(No Model.) 2 Sheets—Sheet 1.

# S. L. WIEGAND.

## ELECTRIC LOCOMOTIVE.

No. 533,259. Patented Jan. 29, 1895.

Fig. 1.

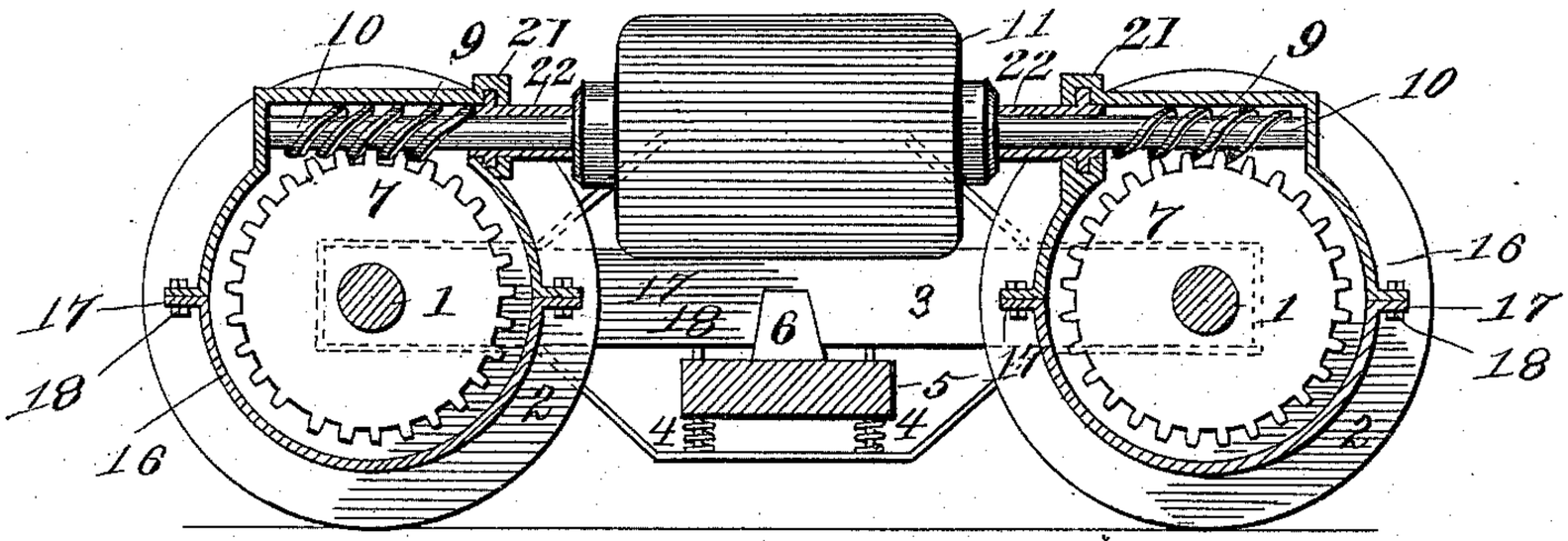



Fig. 2.

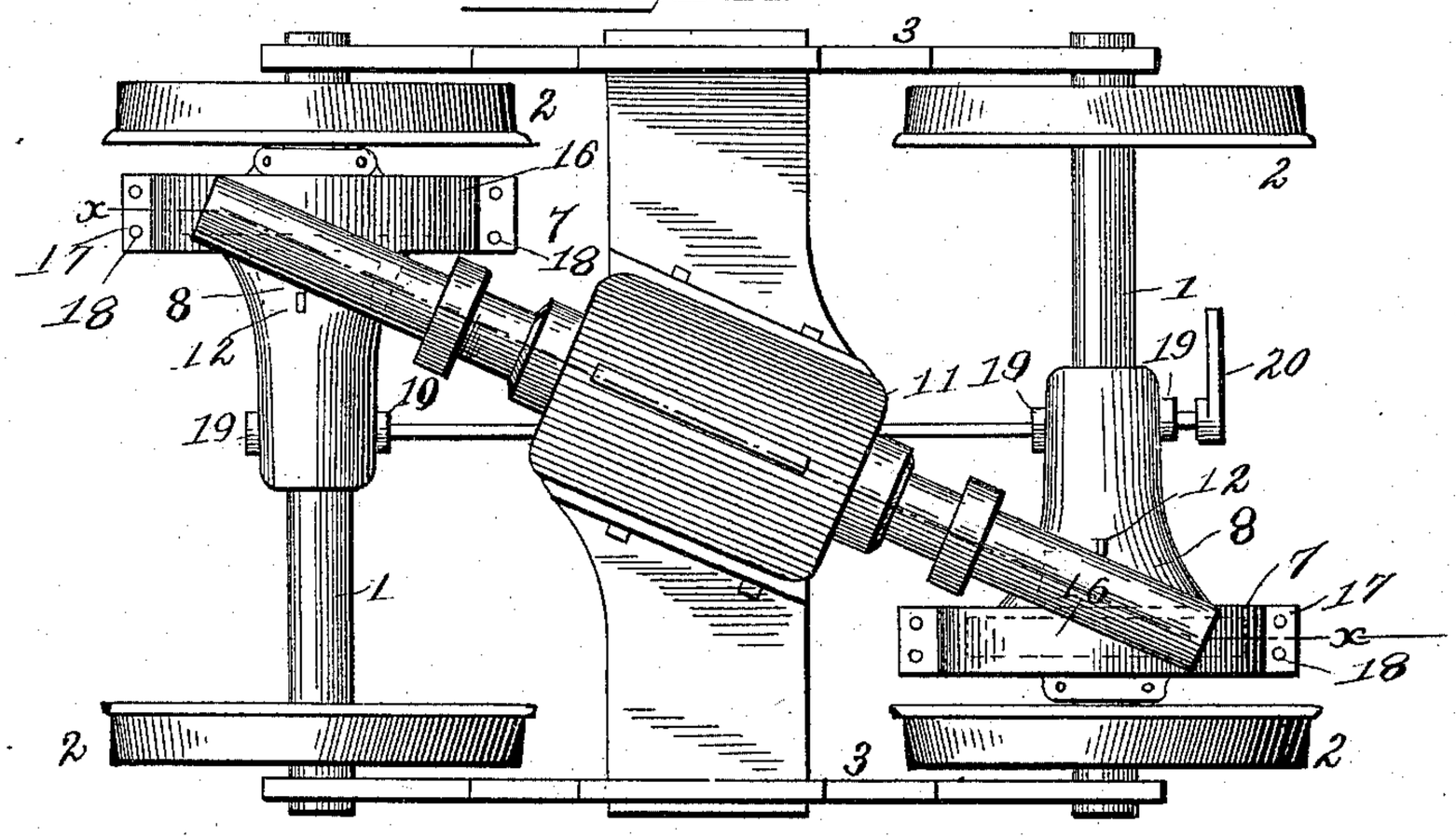
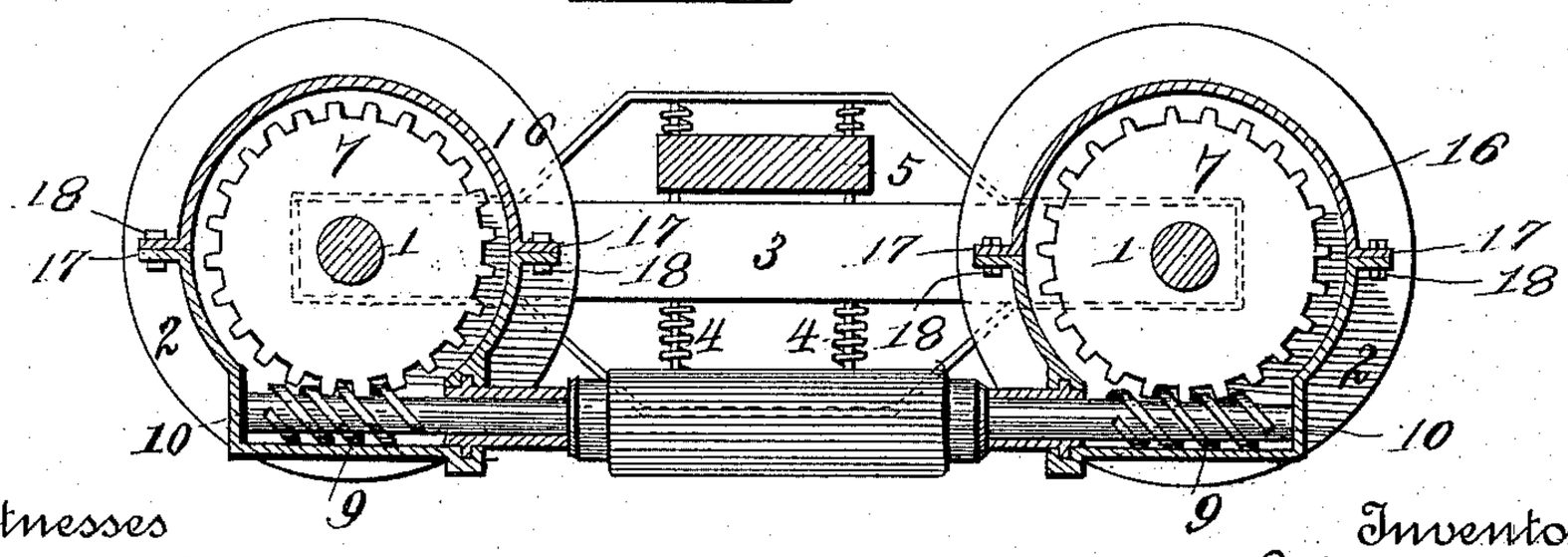



Fig. 3.




Witnesses

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

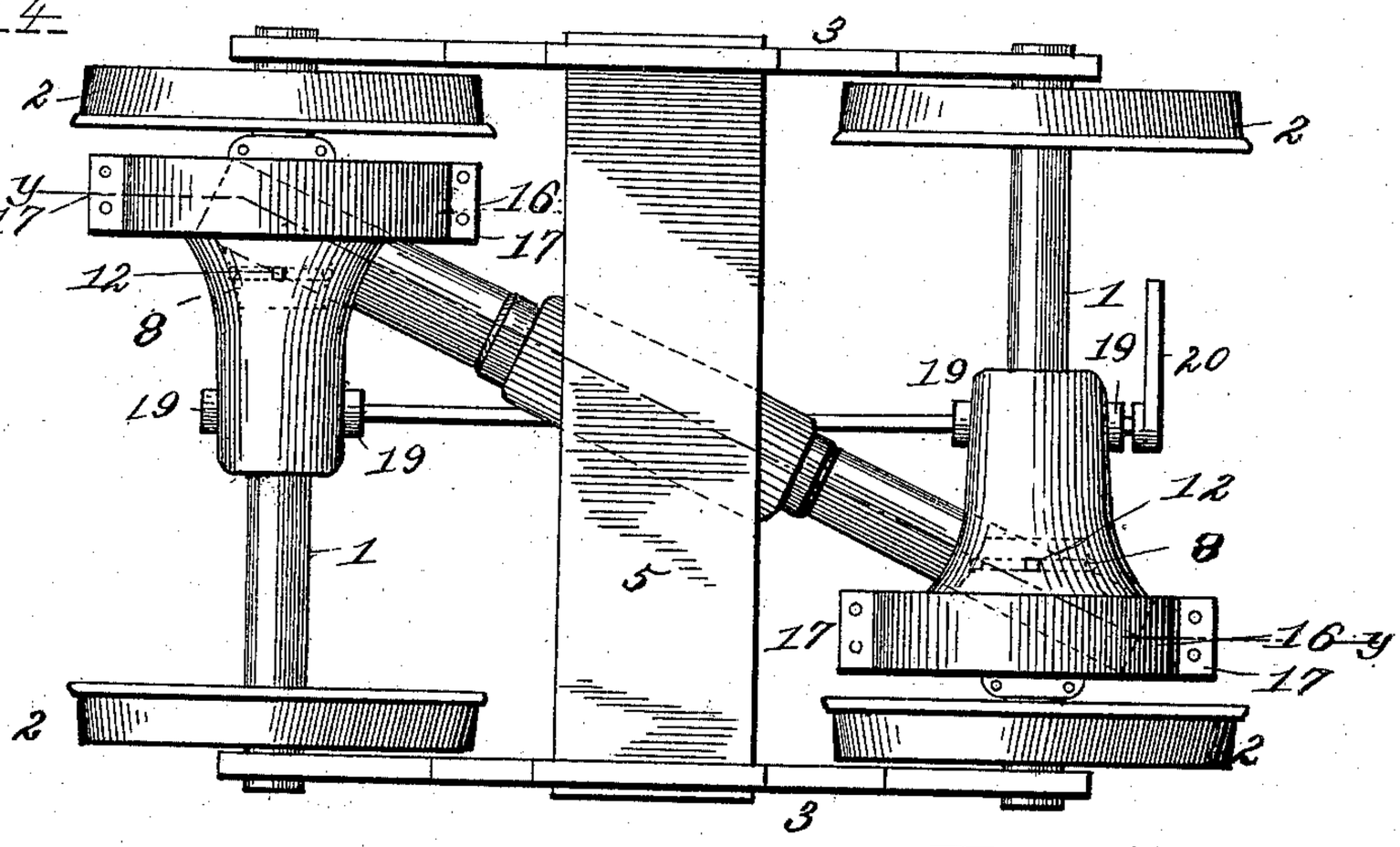



Fig. 5.

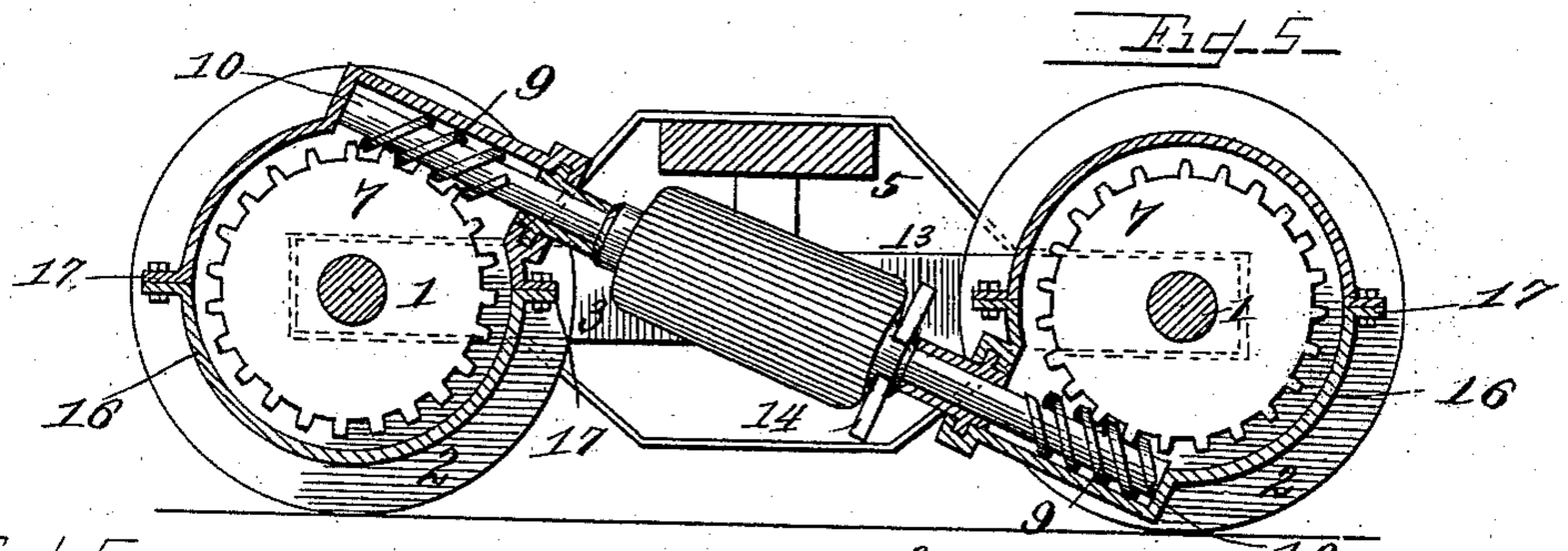
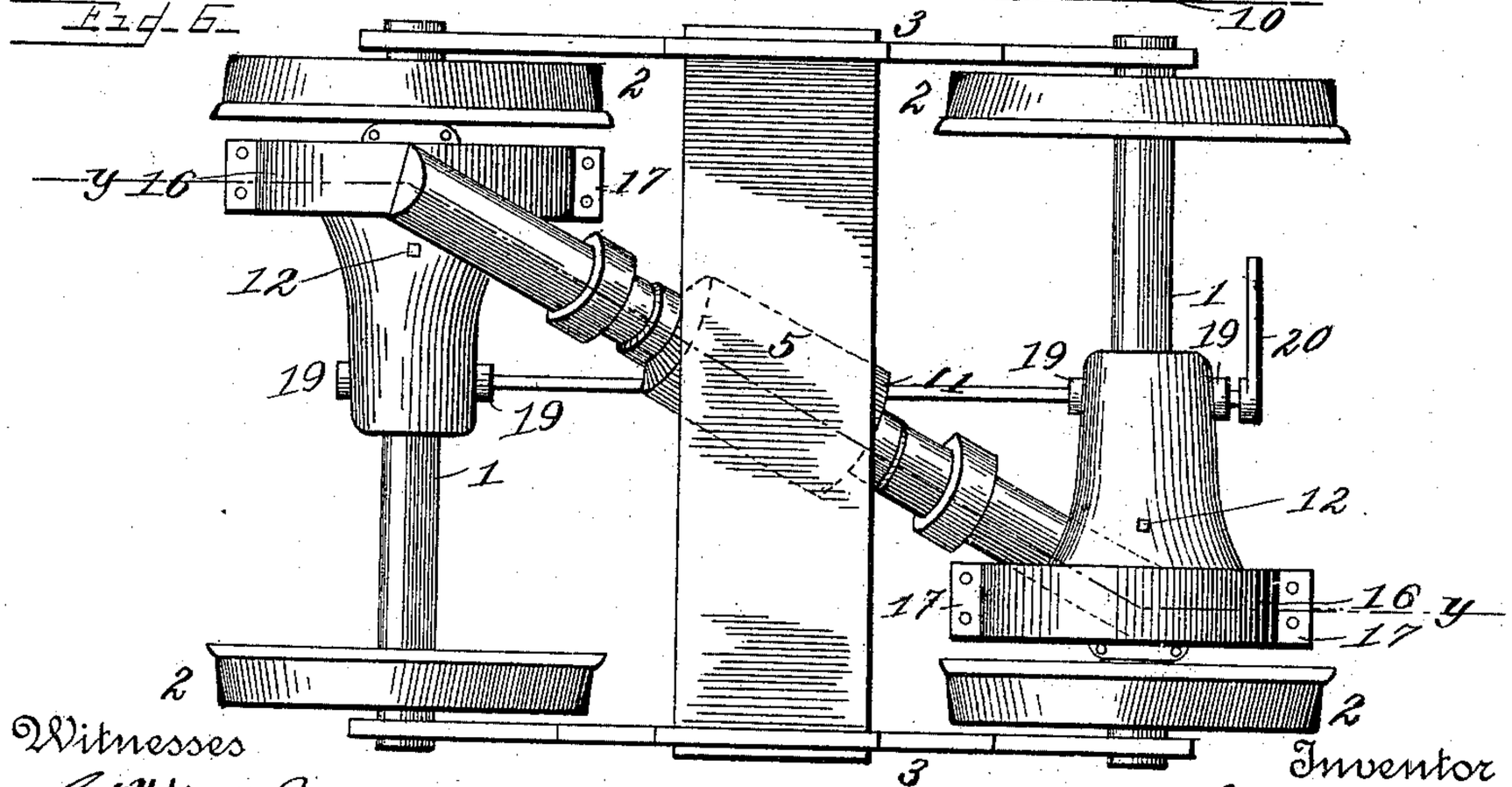



Fig. 6.

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# UNITED STATES PATENT OFFICE.

S. LLOYD WIEGAND, OF PHILADELPHIA, PENNSYLVANIA.

## ELECTRIC LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 533,259, dated January 29, 1895.

Application filed October 23, 1890. Serial No. 369,142. (No model.)

*To all whom it may concern:*

Be it known that I, S. LLOYD WIEGAND, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric-Railway Propulsion; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to electrical railway car propulsion, and has for its object the reduction of weight and avoidance of friction in such apparatus, the prompt starting and stopping of electrically propelled vehicles, and in the simplification of the gearing required for the reduction of the high speed of the electric motor to a requisite lower speed of the axles of the cars.

The construction and operation of this invention is hereinafter fully described and shown in the accompanyings drawings, in which—

Figure 1 represents a section of this invention partly in the vertical plane indicated by the dotted line *x x* in Fig. 2 and partly in elevation. Fig. 2 is a plan view of the invention of the form shown in Fig. 1. Fig. 3 is a partial vertical section of another form in the plane indicated by the dotted line *y y* in Fig. 4 with other parts shown in elevation. Fig. 4 is a plan view, with a partial horizontal section, in dotted lines of the form of the invention shown in elevation in Fig. 3. Fig. 5 is a vertical section in the plane indicated by the dotted line *y y* in Fig. 6. Fig. 6 is a plan view of the invention of the form shown in section in Fig. 5.

Referring to the drawings, 1 represents the axles; 2, the wheels supporting the weight of the car by side frames 3, springs 4, bolster beams 5, and pivots 6.

The supporting parts of the truck may be of any of the usual forms employed for eight wheeled railway cars, but the invention is applicable to short cars supported only upon four wheels, in which case the pivot between the bolster beam and the car body is omitted.

Upon each axle 1 is placed a toothed wheel 7, which is fitted so as to turn freely upon the axle, and is connected with a friction clutch 8, whereby it may be secured so as to rotate the axle, or may be disengaged from it. The friction clutch may be of any of the usual forms, but the preferred form is that depicted in the United States Letters Patent No. 430,907, of June 24, 1890. Into the teeth of each of the wheels 7, there are engaged the threads or spiral teeth of the helical pinions marked 9, secured or formed upon the shaft 10 of the electrical motor, which shaft 10 is placed diagonally both with reference to the axles of the car, and the line of motion of the car.

The armature of the motor is placed directly upon the shaft 10, and by reason of the rapid reduction of motion permissible with this form of gearing, correspondingly great increase of force is afforded by the operation of the helical pinions 9 in the toothed wheels 7.

As shown in Figs. 1 and 2, the helical pinions 9 and motor shaft 10 are located above the toothed wheels 7, which situation affords greater space for clearing objects on the road below the axles 1, and is for that reason desirable when the railway is located upon thoroughfares devoted to other travel and liable to have objects lying between the tracks.

As shown in Figs. 3 and 4, the motor shaft 10 and helical pinions 9, are placed below the axles 1 and wheels 7 and occupy a space lower down. This arrangement affords better convenience for the connection between the car body and the bolster beam, and the pivotal construction involved therein, than in the form shown in Fig. 1, but places the motor so near to the roadway as to necessitate the space between the rails being clear of obstruction. It has the advantage over the form shown in Figs. 1 and 2, of bringing the thrust of the helical pinions 9 upon the same side of the axle as the points of resistance or contact of the wheels on the rail, and relieves the axle bearings of a proportionate amount of journal friction to which they are subjected when having the fulcrum located between the pinions 9 and point of contact of the wheels and rails as shown in the first two figures. The avoidance of this strain upon the axle is attended with corresponding avoidance of friction and therefore economy of motive force.

Gearing as above described is of a distinctly different character of construction of teeth

from what is termed worm wheel gearing in which the axis of the screw lies in the plane of the toothed wheel and the teeth of the wheel are concave, and such worm gearing is hereby disclaimed as forming any part of this invention.

The gearing herein employed necessitates the placing of the screw shafts in a direction diagonal to the axis of the toothed wheel and the teeth of the wheel are of equal radii throughout their entire length.

As shown in Figs. 5 and 6, the motor shaft 10 and helical pinions 9 are placed diagonally as to the axles and the line of motion of the car, and also as to the horizontal plane, and one of the pinions 9 engages in the under side of one of the wheels 7, while the other pinion engages in the upper side of the other wheel 7 upon the other axle. The helical pinions 9 in this case, are made with opposite directions of thread or pitch and the arrangement possesses the advantage of locating the motor 11 on the shaft 10, clear of the roadway, and also clear of the bolster beam, and of equalizing the end thrust of the pinions 9, within the shaft 10, by reason of the pinions 9 and 9 pulling or thrusting in opposite directions, the end thrusts in the shaft 10, in Figs. 1 and 4 being sustained upon the end of said shaft and causing friction upon the end bearing. In the form shown in Figs. 5 and 6, such end thrust upon the frictional surface is avoided by the balancing of the strains of propulsion within the shaft 10. It is preferable in the construction of the helical pinions 9 and the toothed wheels 7 in which they are engaged, to have such helical inclination of the teeth of the wheel 7 and corresponding inclination of the threads or teeth of the helical pinions 9, that the frictional thrust in the direction of the rotation of the pinions 9 in the teeth of the wheels 7, shall be balanced or equaled by the inclination of the teeth of the wheel, so that little or no resulting end thrust upon the axle 1 takes place from the rotative motion of the pinions 9 and the frictional contact thereof with the teeth of the wheel 7. The clutches 8 are operated by means of a lever 12 in the usual manner and controlled by the conductor or brakeman, and the functions of the motor for propelling forward or backward are controlled by means of double sets of brushes 13 and 14 upon a commutator 15 of the motor, which brushes engage alternatively and determine the direction of the rotation of the motor.

In the normal running ahead of the car, the clutch 8 remains engaged with the wheel 7, and when it is desired to stop, without stopping the motion of the motor, the wheels 7 are permitted to turn, but are unclutched from the axle by means of the clutches 8. The momentum of the motor is maintained by this arrangement, while the motion of the car is stopped and such momentum contributes greatly to the prompt starting of the car, when the clutches 8 are re-engaged. The wheels 7 and pinions 9 are inclosed in a case or shell 16 adapted to exclude dust and retain lubricants and also to form supports or bearings for the shaft 10.

The cases 16 are made in two parts united by flanges 17 and bolts 18 and fit around the axle 1, and are formed so as to embrace the wheels 7 and the bearings or fulcrums 19 of the lever 20 for engaging and disengaging the friction clutches 8 so that the thrust or strain of operating the clutches is received and supported within the cases 16 unaffected by any lengthwise motion of the axles. The motor frame and bearings are also connected to the cases 16 so that the proper position of the bearings of the shaft 10 are enforced and lateral strain of the bearings and consequent friction are avoided.

The connections between the motor shaft, bearings or frame and the case 16 are made rigid in the direction of the axis of the shaft but are susceptible of a turning or angular motion, the parts being united by cylindric sleeves 21 formed upon the cases 16 embracing cylindric extensions 22 of the motor bearings and by permitting angular motion between axles 1 without strain upon the cases 16 and motor shaft 10, such angular motion being almost inevitable from the deviations of rails from the same plane and from accidental obstructions upon the rails. Strain on these parts is avoided by the sleeves 21 turning upon the bearings 22.

Having described this invention, what I claim is—

1. In a railway car motor, a shaft 10, helical pinions turning therewith and engaging toothed wheels, turning in planes diagonal to said shaft and pinions, combined with and located upon the axles of the car wheels substantially as shown and described.

2. In a railway car motor, toothed wheels having teeth of equal radial length located in different vertical planes upon the bearing axles of the car and engaged in helical pinions upon a motor shaft diagonal to the planes of the toothed wheels, in combination with friction clutches located upon the bearing axles, and arranged to engage and disengage for rotative propulsion between the toothed wheels and axles substantially as set forth.

3. In a railway car motor, toothed wheels, located upon the supporting and propelling axles, friction clutches arranged to rotatively engage said wheels, with said axles, helical pinions having axes diagonal to the planes of said wheels, in combination with inclosing cases arranged to support said friction clutches and helical pinions substantially as described and shown.

4. In a railway car motor, a shaft bearing oppositely inclined helical pinions, in combination with toothed wheels located in planes diagonal to said shaft and pinions, and engaged therewith to receive rotary mo-

tion therefrom, and impart such motion to the supporting and propelling axles of the car, substantially as set forth and shown.

5. In a railway car motor, the toothed wheels 7 and clutches 8 upon the axles 1 in different vertical planes in combination with inclosing cases 16, provided with bearings fitting the axles 1, bearings fitting a diagonal shaft bearing pinions engaging said toothed wheels, and bearings for the clutch engaging lever 20, substantially as set forth.

6. In a railway car motor, toothed wheels located upon the axles thereof in different vertical planes, and helical pinions engaging in said wheels, in combination with a case inclosing said pinions and wheels and also inclosing bearings supporting the arbor of said pinions substantially as and for the purpose set forth.

7. In an electric railway motor, the parallel axles 1 provided with toothed wheels 7, in different vertical planes, geared with helical pinions 9, turned by the same shaft 10, upon an axis oblique to the planes of motion of the wheels 7, in combination with the cases 10, inclosing the wheels 7, pinions 9, and connected by sleeves 21 and extensions 22, arranged to accommodate variations of the axles 1 from a common plane substantially as set forth.

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