side bars connecting the pedestals and journal-boxes of two car-axles, substantially as described.

2. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and field-magnets directly journaled on said axle, and a connection with a truck-frame, substantially as described.

3. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle, and field-magnets directly journaled on said axle, and a connection with a frame between the car-axles, substantially as described.

4. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and field-magnets directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

5. The combination, with a car, of a propelling-motor spring mounted on the car-axle and comprising an armature axially placed with reference to said axle and directly connected therewith, and field-magnets directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

6. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and field-magnets journaled on said axle, and a spring or yielding connection with a frame under the car-body, substantially as described.

7. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle, and field-magnets journaled on said axle, and a spring or yielding connection with side bars connecting the pedestals and journal-boxes of two car-axles, substantially as described.

8. The combination, with a car, of a propelling-motor spring mounted on a car-axle and comprising an armature axially placed with reference to said axle and directly connected therewith, and field-magnets mounted on said axles by means of journal-bearings, and a spring or yielding connection with a frame under the car-body, substantially as described.

9. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected therewith, and field-magnets mounted on said axle by means of journal-bearings, said motor being insulated from said axle by way of the mounting and driving connection, and an insulating connection with a frame under the car-body, substantially as described.

10. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and symmetrically-disposed field-magnets directly journaled on said axle, and a connection with a truck-frame or frame under the car-body, substantially as described.

11. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a car-axle and directly connected therewith, and horizontally-arranged field-magnets directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

12. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected therewith, and field-magnets arranged above (or not materially below) the lowest part of said armature and directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

13. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and field-magnets at the sides of said armature parallel with the axis thereof, directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

14. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and multipolar field-magnets directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

15. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to a car-axle and directly connected with said axle, and multipolar field-magnets symmetrically disposed in a horizontal position at the sides of said armature, directly journaled on said axle, and a connection with a frame under the car-body, substantially as described.

16 The combination, with a car, of a pro-

pelling-motor comprising an armature mounted on or axially placed with reference to a driving-axle and directly connected with said axle, and multipolar field-magnets directly journaled on said axle, said magnets being so arranged that the magnets of the two lowermost poles are equidistant from the lowest part of the armature in front and rear of the same, respectively, and a connection with a frame under the car-body, substantially as described.

17. The combination, with a car, of a propelling-motor comprising an armature mounted on or axially placed with reference to the driving-axle and directly connected with said axle, and field-magnets projecting from yokes at the sides of said armature, said yokes being perforated for the passage of said axle and directly journaled on the same, and a connection with a frame under the car-body, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

S. H. SHORT.

Witnesses:
A. B. CALHOUN,
JOHN C. DOLPH.