(No Model.)

3 Sheets—Sheet 1.

W. L. SILVEY.

ELECTRIC LOCOMOTIVE.

No. 575,314. Patented Jan. 12, 1897.

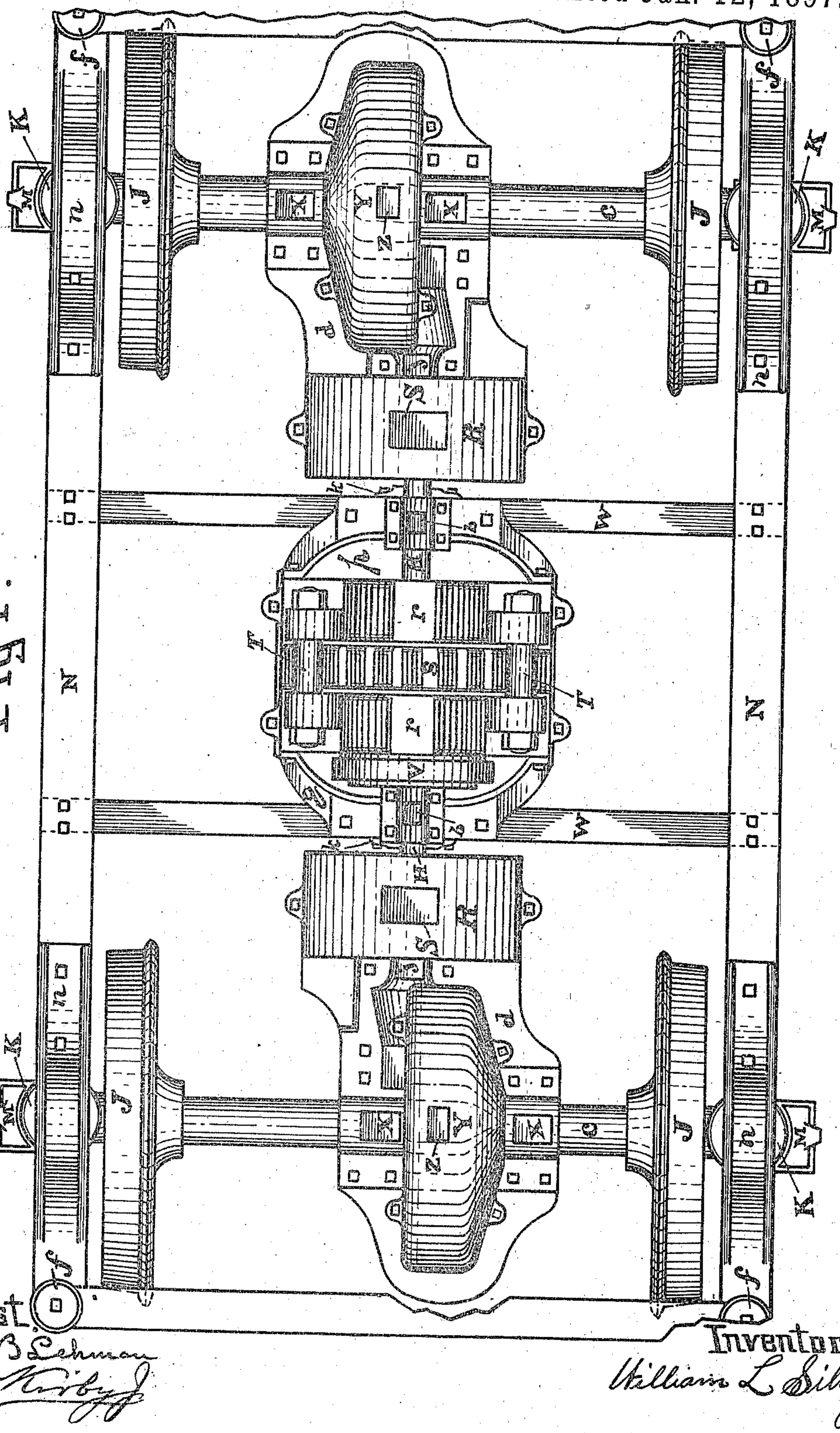


Fig. 1.

Attest.
E. B. Lehman
J. Kirby Jr.

Inventor.
William L. Silvey

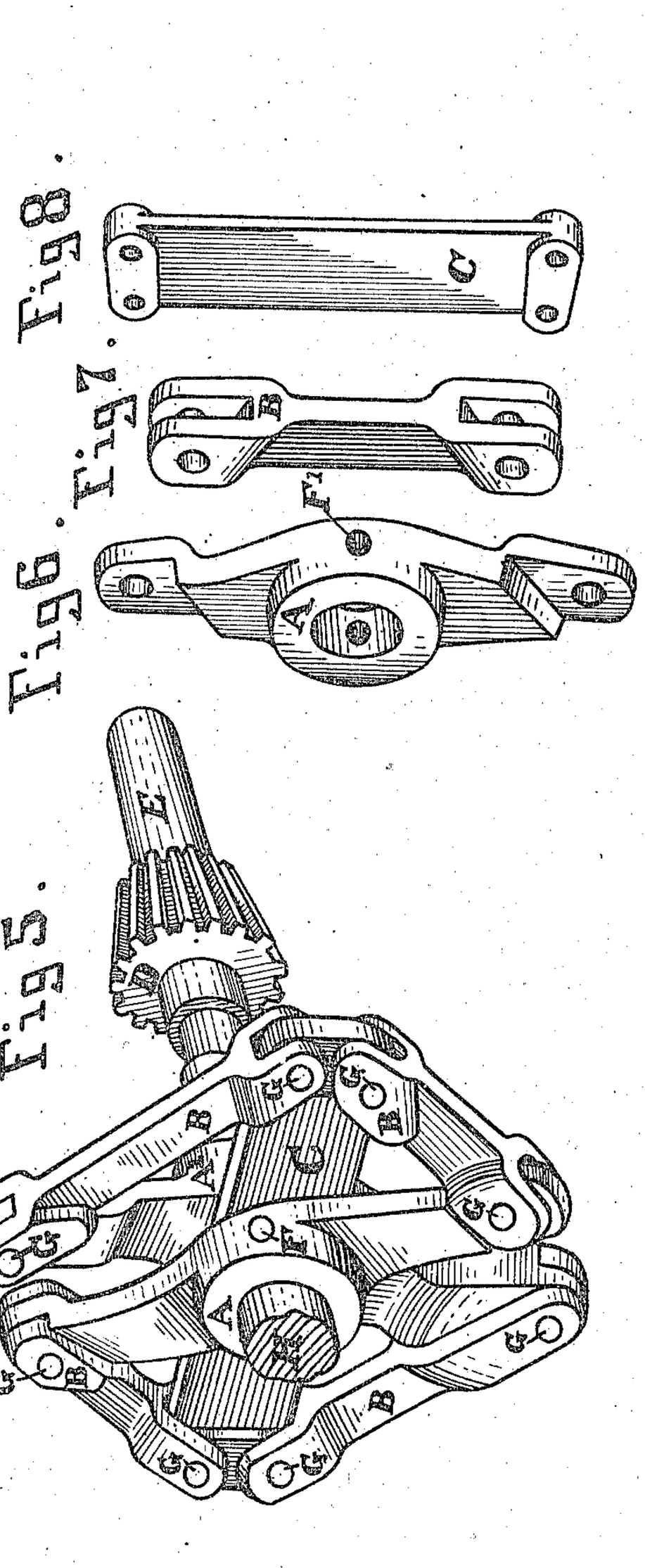
(No Model.)

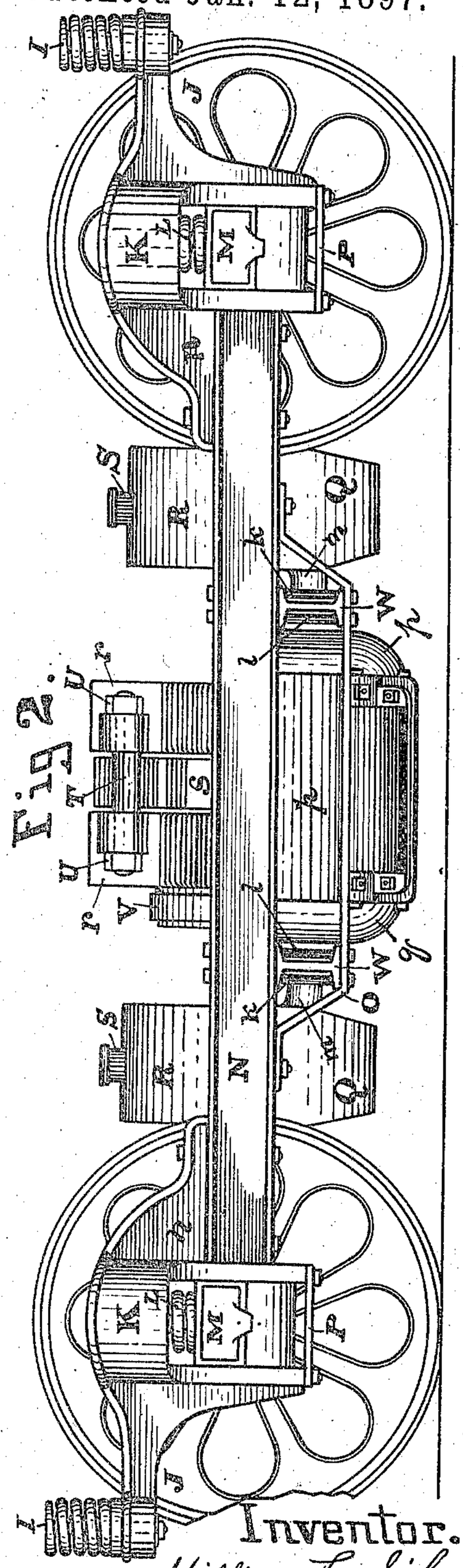
3 Sheets—Sheet 2.

W. L. SILVEY.

ELECTRIC LOCOMOTIVE.

No. 575,314. Patented Jan. 12, 1897.





Attest:
E. B. Lehman
J. Kirby Jr.

Inventor.
William L. Silvey

(No Model.)

3 Sheets—Sheet 3.

W. L. SILVEY.

ELECTRIC LOCOMOTIVE.

No. 575,314. Patented Jan. 12, 1897.

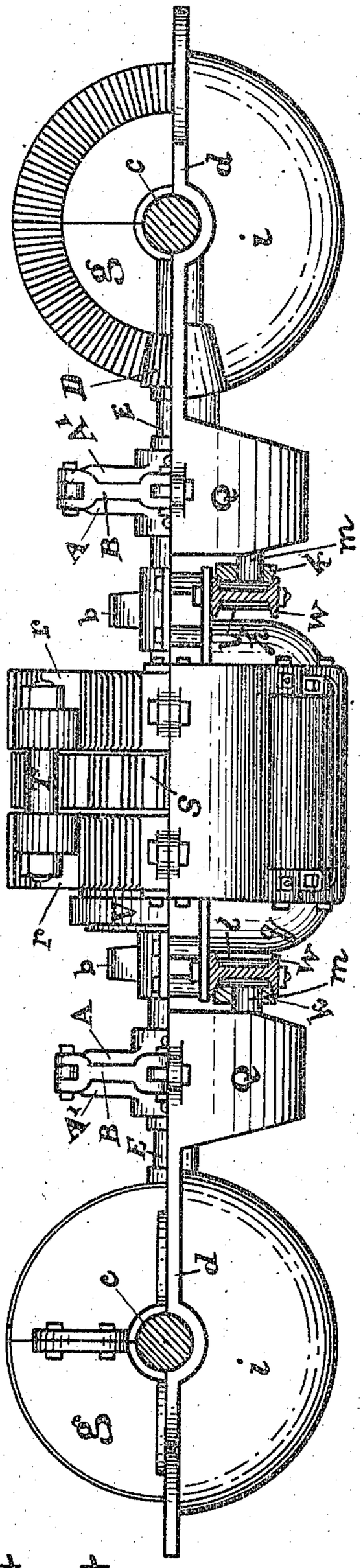


Fig. 4.

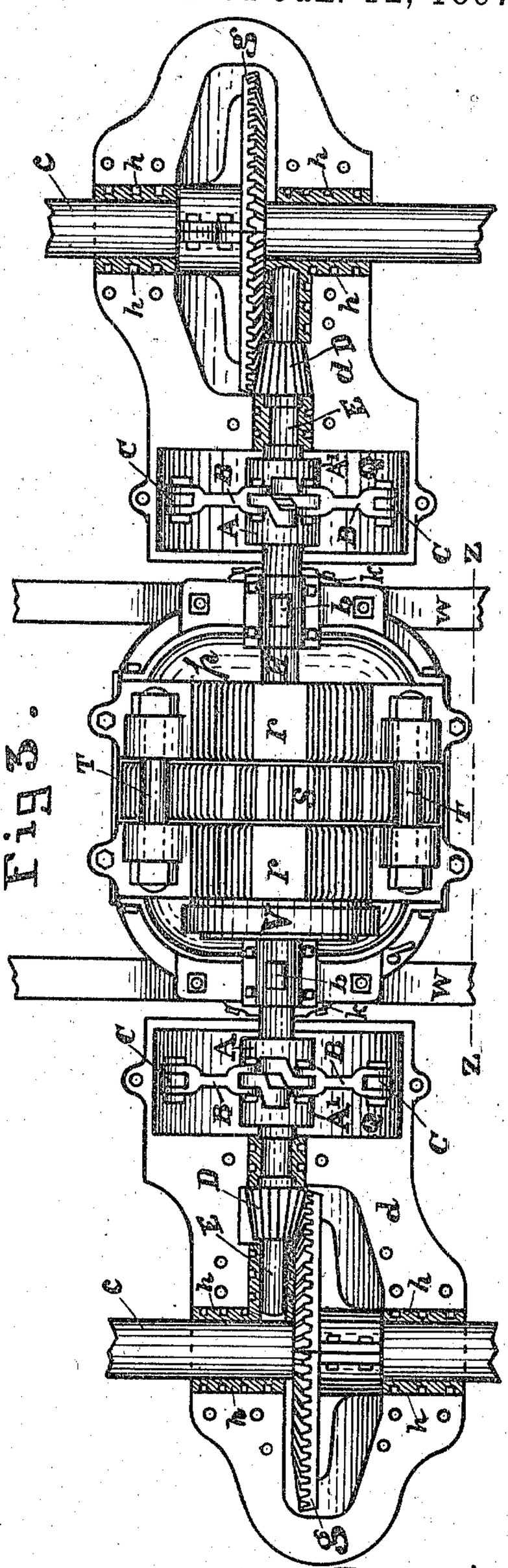


Fig. 3.

Attest;
E. B. Schmain
J. Kirby Jr.

Inventor.
William L. Silvey

UNITED STATES PATENT OFFICE.

WILLIAM L. SILVEY, OF DAYTON, OHIO.

ELECTRIC LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 575,314, dated January 12, 1897.

Application filed November 7, 1895. Serial No. 568,211. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. SILVEY, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented a certain new and useful Improvement in Electric Locomotives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improvement in electric locomotives of the class in which a single motor is mounted on the truck in such a manner that undue strains on and vibrations of the latter, resulting from the irregularities of the track, will not produce bad effects on the motor mechanism.

The main object of my invention is to provide means whereby the pinion-shafts, which are flexibly connected with the motor-shaft, will be so supported that the pinions will at all times be kept in positive mesh with the gear-wheels on the axles, notwithstanding the variable positions assumed by the truck-wheels, axles, and gear-wheels, due to the curvature of and variations in the track over which the locomotive is operated, the above-mentioned means for supporting the pinion-shafts being what I will hereinafter term "gear-frames."

Another object of my invention is to combine with the gear-frames suitable casings for the gear-wheels and shaft-couplings, said casings being adapted not only to protect the parts from injury, but also to contain oil for the constant lubrication of the protected parts.

The invention will first be described in connection with the accompanying drawings, and then pointed out in the claims.

Figure 1 of the drawings is a top plan view illustrating my invention, all parts in position, with the gear and coupling casings closed. Fig. 2 is a side elevation of Fig. 1, showing the manner of mounting the motor on the truck. Fig. 3 is a top plan view illustrating my invention with the tops R R and Y Y of the respective coupling-casings and gear-casings removed and with the car-wheels and truck-frame broken away. Fig. 4 is a side elevation of Fig. 3 along the horizontal line Z Z. Fig. 5 is a perspective view of one of the flexible couplings by which the pinion-shafts are connected with the motor-shaft. Figs. 6, 7, and 8 are enlarged detail perspective views of parts of the coupling shown in Fig. 5.

In the drawings, N are the side beams of the truck; J, the wheels, and *c* the axles. To these side beams are attached suitable journal-boxes M, which are preferably surmounted by, or in a suitable manner connected to, springs L, on which the car-frame is supported. In this case I have shown the springs mounted on top of the journal-boxes and partially concealed in chambers K in the pedestals *n*, whereby the springs are not only steadied, but they are also protected. The pedestals are all connected together into a semi-rigid frame by the side beams N and suitable end beams, as will be seen in Fig. 1. To the end beams the brake mechanism and other necessary parts (not shown) are attached. It will be observed that the side beams are attached to the jaws or pedestals *n*, in which the journal-boxes M are free to move in a vertical direction, the fork in the respective pedestals preventing the wheels and axles from getting out of proper alinement in a longitudinal direction and at the same time allowing them to take up any irregularity in the track, the inequalities being taken up in the pedestal-springs L without to any great extent throwing the side beams N out of parallelism with respect to each other.

The electric motor is supported upon cross-beams W, which are secured to the side beams N of the truck by bolts *l*. In some cases it is necessary to hang these cross-beams under the side beams, so as to get the center of the armature-shaft H in alinement with the center of the car-axles; and in order to support and hold these cross-beams perfectly rigid I use trusses O, which prevent surging or swaying of the motor or the frame on which it rests. As will be seen in the drawings, the end plates or heads *p q* of the motor are provided with lateral flanges directly under the motor-bearings *b*, by which the motor rests on top of the cross-beams. These flanges are sufficiently large to afford ample bearing-surface on the cross-beams and to allow the parts to be bolted together in the most substantial manner. The field-magnets *r r* of the motor are of the ring

type, having consequential poles, the two field-magnet rings being maintained equidistant by stud-bolts T, passing through lugs on the rings, and heavy nuts to keep said rings in alinement with each other. These rings are held in position by the arched heads *p q* or bearing-supports, to which the bearings *b* are attached. The armature S consists of a suitable slotted ring mounted on a spider and wound with coils of wire, which revolves between and in close proximity to the field-magnet rings, the coils on the armature being connected to the commutator as well as to the armature, both being supported upon the shaft H, which in turn revolves in the journal-boxes *b* on the arched heads of the motor.

On each axle *c* is rigidly fixed a split bevel gear-wheel *g*, with which meshes a pinion D on a short shaft E, which latter is at a right angle to the axle and has flexible connection with the motor-shaft in a manner hereinafter described.

Nothing above described is claimed herein; but I will now describe the gear-frames and their combination with other parts, which constitute my present invention, it being understood that there are two of these gear-frames, one at each end of the truck, and a description of one will answer for both.

d represents the gear-frame, which may be of any suitable metal. The outer end of the frame is so formed as to diametrically encompass the gear-wheel *g*, and on each side of said wheel it is provided with a babbitted journal-bearing *h*, in which the axle *c* works, these bearings being covered by caps or half-bearings X, removably secured thereto, thus supporting the outer end of the gear-frame on the axle, undue lateral movement of said frame on the axle being prevented by the face and hub of the gear-wheel, as clearly seen in Fig. 3. At its outer end the gear-frame is provided on its under side with an oil-tight casing *i*, which incloses half the gear-wheel, and also serves to contain oil for the constant lubrication of said wheel and its coacting pinion, as best seen in Fig. 4. A top casing Y is removably secured to casing *i*, serving to entirely inclose the gear-wheel *g*. In the upper side of the gear-frame, at a right angle to the bearings *h*, are formed bearings *h'* for the pinion-shaft E. At its rear end the gear-frame is provided on its under side with an oil-tight casing Q, encompassing the flexible coupling hereinafter described and adapted to receive a removable top casing R, these two casings entirely inclosing said coupling. The casing Q is designed to contain oil, and the coupling, by revolving therein, is kept constantly lubricated. To the inner end of casing Q is secured a short stud *m*, which is adapted to rest loosely in a bearing-block *k*, rigidly fixed to the cross-beam W below and in vertical alinement with the motor-shaft.

The flexible coupling is constructed and arranged as follows: On each end of the motor-shaft H is fastened a two-armed driver A, and on the inner end of each pinion-shaft E is fixed a similar driver A'. In Figs. 3, 4, and 5 it will be observed that the outer ends of these driver-arms are made to arch toward each other, so that the centers of the outer arms shall come as nearly in relative alinement with each other as possible, thereby preventing side strains, which would tend to disrupt the material of which the drivers are made. Suitably-formed links B are fastened at one end to the drivers by means of bolts G, passed through the links and through holes in the outer ends of the drivers, they being similarly fastened at their outer ends to a floating plate or spreader C. Considerable space is allowed between the meeting faces of the drivers A A', to permit the floating plate to take varying positions without undue friction against the drivers. In practice the motor-shaft H acts as a driver and is free to revolve in either direction, or in running downgrade, where the car becomes the driver and the motor-armature the driven part, the pinion D and pinion-shaft E and the two-armed driver may become the drivers, and the arm A and motor-shaft H will then become the driven parts, which may be rotated in either direction. In case the shaft H and pinion-shaft E should get out of alinement the irregularities will be taken up by the floating plate and the four links B. In fact, the two shafts frequently get out of alinement as much as an inch or more in any direction without throwing undue strain on any of the bearings or parts and without the car-wheels getting out of time. There is also a considerable allowance for end-to-end motion between the parts, as the floating plate C is supposed to be suspended at all times by means of the four links which connect it to the ends of the drivers.

The stud *m* on the gear-frame *d* serves as a support for the inner or pinion end of that frame, allowing the axle *c* to take up the irregularities of the track without throwing any strain on said frame. In fact, the gear-frame being supported at its outer end, on each side of the large gear-wheel *g*, by the axle and at its inner end by the stud *m*, the car-axle may assume a rotary position around the center of this stud, as it has a certain amount of longitudinal play in the jaws of the car-frame, which will be taken up by the stud *m* sliding inward and outward in the box *k*, or the wheels may assume a considerable side motion with relation to each other, all lateral, vertical, and horizontal motions being provided for by looseness of the stud in the box, which prevents any strain on the framework of the car; and the flexible couplings A A', with their connecting-links B and floating plate C, prevent any possible undue strain on the bearings, shafts, or gears, all of which are matters of great importance in the operation of railway and street cars, and must be provided for and their dangers guarded against before it becomes possible to rigidly gear a plurality of axles together.

The advantages to be derived from this class of gearing are manifold. For instance, the motor apparatus can be entirely suspended upon springs forming part of the framework of the car, the axle gears and pinions, with their connecting mechanism, being supported on three points of suspension—namely, the wheels J and the stud *m*—allows each pair of wheels independence of motion with relation to the other parts of the apparatus; there is but little dead-weight supported on the car-axle proper, for the reason that the stud *m*, which carries the greater part of the strain as well as the greater part of the weight of the gear-frame, is supported on the framework of the car, and therefore the hammer-like blows imparted to the rails by the car-wheels are to a great extent prevented, and, finally, one motor is dispensed with by this mechanism, at the same time allowing all the flexibility that can be obtained from having a motor supported on each axle.

An advantage in the rigid gearing of a plurality of axles is that a flat wheel is seldom produced, for the reason that the irregularity of the friction of the brakes on the several wheels is imparted to all the wheels alike, owing to their all being positively geared together, and, besides, it is possible to produce very much greater tractive effect by coupling two pairs of wheels together than if each pair of wheels were driven independently, as well as the tractive effect produced from a given weight, and therefore the skidding of wheels on steep grades or on slippery rails is almost entirely prevented, for the reason that it is impossible to skid one pair of wheels unless all the wheels are skidded.

It is evident that the motor can be entirely incased, making it waterproof; but I have shown only the lower half of it incased, all necessary parts, such as the brush-holders, binding-posts, &c., having been omitted for the purpose of making the drawings as plain as possible and to avoid unnecessary prolixity.

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

1. In an electric locomotive, the combination, with the truck and an electric motor mounted thereon, a gear-wheel rigidly secured on one of the axles, a pinion-shaft flexibly coupled to the motor-shaft, and a pinion carried by the pinion-shaft and in mesh with the gear-wheel, of a gear-frame affording bearing for the pinion-shaft and including casings for the gear-wheel and shaft-coupling, the outer end of said frame being suspended from the axle at two points in such manner as to prevent its lateral movement, and its inner end yieldingly suspended at a single point through pivotal connection with a cross-beam of the truck-frame, said connection comprising a stud and a bearing therefor.

2. In an electric locomotive, the combination, with the truck and an electric motor mounted thereon, a gear-wheel rigidly secured on one of the axles, a pinion-shaft flexibly coupled to the motor-shaft, and a pinion carried by the pinion-shaft and in mesh with the gear-wheel, of a gear-frame affording bearing for the pinion-shaft and including casings for the gear-wheel and shaft-coupling, said frame having at its outer end two points of support on the axle, its inner end being yieldingly suspended at a single point through pivotal connection with a cross-beam of the truck-frame, said connection comprising a stud and a bearing therefor, the bearing being below and in vertical alinement with the motor-shaft.

3. In an electric locomotive, the combination, with the truck and an electric motor mounted thereon, a gear-wheel rigidly secured on one of the axles, a pinion-shaft flexibly coupled to the motor-shaft, and a pinion carried by the pinion-shaft and in mesh with the gear-wheel, of a gear-frame affording bearing for the pinion-shaft and including, at its outer and inner ends respectively, casings for the gear-wheel and shaft-coupling, the coupling-casing being provided on its inner end with a fixed stud, and a bearing-block secured to a motor-supporting cross-beam of the truck below and in vertical alinement with the motor-shaft, said stud being adapted to rest loosely in said block, thereby supporting the inner end of the gear-frame at a single point, the outer end of said frame having two points of support on the axle, one on each side of the gear-wheel.

In testimony whereof I have set my hand in presence of two subscribing witnesses.

WILLIAM L. SILVEY.

Witnesses:
E. B. LEHMAN,
W. G. MITCHELL.