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W. R. & F. S. WOODWARD.
ELECTRIC RAILWAY.

(Application filed Mar. 29, 1898.)

(No Model.)

Fig. 1

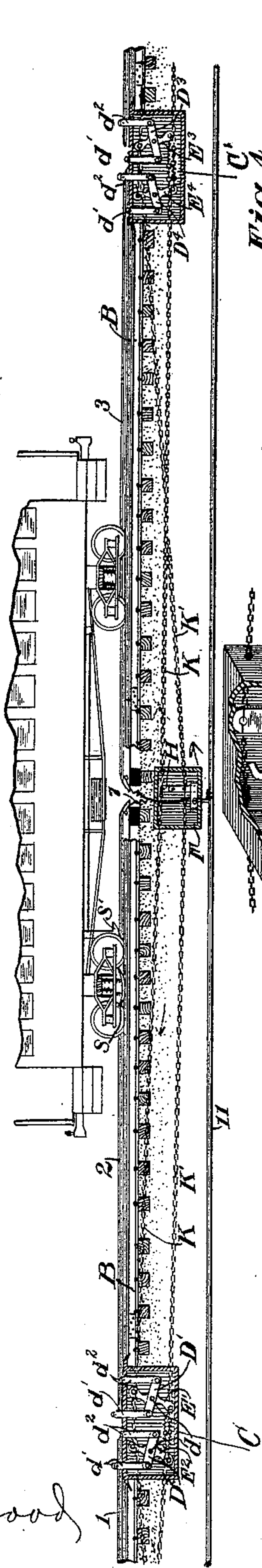


Fig. 4

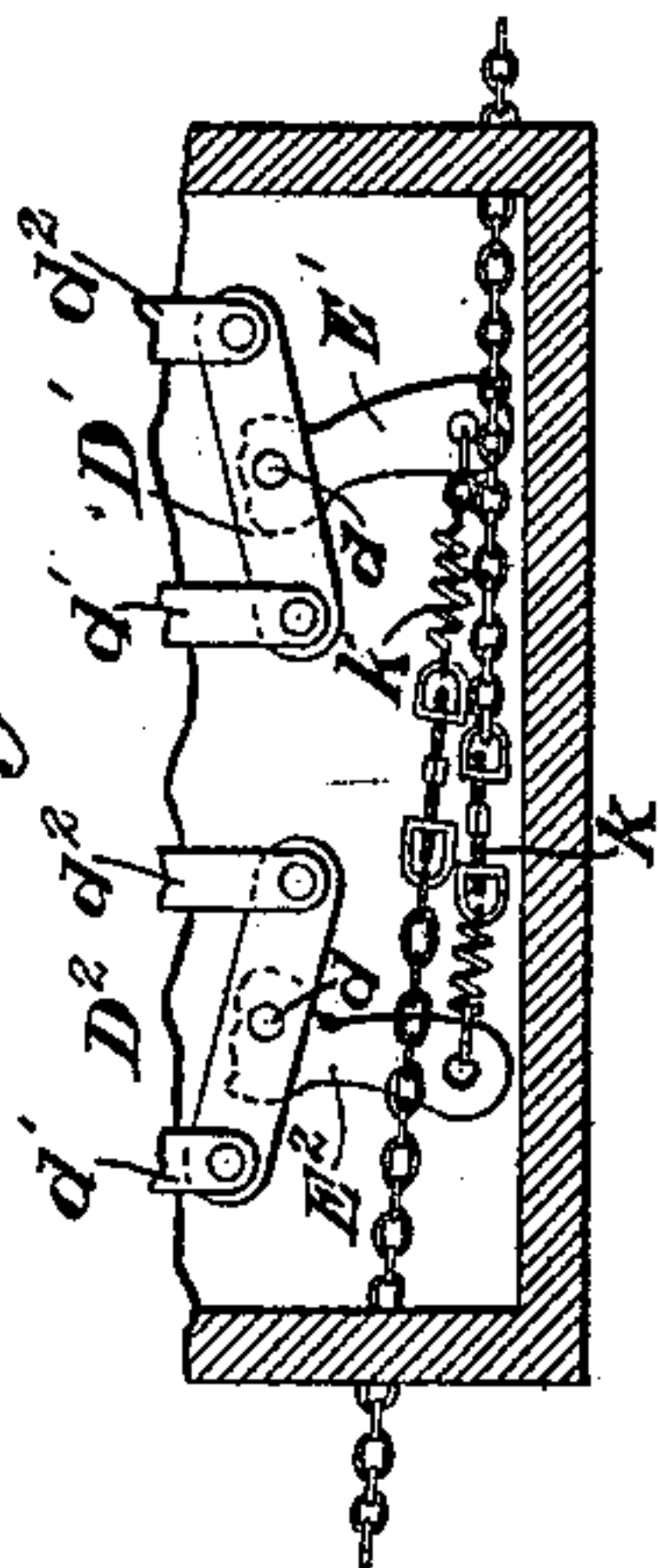


Fig. 3

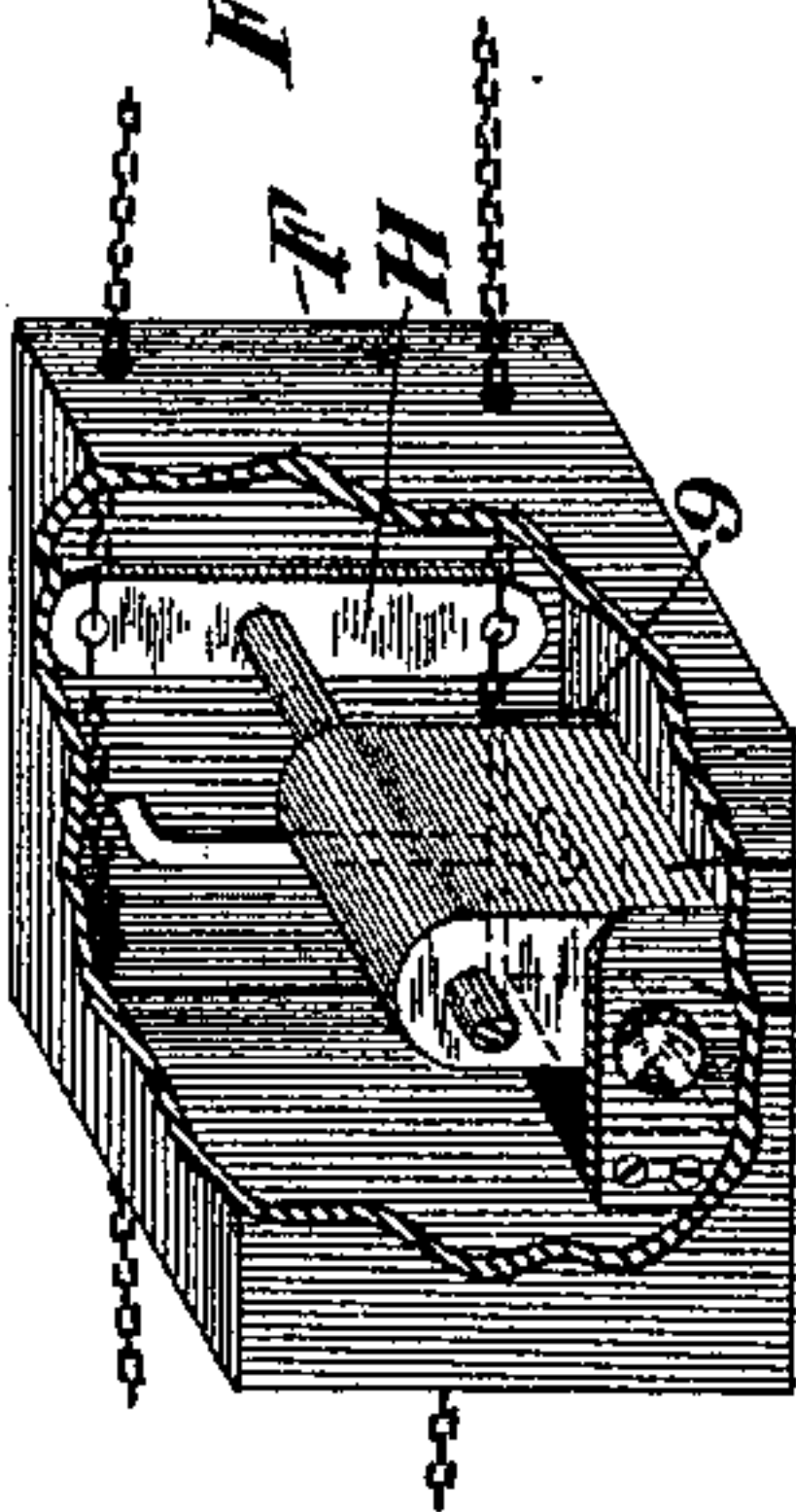


Fig. 5

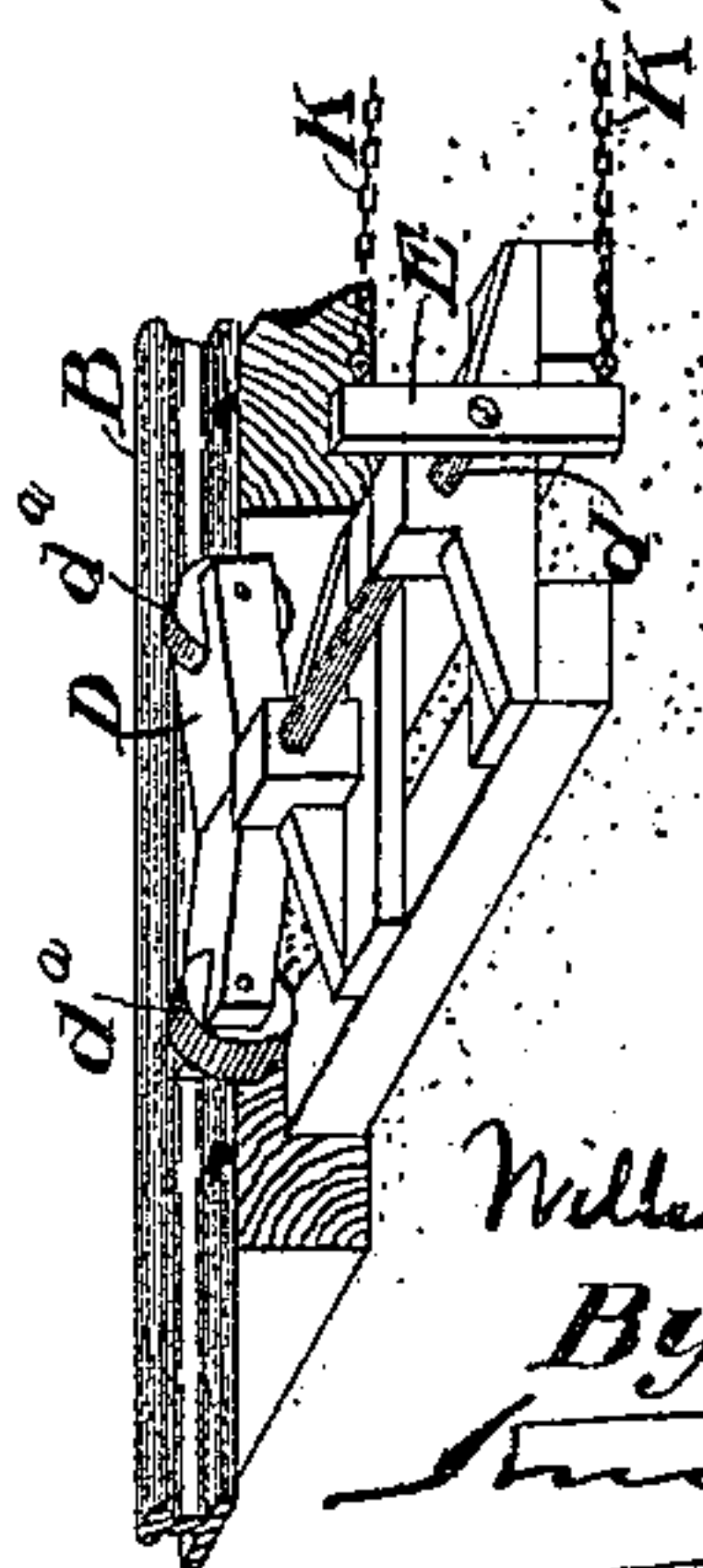


Fig. 6

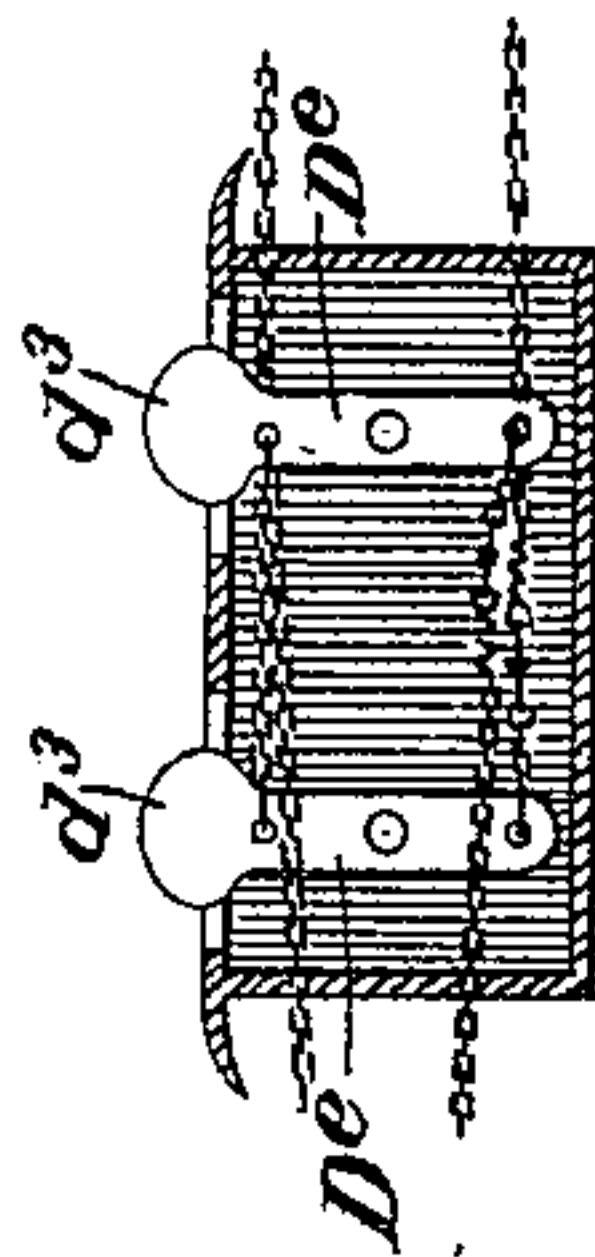
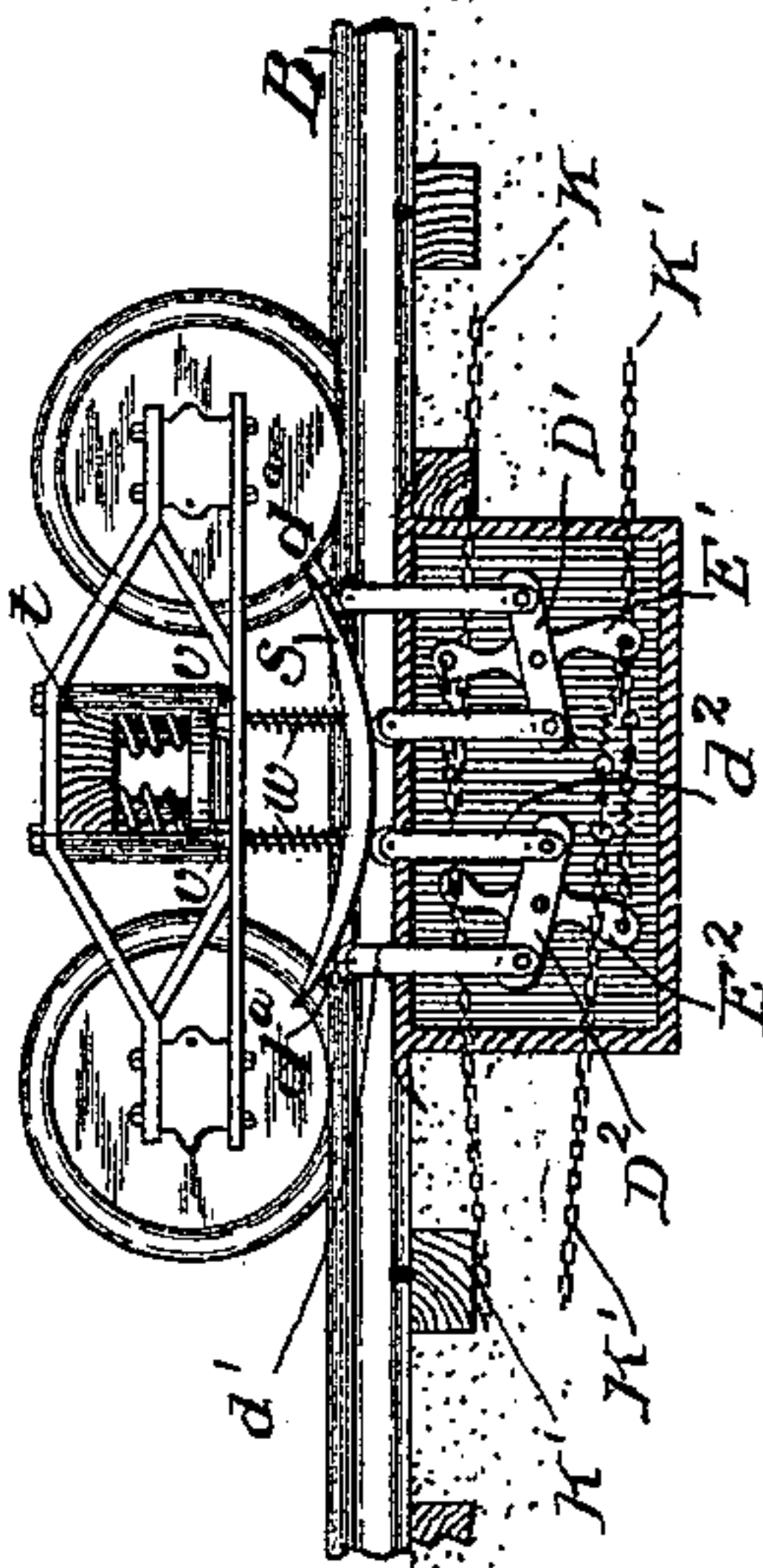


Fig. 2



Witnesses

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WILLIAM R. WOODWARD, OF NEW YORK, N. Y., AND FREDERICK S. WOODWARD, OF GRANITEVILLE, MISSOURI, ASSIGNORS OF ELEVEN-TWENTY-ETHS TO HENRY F. COOK, OF SAG HARBOR, NEW YORK.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 620,009, dated February 21, 1899.

Application filed March 29, 1898. Serial No. 675,591. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM R. WOODWARD, residing at New York, (Brooklyn,) in the county of Kings and State of New York, and FREDERICK S. WOODWARD, residing at Graniteville, in the county of Iron and State of Missouri, citizens of the United States, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

This invention relates to improvements in electric railways, and more particularly to an improved third-rail system, the object of the invention being to provide means for placing the successive sections of a third-rail system into or out of connection with a supply-wire as the car or train passes on and off such sections in such manner as to permit of the sections being of any desired length and also to permit of equally efficient operation in either direction of movement of the car or train.

In the accompanying drawings, which form a part of this specification, Figure 1 is a partly-sectional side view, more or less diagrammatic, of a portion of track and a car running thereon, showing the application thereto of our improved system. Fig. 2 is an enlarged representation of the lever mechanism and the devices on the car for operating same. Fig. 3 is a detail view of the switch. Fig. 4 is a detail view of portions of the operating-levers and the mechanical connections attached thereto. Figs. 5 and 6 show modifications.

The third rail, which may be located between or at one side of the track-rails, one of which is indicated at B in Fig. 1, may be composed of successive lengths 1 2 3 4 of rails of the usual shape or of any suitable shape. Any desired number of these rail lengths may be connected together by suitable bonds or connections to form a single third-rail section. In Fig. 1 we have indicated two lengths 2 3 connected together to form one section by means of a bond or connection 7, the adjacent rail length 1 or 4 on either hand being unconnected to these rail lengths, and thus belonging to different sections. At the dividing or separating points between the successive sections and preferably alongside of the track

are located the boxes C C' for containing the operating-levers. Each box may contain two levers D' D² or D³ D⁴, corresponding, respectively, to the two sections whose ends are adjacent thereto. Thus box C contains lever D', corresponding to and located beyond the end of section 1, and lever D², corresponding to and located beyond the end of section 2 3. Similarly box C' contains lever D³, corresponding to and located beyond the other end of section 2, and lever D⁴, connected to and located beyond the end of section 4. Each lever D' D² D³ or D⁴ has pivoted at opposite ends thereof rods *d'* *d*², which extend through the top of the box into the path of an operating-shoe on the car. Levers D' D², &c., are fast on shafts or center pins *d*, which also carry levers E' E² E³ E⁴, corresponding to the respective levers D' D² D³ D⁴. At any convenient point—as, for example, midway between the lever-boxes—are arranged the switch-boxes, of which one is indicated at F. A switch-lever H, supported within this box, carries or operates a contact 8, adapted to open and close the connection between two switch-contacts 9 10, of which contact 9 is connected to the corresponding third-rail section—in this case the section composed of rail lengths 2 3—while contact 10 is connected to the insulated main conductor or feeder 11. We have here shown the connection from contact 9 to rail-sections 2 3 as effected by the same wire or bond 7 that connects the two rail-sections together. This switch-box is operated from either hand by means of chains, wires, or other flexible connections K K', attached to the switch-lever H and to the operating-levers D² D³. It will be observed that the operating-levers D² D³, which are connected to the switch controlling the section 2 3, are beyond the end of such section on either hand, so that the switch will be operated before the car or train passes on the section from either direction. Similarly the operating-levers D' D⁴, which are connected to and operate chains or wires which pass to the respective sections 1 4 on either side of section 2 3, are located beyond the ends of these sections 1 4, so as to control same in advance in a similar manner. The effect of this arrangement is also to main-

tain the closure of circuit to the respective sections until after the car has left same, as will be hereinafter explained.

The operating device on the car consists of
 5 a shoe S with a doubly-inclined bottom and carried from a part of the car, such as the truck-frame *t*, by means of upwardly-yielding supports, such as bolts *v*, with springs *w* intervening between the truck-frame and the
 10 shoe, so as to press the latter downwardly.

When a car or train passes over the operating mechanism above described, the inclined bottom of the shoe S strikes any of the rods *d'* *d*² which may at that time be projecting up into its path and depresses same.
 15 Such depression of any of the rods, as *d'*, results in a simultaneous elevation of the other rod, as *d*², attached to the opposite end of the same lever. Antifriction-rolls *d*³ may be
 20 provided on the top of the several rods to enable the shoe to travel over same more smoothly. If at any time too strong a pressure is brought upon the shoe and the vertically-sliding rods by reason of tipping of the
 25 car or of inequalities of the road-bed, &c., the springs *w* will allow the shoes to yield upwardly, and thus relieve the strain.

Assuming now that the car is passing onto the portion of track indicated in Fig. 1 from
 30 the left, being about to leave the end length 1 of the left-hand section, the shoe S will next strike rod *d*² on the same lever D², and depressing said rod will reverse the lever D² and throw the switch-lever H into the position
 35 closing the connection from main conductor 11, thus rendering the next succeeding section 2 3 alive. The car then leaves section 1, which is still alive, and passes onto section 2 3, and the shoe S then strikes the rod *d'* of
 40 lever D', which if not already depressed will be depressed by the shoe, which latter then passes over rod *d'* of said lever *d*², thus turning said lever into the position indicated in Fig. 1, which corresponds to an open condi-
 45 tion of the switch of the preceding section 1, thus cutting said section off from the main conductor. The car may now pass over the section 2 3, and when it reaches the end thereof it will operate the lever D⁴, so as to cut in
 50 section 4, just as above described for section 2 3. Then passing onto said section D⁴ it operates lever D³ in a similar manner to that in which it operated lever D', and will thus render section 2 3 dead. It will be noticed that
 55 the levers D² D³ are connected to the switch-lever H in reverse manner, the chains or wires K K from lever D² being connected to lever H without crossing, while the chains from lever D³ are crossed. This is necessary, because
 60 it is required that the switch 8 9 10 should be opened after the car passes off of the section 2 3 at either end, and thus when the ends of said levers farthest from this section (the outer ends) are depressed, and conversely the
 65 switch should be closed when the car passes onto this section from either end—that is, when the ends of the levers D² or D³ which

are nearer the section 2 3 (the inner ends) are depressed. The inner ends of one lever thus correspond in action to the inner ends of the
 70 other lever, and their outer ends also correspond, and it is therefore necessary that the levers should be oppositely connected to the switch-lever, as stated.

It is clear from the above that the car be-
 75 fore it passes onto a section in either direction will close the connection to such section from the feeder, and after it passes onto such section from either direction it will operate the switch of the section it has just left to
 80 break connection to such preceding section. It will also be noted that the sections are not limited in length by any consideration as to the length of a car or train, but only by the
 85 distance at which it may be convenient to operate the switches by means of the mechanical connections shown. Such mechanical connections may be made to work positively and efficiently over distances much greater
 90 than the length of a car or even of the usual train, such as a passenger-train, so that the number of switching devices is much less than in a system limited to sections of a car or train length or less. This results not only in greater
 95 economy in installation, but in decreased expense of maintenance and repair and in diminution of the noise and wear due to the striking of the numerous successive switch-operating devices.

In order to take up slack or tighten the
 100 chains or wires or mechanical connections K K', we prefer to provide same with suitable length-adjusting devices, such as turnbuckles *k*, and springs *k'* may also be attached to or
 105 inserted in these mechanical connections to impart a certain amount of elasticity to same, thus enabling the parts to yield more or less under excessive pressure, and thereby avoid undue strains. These features are more
 110 clearly shown in Fig. 4.

The operating-levers may be variously arranged and may obviously take the form of plates, disks, or wheels, their motion, how-
 115 ever, in any case being vibratory and their function being that of levers whatever their shape may be. In Figs. 5 and 6 we have shown modified arrangements of these levers. The rods *d'* *d* are omitted in the form shown in
 120 Fig. 5, the lever D itself carrying the friction-rollers *d*³ to engage with the shoe on the car and being horizontally arranged, so that the passage of the car leaves the lever turned one way or the other, according to which end was
 125 struck last and therefore according to the direction of motion of the car. The shaft *d* in this case is shown as of greater length and carries at its other end the vertical lever E, connected by chains K K' to the switch, as
 130 above described, the operation of this device being identical with that above described, except that the shoe strikes directly on the levers instead of operating same through the rods *d'* *d*².

As shown in Fig. 6, the levers D and E can

be combined in a single lever D^e , which may be made to operate in a substantially vertical position, the upper end of this lever carrying a head d^3 , which engages with the shoe on the car, so that said lever will be thrown in one direction or the other, according to the direction of motion of the car, it being understood that the springs on the shoe in the car will permit the same to ride over the top of this lever after the latter has been operated.

The car or electrically-propelled vehicle that carries the shoe S should of course be the motive car of the train in case there is more than one car, and this car should also carry means (indicated at S') for engaging with the third rail to take off the operating-current therefrom.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an electric-railway system, the combination with a main conductor and a series of stationary insulated third-rail sections, of switches controlling the connection between such sections and the main conductor, mechanical operating devices located beyond each end of each section and reversely connected to such switches, and an electrically-propelled vehicle having means for taking current from said third-rail sections and provided with means such as a shoe for engaging with the aforesaid switch-operating devices, to close the switch before the vehicle passes onto said section from either direction, and to open said section after the vehicle passes off of said section in either direction.

2. In an electric-railway system, the combination with a main conductor and a series of stationary insulated third-rail sections, of switches controlling the connection between such sections and the main conductor, operating-levers of which one is supported at a point beyond each end of each section, mechanical connections connecting said operating-levers in reverse manner to the said switch, and an electrically-propelled vehicle having means for taking current from the said third-rail sections and provided with a doubly-inclined shoe adapted to engage with said operating-levers to cause the main conductor to be connected to each third-rail section before the vehicle passes thereon from either direction, and to disconnect such conductor from said section after the train passes from same, in either direction.

3. In an electric third-rail system, the combination with a main conductor and a series of stationary insulated third-rail sections, of an operating-lever located beyond each end of each section, a box containing said lever, rods extending upwardly from said lever through the top of said box, a switch controlling the connection from said main conductor to each section, mechanical connections such as chains, connecting each switch in reverse manner to the two operating-levers of the corresponding sections, and an elec-

trically-propelled vehicle having a doubly-inclined shoe engaging with the rods on such operating-levers.

4. In an electric-railway system, the combination with a main conductor and a series of stationary insulated third-rail sections, of switches controlling the connection between such sections and the main conductor, operating-levers of which one is supported at a point beyond each end of each section, mechanical connections connecting said operating-levers in reverse manner to the said switch, and an electrically-propelled vehicle having means for taking current from the said third-rail sections and provided with a doubly-inclined shoe adapted to engage with said operating-levers to cause the main conductor to be connected to each third-rail section before the vehicle passes thereon from either direction, and to disconnect such conductor from said section after the train passes from same, in either direction, such shoe being provided with springs whereby it is enabled to yield vertically.

5. In an electric-railway system, the combination with a main conductor and a series of stationary insulated third-rail sections, of switches controlling the connection between such sections and the main conductor, operating-levers of which one is supported at a point beyond each end of each section, mechanical connections connecting said operating-levers in reverse manner to the said switch, and an electrically-propelled vehicle having means for taking current from the said third-rail sections and provided with a doubly-inclined shoe adapted to engage with said operating-levers to cause the main conductor to be connected to each third-rail section before the vehicle passes thereon from either direction, and to disconnect such conductor from said section after the train passes from same, in either direction, the aforesaid operating-levers being provided with anti-friction-rollers whereby the passage of the shoe over them is facilitated.

6. In an electric-railway system, the combination with a main conductor and a series of stationary insulated third-rail sections, of switches controlling the connection between such sections and the main conductor, operating-levers of which one is supported at a point beyond each end of each section, mechanical connections provided with length-adjusting devices such as turnbuckles, and connecting said levers in reverse manner to said switch, and an electrically-propelled vehicle having means for taking current from the said third-rail sections and provided with a doubly-inclined shoe adapted to engage with said operating-levers to cause the main conductor to be connected to each third-rail section before the vehicle passes thereon from either direction, and to disconnect such conductor from said section after the train passes from same, in either direction.

7. In an electric-railway system, the com-

bination with a main conductor and a series
of stationary insulated third-rail sections, of
switches controlling the connection between
such sections and the main conductor, oper-
5 ating-levers of which one is supported at a
point beyond each end of each section, me-
chanical connections provided with springs
and connecting said levers in reverse man-
ner to said switch, and an electrically-pro-
10 pelled vehicle having means for taking cur-
rent from the said third-rail sections and pro-
vided with a doubly-inclined shoe adapted to

engage with said operating-levers to cause
the main conductor to be connected to each
third-rail section before the vehicle passes 15
thereon from either direction, and to discon-
nect such conductor from said section after
the train passes from same, in either direc-
tion.

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