(No Model.) 2 Sheets—Sheet 1.

H. F. & G. F. SHAW.

ELECTRIC LOCOMOTOR.

No. 458,729. Patented Sept. 1, 1891.

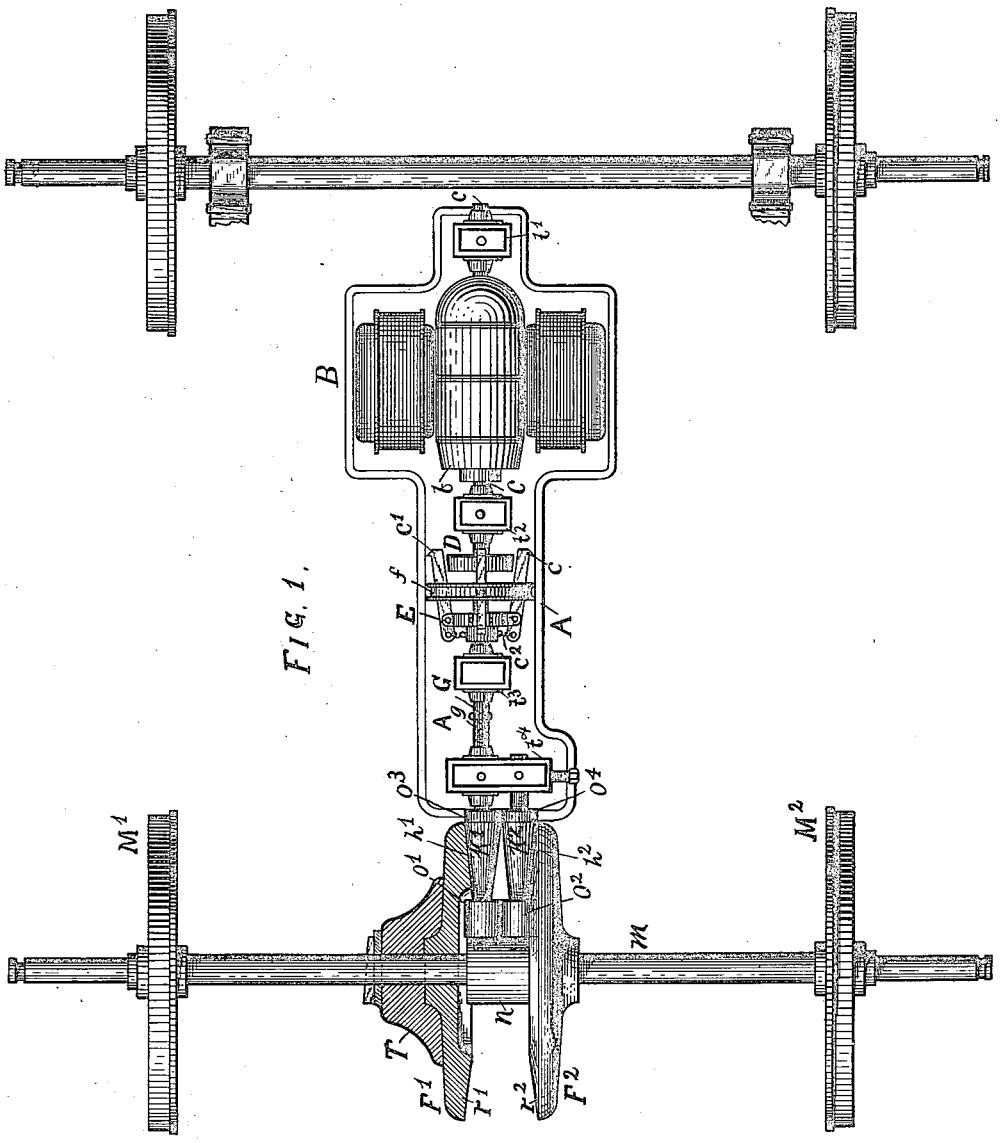

FIG. 1.

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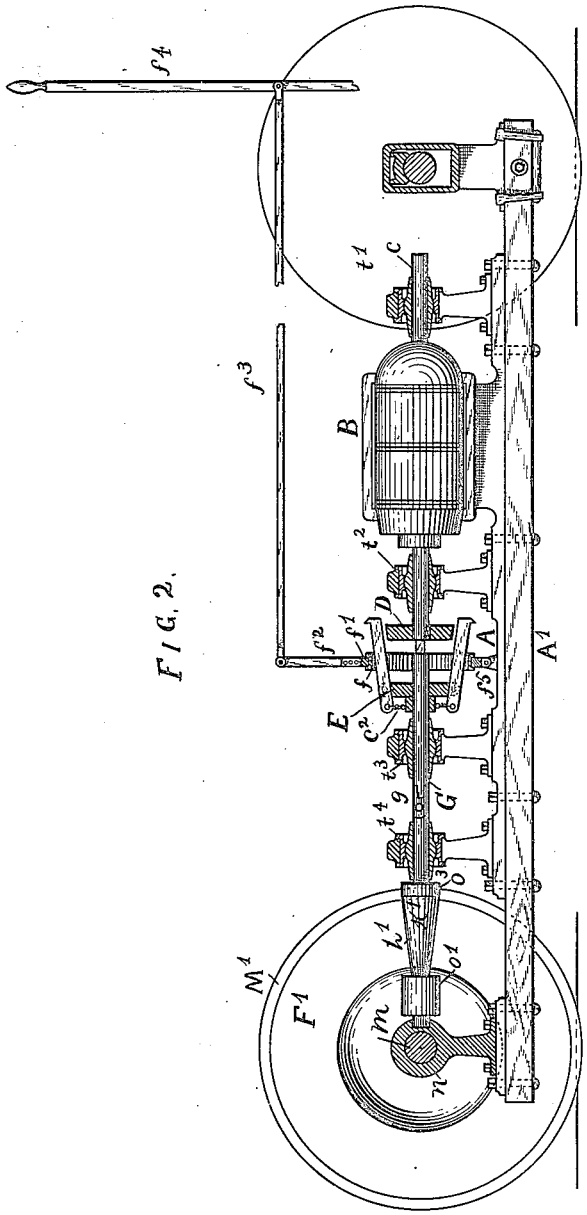
FIG. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC LOCOMOTOR.

SPECIFICATION forming part of Letters Patent No. 458,729, dated September 1, 1891.

Application filed October 27, 1888. Serial No. 289,315. (No model.)

To all whom it may concern:

Be it known that we, HENRY F. SHAW, a citizen of the United States, residing at Boston, Suffolk county, Massachusetts, and GEORGE F. SHAW, a citizen of the United States, residing at Dedham, Norfolk county, Massachusetts, have invented certain new and useful Improvements in Electric Locomotors, of which the following is a specification.

The invention relates to the construction of the driving mechanism of electrically-propelled vehicles.

The object of the invention is to provide reliable, durable, and efficient mechanism for applying the power of a high-speed electric motor to the driving-wheels of the vehicle and propel them at such speed as may be required, and also to render it possible to readily connect and disconnect the motor without stopping it.

The invention may be described in general terms as follows: An electric motor of any suitable well-known construction is mounted upon the truck of the vehicle. This motor may be driven by currents derived from any suitable source—as, for instance, storage-batteries carried by the vehicle or a dynamo-electric generator connected with the motor through conductors laid along the bed of the track or through overhead conductors and trolleys. A shaft driven by the armature of the motor is adapted to be coupled at will with a second shaft by means of a clutch or chuck, the operation of which is controlled by the driver of the vehicle. The revolutions of this second shaft are communicated to the driving-wheels through a frictional gearing consisting of two frictional rollers respectively pressing against the faces or sides of corresponding friction-wheels, which are mounted upon the axle of the driving or supporting wheels of the vehicle. One of the rollers receives its motion directly from the shaft, and this roller in turn drives the second. The friction-wheels are so constructed that the rollers press against them near their peripheries, so that the power is applied to the axle through a long leverage. By means of the chuck which is interposed between the two shafts the motor may be connected or disconnected from the driving-shaft without in any way modifying the pressure of the frictional gearing.

In the accompanying drawings, Figure 1 is a plan of such parts of the motor and gearing as are required to illustrate the invention; and Fig. 2 is a side elevation, partly in section, of the same.

Referring to the figures, B represents an electric motor of any suitable construction, supported upon a frame A, which is carried by the truck A′ of the vehicle. The armature *b* of the electric motor is carried upon a shaft *c*, supported in bearings t' and t^2. The shaft *c* carries at one end a disk D. A shaft G, supported in bearings t^3 and t^4, is placed in alignment with the armature-shaft *c*, and it carries at one end a chuck-head or support E. In this a suitable number (say four) of arms c' are pivoted. These arms are designed to grasp the disk D when it is desired to couple the shaft *c* with the shaft G. For this purpose a sleeve *f* surrounds the arms between their points of support and the disk D, and it is operated by a collar f', carried by a lever f^2. This lever is pivoted to the frame A at some suitable point f^5 and may be moved in a direction parallel to the length of the arms c' by means of suitable connecting-levers f^3 f^4, extending to a point convenient to the engineer or driver. When the vehicle is not in operation, the arms are held away from the disk D by suitable springs c^2 or in any other convenient manner, but as the lever f^4 is thrown forward it causes the arms *c* to grasp the disk D, and thus firmly couple the shaft *c* to the shaft G. At the opposite end of the shaft G from that at which the arms c' are supported there is carried a friction-roller k', which is perpendicular to the axle *m* of the driving-wheels M′ M². The end of this roller is journaled in a support *n*, which for convenience of construction may be a sleeve surrounding the axle *m*. The support *n* is carried upon the frame A or the truck A′ and independently of the axle *m*. Parallel with the roller k' there is placed a second roller k^2. One end of this roller is also supported in the sleeve *n* and the other in the bearing t^4. Motion is communicated from the roller k' to the roller k^2 through cylindrical contact-surfaces o' and o^2 and o^3 o^4, formed upon the respect-

ive rollers near their respective ends. The middle portion of each of the rollers is made tapering or conical, as shown at h' h^2.

Two friction-wheels F' F² are mounted upon the axle m upon opposite sides of the rollers k' k^2. These are constructed with confronting flanges r' r^2, which are beveled at an angle to correspond to the portions h' h^2 of the corresponding rollers. The wheel F² is fixed upon the axle m, while the wheel F' is mounted by a spline or feather and is movable a slight distance along the shaft. A spring or rubber cushion T presses the wheel F' toward the wheel F², and the two rollers are thus wedged tightly between the flanges of the two wheels. The rollers may be carried in sliding boxes in the support n for the purpose of allowing them to accommodate themselves to the friction-surfaces. It will be evident that the two friction-rollers will revolve in opposite directions, and therefore their outer surfaces pressing against the respective flanges unite in revolving the axle m in a given direction. By the employment of the two rollers wedged between the two wheels the pressure and friction are so distributed as to relieve the journals of the rollers from undue strain. The sleeve n, also being rigidly attached or supported from the car-truck, instead of directly from the axle, affords a fixed bearing for the friction-rollers, and thereby relieves the axle from the pressure and thrust of the rollers. If the portions h' h^2 of the rollers and the faces of the flanges r' r^2 are beveled at the proper angle, there will be little or no relative movement between the friction-surfaces of the wheels and rollers while in contact, owing to the gradually-diminishing speed of the wheels F' F² as their centers are approached. An improved frictional gearing is thus obtained, as the contact-surfaces are not so rapidly worn away and are easily adapted to the friction-surfaces of the wheels. This would not be the case if the bearing-surfaces were perpendicular to the axle m. It will be observed that the flanged portion of the wheels F' F², through which the power is applied, is near the periphery of the wheels, and therefore the advantages incident to long leverage are obtained, and also any required reduction in speed may be obtained, so that a high-speed electric motor may be employed for driving the car or vehicle at a very low speed, if it is so desired.

The shaft G may be constructed with a universal joint g, which will permit the portion carrying the roller k' to move in either direction, and thus better accommodate itself to the wheel F'. The clutch or chuck interposed between the motor and the shaft G permits the motor to be connected with and disconnected from the driving-wheels of the vehicle at will without stopping the motor. This clutch may be omitted, however, in case it is not desired to disconnect the motor from the frictional gearing. One advantage resulting from the employment of the clutch, however, is that it affords a second yielding point between the motor and the driving-wheels, and thus lessens the liability of any accident due to the sudden coupling of the motor to the wheels.

We claim as our invention—

1. In an electrically-actuated vehicle, the combination of an electric motor, two rollers driven thereby revolving in frictional contact with each other, and two friction-wheels having flanged peripheries, between which said contact-rollers are interposed and against which they respectively press, whereby power is communicated to the axle of said wheels.

2. The combination of an electric motor, a vehicle upon which the same is carried, two friction-wheels mounted upon the axle of said vehicle, two rollers actuated by the motor revolving in frictional contact with each other and having their axes at right angles to said axle, and frictional bearing-surfaces for said rollers formed upon the respective friction-wheels at a distance from their centers, substantially as described.

3. In an electrically-actuated vehicle, the combination, with the driving-axle, of two friction-wheels, one of which is capable of longitudinal adjustment in the direction of the length of said axle, two driving-rollers maintained in frictional contact with the confronting faces of said friction-wheel and also in peripheral contact with each other, a support for the bearings of said driving-rollers sleeved upon said axle, and means, substantially such as described, for exerting pressure simultaneously upon the surfaces of contact of the driving-rollers with each other and with the friction-wheels.

4. The combination, with a vehicle and an electric motor carried thereby for driving the same, of friction-rollers actuated by the motor, friction-wheels pressing against the respective rollers, an axle carrying the wheels, toward which the axes of the rollers are directed, and a bearing for the ends of said rollers adjacent to but independent of said axle, substantially as described.

5. In an electrically-actuated vehicle, the combination of an electric motor, a shaft driven thereby, a second shaft in alignment therewith, a clutch or chuck for coupling the two shafts together, and driving-wheels mechanically coupled with the second shaft.

6. In an electrically-actuated vehicle, the combination of an electric motor, a shaft driven thereby, a frictional gearing interposed between the shaft and the driving-wheels of the vehicle, and a coupling-clutch interposed between the motor and the driving-wheels.

7. In an electrically-actuated vehicle, the combination of the driving-wheels, an electric motor, a shaft driven thereby, a second shaft in alignment therewith, a clutch or chuck for coupling the two shafts together, and a frictional gearing interposed betweeen said shaft and the driving-wheels, consisting of friction-

wheels moving with the driving-wheels and friction-rollers extending in a radial direction with reference to the friction-wheels and driven by the second shaft.

8. The combination, with the driving-wheels and axle of a vehicle, of two parallel friction-wheels fixed upon and revolving with said axle, one of which is movable longitudinally upon said axle, two friction-rollers revolving in contact with each other between said friction-wheels and in contact therewith, and a compression-spring for maintaining the pressure between the frictional surfaces of said wheels and rollers.

In testimony whereof we have hereunto subscribed our names this 16th day of October, A. D. 1888.

HENRY F. SHAW.
GEORGE F. SHAW.

Witnesses:
SYLVENUS WALKER,
P. H. BRENNAN.