No. 772,730. PATENTED OCT. 18, 1904.

E. C. MORGAN.

ELECTRIC RAILWAY SYSTEM.

APPLICATION FILED AUG. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

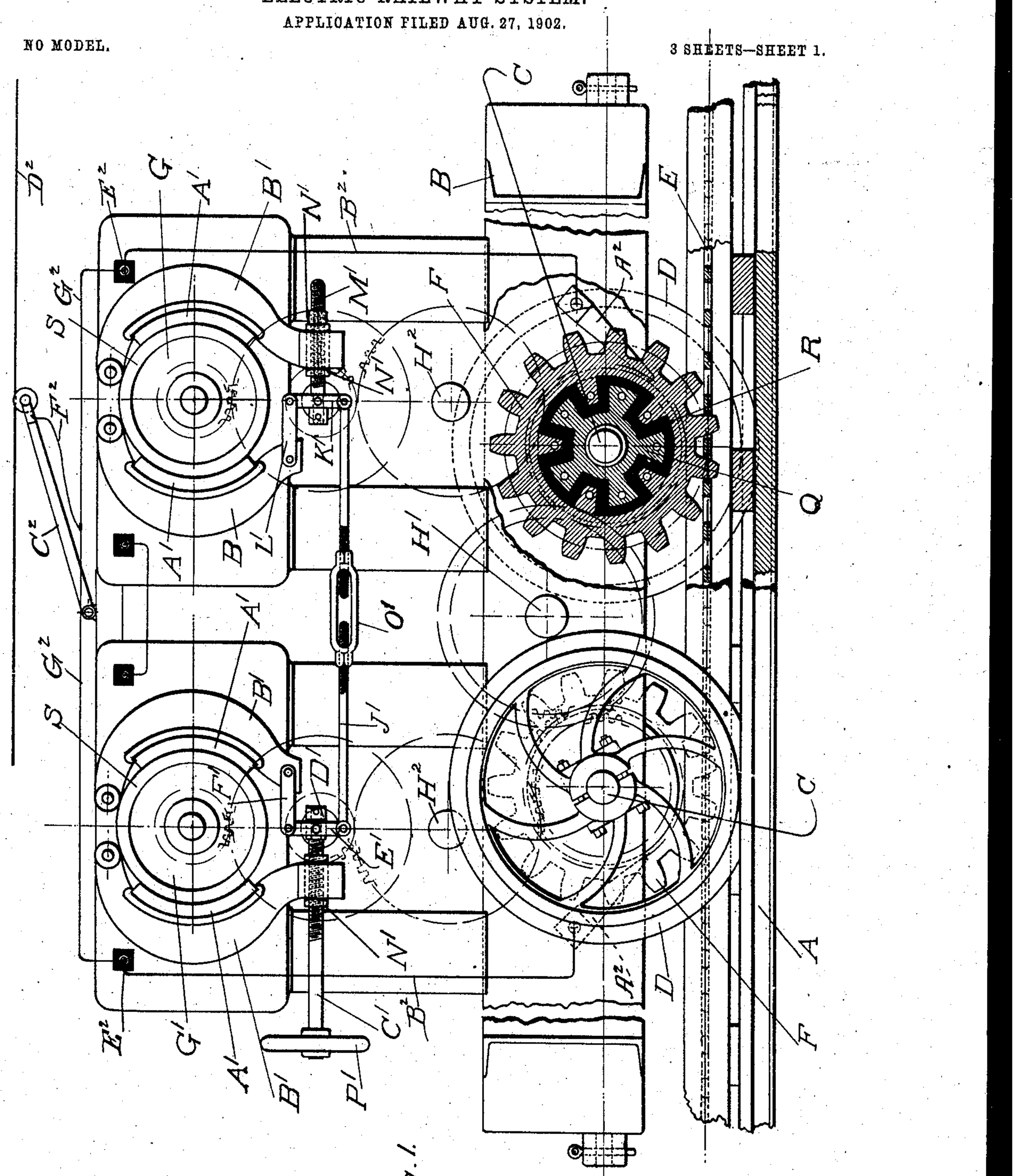

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

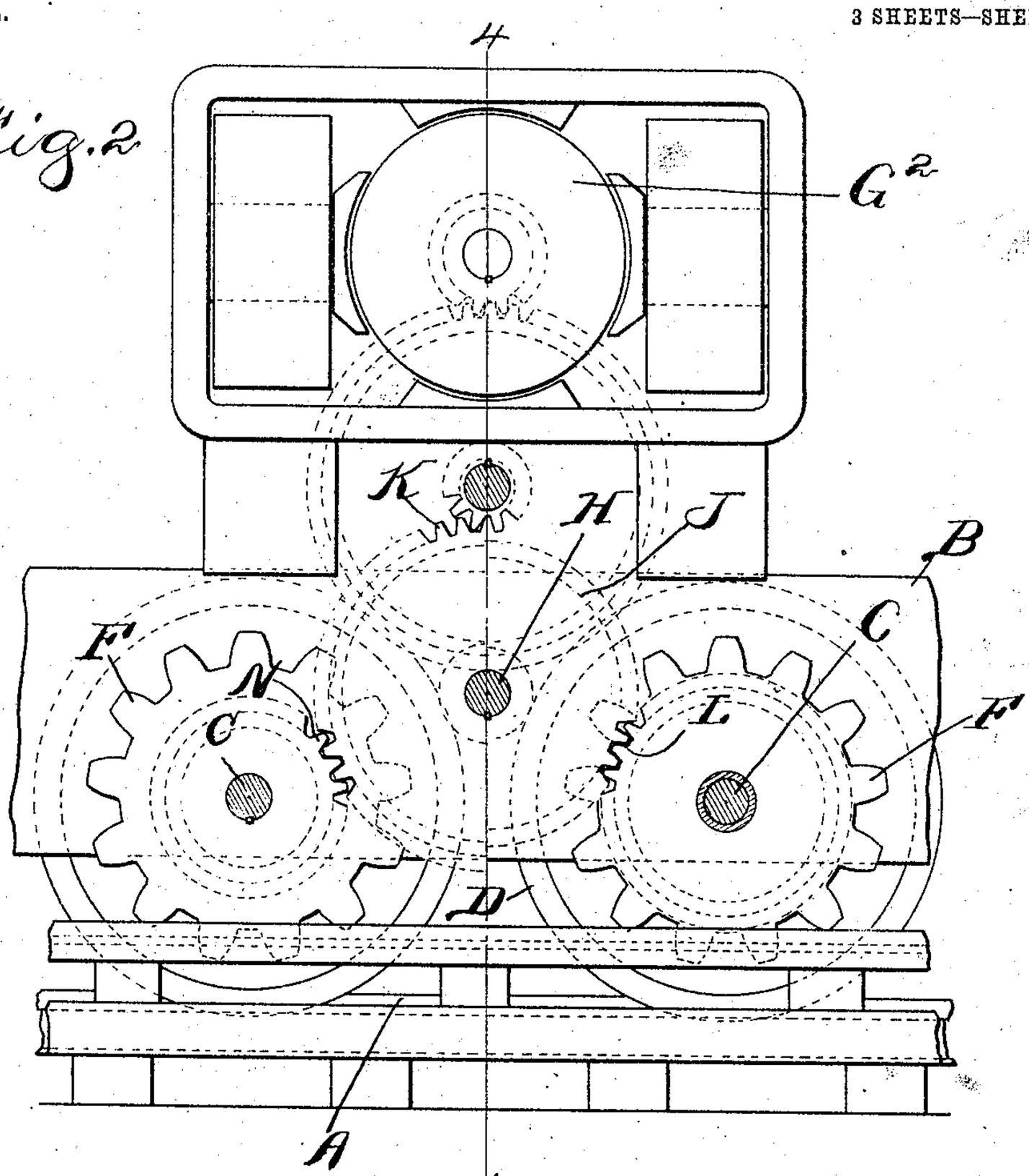


Fig. 5.

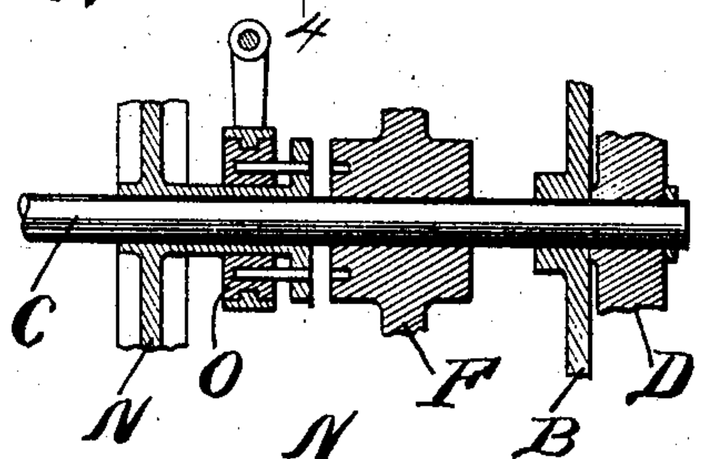
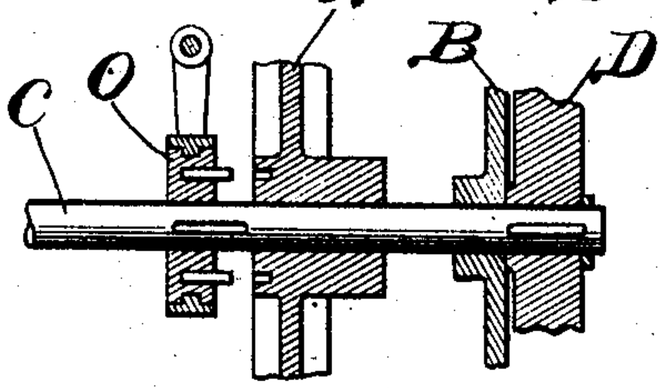


Fig. 4.



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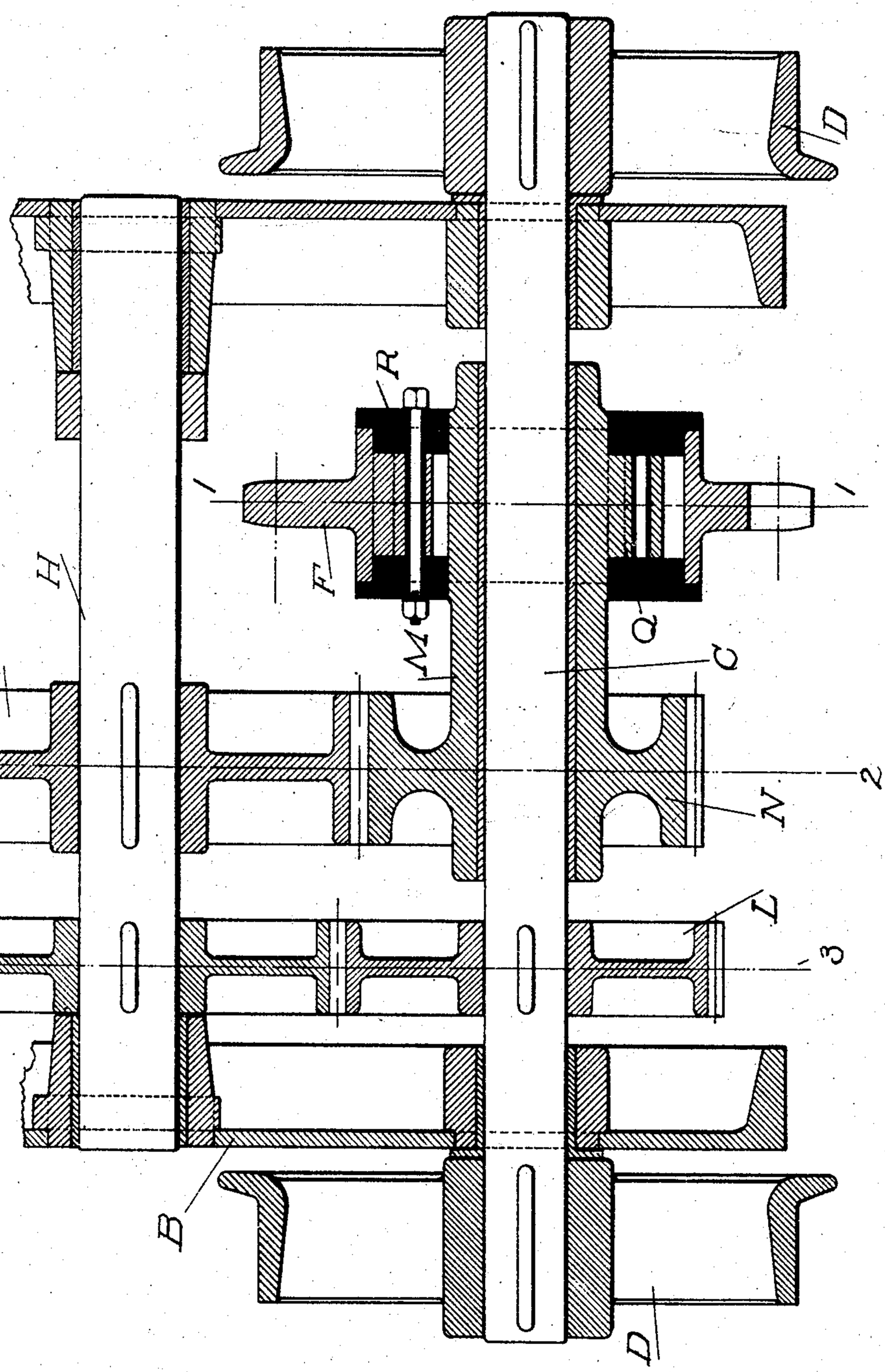
NO MODEL. 3 SHEETS—SHEET 3.

Fig 3



WITNESSES:
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No. 772,730. Patented October 18, 1904.

UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MORGAN ELECTRIC MACHINE COMPANY OF WEST VIRGINIA, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 772,730, dated October 18, 1904.

Application filed August 27, 1902. Serial No. 121,192. (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 Electric-Railway System, of which the following is a specification.

This invention relates to electric-railway systems.

The object of the invention is to simplify and improve apparatus of this class and to render the same more efficient in operation.

A further object of the invention is to provide a railway-truck supported upon wheels and wherein propulsion is effected through motor-driven gearing, the motor being mounted upon the truck and receiving current through said gearing from a third and traction rail.

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 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 view in side elevation of a truck, parts broken off and parts in transverse section on the line 1 1 of Fig. 3 and showing the application of a construction embodying the principles of my invention and wherein two motors are used. Fig. 2 is a view showing parts in side elevation and parts in section, the plane of section of the left-hand half of the figure being on the line 2 2 of Fig. 3 and the section of the right-hand half of said figure being on the line 3 3 of Fig. 3. Fig. 3 is a view in section on the line 4 4 of Fig. 2. Figs. 4 and 5 are broken detail views in section, showing means for coupling or uncoupling the truck-wheel and the traction and conductor gear with respect to axle C.

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

In the construction of electric railways and railway motor-trucks, and especially motor-trucks employed in connection with a combined third and traction rail, wherein the motor is mounted on the truck and operates to drive a traction-wheel engaging with the combined third and traction rail, which rail is charged with current to supply the same to the motor, it is desirable to provide means whereby the motor-truck may be propelled by said gear and traction-rail or by the transmission of power direct to the truck-wheels. It is also desirable to provide means whereby the truck may be shifted or switched from one track to another, in which event it is necessary to so mount and arrange a conducting and traction gear as to enable the same to clear the track-rails on which the truck-wheels operate when crossing or passing from one track to another or when passing over switch-tracks.

In carrying out my invention I employ a combined third and traction rail and support the same in raised relation with respect to the track-rails on which the truck-wheels operate, thereby causing a reduction in the relative diameters of the traction and conductor gear and truck-wheels, the traction and conducting gear being of smaller diameter than the diameter of the truck-wheels. With such a construction it is desirable to provide a system of gearing whereby the traction and conductor gear is driven at a peripheral speed equal to the peripheral speed of rotation of the truck-wheels, particularly where the truck-wheels are positively driven from the motor. It is also desirable to provide means for efficiently mounting and insulating the traction and conductor gear. It is also desirable to provide an efficient braking arrangement for securing an equalized application of the brakes. It is also desirable to provide means whereby either the truck-wheels or the traction and conductor gear, or both of these parts, may be positively driven in unison or either of them may be thrown out of gear at will.

My invention therefore contemplates the provision of means for accomplishing all of these purposes, and I will now describe vari-

ous constructions and arrangements of apparatus for carrying my invention into practical operation.

Reference-sign A designates track-rails of a railroad.

B designates a truck-frame in which are suitably journaled the axles C. Upon the axles C are mounted the truck-wheels D, operating on the track-rails.

E designates a combined third and traction rail, the specific construction of which is unimportant so far as the present invention is concerned except that it is in the form of a rack arranged to be engaged by the teeth of a combined traction and conductor gear F.

A specific construction of combined third and traction rail in connection with which my improved electric-railway system forming the subject-matter of this application is adapted to be used is disclosed in an application executed of even date herewith, filed August 27, 1902, and bearing Serial No. 121,193.

In practice, and particularly in the use of an electric motor-truck intended for use in an electric-railway system where the truck is required to pass over switch-tracks or from one track to another, it is necessary that the traction and conductor gear F be raised to a sufficient height to pass over the track-rails in crossing the tracks without interference. This necessitates the raising of the combined third and traction rail E above the top surface or tread of the track-rails A, and since it is desirable in motor-trucks designed for use in mines particularly to avoid as much as possible any undue or excessive height of the motor-truck and motor it is necessary to employ a traction and conductor gear F of smaller diameter than the diameter of the truck-wheels, so as to enable said traction and conductor gear to operate in connection with the raised or elevated combined third and traction rail, it being understood that the combined third and traction rail carries the current or electrical pressure to be supplied to the motor through the contact with such rail of the traction and conductor gear F.

In Fig. 1 I have shown a truck-frame employing two motors G G′.

In Fig. 2 I have shown a single motor G^2.

H designates a counter-shaft, suitably journaled in the truck-frame. In the form shown in Figs. 2 and 3 this counter-shaft receives rotation from the motor G^2 through a suitably-arranged train of gearing. In the construction shown in Fig. 1 this counter-shaft is designated by reference-sign H′ and serves merely the purpose of an equalizer-shaft, carrying gears meshing with gears on both axles C, so that both axles may be driven from either or both motors G G′—that is, each motor G G′ is independently geared to an axle, but the axles are geared together through gears on the counter-shaft H′, so that if one motor only is in operation rotation may be imparted therefrom to both axles.

As shown in Figs. 2 and 3, two drive-gears J K are keyed on counter-shaft H. These drive-gears are of different diameters, the drive-gear J being of smaller diameter than the drive-gear K. The drive-gear J meshes with and drives a gear L, keyed upon axle C. In this form of my invention the truck-wheels D are also keyed on axle C. Therefore the truck-wheels are positively driven from the motor through counter-shaft H and intermeshing gears J L, and since the diameter of the truck-wheels is greater than the diameter of the traction and conductor gear F it is necessary to make provision for driving said gear at the same peripheral speed as that at which the truck-wheels are driven. To this end the traction and conductor gear F is mounted upon to revolve with a sleeve M, (see Fig. 3,) said sleeve having mounted thereon or formed therewith a gear N of smaller diameter than the gear L, and with which gear N gear K meshes. The relative proportions of the diameters of the gears J K L N are such that the traction and conductor gear F is driven at the same peripheral speed as the truck-wheels D.

By "peripheral speed" is of course meant the speed of the working periphery of the parts—as, for instance, the tread-surface of the truck-wheels and the pitch diameter of the traction-gear.

From the foregoing description it will be seen that both the traction and conductor gear F, as well as the truck-wheels D, are positively driven from the motor, and although of differing diameters said gears and wheels are driven at the same peripheral speed. In the form shown in Fig. 1 each motor is geared to and drives a counter-shaft H^2, corresponding in function and arrangement of gears to counter-shaft H, (shown in Figs. 2 and 3,) and the same arrangement of compensating gearing as that above described is employed in connection with each motor and each axle. It will also be seen from the foregoing description that provision is made for the passage of the traction and conductor gear F freely over track-rails when the truck is passing along switch-tracks or from one track to another without increasing the height of the truck-frame or motor, while being positively driven at the same peripheral speed as the truck-wheels.

In some cases it may be desirable to propel the truck solely through the traction of the truck-wheels upon the track-rails. In such event I provide means whereby the axles upon which the truck-wheels are carried may be driven through a clutch mechanism from the gearing driven from the motor. This idea I have indicated in Fig. 4, wherein the truck-wheels D are keyed on the

axle C, as is also a clutch-sleeve O, the latter, however, being mounted for shifting movement longitudinally of the axle. The gear N is in this instance loosely sleeved upon the axle and is driven from the motor. Clutch-pins carried by the clutch-sleeve O coöperate with suitable seats formed in the hub of gear N, whereby by shifting sleeve O back and forth said sleeve and consequently also the axle and truck-wheels carried thereby are coupled or uncoupled with reference to the gear N. Similarly it may sometimes be desirable to provide means whereby the traction-gear F may be detachably coupled to the driving-gearing. This idea is indicated in Fig. 5, wherein the clutch-sleeve O is mounted to revolve with the gear N and may be moved into and out of coupling relation with respect to the traction-gear F, the latter being loosely sleeved or mounted upon the axle. In either of the cases above noted the clutch-sleeve O may be shifted in any suitable or convenient manner.

Since the combined traction and conductor gear F serves not only the purpose of a means of propelling the truck along the track, but also to convey current to the motor from the charged third and traction rail, it is necessary to efficiently couple or mount said gear upon its supporting-axle and also to insulate the same therefrom. I have shown an arrangement for accomplishing this purpose wherein the sleeve M, which carries the gear F. is provided with a hub Q having radial projections, and I provide the bore or inner ring surface of gear F with coöperating radial studs or projections, as clearly seen in Fig. 1, intermeshing with the projections on hub Q, and I interpose insulation R between the opposed surfaces of these projections. In this way I securely lock rotatively the gear F to its supporting-hub Q, but insulate the same therefrom.

Where the gears F constitute conductor-gears for collecting current from the combined third and traction rail and conducting the same, the circuit therefrom through the motors to ground may be completed in any simple, suitable, or convenient manner. I have shown brushes A^2 (see Fig. 1) arranged to bear upon the hubs of gears F, said gears, as above explained, being insulated, from which brushes conductors B^2 lead to binding-posts E^2 upon the motors. The circuits may be completed from such binding-posts through the motors to ground in any suitable, simple, or convenient manner—as, for instance, through the motor-shaft journal-bearings, the framework, and supporting-axles C to the truck-wheels D and track-rails A. It may sometimes occur that the track-rails are extended beyond the termination of the combined third and traction rail. In such event the entire propulsion of the truck is effected through the truck-wheels, and in order to supply current to the motors for driving the truck-wheels a trolley C^2, carried by the truck and operating in connection with any suitably-arranged supply-conductor D^2, may be employed, as shown in Fig. 1, the trolley C^2 being suitably wired through conductors F^2 G^2 to the binding-posts E^2 on the motor-frames, whence the circuits may be completed through the motors, motor-shaft, journal-bearings, the supporting-framework, and axle C to truck-wheels D and track-rails to ground, or, if desired, both these sources of supply of current to the motor may be employed.

In Fig. 1 I have shown an equalizing braking mechanism forming part of my invention in the arrangement employing two motors upon the truck wherein each motor is supplied with a brake-wheel S, upon each of which bears a brake-shoe A′, carried by arms B′, each arm being pivotally mounted at one end, and in the other end of one of said arms for one of said motors is arranged a bearing-support for a threaded rod C′, said threaded rod engaging a traveling nut D′, carrying a bar E′, to one end of which is connected a link F′ and to the other end of which is connected a rod J′. The link F′ is connected to the free end of the other arm, B′, and rod J′ is connected to one end of a pivoted bar K′, the other end of said bar being connected by a link L′ to the free end of one of the brake-shoe-carrying bars B′ of the other motor, the free end of the other brake-shoe-carrying arm B′ receiving and forming a bearing for a threaded stud or bolt M′. The set-nuts N′ serve to properly adjust the equalizing mechanism. If desired, a turnbuckle O′ may be interposed in rod J′.

From the foregoing description it will be readily seen that by operating the hand-wheel P′ on threaded shaft C′ the application of the brake-shoes throughout the system is equalized.

It is obvious that many variations and changes in the details of construction and arrangement would readily occur 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 set forth; but,

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In an electric-railway system, a truck, traction-rails, truck-wheels carried by said truck and operating on said rails to support the truck thereon, a third and traction rail, a conductor and traction gear carried by the truck and engaging said rail, a motor carried by the truck, and gearing for positively driv-

ing said wheels and gear from said motor, as and for the purpose set forth.

2. In an electric-railway system, a truck having truck-wheels, track-rails upon which said wheels operate, a combined third and traction rail, a conductor and traction gear carried by the truck and coöperating with said third rail, said gear being of smaller diameter than said wheels, a motor carried by the truck, and means operated by said motor for driving said gear and wheels at the same peripheral speed, as and for the purpose set forth.

3. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted on said axle, a propelling-gear also mounted upon said axle, gearing driven by said motor for positively driving said wheels, and independent gearing also actuated by said motor for positively driving said propelling-gear, as and for the purpose set forth.

4. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted upon said axle, a conductor and traction gear of smaller diameter than said wheels and also mounted upon said axle, a motor carried by said truck, and gearing actuated thereby for positively driving said wheels and gear at equal peripheral speeds, as and for the purpose set forth.

5. In an electric-railway system, a truck, track-rails upon which said truck is supported, a combined third and traction rail, a shaft mounted on said truck, a propelling-gear mounted upon said shaft, insulation interposed between said gear and its bearing on said shaft, a motor carried by the truck, and gearing intermediate said motor and traction-gear for actuating the latter, as and for the purpose set forth.

6. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted on said axle, track-rails upon which said wheels operate, a combined third and traction rail, a conductor and traction gear loosely sleeved upon but insulated from said axle and engaging said third and traction rail, a motor carried by said truck, gearing actuated by said motor for positively driving said wheels, and independent gearing also actuated by said motor for positively driving said gear; all combined and arranged as and for the purpose set forth.

7. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted upon said axle, a combined third and traction rail, a conductor and traction gear mounted on said axle and coöperating with said rail, a counter-shaft also mounted on said truck, a motor for driving said shaft, and gearing intermediate said shaft and axle for independently driving said wheels and gear, as and for the purpose set forth.

8. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted upon said axle, a combined third and traction rail, a conductor and traction gear of smaller diameter than said truck-wheels and also mounted upon said axle, a counter-shaft journaled in said truck-frame, a motor journaled in said truck-frame and arranged to drive said counter-shaft, and gearing, of varying diameters, intermediate said counter-shaft and axle for positively driving said wheels and gear and at the same peripheral speed, as and for the purpose set forth.

9. In an electric-railway system, a truck, an axle journaled therein, truck-wheels mounted on said axle and supporting said truck, a conductor and traction gear also mounted on said axle, a motor mounted on said truck, gearing driven by said motor for driving said axle, and means for independently connecting said wheels or gear to revolve with said axle, as and for the purpose set forth.

10. In an electric-railway system, a truck, an axle journaled therein, a motor carried by said truck, gearing actuated thereby for driving said axle, truck-wheels and a traction and conductor gear mounted on said axle, and means for coupling either one of said parts to rotate with said axle at will, as and for the purpose set forth.

11. In an electric-railway system, a truck, an axle journaled therein, truck-wheels and a traction and conductor gear mounted upon said axle, a motor mounted upon said truck, and independent trains of gearing actuated by said motor for driving said wheels and gear, and means for coupling or uncoupling one of these parts to rotate with said axle, as and for the purpose set forth.

12. In an electric-railway system, a truck, an axle mounted therein, truck-wheels mounted on said axle and arranged to support said truck, track-rails upon which said wheels operate, a combined third and traction rail elevated above the surface of said track-rails, a combined conductor and traction gear mounted on said truck and arranged to engage said traction-rail, a motor mounted on said truck, independent trains of gearing actuated by said motor for driving said wheels and gear, as and for the purpose set forth.

13. In an electric-railway system, a truck, two or more motors mounted on said truck, gearing actuated by each of said motors for driving an axle, truck-wheels mounted on each axle, a combined traction and conductor gear also mounted upon each axle, and equalizing-gearing arranged between said axles, as and for the purpose set forth.

14. In an electric-railway system, a truck, axles mounted therein, traction-wheels mounted on said axles, two or more motors mounted on said truck-frame and each geared to drive an axle, and intermediate gearing between said axles whereby all the axles may be driven from a single motor or a motor may drive each axle, as and for the purpose set forth.

15. In an electric-railway system, track-rails, a truck, supporting-wheels therefor operating on said track-rails, a traction-gear carried by said truck but insulated therefrom, a combined conductor and traction rack with which said gear coöperates, a motor carried by the truck for driving said traction-gear, a trolley wire or conductor, and electrical connections between said trolley wire or conductor and the motor, and electrical connections between said traction-gear and motor.

16. In an electric-railway system, track-rails, a truck operating thereon, a traction-gear carried by said truck, a combined conductor and traction rack with which said gear coöperates, said traction-gear being insulated from the truck, a motor for driving said gear, electrical connections between said gear and motor and an independent trolley wire or conductor, and electrical connections between said trolley-wire and the motor whereby the motor may be supplied by current from either said conductor or traction rack, or both.

17. In an electric-railway system, a truck, an axle mounted therein, truck-wheels mounted on said axle, a hub mounted on said axle and provided with radiating projections, a gear having internal coöperating radiating projections, insulation interposed between said projections, a motor mounted on the truck, gearing actuated thereby for driving said gear, and a combined third and traction rail with which said gear coöperates, as and for the purpose set forth.

18. In an electric-railway system, a truck having truck-wheels, track-rails upon which said wheels operate, a combined third and traction rail, a conductor and traction gear carried by the truck and coöperating with said third rail, said gear being of smaller diameter than said wheels, a motor carried by the truck, and means operated by the motor for driving the pitch-line of said gear and the tread-surface of said wheel at the same speeds, as and for the purpose set forth.

19. In an electric-railway system, a truck, track-rails upon which said truck is supported, a combined third and traction rail, a shaft mounted on said truck, a propelling-gear mounted upon said shaft, insulation interposed between said gear and its bearing on said shaft, a motor carried by the truck, gearing intermediate said motor and traction-gear for actuating the latter, said gear forming a direct conducting-path for the current, as and for the purpose set forth.

20. In an electric-railway system employing a traction-rack, a truck-frame, supporting-axles therefor, and a propelling-gear mounted upon said axle but insulated therefrom and arranged to engage said rack, as and for the purpose set forth.

21. In an electric-railway system employing a traction-rack, a locomotive, supporting-axles therefor, propelling-gears loosely mounted upon said axles and arranged to engage said rack, and means carried by the locomotive for driving said gears, as and for the purpose set forth.

22. In an electric-railway system employing a traction-rack, a truck, supporting-axles therefor, a traction-gear loosely sleeved upon one of said axles and coöperating with said rack, a motor carried by said truck and gearing actuated thereby for driving said traction-gear, as and for the purpose set forth.

23. In an electric rack-rail locomotive, a truck-frame, a propelling gear or gears engaging the rack, car-wheels resting upon the track, an axle for the wheels, and a propelling-gear mounted thereon but insulated therefrom, as and for the purpose set forth.

24. In an electric rack-rail locomotive, a truck-frame, a propelling gear or gears engaging the rack, car-wheels resting upon the track, an axle for the wheels, a propelling-gear mounted thereon but insulated therefrom, and an electrical connection extending from the truck or attached parts to the insulated propelling-wheels, as and for the purpose set forth.

25. In an electric-railway system, an insulated propelling-gear consisting of a ring near to and supporting the propelling-gear teeth, clutch-like projections extending from the ring, coöperating projections for driving the gear, and insulating material between said projections, as and for the purpose set forth.

26. In an electric-railway system employing a traction-rack, a truck, a shaft mounted thereon, a hub mounted upon said shaft and provided with engaging projections, a traction-gear ring having teeth and coöperating engaging projections, and insulating material interposed between said coöperating engaging projections, as and for the purpose set forth.

27. In an electric-railway system employing a traction-rack, a truck, a supporting-axle therefor, a traction-gear arranged to cooperate with said track and comprising a hub having external radial projections and mounted upon said axle, and a ring having gear-teeth and coöperating internal engaging projections and insulating material interposed between said coöperating projections, as and for the purpose set forth.

28. In an electric-railway system employing track-rails, and a traction-rack, a truck, supporting-wheels therefor, a traction-gear carried by said truck, a motor, gearing intermediate said motor and traction-gear, and independent gearing interposed between said motor and supporting-axles, whereby the truck may be operated through either the traction-rack or the truck-axles, as and for the purpose set forth.

29. In an electric-railway system, a truck having supporting axles and wheels, a traction-rack, a traction-gear carried by the truck and coöperating with said rack, a motor, gear-

ing intermediate said motor and traction-gear, gearing intermediate said motor and axles, and means for coupling or uncoupling said gearing at will, as and for the purpose set forth.

30. In an electric-railway system, a truck, a plurality of track-wheels supporting the same, and a plurality of traction-gears, a rack with which said gears coöperate, and means for driving all of said wheels and gears at the same peripheral speed, as and for the purpose set forth.

31. In an electric-railway system, a truck, a plurality of track-wheels supporting the same, a plurality of traction-gears, a rack-rail with which said gears coöperate, and a common means for simultaneously driving all of said wheels and gears at the same peripheral speed, as and for the purpose set forth.

32. In an electric-railway system, a truck, a plurality of track-wheels supporting the same, a plurality of traction-gears, a traction-rack with which said gears coöperate, and means for driving said traction-gears and traction-wheels, said traction-gears being driven at the same peripheral speed as that of the treads of the track-wheels, as and for the purpose set forth.

33. In an electric-railway system, a road-bed provided with track-rails, and a rack-rail, a truck, supporting-wheels therefor operating on said track-rails, a plurality of traction-gears carried by the truck and arranged in the same vertical plane with said rack-rail to engage the latter, and means for driving said gears and wheels at the same peripheral speed, as and for the purpose set forth.

34. In an electric-railway system, a truck, axles carried thereby at each end thereof, track-wheels mounted upon to revolve with each axle, traction-gears also mounted upon said axles, and means for driving said axles and traction-gears simultaneously, as and for the purpose set forth.

35. In an electric-railway system, a road-bed provided with track-trails and a rack-rail, a truck, a plurality of axles carried thereby, track-wheels rigidly mounted upon each axle to revolve therewith and supported upon said track-rails, a traction-gear also mounted upon each axle and engaging said rack-rail, and means for simultaneously driving said axles and gears, as and for the purpose set forth.

36. In an electric-railway system, a road-bed provided with track-rails and a rack-rail, a truck, a plurality of axles mounted thereon, supporting-wheels rigidly mounted upon each of said axles, said wheels operating upon the track-rails, a traction-gear also mounted upon each axle and coöperating with the rack-rail, and means for driving said axles and gears, said means operating to drive said gears at the same peripheral speed as that of the wheels, as and for the purpose set forth.

37. In an electric-railway system, track-rails, a conductor traction-rack extending for a portion only of the length of such track-rails, a truck, truck-wheels and a traction-gear carried by said truck, said wheels operating on the track-rails, and said gear being insulated and arranged to engage said rack, electrical connections between said gear and motor, a motor carried by the truck for driving said wheels and gear, a conductor independent of the rack for supplying current, and means for effecting electrical connection between said conductor and motor, as and for the purpose set forth.

38. In an electric-railway system, track-rails, a traction-rack extending for a portion only of the length of such rails, a truck, truck-wheels and a traction-gear carried by said truck, said wheels operating on the track-rails and said gear arranged to engage said rack, a motor carried by the truck for driving said wheels and gear, a conductor independent of the rack for supplying current, means for effecting electrical connection between said conductor and motor, and an electric circuit connection from said motor to the track-rails, as and for the purpose set forth.

39. In an electric-railway system, track-rails, a traction-rack extending for a portion only of the length of such track-rails, a truck, truck-wheels and a traction-gear carried by said truck, said wheels operating on the track-rails and said gear arranged to engage said rack, a motor carried by the truck for driving said gear, a conductor independent of the traction-rack for supplying current, means for effecting electrical connection between said conductor and motor, and an electrical circuit connection from the motor to the track-rails and traction-rack, as and for the purpose set forth.

40. In an electric-railway system, track-rails, a traction-rack extending for a portion only of the length of such track-rails, a truck, a plurality of truck-wheels and traction-gears carried thereby, said wheels operating on the track-rails, and said gears arranged to engage said rack, a motor carried by the truck for driving all of said wheels and gears, a conductor for supplying current, and means for effecting electrical connection between said conductor and motor, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 7th day of August, 1902, in the presence of the subscribing witnesses.

EDMUND C. MORGAN.

Witnesses:

C. H. LEEM,

S. E. DARBY.