(No Model.). 3 Sheets—Sheet 1.

C. J. VAN DEPOELE.

ELECTRIC LOCOMOTIVE.

No. 488,930. Patented Dec. 27, 1892.

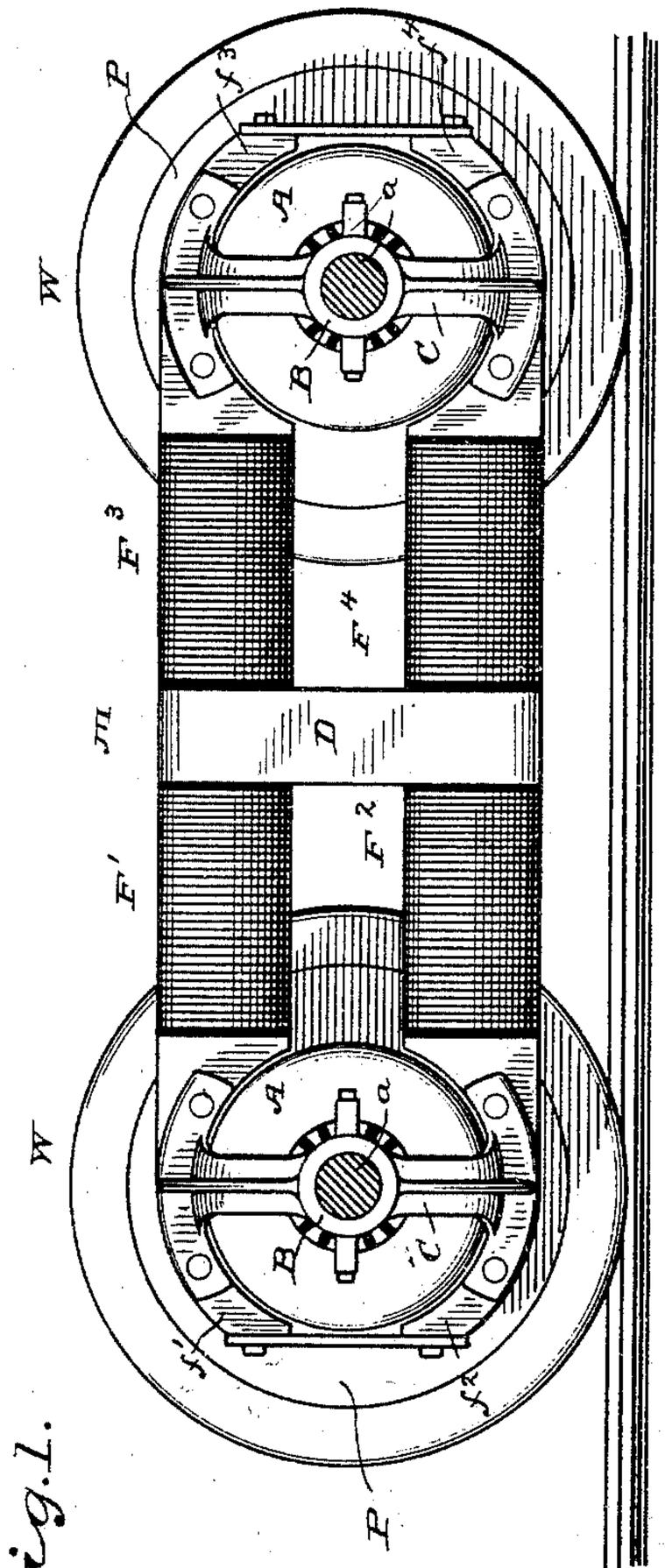

Fig. 1.

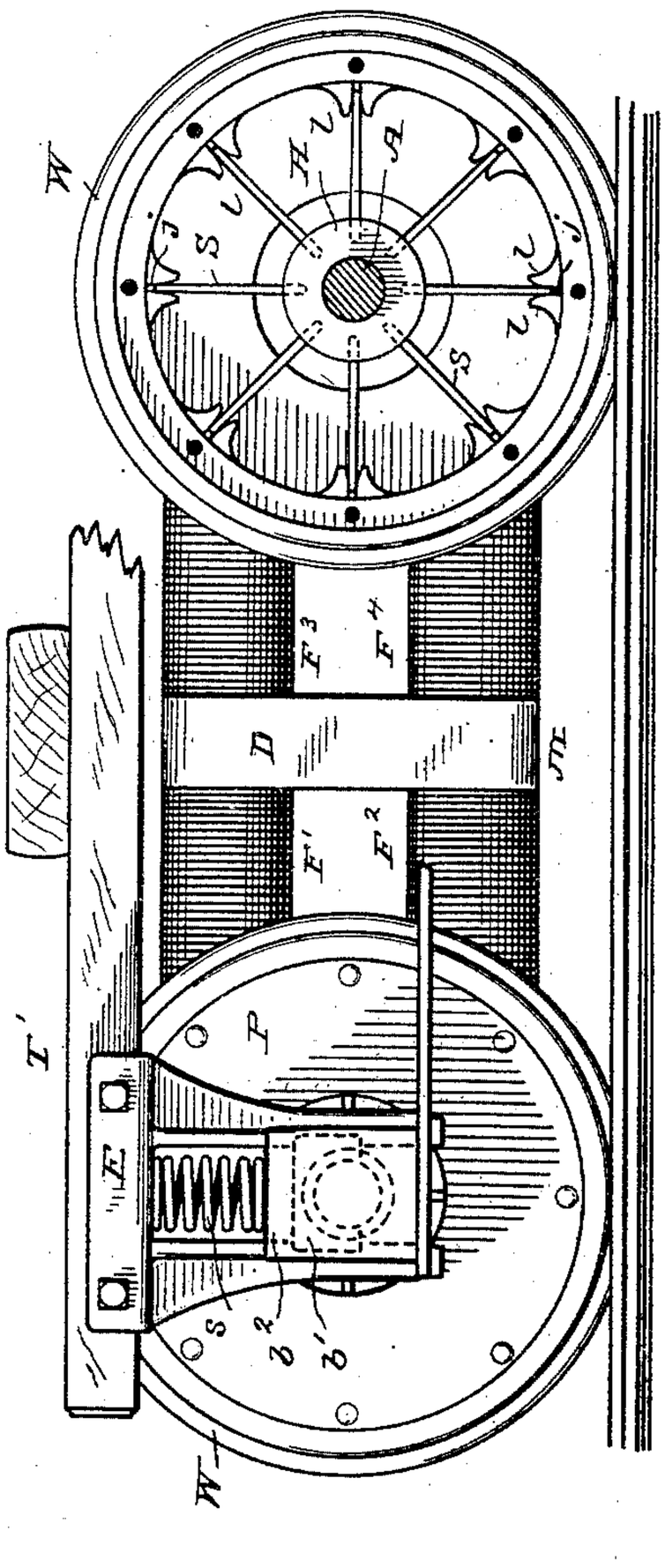

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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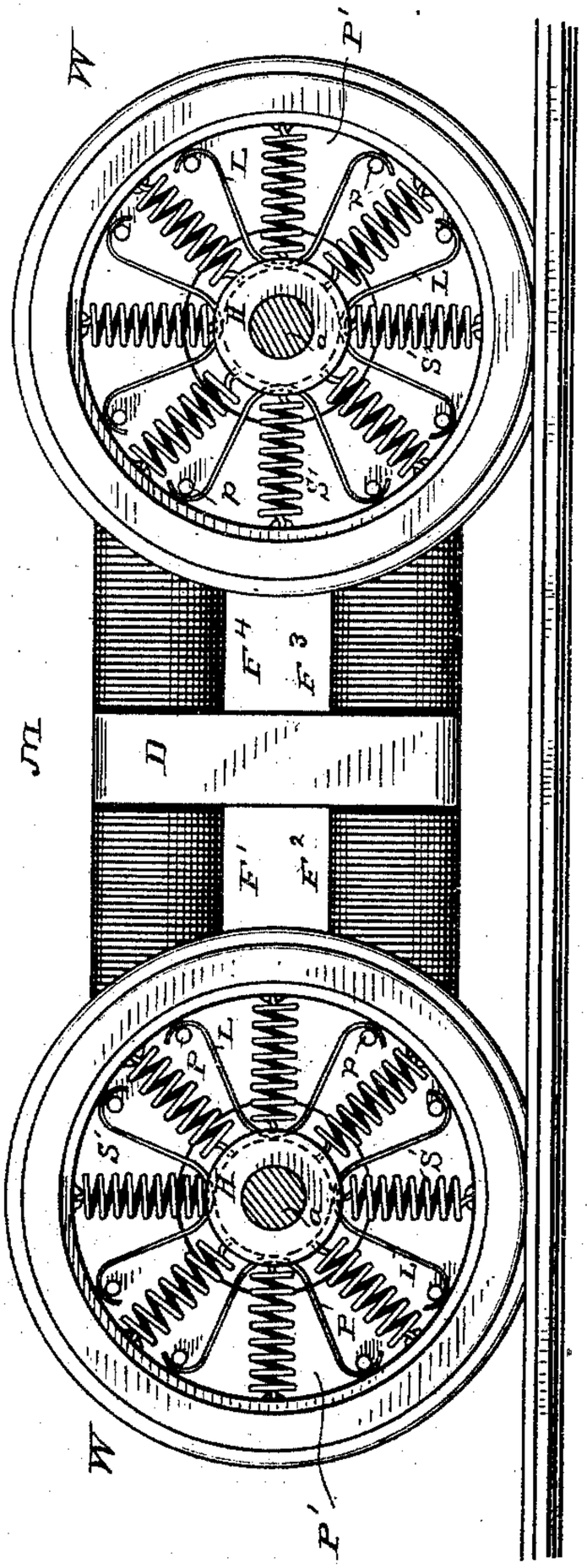

Fig. 3.

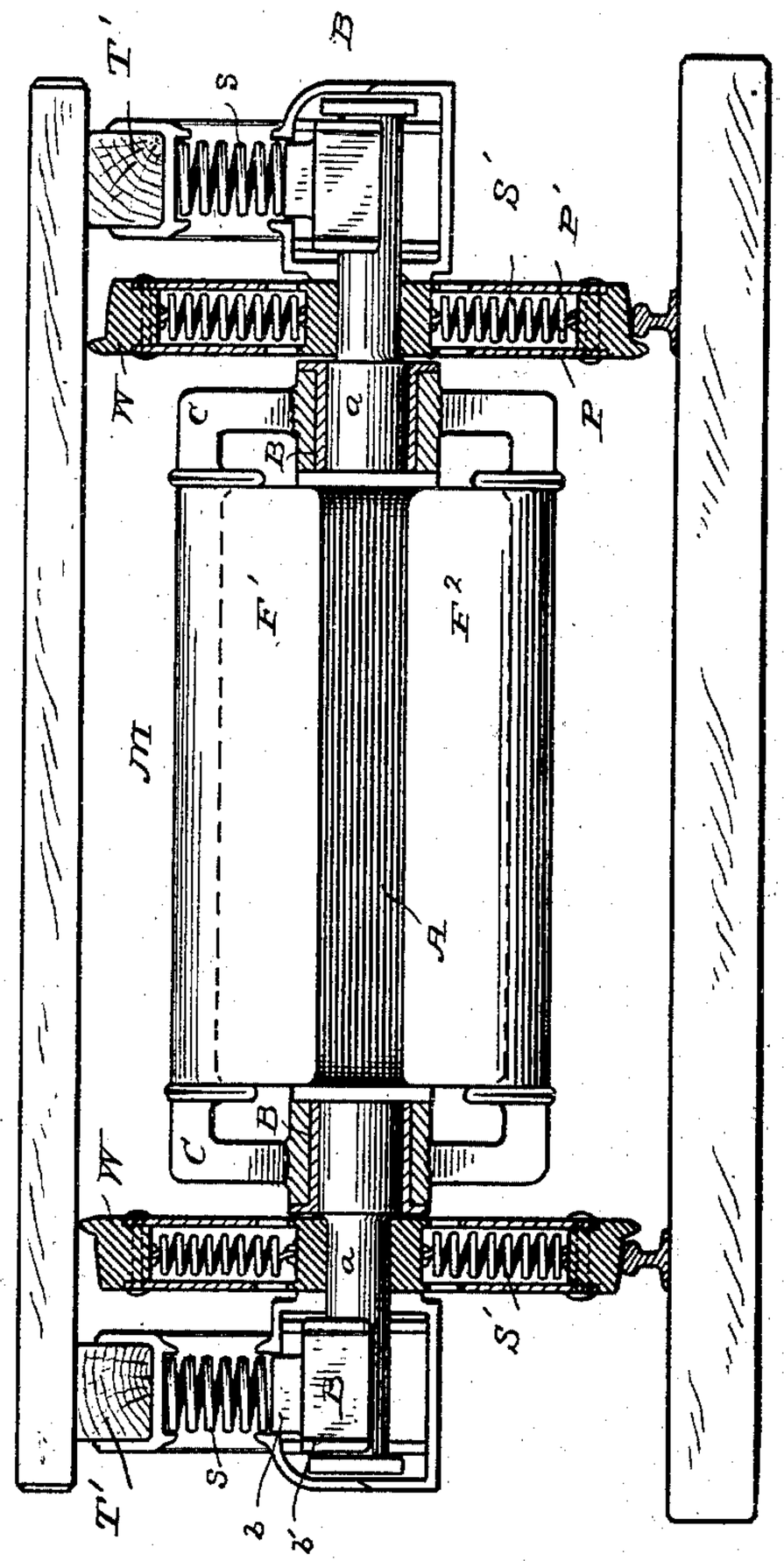

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

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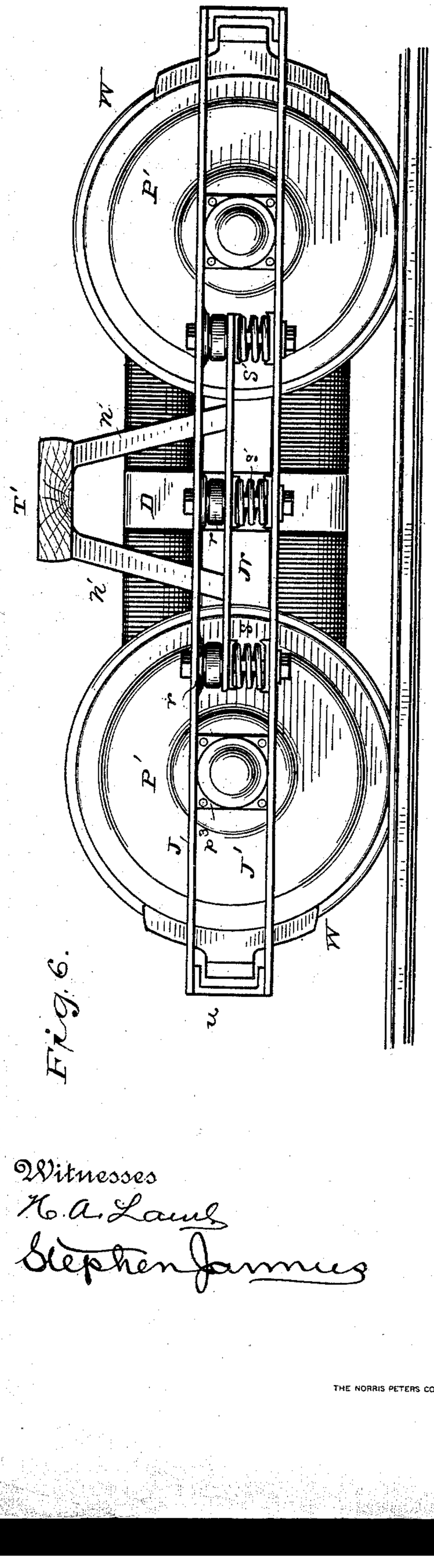

Fig. 6.

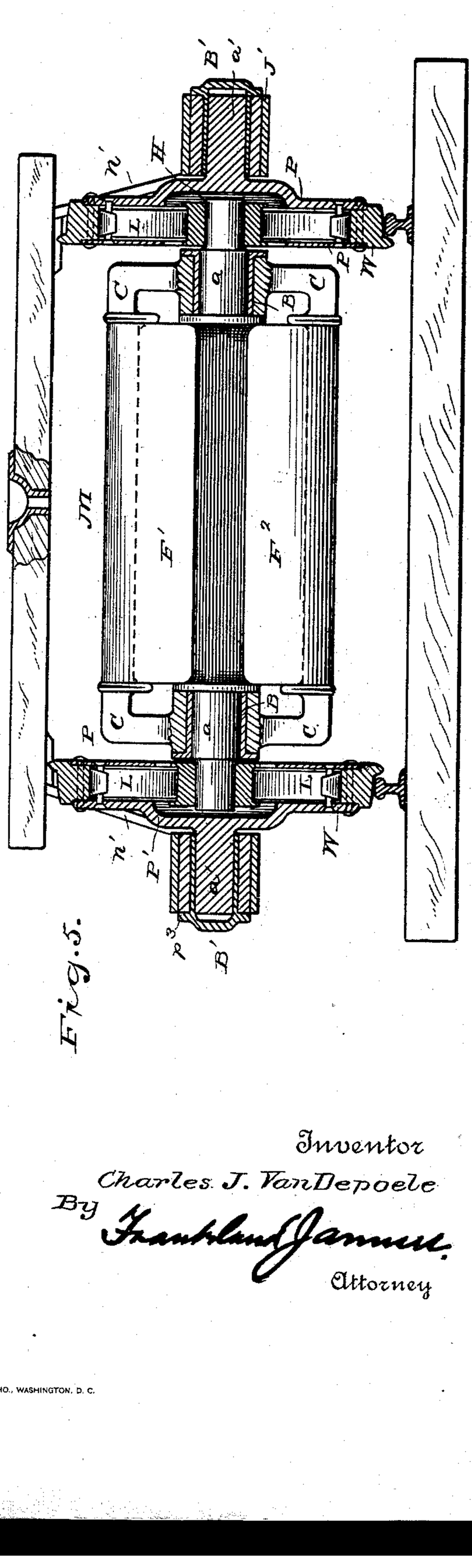

Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS; C. A. COFFIN AND ALBERT WAHL, EXECUTORS OF SAID VAN DEPOELE, DECEASED, ASSIGNORS TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF BOSTON, MASSACHUSETTS.

ELECTRIC LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 488,930, dated December 27, 1892.

Application filed April 1, 1891. Serial No. 387,224. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric Locomotives, of which the following is a description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention comprises an improvement in the construction of electric locomotives and particularly refers to the relations between the motor or motors and the wheels driven thereby. In most constructions, the driven wheels are integral with their supporting axle and the motor is carried upon the truck frame or upon the body of the vehicle, and flexibility of connection obtained by the interposition of train gearing, belting, sprocket wheels and chairs, or some other of many well-known mechanical devices. I have departed from all such constructions and have devised and herein show and describe an electric locomotive in which the driven axle is also the armature shaft of the motor, and the field pieces of the motor are supported by suitable arms fixed to bearings upon the said shaft, or axle. In such a construction the relations maintained between the driving motor and driven axle are necessarily constant. The axle, or axles, where more than one armature is used, will therefore rotate in fixed and true relation with respect to the frame of the motor. As herein shown, a double motor is constructed upon the axles of a four-wheel truck and the two axles are in parallel horizontal lines with each other and in fixed relation when in operation. If the supporting wheels were connected directly to the axles driven by the motors there would be absolutely no flexibility in the construction and on rounding curves or in places where the tracks traversed were not perfectly level, only two or three wheels could bear upon the rails. It is this difficulty that I have overcome, and my invention is embodied in a construction in which all the driving wheels bear solidly upon the rails and do effective work notwithstanding the irregularities in track level with regard to parallelism of the driving axles. This result I accomplish by the use of spring wheels, that is, wheels which are positively connected to the driving axle but which have flexible webs so that the center of the axle need not be the center of the driving wheel, and a certain amount of flexibility is allowed between the tires of the driving wheels and the driving axle. By this means all necessary flexibility between the motors and rails is obtained and the wheels are allowed to follow the inequalities in the level of the track without straining or wrecking the frame of the motor.

The principal details of construction will be fully hereinafter set forth and referred to in the appended claims.

In the drawings—Figure 1 is a view in side elevation showing an electric railway truck embodying the invention, the front wheels being removed for convenience of illustration. Fig. 2 is a view in elevation of a truck and part of a truck frame embodying the invention, the face plate of one wheel being removed to show the interior construction. Fig. 3 is an elevation with the face plates removed from both wheels to show their detail construction. Fig. 4 is an end view partly in section showing the motor bearings, pillow blocks and truck frame assembled in operative relation. Fig. 5 is an end view partly in section showing a somewhat different method of connecting the driving axle and truck frame to the wheels. Fig. 6 is a side view of the construction seen in Fig. 5.

Fig. 1 shows a pair of motors M, having two pairs of field magnet coils F′, F², and F³, F⁴, and two armatures A, A, rotating in the fields of force thereof. The armature shafts *a*, *a*, rotate in heavy bearings B, B, supported by the frames C, C, attached to the field magnets *f*′, *f*², *f*³, *f*⁴, of the motors M. The frames and bearings should be of diamagnetic material in order not to short-circuit the lines of force between the magnets *f*′, *f*² and *f*³, *f*⁴. It will further be seen that the bearings B, B, should be very substantial as they have to support the greater part of the weight of the motors themselves and also keep the armatures A, A, and shafts *a*, *a*, in constant alignment with the inner periphery of the field magnets *f*′, *f*²,

f^3, f^4, between which the armatures revolve. The two motors shown are one mechanical organization and the magnetic circuits actuating the armatures A, A, are completed through the heel or connecting piece D, common to both.

In Fig. 2 I have shown one of the wheels W, of the truck with the face plate P, removed, showing the disposition and arrangement of springs S, within the web thereof. The springs S, are fixed in the hub H, which is driven by the axle A. The outer ends of the springs S, fit into the slots formed by the lugs l, l, upon the inner periphery of the wheels, W, thus forming a flexible and yet positive connection between the driving axle A, and the outer periphery of the driving wheels W. The outer ends of the springs S, having free endwise play in the slots j, will allow a certain amount of motion between the center of the shaft A, and the outer periphery of the driving wheel W. The strength of the springs S, will depend upon the amount of work to be done and weight carried, this being merely a mechanical question governed by circumstances. In connection with the other wheel shown in Fig. 2, I have illustrated a method of supporting the truck frame T, upon the axles A. Upon the axle A, is a bearing b', and upon this bearing is the pillow-block b^2, running in a suitable pedestal E, fastened to the side beam T', of the truck frame T. Proper springs as s, are interposed between the pillow-block and upper part of the pedestal to support the truck and load carried thereby. This arrangement of the pillow-blocks, pedestal, and truck frame, will keep the centers of the axles a, a, equidistant in a horizontal line with each other while the springs within the web of the wheel will allow vertical motion to take place between the center of the axles a, a, and the periphery of the wheel W. The truck frame T, and its support upon the axles are also shown in Fig. 4.

In Fig. 3 I show another form of the spring web of the wheels W. As there indicated, a number of spiral springs forming spring-spokes, are placed between the hub H, and the inner periphery of the tires of the wheels W. These springs press from the inner periphery toward and upon the hub H. Between the springs S', are placed curved lamellar springs L, having their apices toward the hub H, and secured thereto, their free ends turned over to engage pins supported by the face plates P', and P, so that when the hub H, is driven the springs L, will pull upon the pins p, and thereby transmit motion to the rim of the wheels W. Perfect flexibility will be preserved between the center of the axle a, and the outer periphery of the wheels W, as in the form shown in Fig. 2, the two forms differing merely in the matter of construction. In both cases face plates P, P', are bolted to both sides of the wheels in order to secure the springs in position and prevent the wheels from assuming any other position than one at right angles to the axles by which they are driven. That is to say, that while the springs have free play the face plates are positioned to prevent the wheels getting out of line with their respective axles. Sufficient space is, of course, left between the face plates and the hub H, so as not to interfere with the play of the web springs. At the same time, it will be seen that where the track rails are perfectly in line the tendency will be to keep the distance between the outer lower periphery of the driven wheels and the driving axles practically constant and that the spring play between them will be continuous while the vehicle is moving.

In Fig. 4 is seen an end view of the arrangement shown in Fig. 2, except that the web springs are somewhat different. As here shown, T, T', T', are the beams of the truck frame, and E, E, the pedestals thereof supported upon the axle a, through springs s, s, pillow blocks b^2, and bearings b'. The axle a, is also the shaft of the armature A, and through arms C, and bearings B, supports the fields F', F^2, of the motor M. The axle a, is fixed in the hub H, of the wheel W, and being continued through the said hub supports the bearings B^2, of the truck. The springs S', of the wheels W, as here shown, must be sufficiently strong not only to carry the weight of the motor but also of the car and load.

In Figs. 5 and 6 an arrangement is shown whereby the weight of the motors is carried upon the spring webs of the wheels and the weight of truck, or car, and load, directly upon the wheels. For this purpose the axle a, is fixed in the hub H, and there ends, and the face plate P', of the wheel W, continued at its center to form a projecting axle a', upon which is placed the box B'. To the pillow-block p^3, of the box B', are fastened the bars J, J', which are united at their ends by the cross bars u, u, to form the side bars of the trucks T. Between the pillow-blocks p^3, p^3, and fastened to the bars J, J,' are springs s', s', s', which carry a plate N, which has two arms n', n', which are turned up and joined to the beam T, which supports a bearing O, for a king bolt. Between this plate N, and the bar J, are placed rubber cushions r, r, r, to prevent rattling and take up any lost motion which might interfere with the correct operation of the device. The weight of the car will be first upon the cross beam T, will be transmitted from said beam to the plate N, springs s', s', s', to bars J, J,' and through them to the axle a', of the face plate P', and thus supported by the periphery of the wheels independent of the flexible webs of the wheels which support the motors alone.

It will be understood that in the construction just described, the truck must be constructed in a very solid and substantial manner so that the wheel axles will be kept in line and not assume any other position than one at right angles to the truck frame. The truck frame will be sufficiently flexible to allow for

any inequalities in the track rails and the spring webs of the wheels will accommodate the movement of the motor axles to the necessary degree. The motor is thus absolutely spring-suspended and each driving wheel can do its share of pulling upon a straight and level track, upon curves, or where considerable inequalities of track level are encountered.

Many modifications might be made embodying the principles herein set forth without departing from the spirit of my invention, and I do not therefore confine myself to the exact details shown.

Having described my invention, what I claim and desire to secure by Letters Patent is:—

1. An electric locomotive having a driving axle or axles, driving wheels the hubs of which are rigidly attached to said axle or axles, and radial springs fixedly connected to said hubs and loosely engaging slots in the peripheries of the said driving wheels.

2. An electric locomotive having driving wheels the hubs of which are fixed upon its driving axle or axles, resilient webs between the said hubs and the peripheries of the wheels, and face plates upon the sides of the said wheels inclosing the said resilient webs and an armature or armatures upon the axle or axles.

3. An electric locomotive having a double motor spanning the axles of a motor truck and wholly supported thereon, armatures for the said motor fixed upon the said axles, arms supporting the fields of said motor upon the axles, and motor wheels fixed to the said axles having flexible resilient webs.

4. An electric locomotive having a double motor supported upon the axles of a motor truck, driving wheels fixed upon said axles, said wheels having flexible webs, and a truck frame supported by said axles and retaining them in fixed parallel relation to each other.

5. An electric locomotive having a double motor upon its driving axles the motor wheels thereof having spring webs by which the motors are wholly supported independent of the truck frame.

6. An electric locomotive having spring-webbed traction wheels fixed upon the driving axles thereof, said wheels supporting the driving motor and having exterior supplemental axles upon which the truck frame of the said locomotive is supported.

7. In an electric locomotive, a driving wheel or wheels having hubs for attaching them to to the driving axle or axles, resilient connections between the said hubs and the peripheries of said wheels, and face plates attached to the outside of said wheels and formed at their centers into supplemental axles for supporting the truck frame of the locomotive independent of the propelling motor.

8. An electric locomotive having driving wheels the hubs of which are fixed upon its driving axle or axles, coil springs between the hubs and peripheries of said wheels to carry the load borne by the driving axle, and flat curved springs having their apices fixed to the hubs and their ends engaging the rims of the said wheels.

9. The combination with a locomotive the wheels of which are supplied with supplemental axles, of side bars fixed to the bearings of said axles holding them in fixed relation to each other, and a cross-beam spring-supported upon said side-bars.

In testimony whereof I affix my signature in presence of two witnesses,

CHARLES J. VAN DEPOELE.

Witnesses:

JOHN W. GIBBONEY,

C. H. OLIN.