(No Model.) 2 Sheets—Sheet 1.

R. EICKEMEYER, Dec'd.

R. EICKEMEYER, JR., Executor,

ELECTRIC LOCOMOTIVE.

No. 588,105. Patented Aug. 10, 1897.

Fig. 1.

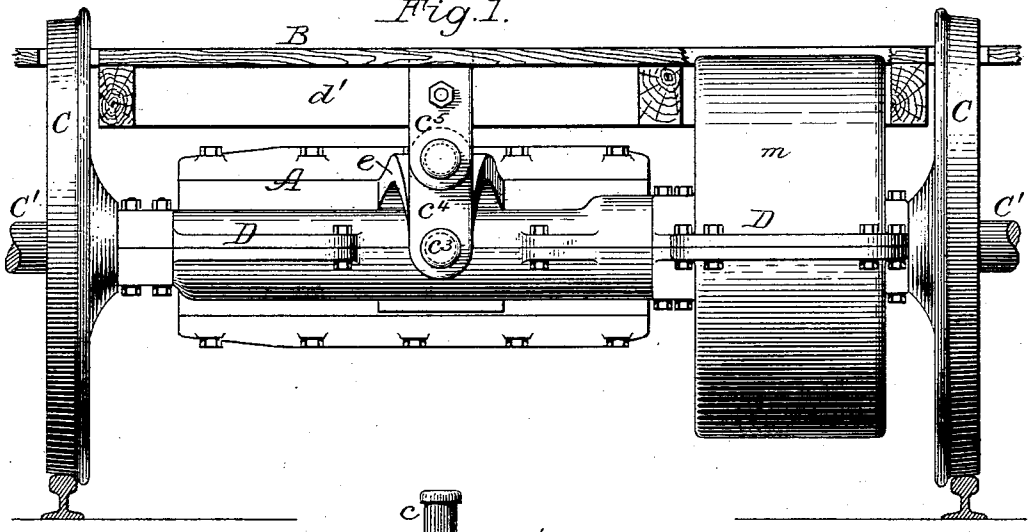
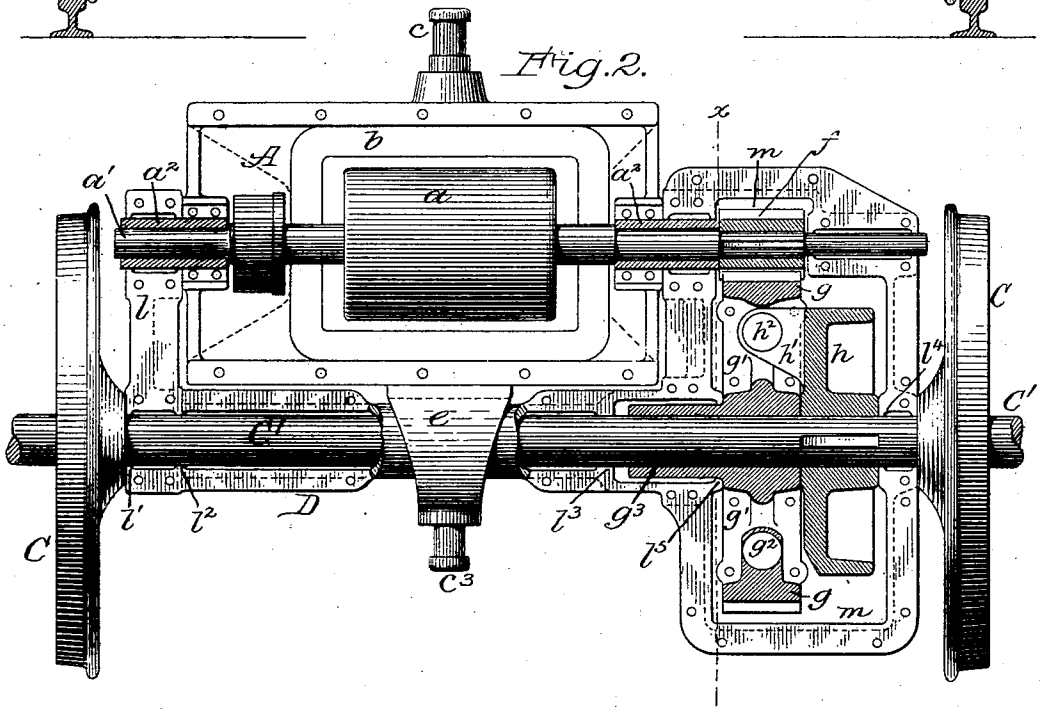


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

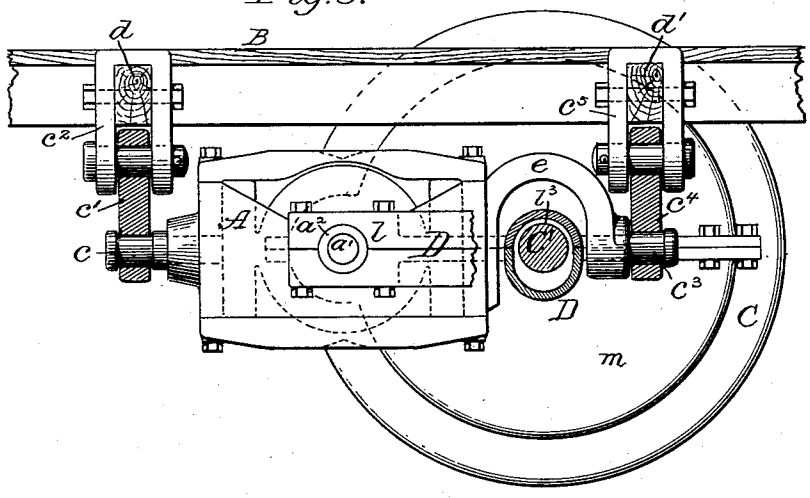


Fig. 4.

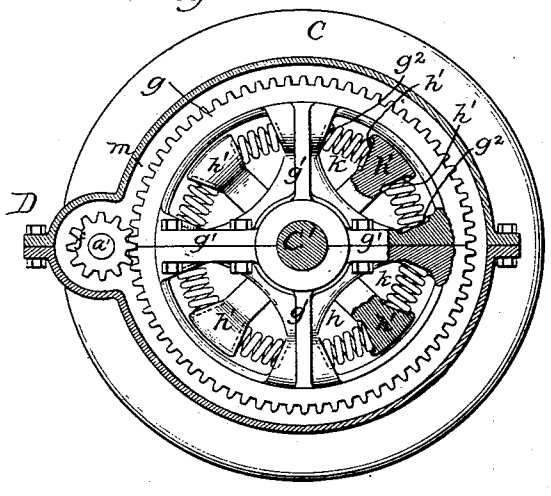


Fig. 6.

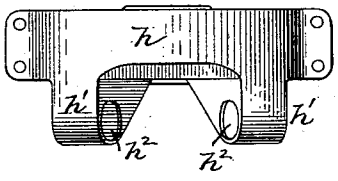
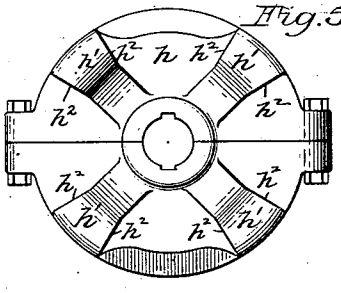


Fig. 5.



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UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK; RUDOLF EICKEMEYER, JR., EXECUTOR OF SAID RUDOLF EICKEMEYER, DECEASED.

ELECTRIC LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 588,105, dated August 10, 1897.

Application filed August 23, 1892. Serial No. 443,837. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Electric Locomotives; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My said improvements relate to that class of electric locomotives in which gearing is employed for coupling the motor-armature to the driven axle, and although my invention is in part applicable to any type of geared motor I have preferred to disclose the same as embodied by me in what are known as "single-reduction" machines, wherein a pinion carried by the armature-shaft of the motor meshes with a gear carried by or upon the driven axle.

The objects of my invention are to secure the motor against rail-shocks, assure a smooth and favorable transmission of power by way of the gearing, and a peculiar and valuable flexibility between the car-body, the motor, the gear-frame, and the driven axle, all of which is conducive to durability of the mechanism and ease in operation.

After describing my improvements in detail as organized by me the features deemed novel will be duly specified in the clauses of claim hereunto annexed.

Referring to the drawings, Figure 1 illustrates a portion of the sill or floor-framing of a car in lateral vertical section, the motor suspended therefrom, the gear-frame, and the driving-axle and its gear-frame and wheels, all as when in position on track-rails. Fig. 2 illustrates the same partly in plan view, but mainly in horizontal section, and with the top of the motor-casing detached, disclosing the armature. Fig. 3 is a side elevation of the motor and one of the driving-wheels, the floor-frame, the motor-suspending links, and a part of the gear-frame being shown in section. Fig. 4 is a sectional view on line x of Fig. 2, illustrating the driving-gear and its cushioned connection with the driving-axle. Figs. 5 and 6 respectively illustrate in side and top views the disk which is keyed to the axle and is engaged by the gear by way of the interposed cushioning-springs.

The electric motor A is of the type of motors heretofore patented to me and adapted to operate at high speed, the armature a being, as usual, within a magnetic casing b, the central section of the latter affording bearings for the armature-shaft a', as is clearly indicated in the drawings. At the one side of said central section, near its gravity center, and projecting centrally at right angles to the motor, there is a supporting or suspending stud c, to which is pivotally hinged a pendent link c', the latter being hinged at its top to a heavy strap c^2, which is supported by one of the cross-beams d of the sill or floor-frame B of the car.

At the opposite side of the motor a projecting gooseneck arm e is bolted to the central section of the casing, the outer end of the arm being provided with a projecting suspending-stud c^3 in line with the other stud and like that connected by a link c^4 and a strip c^5 to another cross-beam d' of the floor-frame B. Thus while firmly suspending the motor from a spring-mounted car-body, as heretofore provided for by me, the motor is now flexibly and pivotally mounted with relation to the car-body, the latter being capable of tilting laterally independently of the motor, which has also a similar capacity.

The driving-wheels C C and the driven axle C′ are as heretofore, the axle-journals being, as usual, outside of the wheels and having the usual jaw-hangers and springs over the boxes for supporting the car-body with the motor suspended therefrom.

The armature-shaft a' has its bearings in long sleeves or bushings a^2 a^2, each of which is clamped beneath suitable caps on the central section of the motor-casing, and near one end said shaft carries a pinion or small gear f, which meshes with the large axle-gear g, mounted loosely on the driven axle C′. As an essential feature in one portion of my invention this gear must be provided with a number of annularly-disposed seats for cushioning-springs to abut against, as heretofore, and the faces of said seats should be in radial planes. The axle-gear is cast in two parts, bolted together, and has four arms or spokes

g', each of which near the rim is provided with internal inclined annular bearings or seats g^2, as clearly shown in Fig. 4.

Outside of the axle-gear g and on the driven axle there is a disk h, which is constructed in sections bolted together and securely keyed to the axle C'. The inner side of said disk is provided with four laterally-projecting arms h', each of which has two bearing-seats h^2, all located in the same plane as the several seats g^2 on the gear-arms g', so that strong short spiral springs k may be interposed between each two seats g^2 and h^2, the several springs being all under compression and annularly arranged and in line with the center of the teeth or face of the gear, as is clearly indicated in Fig. 4.

The axle-gear g, being loosely mounted on the driving-axle, is practically supported by the disk h upon its intervening cushioning-springs, it being obvious that at every point in its rotation the axle-gear always has a reliable supporting-bearing on two or more of the springs, and therefore no vertical rail-shocks communicated to the axle by way of the wheels can be directly imparted to the axle-gear g. So also, regardless of the direction in which the locomotive may be moving, no shocks can be directly imparted to the gear g as the result of tangential shocks received by the wheels at the rails, as when the latter have imperfect joints or when stones or other obstructive matters are encountered or when curves are taken at considerable speed or in passing over frogs at junctions and switches.

In starting and stopping the locomotive the freedom of the gear g to yield within certain limits is also conducive to the durability of the teeth of that gear, as well as of such other gears or pinions as may be employed between it and the motor-armature, and with the prompt starting of a motor there is a less sudden strain, as between the wire winding and the core of the armature, because of said yielding capacity. It is obvious that any axle-gear may be thus combined with the spring-cushioning disk regardless of the manner in which power is communicated to the axle-gear for the armature of the motor. This general method of cushioning the gearing is not new with me, but the organization of spring cushioned gearing with the pivotally-suspended motor constitutes a valuable feature of my invention.

As heretofore organized and patented by me the gearing is inclosed by a casing, which is organized as a portion of the gear-frame, but my present machine in this connection embodies novel features in the construction of the gear-frame and in its combination with the suspended motor. This gear-frame D is constructed in two sections divided on a horizontal plane in line with the axis of the driving-axle and surrounding the latter. It extends from one wheel-hub to the other. The two sections of the frame are bolted together at the rear of the axle and also in front adjacent to the axle and also at the two ends of the armature-shaft. At one end the gear-frame has an arm l, which extends to the motor-shaft at its commutator end, and the adjacent portion of the gear-chamber m of the casing at the other end of the motor serves as another arm, which with the arm l is so hinged to or in line with the motor-shaft that the latter holds the gear-frame against rotative movement on the driving-axle and also maintains the pinion and the gear in proper working relations. The gear-chamber, being thus mounted and serving as a link hinged or articulated with both the axle and the motor, constitutes an inclosing housing for the gearing, while the arm l, extending from the axle to the motor, assures appropriate relations between the other end of the motor and the axle.

The central sleeve or tubular portion of the gear-frame D has an oval interior in cross-section, as shown in Fig. 3, but interior webs, as at l' l^2 l^3 l^4, loosely engage with the axle, as shown in said figure, but more fully in Fig. 2, thus limiting frictional contact to several very small areas. The axle-gear g, being loosely mounted on the axle, is kept in place closely adjacent to the coupling-disk h by means of an interior web l^5, the latter loosely engaging peripherally and laterally with the shouldered hub g^3 of the axle-gear. With a view to special durability in avoiding undue wear between the gear-frame and the axle the bearing-points at l', l^2, l^3, and l^4 should be provided with metal journal-boxes and also a similar box for the hub of the axle-gear to revolve in.

The armature or motor shaft a', as before described, has its bearings in long sleeves or bushings a^2 a^2, and it will be observed that while these bushings are securely held against rotation by the box-caps on the casing or frame of the motor both of said bushings are loosely embraced by the adjacent portions of the gear-frame, one at the outer end of the arm l and the other by that portion of the gear-frame which occupies the space between the pinion f and the end of the motor-frame, as shown in Fig. 2. The adjacent outer end of the motor or armature shaft is also loosely embraced by the adjacent portion of the gear-frame, so that the hinging of the latter with reference to the armature-shaft is mainly restricted to the non-rotative bushings.

It will now be obvious that the electric motor is capable of being moved up and down with the car-body while responding to the action of the car-springs and that the gear-frame will be freely tilted on the axle to correspond with such movements. The armature or motor shaft has a slight capacity for longitudinal movement, and so also has the gear-frame a similar capacity not only with relation to the driving-axle, but also on the armature-shaft and its bushings, and hence if the swaying action of the car-body should

sway the motor the latter may cause a slight sidewise movement of the gear-frame; but the whole organization is so flexible in its capacities that each part thereof can readily adjust itself to the various vibratory movements incident to railway-service. With the motor flexibly suspended, as described, from a spring-mounted car-body the latter under ordinary circumstances will, as a rule, sway to and fro without causing any corresponding movement of the motor; but if the latter does swing it cannot injure any of the connecting mechanism or cause undue binding or friction at the flexible connections of the several parts. The sharp longitudinal tilting movements of the driven axle liable to occur independently of the car-body cannot cause any tightening or binding action of the armature-shaft at its bearings, because the motor is pivoted to the car-body on a line at right angles to the driven axle and it can promptly assume positions most favorable to smooth and easy operation.

If the axle-gear was keyed to the axle and therefore employed without the annular cushioning-springs and disk, then the flexibly-suspended motor, the gear-frame, and the pinion on the motor-shaft would involve certain effective portions of my invention.

The novel suspension of the motor from the floor-frame of the car or locomotive, as described, as by the laterally-vibrative links and pivotal supporting-studs on the motor-casing at right angles to the driven axle, involves a portion of my invention which may be profitably employed regardless of the means by which power is or may be communicated from the motor to the driven axle or axles, because of the fact that during swaying movements the motor and the car-body are free within prescribed limits to sway independently of each other and each serves to smoothly check undue swaying movement by either.

In the organization described, as with my prior patented machines, desirable facility is afforded for assembling the parts, as well as in dismantling for repairs. Through the usual trap-door in the car-floor access may be had to the motor-brushes. The top section of the motor-casing can be unbolted and readily removed for exposing the armature, or, if inspection only is desired, the bottom section of the casing may be unbolted and dropped out of the way. If the armature is to be removed, the upper portion of the gear-frame and casing can be readily detached, leaving the central and bottom portions of the motor-casing intact; and for inspecting the gearing the lower portion of the gear-frame can be unbolted and dropped out of place, leaving all the rest of the machine intact.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric locomotive or car, the combination substantially as described, of an electric motor pivotally suspended from the car-floor; a pinion on the motor-shaft; a driven axle; a gear-frame flexibly supported, at one end upon said axle, and at the other end upon the motor-shaft, an axle-gear loosely mounted on the axle and meshing with the pinion; a disk keyed to said axle alongside of said gear; spring-seats on said gear and on said disk, in one plane; and springs annularly arranged and interposed between each two adjacent seats, affording a rotative yielding connection between the axle-gear and the driven axle.

2. In an electric locomotive or car, the combination substantially as hereinbefore described, of an electric motor suspended from the floor-frame of the car, a pinion on the armature or motor shaft, an axle-gear meshing with the pinion, and rotatively coupled to the axle, and a gear-frame carried on said axle, and hinged to the motor in line with its armature-shaft.

3. In an electric locomotive or car, the combination substantially as described, of the car floor-frame, an electric motor having two pivotal supporting-studs projecting centrally at right angles to the motor, in opposite directions and lengthwise of the car; and pendent links flexibly connecting the supporting-studs of the motor with the car floor-frame, whereby the car floor-frame and the motor, may separately tilt or be tilted, and sway or vibrate from side to side within prescribed limits independently of each other.

4. In an electric locomotive, an axle, a motor separate therefrom, gearing between the motor and the axle, a link hinged or articulated with both the axle and the motor constituting a housing for the gearing, and another arm extending from the axle to the motor.

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Witnesses:
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JAMES E. IRVINE.