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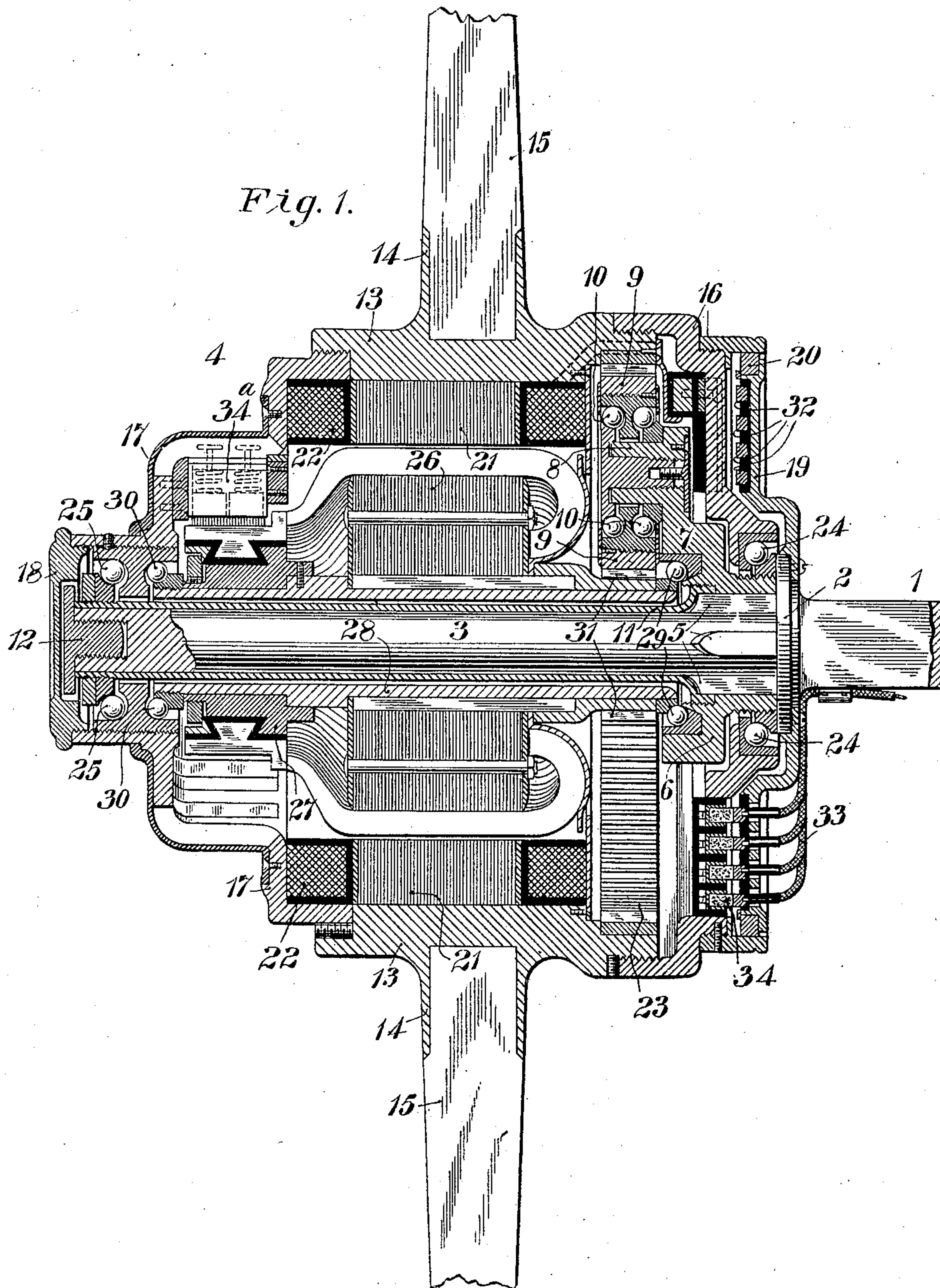
Patented Aug. 20, 1901.

F. J. NEWMAN & J. LEDWINKA.  
ELECTRICALLY PROPELLED VEHICLE.

(Application filed Jan. 18, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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Birney Hines

INVENTORS

Frederick J. Newman  
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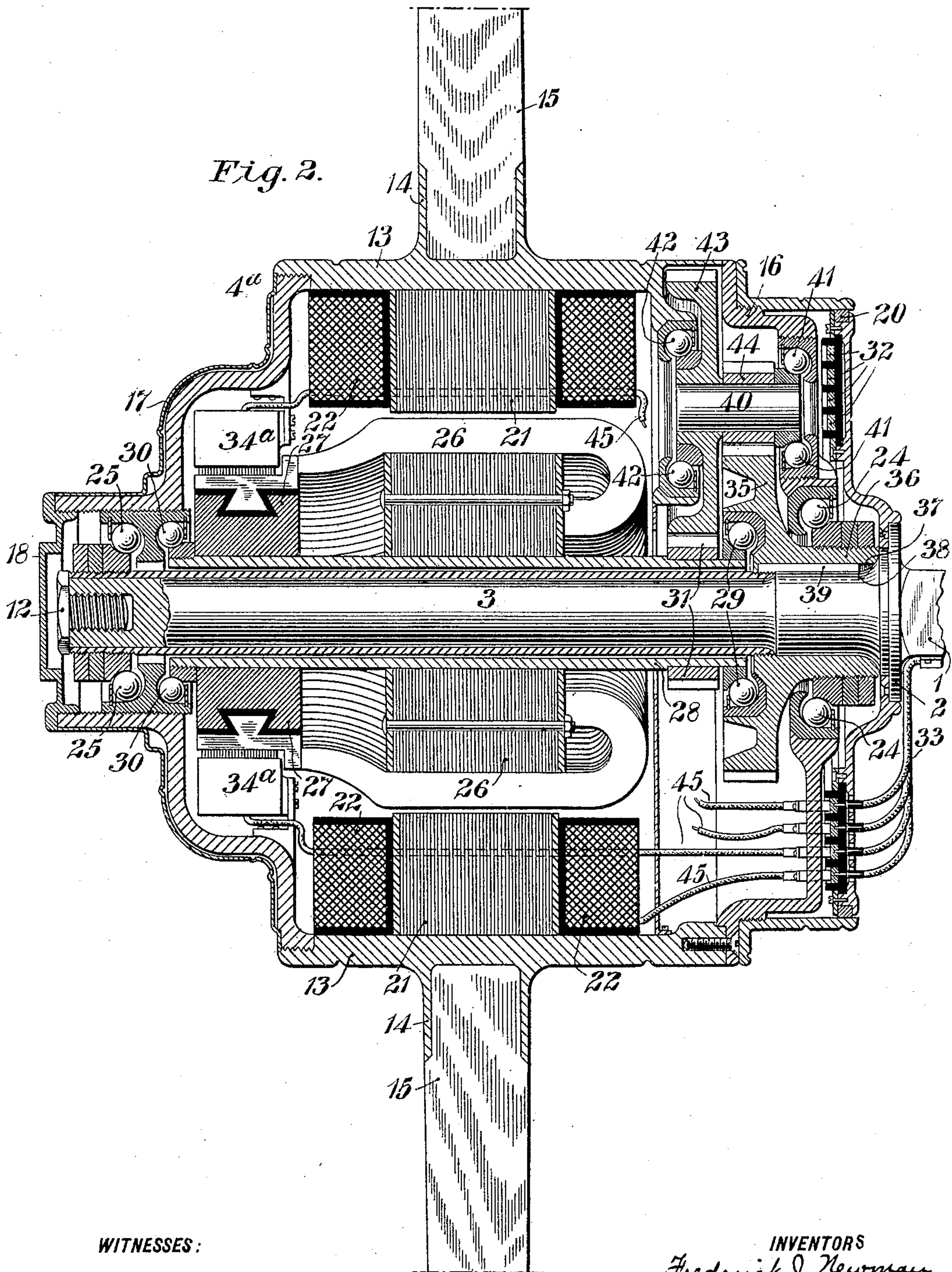
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# UNITED STATES PATENT OFFICE.

FREDERICK J. NEWMAN AND JOSEPH LEDWINKA, OF CHICAGO, ILLINOIS,  
ASSIGNORS TO THE HUB MOTOR COMPANY, OF NEW JERSEY.

## ELECTRICALLY-PROPELLED VEHICLE.

SPECIFICATION forming part of Letters Patent No. 680,804, dated August 20, 1901.

Application filed January 18, 1901. Serial No. 43,716. (No model.)

*To all whom it may concern:*

Be it known that we, FREDERICK J. NEWMAN, a citizen of the United States, and JOSEPH LEDWINKA, a subject of the Emperor of Austria-Hungary, both residents of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electrically-Propelled Vehicles, of which the following is a specification.

Our invention relates to electrically-propelled vehicles, and has special reference to such vehicles as are intended to operate upon roads and streets without the provision of supporting and guiding rails, though not necessarily limited thereto.

Our invention has for its objects to provide means whereby a propelling electric motor and its power-transmitting gearing may be so embodied in a vehicle-wheel hub as to be securely housed without materially modifying the appearance of the wheel, to reduce the friction incident to the operation of the mechanism, to remove the weight of the motor from the axle, to simplify and improve the transmitting-gearing, and to so construct and combine the parts that the wheel and its driving mechanism may be removed from the axle as a unit.

In order to enable others skilled in the art to which our invention pertains to make and use the same, we will now proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a central sectional view of a wheel-hub embodying one form of our invention. Fig. 2 is a view similar to Fig. 1, but illustrating a modified form of power-transmitting gearing.

Referring now particularly to Fig. 1, the axle 1 is provided with an annular flange 2, beyond which projects the cylindrical portion 3 of the axle, which is surrounded by the hub 4 of a supporting-wheel, a portion only of which is shown. The portion 3 of the axle is provided adjacent to the flange 2 with one or more lugs or ribs 5, four of these devices being indicated in the drawings, though a single one, if of proper form and dimensions, will generally be sufficient, and any other number may be employed, if desired. A collar 6 is provided with key ways or slots to re-

ceive the lugs 5, so as to lock it securely to the axle, but at the same time permit of its ready removal longitudinally. Any other suitable means may of course be employed for removably locking the collar 6 against rotation. The collar abuts against the flange 2 and is provided at one side with a bracket 7, having a stub-shaft 8, on which is journaled a gear-wheel 9, ball-bearings 10 being interposed between the gear-wheel and the shaft. Fitted over the cylindrical portion 3 of the axle is a sleeve 11, which has a screw-threaded engagement with the collar 6 and is held upon the axle by means of a suitable locking device, here shown as a bolt 12, screwed into a socket in the end of the axle and having a head of greater diameter than the axle, so as to bear against the end of the sleeve. The internal diameter of the sleeve 11 is substantially the same as that of the axle, but the fit between the two is such that the sleeve may be easily slipped off and on. The shell of the hub 4 comprises a middle portion 13, of iron or steel, having sockets 14, in which are seated the inner ends of the wheel-spokes 15, an inner end cap-piece 16, an outer end portion 17, and a removable cap-nut 18 for closing the outer end. The inner end of the hub is closed by means of a stationary plate 19, which is fastened to the flange 2, and a ring 20, of felt or other suitable material, which is interposed between the edge of the plate 19 and the projecting end of the part 16 in order to exclude dirt, moisture, &c., from the interior of the hub. The portion 13 of the hub constitutes the frame or ring of the field-magnet of the motor and is provided with inwardly-projecting pole-pieces 21, on which are mounted the field-magnet coils 22. The portion 13 of the hub is also shown as provided with an annular rack or internal gear 23, with which the gear-wheel 9 meshes. The hub-shell is provided at its inner end with ball-bearings 24 and at its outer end with similar ball-bearings 25, so that it may be rotated with the minimum amount of friction.

The motor-armature 26 and the commutator-drum 27 are mounted upon a hollow shaft or sleeve 28, which is supported in the hub independently of the axle by means of ball-



bearings 29 and 30 at its respective ends. The hollow shaft or sleeve 28 is also provided with a pinion 31, that meshes with the gear-wheel 9, so as to act through said gear-wheel and the internal gear or rack 23 to drive the hub and its wheel.

The plate 19 is provided with four contact-rings 32, to which are connected the conductors 33 for supplying electrical energy to the motor. Suitable brushes 34 are mounted in the hub in position to engage with the respective rings 32, these brushes being properly connected by suitable conductors (not shown) to the terminals of the field-magnet winding and the commutator-brushes 34<sup>a</sup>, so as to supply current to both the field-magnet and the armature-windings and to effect a reversal of the motor when desired. It will be understood that the circuit connections of the armature and field-magnet windings may be made such with reference to each other and to the source of energy as the conditions of operation may render desirable.

It will be further understood that any suitable source of current may be employed for supplying energy to the motor and that the number of motors employed for driving the vehicle may also be varied to suit the desires of the designer or builder and the service to be performed by the vehicle. In the case of vehicles having four wheels it will usually be found desirable to employ either two or four motors; but one, two, or three motors may be satisfactorily employed for driving a three-wheeled vehicle.

Referring now to Fig. 2, the several parts of the hub 4<sup>a</sup> and the motor embodied therein are substantially the same, except for slight variations in form, as the corresponding parts shown in Fig. 1 and already described, and since the same reference-numerals are here employed the description heretofore given may be read in connection with this figure, except as regards the gearing for transmitting motion from the armature to the hub-shell.

In the form of the invention shown in Fig. 2 we employ a non-rotatable gear-wheel 35, the hub 36 of which is provided with a key way or slot 37. The portion 3 of the axle 1 that is surrounded by the hub 36 is also provided with a corresponding key way or slot 38, and the gear-wheel is securely fastened against rotation by means of a key 39, which is driven into one of the keyways and makes a removable engagement with the other. Any other suitable means may obviously be employed for making a non-rotative but longitudinally-removable connection between the gear-wheel 36 and the axle 3. The hollow shaft or sleeve 28 is provided with a pinion 31, the same as in the form shown in Fig. 1; but the means for transmitting the power from this pinion to the hub-shell comprises a shaft 40, which is mounted in ball-bearings 41 and 42 and has keyed to it a gear-wheel 43 and a pinion 44, the gear-wheel being of such dimen-

sions and so located as to mesh with the pinion 31 and the pinion 44 being of such dimensions and so located as to mesh with the non-rotatable gear-wheel 35. It will be readily seen from this construction that as the pinion 31 is rotated by the armature it will cause the gear-wheel 43 and pinion 44 to rotate in the opposite direction, and since the gear-wheel 35 is held against rotation the pinion 44 will revolve around the non-rotatable gear-wheel and carry the hub with it. This arrangement of gearing is advantageous by reason of the fact that it leaves ample space for the conductors 45 leading to the motor field-magnet coils and the commutator-brushes 34<sup>a</sup>. In this modification of the invention as well as in that shown in Fig. 1 it will be seen that all of the parts of the motor and power-transmitting gearing are supported by the hub independently of the axle and that they are so connected by means of the sleeve 11 that by removing the cap 18 and bolt 12 the wheel, hub, and contained mechanism may all be removed as a unit and without disturbing or disarranging the component parts of the structure. It will be also understood that the motor may be utilized without the employment of gearing by so supporting one of the members of the motor that it is non-rotatable, and thereby insuring direct rotation of the other member, if desired.

The details of construction may obviously be varied as regards form, dimensions, and location of parts without departing from our invention, and we therefore desire it to be understood that the invention is not limited except in so far as limitations are specified in the claims.

We claim as our invention—

1. The combination with a vehicle-axle, of a supporting-wheel the hub of which embodies an electric motor, the parts of which are supported by the wheel independently of the axle, substantially as described.

2. The combination with a vehicle-axle, of a supporting-wheel having a hollow hub serving as an electric-motor field-magnet and an armature supported by the wheel independently of the axle, substantially as described.

3. The combination with a vehicle-axle, of a supporting-wheel having a hub that serves as an electric-motor field-magnet, a hollow shaft loosely mounted on the axle and having its bearings in the hub, an armature keyed upon said hollow shaft, and means for transmitting the rotary motion of the armature to the wheel, substantially as described.

4. The combination with a vehicle-axle, of a supporting-wheel having a hub that serves as an electric-motor field-magnet, a hollow shaft loosely mounted on the axle and having its bearings in the hub and provided with a gear-pinion, an armature mounted on said hollow shaft, and gearing between said gear-pinion and the hub, substantially as described.

5. The combination with a vehicle-axle, of a sleeve removably located on the axle, and a



5 wheel having a hub that embodies an electric motor, the parts of which are supported by the wheel independently of the axle, said sleeve, wheel and motor being removable from the axle as a unit, substantially as described.

6. The combination with a vehicle-axle, of a sleeve removably located on the axle, means for locking said sleeve against rotation, a wheel having a hub that embodies an electric motor and surrounds said sleeve, means on the free end of the axle for holding the hub and its parts in place, a hollow shaft surrounding the sleeve and having its bearings in the hub, and having the motor fastened thereon, substantially as described.

7. The combination with a vehicle-axle, of a sleeve located on and fastened to the axle but longitudinally removable therefrom, a wheel having a hub that embodies an electric motor, means on the free end of the axle to hold the hub and its parts in place, a hollow shaft surrounding the sleeve and having its bearings in the hub, a gear-pinion and a motor-armature keyed to the hollow shaft and gearing between the gear-pinion and the hub, substantially as described.

8. A wheel for an electrically-propelled vehicle having a hub that embodies an electric motor, all the parts of which are supported within and by the hub structure.

9. A wheel for an electrically-propelled vehicle having a hub that embodies an electric motor and a portion of the shell of which constitutes the field-magnet frame or ring, all the other parts of the motor being contained within and supported by said shell.

10. A vehicle-wheel having a hub that embodies an electric motor and gearing between the armature and field-magnet thereof, a portion of the hub-shell constituting the field-magnet frame or ring and all of the other parts being inclosed in and supported by said shell.

11. A vehicle-wheel hub comprising a shell the spoke-supporting part of which constitutes an electric-motor field-magnet frame or ring, in combination with field-magnet pole-pieces and coils, an armature and commutator and gearing between the armature and the hub-shell, all of said parts being inclosed in and supported by said hub-shell.

12. A vehicle-wheel hub embodying an electric motor, the field-magnet frame of which is the spoke-supporting part of the hub-shell and the other parts of which are all inclosed in and supported by the hub-shell.

13. The combination with a vehicle-axle, of a hub-shell embodying an electric-motor

field-magnet, an armature rotatably mounted in the hub-shell, a gear-wheel non-rotatably mounted on the axle but longitudinally removable therefrom and gearing between the armature, the hub-shell and said gear-wheel.

14. The combination with a vehicle-axle, of a hub-shell embodying an electric-motor field-magnet, an armature rotatably mounted in the hub-shell, a stationary gear-wheel removably supported on the axle, gearing between said wheel and the hub-shell and armature and means for connecting the hub-shell and the parts supported therein so that they are removable from the axle as a unit.

15. The combination with a vehicle-axle, of a wheel-hub shell embodying an electric-motor field-magnet, an armature rotatably mounted in said hub-shell, a pinion rigidly connected to the armature, a stationary gear-wheel and a gear-wheel and pinion journaled in the hub-shell and respectively meshing with the armature-pinion and the stationary gear-wheel.

16. The combination with a vehicle-axle, of a wheel provided with a hub-shell which embodies an electric-motor field-magnet, a shaft journaled in said shell and provided with a gear-wheel and a pinion, a gear-wheel keyed to the axle in position to mesh with said pinion and an armature surrounding the axle but supported by the hub and provided with a driving-pinion that meshes with the rotating gear-wheel.

17. A vehicle-wheel hub having an electric-motor field-magnet and an armature, in combination with an armature-driven pinion, a stationary gear-wheel and intermediate gears that have movements of both rotation and revolution whereby the field-magnet and armature rotate in opposite directions.

18. A vehicle-wheel hub having an electric-motor field-magnet and an armature in combination with an armature-driven pinion, a stationary gear-wheel, intermediate gears respectively in mesh with said pinion and said stationary gear-wheel and means for connecting all of said parts so that they may be mounted upon and removed from an axle as a unit.

In testimony whereof we have hereunto subscribed our names this 15th day of January, 1901.

FREDERICK J. NEWMAN.  
JOSEPH LEDWINKA.

Witnesses:

JAMES B. YOUNG,  
WESLEY G. CARR.