No. 797,589. PATENTED AUG. 22, 1905.

N. D. LEVIN.

ELECTRIC CAR OR LOCOMOTIVE.

APPLICATION FILED APR. 22, 1904. RENEWED APR. 6, 1905.

3 SHEETS—SHEET 1.

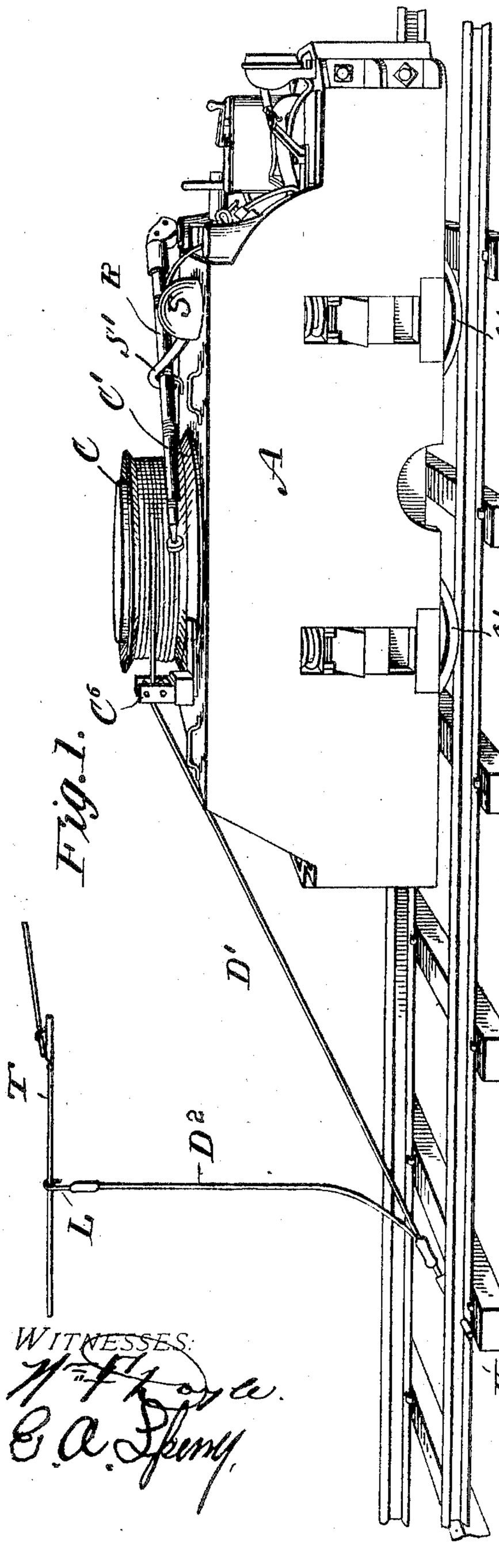

Fig. 1.

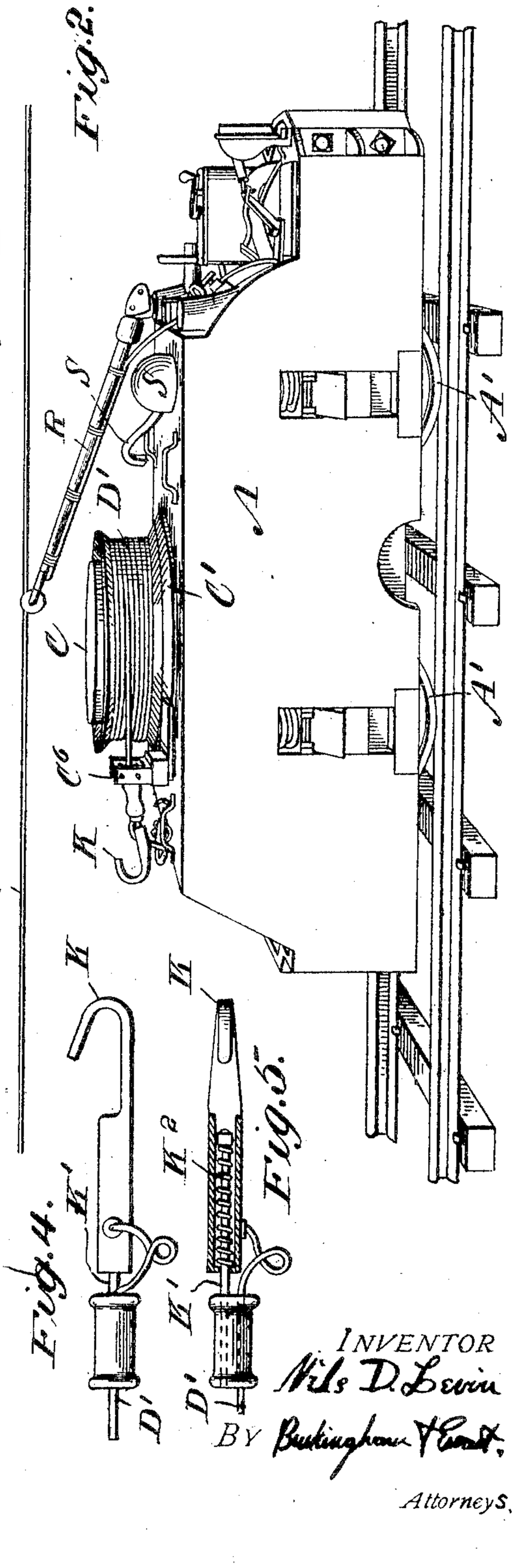

Fig. 2.

Fig. 4.

Fig. 5.

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3 SHEETS—SHEET 2.

Fig. 8.

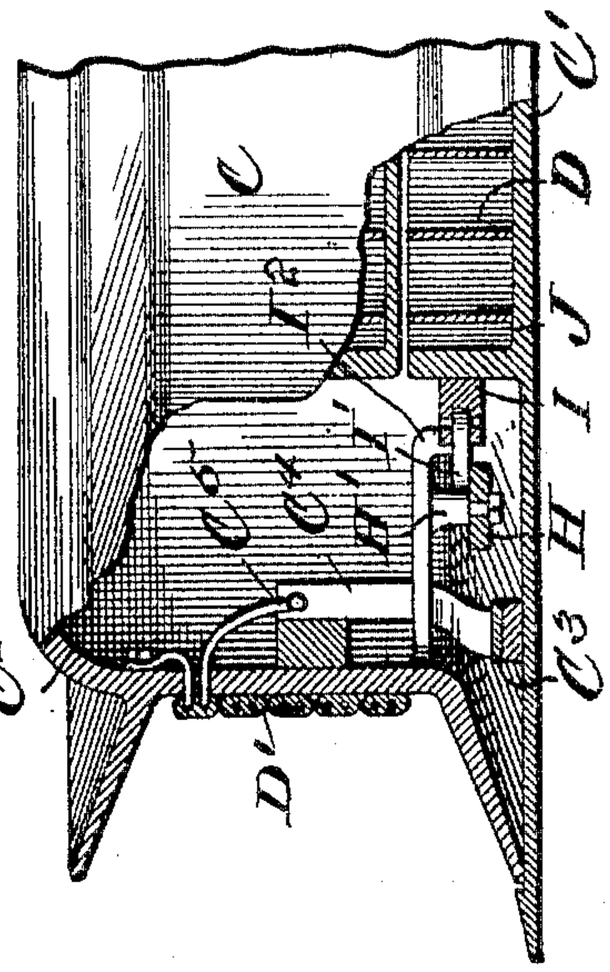


Fig. 7.

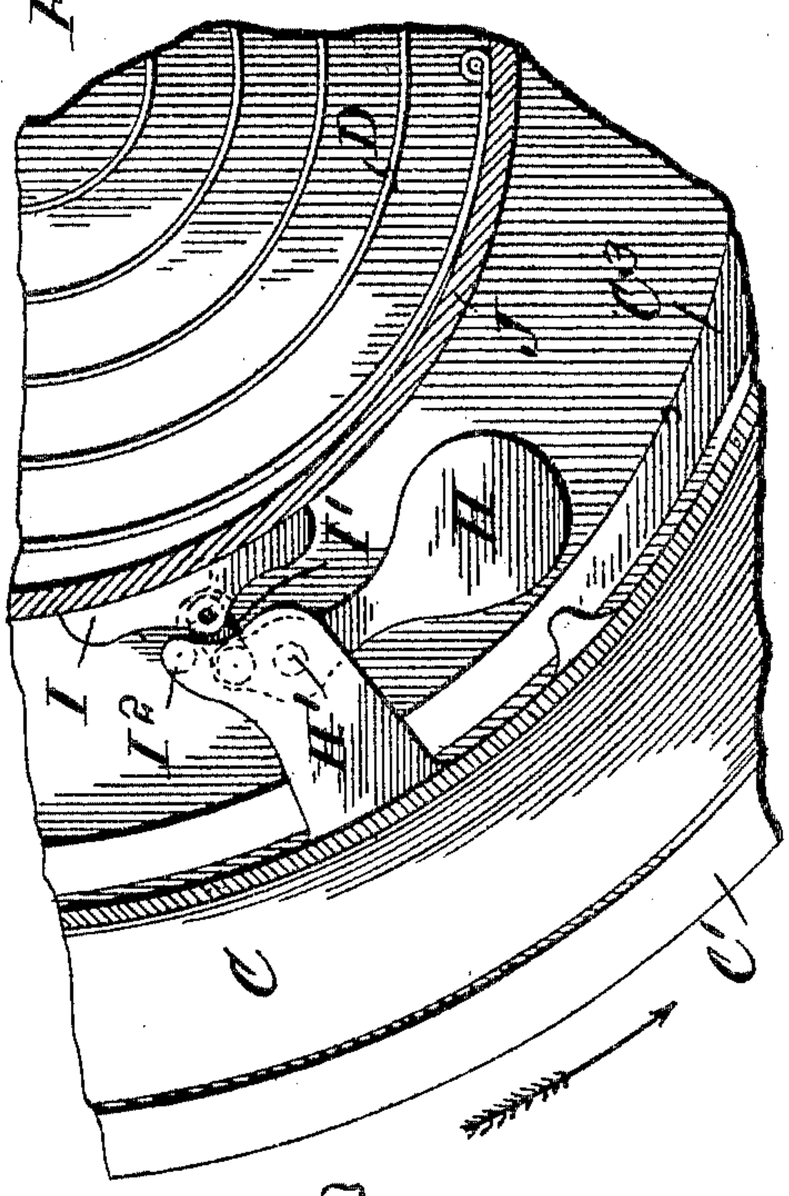


Fig. 3.

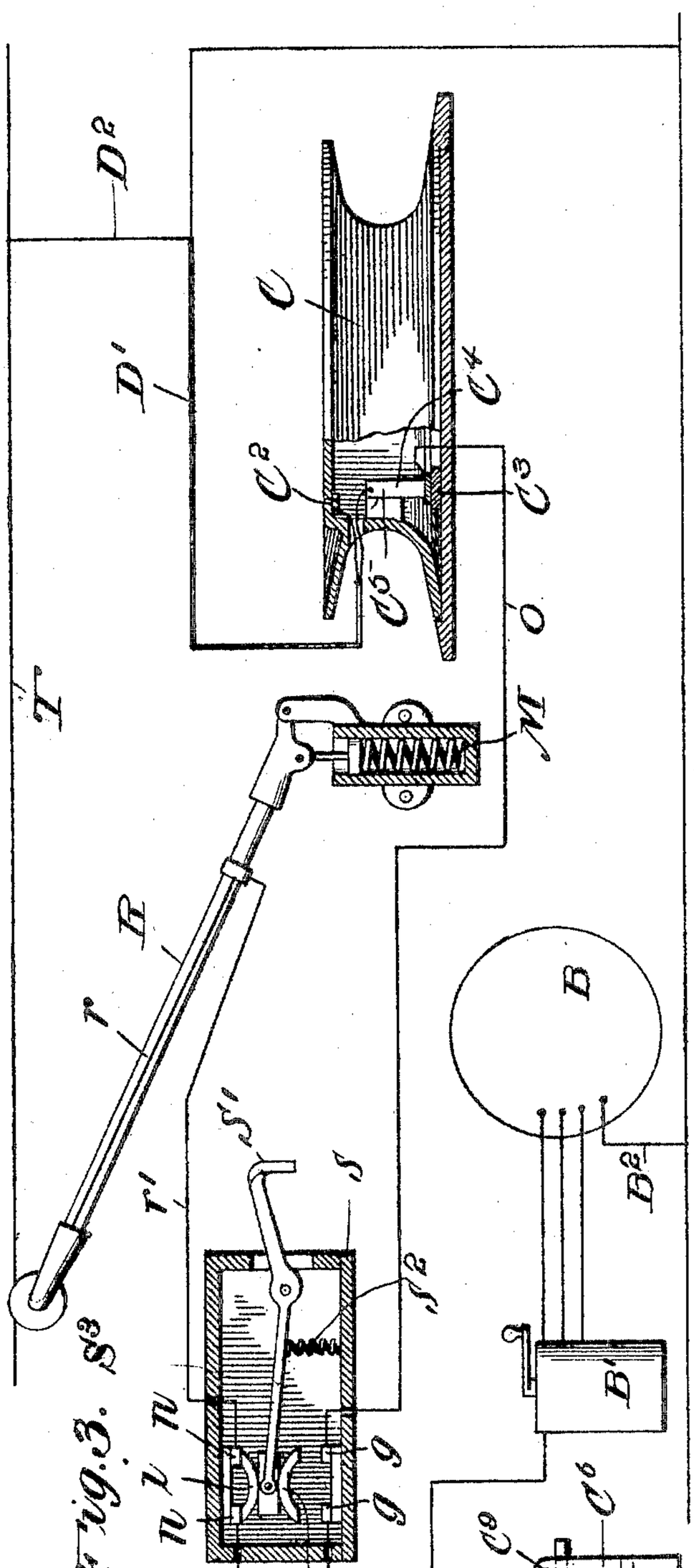
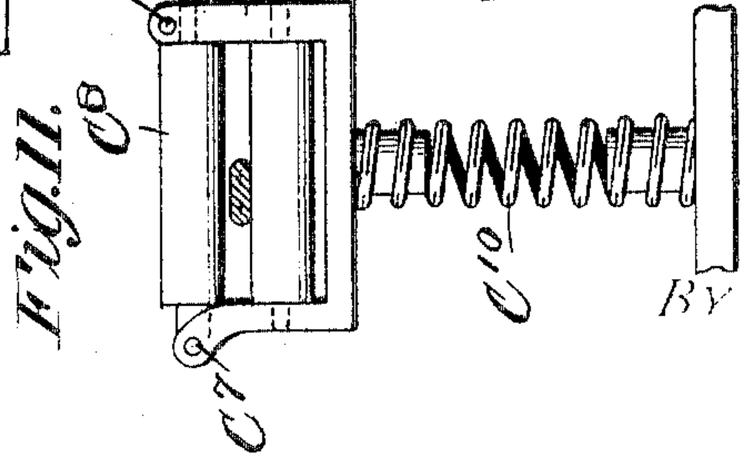


Fig. 11.



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APPLICATION FILED APR. 22, 1904. RENEWED APR. 6, 1905.

3 SHEETS—SHEET 3.

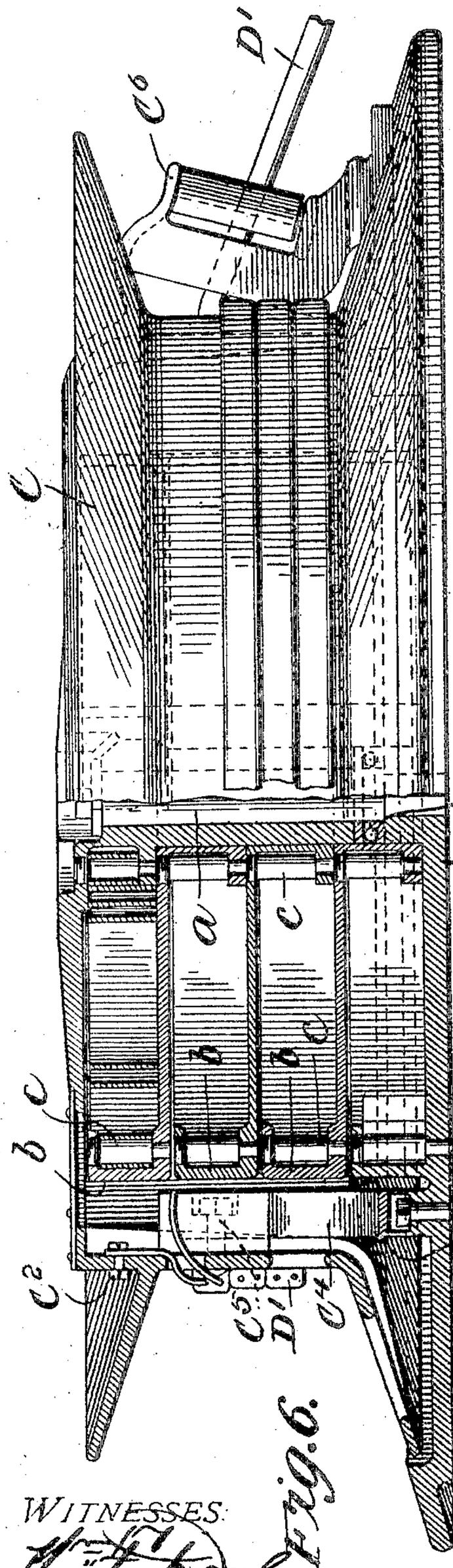

Fig. 6.

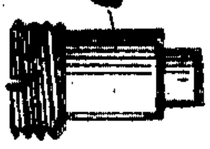

Fig. 12.

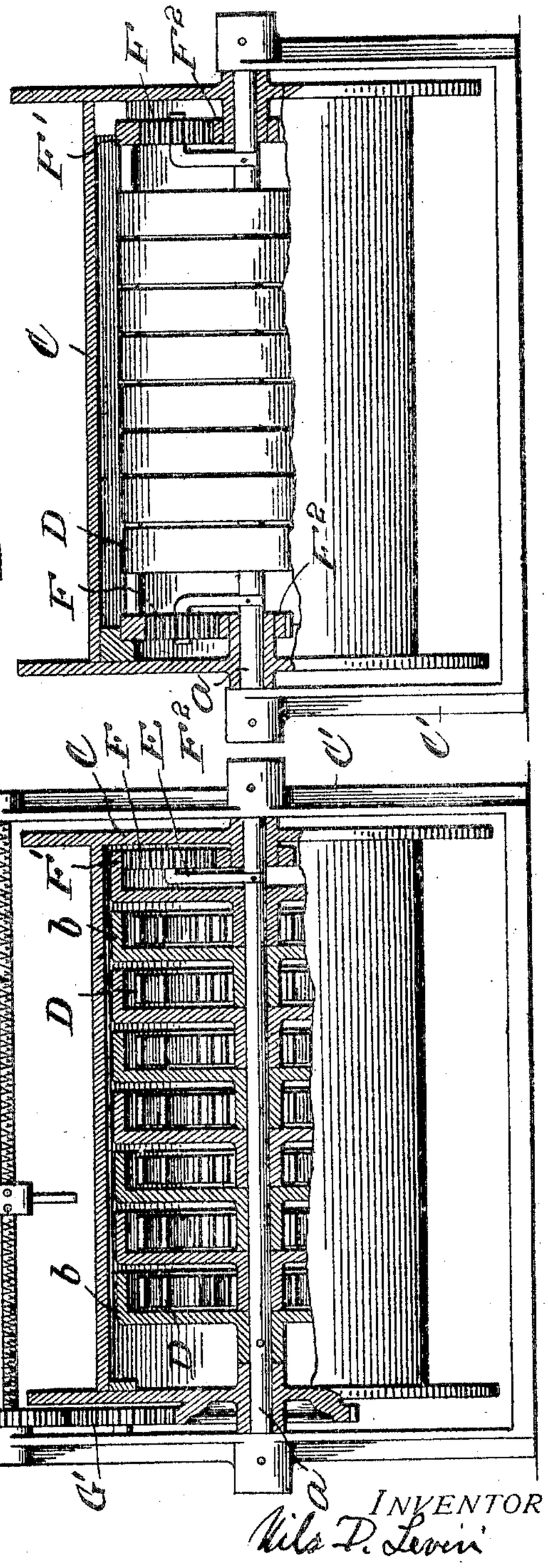

Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE.

NILS DAVID LEVIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GOODMAN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTRIC CAR OR LOCOMOTIVE.

No. 797,589. Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed April 22, 1904. Renewed April 6, 1905. Serial No. 254,114.

To all whom it may concern:

Be it known that I, NILS DAVID LEVIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Electric Cars or Locomotives, of which the following is a specification.

My invention relates to electric cars or locomotives that are adapted to operate upon a railway-track or upon a road-bed of any desired construction—as, for instance, a pavement—and it relates especially to means of supplying the motor or motors of the car with electrical energy; and it consists in certain details of construction and parts which cöoperate to fulfil the functions described and which are illustrated in the accompanying drawings, forming part of this specification, in which—

Figure 1 is an outline of the car while being supplied with electrical energy through a flexible conductor which is carried upon a reel upon the car. Fig. 2 is an outline sketch of the same car while being supplied with a trolley, the cable being entirely wound up upon the reel. Fig. 3 is a diagrammatic illustration of the circuits of the car when one motor is employed. Figs. 4 and 5 are details of the contact device. Fig. 6 shows the details of the winding mechanism in one of its forms as applied to the reel. Figs. 7 and 8 show a reel supplied with a retarding device. Figs. 9 and 10 show a horizontal reel arrangement—the latter where the springs or equivalent are coupled in multiple, the former where the springs are coupled in series—each showing a power-multiplying device between the motor and the reel. Fig. 11 shows the details of the flexible cable-guide in one of its forms. Fig. 12 shows a detail of the threaded pin which is used to hold the ends of the springs.

A traveling reeling device for the cable is shown in Fig. 9.

In the figures like letters indicate similar parts throughout.

By reference to the drawings it will be seen that the invention relates to a locomotive or car having duplicate means of energizing its propelling motor or motors, each means shown as being operative, respectively, in Figs. 1 and 2.

When the car is being energized from the flexible cable and as it moves toward the point of attachment of the cable, means are provided for automatically winding the cable upon the reel. This consists of any form of motor, which may be independent of the propelling-motor of the car. This motor is preferably of such a nature that it receives energy during the time that the cable is paid out, which energy is utilized to rewind the cable upon the reel during the opposite motion or whenever the cable is free to be so wound. Any form of motor, such as compressed air or the equivalent tension means, may be employed; but I prefer to use coil-springs, which may be applied in many different ways. The preferable form, however, is in a flat helix similar to a watch or clock-spring. In providing for reels, however, with large capacity for winding and holding cable or for winding long lengths of cable I have found difficulty in obtaining springs of sufficient length, and when so obtained I find that such springs are exceedingly cumbersome and even dangerous to handle. To overcome this difficulty, I have devised spring-drums in which portions of the spring as a whole may be suitably mounted and wound, and these spring-drums may be coupled to the reel in any suitable manner, as shown in Figs. 6, 9, and 10.

I will now proceed to describe one of the drums in Fig. 6, which will suffice for the other structures. Suitable loops are formed in each end of the spring, which are suitably held, the whole being mounted on a central stud rising from a base-plate resting in any suitable position upon or attached to the car.

By referring to the drawings it will be seen that the motor-car A is provided with suitable wheels A′ A′, motor B, (see Fig. 3,) controller B′, and ground-wire B^2. Upon this motor rests the reel C, and from its foundation c' rises stud a, (see Fig. 6,) which in each case is stationary. Upon this stud are mounted spring-drums $b\ b\ b$, the springs themselves being looped at the ends, as heretofore pointed out, and attached to the drums by pins $c\ c\ c$, the form being clearly shown in Figs. 6 and 12, the pin being screw-threaded and in a plurality of diameters, three diameters being preferred, the threads in this instance being of the largest diameter. The peculiarity of the drums is that the hub of each drum offsets the periphery in such a manner as to re-

ceive the inner end of the spring of the drum lying next adjacent, as in Fig. 9, or immediately below, as in Fig. 6. Thus it will be seen in the latter figure that the outer end of the lower spring attaches to the frame C′ by this stud *c*, and at its inner end, through a similar stud *c*, is attached to the hub of the drum immediately above. This arrangement is duplicated until the top spring or end spring is reached, which in case of Fig. 6 is attached directly to the reel C itself, and Fig. 9 is attached to a gear which drives the reel through an intermediate speed-multiplying device. In Fig. 6 a ball-thrust bearing is shown at *d*. It will be noticed that the studs *c* are removable. Referring, further, to Fig. 6, it will be observed that the two terminals of the duplicate cable wound thereon pass to the interior of the reel, one being secured directly to the metallic portion of the reel C by a bolt C^2 and the other conductor maintaining an electrical connection with the stationary conductor C^3 by an intermediate traveling contact secured to the insulating portion C^4, the cable being attached to the traveling contact at C^5. A form of cable-guide consisting of suitable rollers is shown at C^6. The guiding device is detachable and pivoted, as clearly seen at C^7, and also opens to receive and release the cable, as is clearly shown by the swinging roller C^8 in Fig. 11, through the removal of pin C^9. This figure indicates the cable-holder mounted upon a resilient support, which may be of any form, the spiral spring C^{10} being preferred. One of the uses of this support is to save the cable-terminals from jar, in case of reeling up to rapidly, as the terminal strikes the guide.

Referring now to the form of reel shown in Fig. 9, it will be seen that this reel is horizontal and that the spring-drums are coupled in series, as in Fig. 6. The springs D serve to couple successive spring-drums, as in case of Fig. 6. The reel C in Fig. 9 revolves loosely upon the stud *a*, which is stationary, and it also serves to hold the loosely-mounted spring-drums *b* together, with a stud-post E, serving as a center of the gear F, serving to connect the internal gear F′ of the last spring-drum *b* with a pinion F^2, connected with and driving the reel C. This reel at its other end is shown as geared to a double screw-shaft G, the traveler upon which serves to hold a cable-guide of any suitable construction—for instance, that shown in Fig. 11—the gear-coupling being illustrated at G′ and operated in the well-known manner.

The reel shown in Fig. 10 resembles that in Fig. 9, except that the springs D are coupled in parallel instead of in series, as in Fig. 9. Here they are similarly geared by intermediate gear F, which lies between the springs and the reel-pinion F^2. Both the reels are mounted in a frame C′, which perform the same functions in all reels, except where the reel is horizontal. The frame C′ is shown as performing the added function of a conical guide for the cable.

It often occurs that when the cable is paid out to some considerable extent the end becomes detached, leaving the reel free to spin faster and faster in winding the cable. The abnormal and dangerous speeds may be easily acquired by the acceleration under these circumstances, and to prevent such an occurrence it is thought wise in some instances to provide an automatic brake, one form of which is shown in Figs. 7 and 8, the particular form herein shown, however, performing the additional function of being operative in one direction only—that is, the cable may be paid out or unreeled at any speed; but it will reel up only at a certain predetermined speed which will not be exceeded. To accomplish this, the centrifugal weight H is pivoted at H′ and serves to apply the brake I by the pivoted link I′. It coöperates with the stationary stop I^2, the brake-shoe I and the link I′ being free to swing in a direction opposite to the stop. The same parts are illustrated in Fig. 8, the brake-shoe I being clearly shown as bearing against the stationary circular face J, rising from the bed-plate C′, the cable being indicated by D′.

When the cable is wound upon the reel and the car is operating through the trolley, it is desirable to have the cable terminal or terminals dead, especially the one not grounded.

By reference to Fig. 1 it will be seen that the two wires composing the duplicate cable are of unequal length. The wire which is shown in Figs. 6 and 8 as being grounded to the reel itself is the one that is secured to the hook K. The other wire, which upon the reel is secured to the traveling contact at C^5, is longer and is illustrated at D^2. The hook at its terminal is indicated by L and is shown as secured to the trolley T in the drawings.

For obvious reasons it is desired to have the tension-resisting member or hook K connected to the cable D′ by a resilient and elastic connection. Such connection is shown in Figs. 4 and 5 and consists of the rod K′, secured to the cable in any suitable manner, as by an end piece or buffer-block, shown to be of spool shape in Figs. 4 and 5 and to be seen in juxtaposition to the cable-guide in Fig. 2. This is also connected with the hook K by a spring K^2. (See Figs. 4 and 5.)

By referring now to Fig. 3, where the diagrams of the circuits are illustrated, means are shown for cutting out the cable when the trolley is in action and also for cutting the trolley out of the electrical contact or out of circuit relation with the source of electrical supply when it is idle and when the cable is active. This consists in the switch S of Figs. 1, 2, and 3, each of said switches being provided with the hook S′ or equivalent, shown in Fig. 1 as engaging the trolley-pole R. The trolley-pole spring M is of much greater ten-

sion than the spring S^2 of the switch S, so that whenever the trolley-pole is allowed to engage the hook S′ the spring S^2 is overcome by the spring M, the lever S^3 is lowered, bringing the contacts *e* into connection with contacts *g g* and breaking the contact shown in the figure as being closed—namely, that between the conductor *r′* and the contacts *n n*. The switch as it stands in Fig. 3 serves to connect the trolley-conductor *r* by a wire *r′* to the controller, whereas when the switch is in its opposite position and the trolley-pole R is under the hook S′, the spring S^2 being overcome, the arm S^3 is depressed and the contacts *g g* are coupled, bringing the controller into circuit with the cable D′ through the contacts within the reel, including contact C^3, wire O, contact *g*, *e*, and *g*.

Having thus briefly described the construction and detail of my invention, its operation will be evident from what has already been pointed out.

The electric car, automobile, or equivalent traveling mechanism in moving to and fro secures its current either from the trolley-wire T or through flexible cable D′, which is wound upon the reel through the motor which drives the reel, the motor being preferably energized by the unwinding cable for the purpose of rewinding same. While so operated, with the trolley-pole R being retained by the hook S′, the trolley connections and parts are dead, as will be understood by the explanations in connection with switch S in Fig. 3. While, however, the car is operating as shown in Fig. 2, by the trolley and the reel being inoperative the cable is rendered dead by the reverse action of switch S, which then stands in the position shown in Fig. 3. While the car is operating back and forth the inertia and swing of the cable is taken up by the resilient factor K^2 of tension-resisting member K, as has been described. Should the cable become detached, the acceleration is at once arrested by the reel-brake I and centrifugal or equivalent device H, which may be arranged as shown in Fig. 7, so as to be operative in but one direction only, thereby avoiding undue tension on cable D′ when required to pay out at high speed. When the cable-terminal, however, strikes the guide C^6, some concussion due to momentum will be present, which should be avoided and reduced to its minimum, this being accomplished by the resilient or cushion factor of this guide, one means for accomplishing this purpose being illustrated in the spring C^{10}, Fig. 11. When very long cables are to be handled, the horizontal form of cable-reel may be used, with springs either in series or parallel, as shown respectively in Figs. 9 and 10, and the intermediate and speed-multiplying gearing F′ and F^2 used. The traveling-cable guide may be employed or not, as found desirable. One form is illustrated in Fig. 9.

The use of the plurality of springs is found to overcome a great many practical difficulties and is the desired form when springs are employed. It will be seen in Fig. 6 that the bottom spring lies within a cup rising from the bed-plate C′, which cup may be filled with a lubricant and the spring submerged, if thought desirable.

It is not intended that this invention should be limited to the exact details illustrated and described, as equivalent and other devices may be used to fulfil the functions.

It is further understood while the details may be employed in substantially the relation indicated that some of the parts may be omitted and the remaining ones employed either alone or with natural and operative substitution for those omitted, and the invention extends to such use.

This device may be termed a "gathering-locomotive," and it will be noted that the drum upon which the gathering-conductor is wound is actuated by means independent of the locomotive-truck wheels.

I claim—

1. A car, an electric motor upon the car, a cable for supplying current to the motor, a reel for the cable, a device contiguous to the reel for storing energy, means for supplying energy and connection between the device and the reel for using the said stored energy to wind up the cable, a guide encircling the cable and an additional guide for the cable encircling the reel.

2. A car, an electric motor upon the car, a cable for supplying current to the motor, a reel for the cable, a double-acting device contiguous to said reel for storing the energy supplied in unwinding the cable a connection between the device and the reel for using this stored energy to wind up the cable and a stationary and also a moving guiding means for the cable contiguous to the reel.

3. A car, an electric motor upon the car, a cable for supplying current to the motor, a reel for the cable having a vertical axis a spring or springs for storing energy and a connection between the device and the reel for utilizing said energy to operate the reel as set forth and a stationary guide for the cable located beneath the reel.

4. A car, an electric motor upon the car, a cable for supplying current to the motor, a reel for the cable having a vertical axis one or more springs for storing energy and actuating the reel and a speed-multiplying power connection between the reel and the spring or springs and a stationary guide for the cable located beneath and encircling the reel.

5. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel, a plurality of terminals for the cable, one of said terminals being longer than the other a tension-resisting part secured to the other ter-

minal and the mechanical connection with the duplex cable.

6. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel in combination with a plurality of terminals for the cable and a tension-resisting member secured to the end of the cable.

7. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel in combination with a plurality of terminals for the cable and a tension-resisting member secured to the end of the cable and an electrical connection between the member and one of the terminals.

8. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with the plurality of springs for actuating the reel the one being secured to the reel and another to a base, in combination with a guiding-flange for the cable secured to said base.

9. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of helical springs each within a disk, one end of each spring secured to such disk, the other end being secured to the adjacent disk a support for the reel, connections between the spring and the support, and a cable-guide connected to the support.

10. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of helical springs each resting upon a disk, and a threaded stud-bolt for securing the end of each spring to such disk.

11. In a car, an electric motor, a cable for supplying current for such motor, a reel for the cable in combination with a plurality of springs for actuating the reel and a stud-bolt with a threaded portion of large diameter constituting a detachable fastening between one end of the spring and the reel.

12. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, the said springs constituting the series consisting of flat resilient material wound so as to form helices, an interposed disk or equivalent for separating the helices the end of the springs formed into loops and a screw-threaded pin threading the loops.

13. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, said springs constituting helices and disposed side by side, and located within the reel each end of the springs forming loops, and screw-threaded pins for the loops.

14. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable, an end piece for the cable and a guide for the cable provided with an aperture smaller than the end piece.

15. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable, a vertical axis for the reel in combination with a plurality of springs for actuating the reel a base for the reel and a cable-guide formed as an integral part of such base.

16. In a car, an electric motor, a cable for supplying current for such motor, a reel for the cable, an end piece for the cable and a guide for the cable provided with an aperture smaller than the end piece and means for detaching the cable from the guide.

17. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a spring or springs for actuating the reel, and a resilient guide for the cable.

18. A car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, a buffer-block at the end of the cable, and a resilient guide for the cable coöperating with the buffer-block.

19. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, and a detachable connection between the inner end of one of the springs and the reel at one side and a stationary inclosure for the reel at the other side.

20. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, an oil-containing pocket within the reel, the springs located within such pocket.

21. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable in combination with a plurality of springs for actuating the reel, the reel being open at one side, the springs located within the opening a stationary inclosure for protecting the springs on one side and a support for the reel connected with such inclosure.

22. In a car, an electric motor, a cable for supplying current for such motor, a reel for the cable, a vertical axis for the reel in combination with a plurality of springs for actuating the reel and a ball-bearing for the reel.

23. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable, a vertical axis for the reel in combination with a plurality of springs for actuating the reel, an oil-pocket within the reel, the springs and the journal at said axis located within the pocket.

24. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable, a vertical axis for the reel in combination with spring for actuating the reel, an oil-pocket within the reel, a spring, a jour-

nal at said axis, and a ball-bearing all located within the pocket.

25. In a car, an electric motor, a cable for supplying current to such motor, a reel for the cable, a vertical axis for the reel in combination with spring for actuating the reel, an oil-pocket within the reel, a spring, a journal at said axis and a ball thrust-bearing all located within the pocket.

26. In a car, an electric motor, a plurality of means for supplying current to motor mounted upon the car, a spring-pressed trolley acting as one of such means in combination with an electric switch connecting with the other means and a mechanically-active connection between the trolley-spring and the switch.

27. In a car, an electric motor, a plurality of means for supplying current to motor mounted upon the car, a spring-pressed trolley acting as one of such means in combination with an electric switch connecting with each of the means, and a mechanically-active connection between the trolley-spring and the switch.

28. In a car, an electric motor, a plurality of means for supplying current to motor mounted upon the car, a spring-pressed trolley acting as one of such means in combination with an electric switch, and a flexible cable constituting the other means in combination with a mechanically-active connection between the trolley and the switch, and an electrical connection between the switch and the cable.

29. In a car, an electric motor, duplicate means carried upon the car for maintaining electric connection with the motor, a spring-pressed trolley constituting one of the means and a switch for throwing the motor connection from one to the other of the said means and an operative connection between the trolley-spring and the switch.

30. In a car an electric motor and reel-cable upon the car for maintaining electric connections with the motor in combination with a fastening upon one end of such cable and a resilient device in line of strain between said fastening and the main portion of the cable.

31. In a car an electric motor and reeled cable upon the car for maintaining electric connection with the motor in combination with a fastening upon one end of the cable, a loop in the cable near such fastening and a resilient member connecting the two sides of the loop.

32. In a car an electric motor, a duplex electric cable connected with the motor one of the conductors of the cable connected with the source of electric supply in combination with a tension-resisting member taking the whole strain of the duplex cable in electrical contact with the other conductor on the cable.

33. In a car an electric motor, a duplex electric cable connected with the motor one of the conductors of the cable connected with the source of electric supply in combination with an anchor or fastening for the end of the cable in electric contact with the other conductor of the cable and a resilient member between the anchor and the cable.

34. In a car an electric motor, a duplex electric cable connected with the motor one of the conductors of the cable connected with the source of electric supply in combination with a tension-resisting member taking the whole strain of the duplex cable in electric contact with the other conductor of the cable, the last-named conductor being also connected with the metallic frame of the car.

35. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a mechanical connection between the trolley-spring and the switch.

36. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a mechanical connection between the trolley-spring and the switch for the purpose of placing the springs in opposition.

37. An electric car, a spring-pressed trolley, a spring-actuated electric switch, the trolley-spring being of a power superior to the switch-spring and a mechanical coupling between the trolley-spring and switch of such a character as to enable it to overcome and move the switch against the switch-spring.

38. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a detachable mechanical connection between the trolley-spring and the switch.

39. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a detachable mechanical connection between the trolley-spring and the switch and an electrical connection between the switch and the trolley.

40. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a detachable mechanical connection between the trolley-spring and the switch, a flexible cable upon the car and an electrical connection between the switch and the cable.

41. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a detachable mechanical connection between the trolley-spring and the switch, a flexible cable upon the car and an electrical connection between the switch, the cable and the trolley.

42. An electric car, a spring-pressed trolley, a spring-actuated electric switch and a detachable mechanical connection between the trolley-spring and the switch, a flexible cable upon the car and an electrical connection between the switch, the cable, the trolley and the motor.

43. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel in combination with a plurality of electrical conductors for the cable one of which is grounded a tension-resisting member at the end of the cable and an electrical connection between the member and the grounded conductor.

44. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel in

combination with a plurality of terminals for the cable, one of said terminals being longer than the other and a tension-resisting member secured to a short terminal.

45. In a car, an electric motor, a duplex cable for supplying current to the motor, a reel for the cable, means for operating the reel in combination with a plurality of electrical conductors for the cable one of which is grounded upon the reel and the other being secured to an insulated terminal upon said reel and a traveling contact between the reel and the car and a switch in circuit with the contact.

46. A car, an electric motor on the car, a cable for supplying current to said motor, a reel for the cable, means for limiting the rate of movement of the reel and a device for rendering the said means inoperative in one direction of rotation of the reel.

47. A car, an electric motor, a cable for supplying current to said motor, a reel for the cable a stationary support for the reel upon the car, a circular portion near the reel, and means actuated by the centrifugal force for impinging the circular portion and limiting the rate of movement of the reel.

48. A car, an electric motor, a cable for supplying current to said motor, a reel for the cable and means actuated by the centrifugal force for limiting the rate of movement of the reel, a shoe and a guide for the shoe.

49. A car, an electric motor, a cable for supplying current to said motor, a reel for the cable and means actuated by the centrifugal force for limiting the rate of movement of the reel, a shoe and a guide for the shoe on one side of the shoe only.

50. In a gathering-locomotive a gathering-conductor, a drum upon which such conductor is wound, and means independent of the locomotive truck-wheels for actuating the said drum, as and for the purpose set forth.

51. In a gathering-locomotive, a truck, a motor mounted thereon, truck-wheels driven from said motor, a drum mounted upon said truck, a gathering-conductor arranged to be reeled upon and unreeled from said drum, and gearing independent of said truck-wheels for actuating said drum, as and for the purpose set forth.

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

NILS DAVID LEVIN.

Witnesses:
H. E. GOODMAN,
CHAS. H. STRAWBRIDGE.