No. 645,648. Patented Mar. 20, 1900.

# E. C. MORGAN.

## ELECTRIC RAILWAY.

(Application filed Nov. 30, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

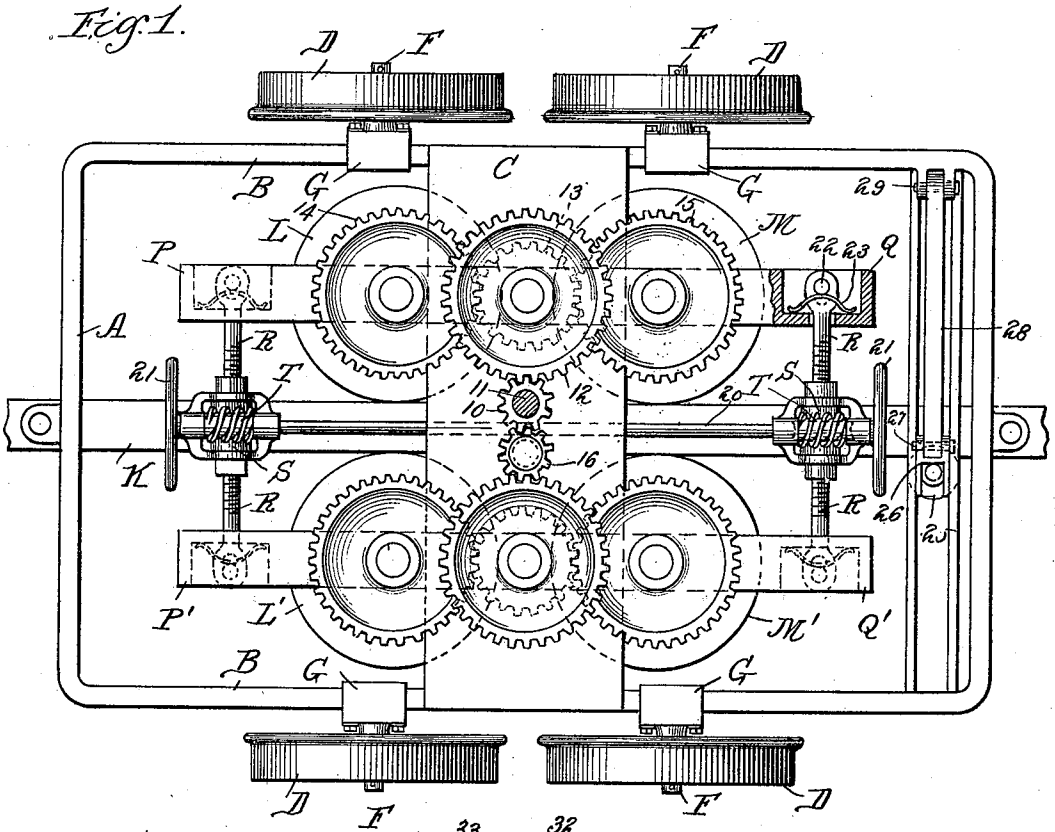
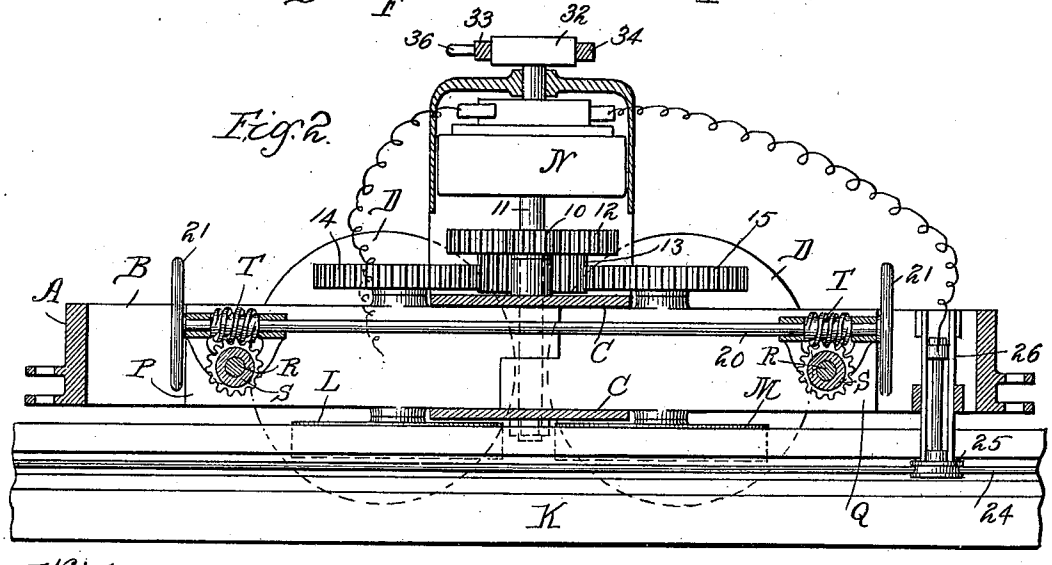



Fig. 2.




Witnesses
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ELECTRIC RAILWAY.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 3

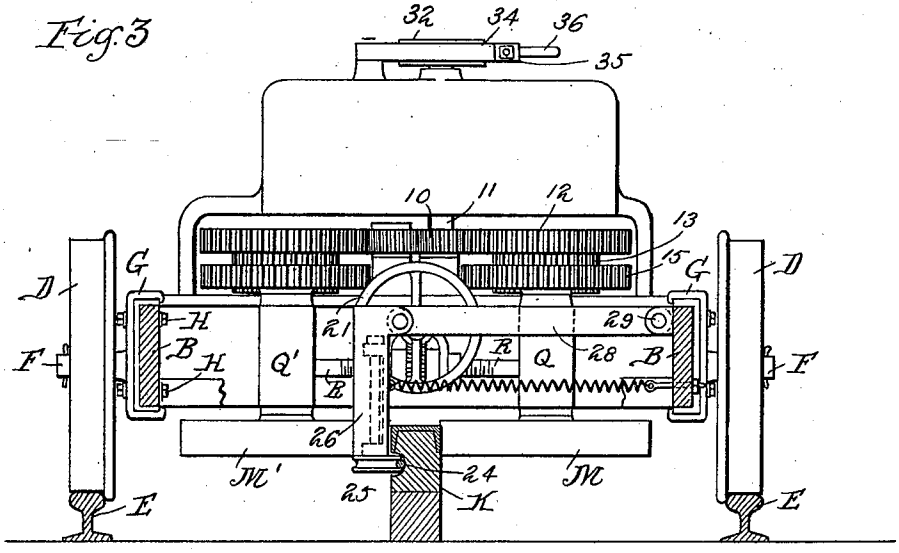



Fig. 4.

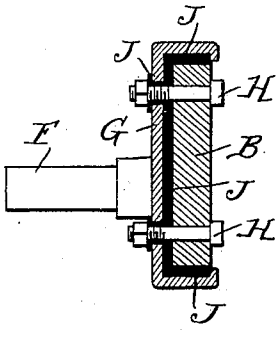



Fig. 5.

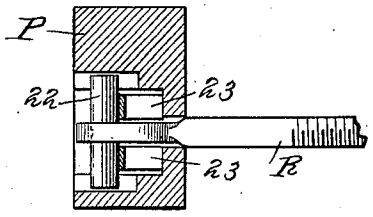
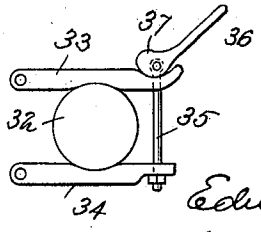



Fig. 6.




Witnesses.

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Edward F. Barrett

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# UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE ELECTRIC HAULAGE AND MANUFACTURING COMPANY, OF BRAZIL, INDIANA.

## ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 645,648, dated March 20, 1900.

Application filed November 30, 1898. Serial No. 697,894. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Railways, of which the following is a specification.

This invention relates to electric railways.

One object of the invention is to provide a simple, efficient, and safe transportation system wherein the propelling power is obtained by means of an electric current supplied from a conductor arranged parallel with the track.

A further object of the invention is to provide an electric railway specially adapted for use in mines.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally specifically pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference-signs appearing thereon, Figure 1 is a plan view of a motor-truck for an electric-railway system embodying the principles of my invention, the motor being omitted and the motor-shaft in transverse section. Fig. 2 is a longitudinal sectional view of the same. Fig. 3 is a transverse section of the same. Fig. 4 is a detached detail sectional view showing the stud or axle pin upon which the truck-supporting wheels are mounted and the manner of attaching the same to and insulating the same from the truck-frame. Fig. 5 is a broken detail sectional view of the construction for controlling the application of the traction or gripping wheels. Fig. 6 is a detail view illustrating the construction and arrangement of brake.

The same part is designated by the same reference-sign wherever it occurs throughout the several views.

Reference-sign A designates the truck-frame, which may be of any suitable and convenient construction and arrangement, but preferably and as shown comprising side bars B, joined at their ends and also intermediate their ends by the cross beams or plates C. The truck is supported by the wheels D upon the track-rails E.

In carrying out the principles of my invention I dispense with transverse axles journaled in the frame and carrying supporting-wheels at the ends thereof, as is now the common practice, and in place thereof I loosely sleeve the supporting-wheels upon independent studs F, suitably and independently secured to the truck-frame. In the particular form shown, to which, however, the invention is not limited, I provide each stud F with a plate G, adapted to be secured to the side bars B of the truck-frame in any suitable and convenient manner, as by means of the bolts H. In order to prevent possible short-circuiting of the current through the truck-frame to the supporting-wheels D, I preferably insulate each wheel, as by interposing insulating material (indicated at J, Fig. 4) between the side bars B of the truck-frame and the securing-plate G and bolts H, by which the wheel-stud is secured to such side bars. By this construction I materially reduce the weight of the truck, as well as the cost of construction and repair, while losing nothing of strength.

Arranged parallel with and preferably, though not necessarily, between the track-rails E is what I shall designate a "third" or "traction" rail K. Suitably journaled upon the truck-frame are what I shall designate "traction" or "gripping" wheels, preferably arranged in pairs L L' M M' and arranged to grip the third or traction rail K between them. The movement of the truck along the track-rails is effected by rotating the traction or gripping wheels in one direction or the other, according to the direction in which it is desired to run the truck, and then causing the rotating wheels to grip the third or traction rail. Positive rotation is imparted to the traction or gripping wheels from an electric motor (indicated at N) suitably mounted on the truck and having a gear-wheel 10 mounted on the shaft 11 thereof. The gear 10 intermeshes on one side with a gear 12. On the shaft of gear 12 is a gear 13, arranged between and intermeshing with gears 14 15, respectively mounted on the shafts of gripping or traction wheels L M.

From this arrangement of gearing it will be seen that wheels L and M are driven in the same direction. A similar train of gearing serves to drive the wheels L′ M′ from the motor-shaft and in the same direction with respect to each other; but in order that the wheels L′ M′ may rotate in the opposite direction with respect to that in which wheels L and M rotate an idler-gear 16 is interposed in the train of gearing which drives said wheels L′ M′.

In the operation of electric railways it is important and desirable that the motor truck or car which hauls the train start from rest gently and smoothly. This is true as well in electric railways for use in mines as for other uses, but is particularly desirable in electric mine-haulage apparatus. This result I accomplish in a most simple and efficient manner by arranging the members of the pairs of gripping or traction wheels to be moved toward or away from each other, so as to grip the third or traction rail with more or less pressure, thus regulating the frictional engagement of said wheels with the traction-rail, and hence controlling the speed. I will now describe a construction and arrangement whereby this result is accomplished, but which is merely illustrative of an operative embodiment of the principles of my invention. In the form shown I mount each wheel in an arm P P′ Q Q′. The arms P and Q are hinged or pivoted about a common axis, which axis is concentric with the axis of rotation of gears 12 and 13, through which rotation is imparted to the wheels L M. By this construction it will be seen that arms P and Q, respectively, carrying the wheels L and M, may be swung about their common pivot without interrupting or interfering with the rotation of said wheels. In a similar manner the wheels L′ M′ are carried, respectively, in the arms P′ Q′, similarly hinged about a common axis, which is also the axis of rotation of the gears through which said wheels are rotated. It is important, in order to secure the proper conjoint action of the wheels, that the members of each pair of wheels be simultaneously advanced toward or retracted from the third rail and that when the coöperating members of one pair are moved either toward or away from the rail the corresponding members of the other pair should be correspondingly moved at the same time. In order to secure this correspondence of movement, I suitably connect a stud or bolt R to the free end of each swinging arm, each stud or bolt having a threaded end. The threaded ends of the studs or bolts R, which are thus connected to the free ends of arms P P′, are arranged to be received in a threaded sleeve or worm-block S, whereby when said worm-block or sleeve is rotated in one direction or the other said studs or bolts are drawn endwise toward each other or are forced endwise apart from each other, thus effecting the swinging of the arms P P′ in the desired directions for securing the coöperative action of the gripping or feed wheels L L′. In a similar manner the outer or free ends of arms Q Q′ are also connected to secure the desired cooperation. In order that the worm-blocks S may be simultaneously operated, I mount a worm-gear T upon each end of a shaft 20, suitably journaled, and which gears are arranged to respectively engage the worm-blocks S. Upon each end of said shaft I mount a suitable hand-wheel 21, by which said shaft may be rotated from either end. By this construction it will be seen that I provide a simple and efficient arrangement wherein the coöperating members of both pairs of feed or traction wheels may be simultaneously actuated to grip or release the traction or third rail, and such actuation may be readily regulated and controlled from either end of the truck. In order to secure a desirable yielding grip of the wheels upon the third rail, I interpose a yielding medium between the studs or bolts R and the ends of levers P Q P′ Q′. This may be conveniently and efficiently accomplished by providing the ends of said studs or bolts which engage the levers with a transverse stud or rod 22, (see Fig. 5,) the ends of which being arranged to be received in an elongated slot in the end of the lever, and I arrange suitable springs 23 between said transverse studs or bolts and the lever ends. By this arrangement a degree of play is secured and a yielding pressure of the feed-wheels against the third or traction rail is maintained.

Current for actuating motor N is delivered thereto from a conductor 24, arranged parallel with the track. A simple and efficient arrangement of the conductor is shown, wherein it is placed within a longitudinal groove or channel, preferably in the side of the traction or third rail K, said rail being preferably of insulating material, and a contact device—such, for instance, as a trolley-wheel 25, mounted on the truck—is arranged to travel in contact with the conductor. In order to maintain said contact device in efficient contact with the conductor, while permitting of the vibrations and swaying movements of the truck-frame and also of the ready removal of the contact device, I mount said device in an arm 26, hinged or pivoted, as at 27, to the free end of a lever 28, which in turn is hinged or pivoted, as at 29, to the truck-frame. A spring 30, connected at one end to the truck-frame and at the other to the pivoted arm 26, serves to press the contact device yieldingly, but constantly, into contact with the conductor. Current is conducted to the motor from the trolley-wheel in any suitable and well-known manner, the return-circuit being completed by suitably connecting the return side of the motor to one of the castings G of the supporting-wheels. From this construction it will be seen that the trolley-wheel maintains constant and efficient contact with the conductor, notwithstanding any movement or vibration of the truck.

I have shown a simple and convenient ar-

rangement of brake to be employed in connection with my invention and wherein instead of applying a brake to the supporting-wheels or to the track-rails or feed-rail I apply it to the motor-shaft, the braking effort being transmitted to the feed-wheels through the gearing, which is driven from the motor-shaft. In the form of brake shown I provide the motor-shaft 11 with a brake-wheel 32, and I arrange two pivoted arms 33 34 to partially embrace and engage the same at diametrically-opposite points, as clearly shown in Fig. 6. A rod 35 is attached at one end in the free end of arm 34 and at the other end is arranged to pass through the free end of arm 33, and to the projecting end of said rod is pivotally connected a lever 36, having a cam-shaped head 37. By suitably turning said lever upon its pivot the cam-head 37 thereof operates to draw the free ends of levers 33 34 toward each other, thus applying the brake, or else to release said ends, thus releasing the brake.

I do not claim herein the subject-matter shown, described, and claimed in my companion application, Serial No. 690,082, filed September 2, 1898.

Having now set forth the object and nature of my invention and a form of apparatus embodying the same and having described the construction, function, and mode of operation thereof, I desire it to be understood that many variations and changes in the details of construction and arrangement would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described; but

What I do claim as new and useful, and desire to secure by Letters Patent, is—

1. In an electric railway, a track, a truck mounted thereon, a third or traction rail, gripping-wheels arranged to grip said rail, a motor mounted on said truck, gears actuated by said motor for positively rotating said wheels, swinging arms pivotally mounted concentric with the axis of rotation of said gears and carrying said wheels, and means for drawing said arms together or spreading them apart, as and for the purpose set forth.

2. In an electric railway, a track, a truck mounted thereon, a third or traction rail, gripping-wheels arranged on opposite sides of said rail, a motor for positively rotating said wheels, swinging arms in which said wheels are mounted, studs or bolts connected to the free ends of said arms and having threaded ends, a worm-gear arranged to receive the threaded ends of said studs, and means for rotating said worm-block, as and for the purpose set forth.

3. In an electric railway, a track, a truck mounted thereon, a third or traction rail, gripping-wheels arranged on opposite sides of said rail, a motor for positively rotating said wheels, swinging arms in which said wheels are mounted, studs or bolts loosely connected to the free ends of said arms and having threaded ends, a sleeve adapted to receive the threaded ends of said studs, and means for rotating said sleeve, as and for the purpose set forth.

4. In an electric railway, a track, a truck mounted thereon, a third or traction rail, gripping-wheels arranged on opposite sides of said rail and adapted to grip the same between them, a motor carried by the truck for positively rotating said wheels, pivotally-mounted arms on which said wheels are carried, studs or bolts yieldingly connected to the free ends of said arms and having threaded ends, a sleeve arranged to receive said threaded ends, and means for rotating said sleeve, as and for the purpose set forth.

5. In an electric railway, a track, a truck, a third or traction rail, gripping-rolls arranged in pairs, the members of each pair being respectively arranged on opposite sides of said rail to grip the same between them, a motor, gearing actuated thereby, for positively rotating said wheels, swinging arms in which said wheels are carried, the arms on the same side of said rail being pivoted about a common center, studs or bolts connected to the free ends of said arms and having threaded ends, a worm-block arranged to receive the ends of corresponding studs or bolts, and a shaft having worm-gears arranged to mesh with and rotate said worm-blocks, whereby when said shaft is rotated all of said wheels are simultaneously advanced toward or retracted from said rail, as and for the purpose set forth.

6. In an electric railway, a track, a truck mounted thereon, a third or traction rail, gripping-wheels arranged on opposite sides of said rail to grip the same between them, gearing for driving said wheels, a motor for actuating said gearing, a friction-wheel mounted on the shaft of said motor, brake-arms pivotally mounted and arranged to engage said friction-wheels on opposite sides, a rod connected at one end to the free end of one of said arms and having a lever pivotally mounted in the other end thereof, said lever provided with a cam-shaped head adapted to engage the free end of the other of said arms, as and for the purpose set forth.

7. In an electric railway, a track, a truck, a third or traction rail, gripping-wheels arranged to grip said rail, a motor, gearing actuated by said motor for driving said wheels, a conductor carried by said rail, a lever pivotally mounted on the truck, an arm pivotally mounted in the free end of said lever, a contact device carried by said arm, and a spring for maintaining said contact device in contact with said conductor, as and for the purpose set forth.

8. In an electric railway, track-rails, a truck-frame having side bars, castings secured to said side bars but insulated therefrom, said

castings having studs or pintles, supporting-wheels sleeved upon said studs or pintles and adapted to operate on said track-rails, a traction-rail, gripping-wheels arranged to grip said traction-rail, and a motor carried by said truck for driving said gripping-wheels, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 28th day of November, 1898, in the presence of the subscribing witnesses.

EDMUND C. MORGAN.

Witnesses:
S. E. DARBY,
E. C. SEMPLE.