(No Model.)

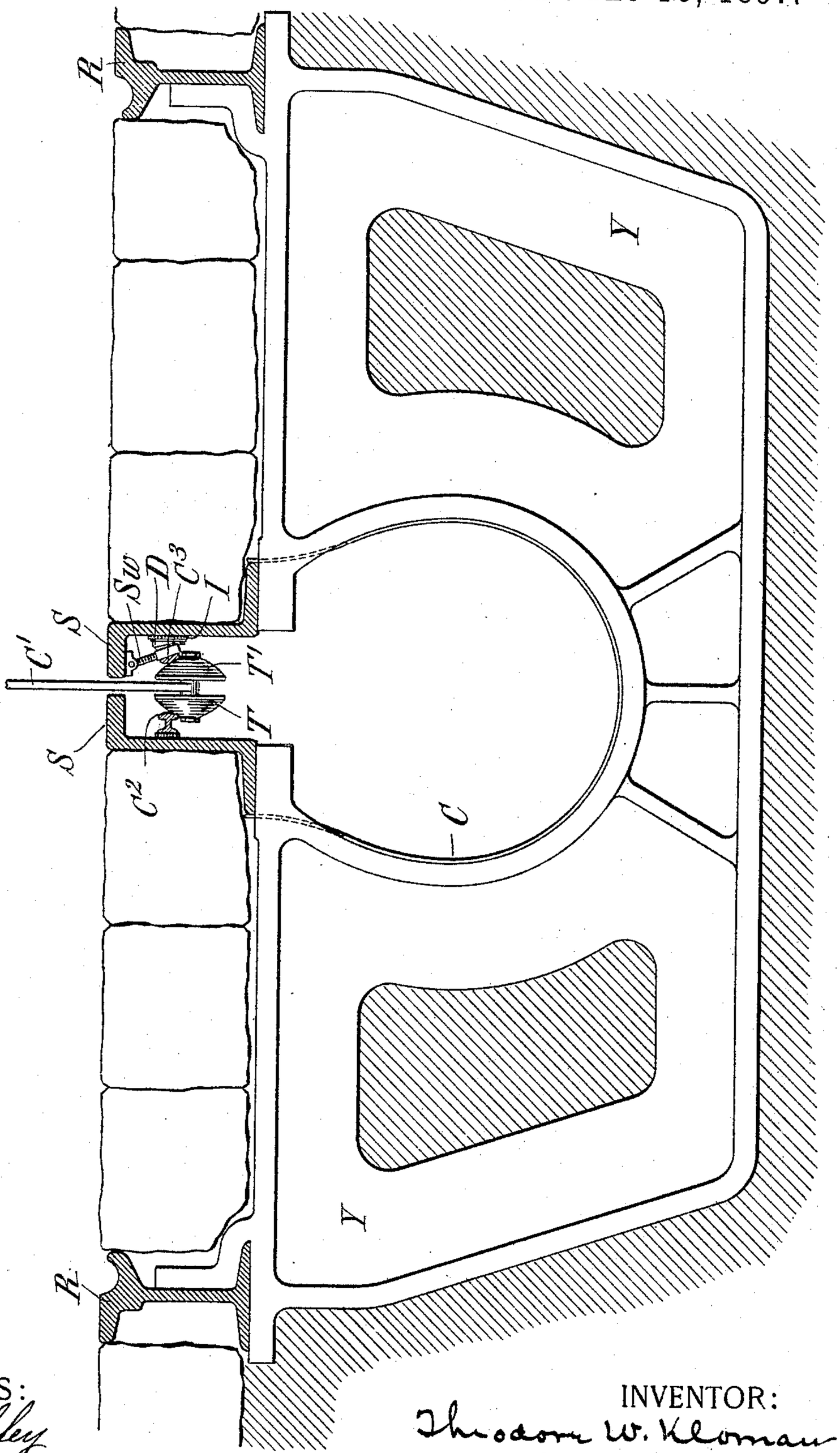
4 Sheets—Sheet 1.

T. W. KLOMAN.

ELECTRIC RAILWAY.

No. 584,511. Patented June 15, 1897.

Fig. 1.



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(No Model.)

4 Sheets—Sheet 2.

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Fig. 2,

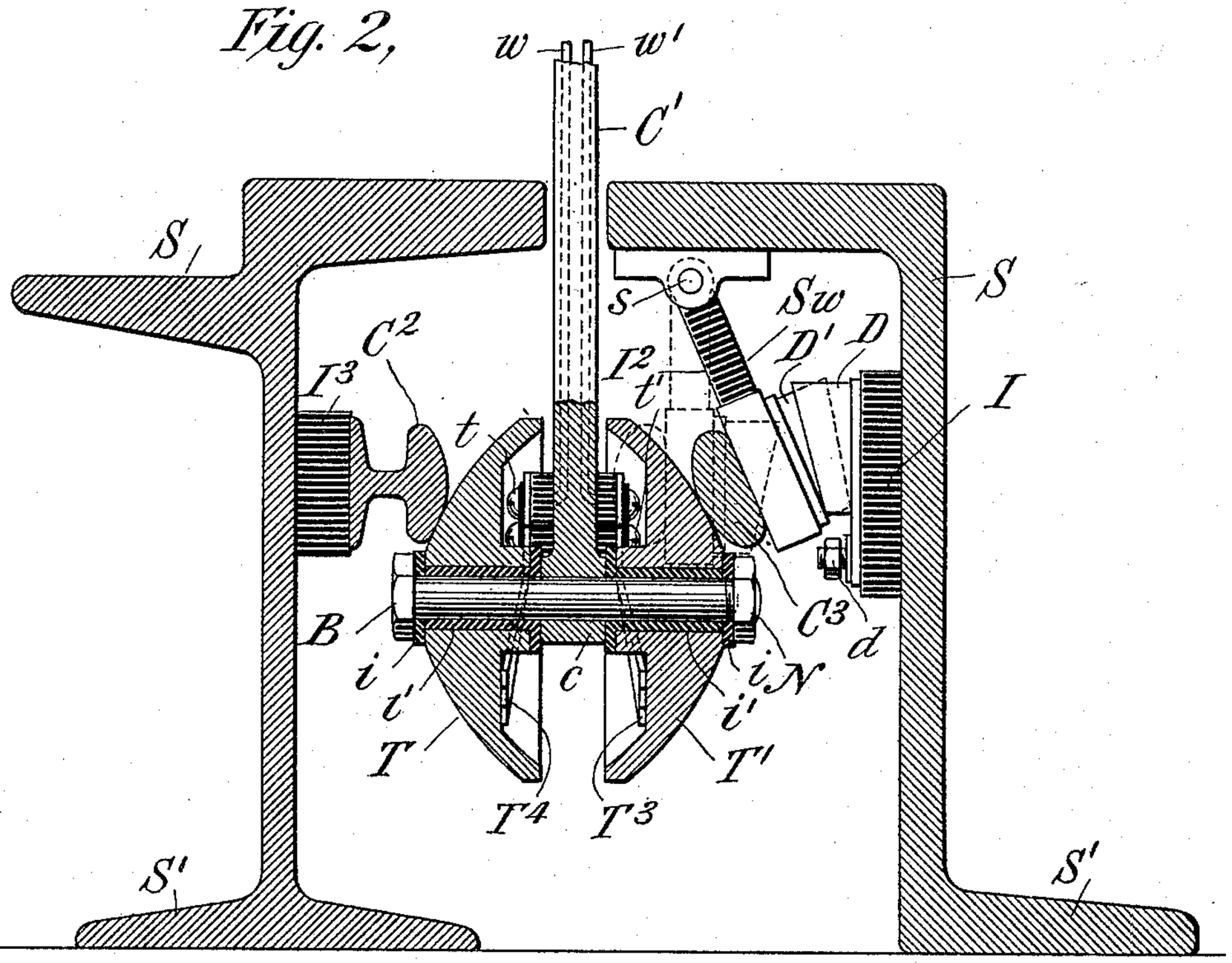
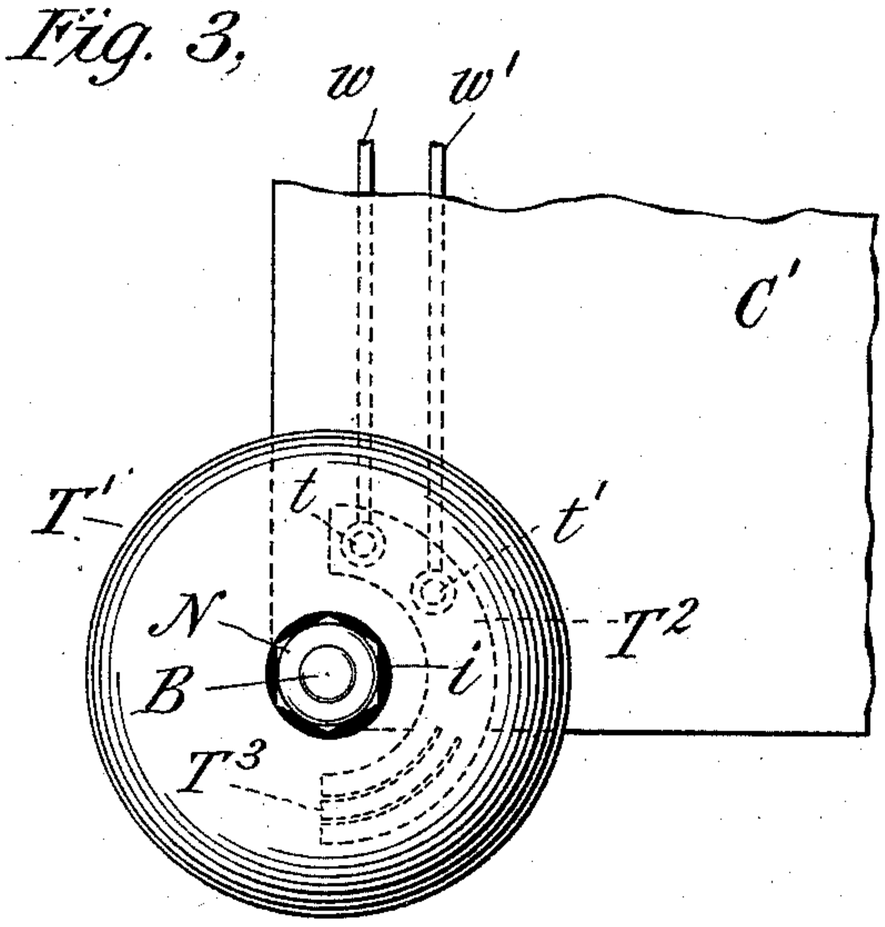


Fig. 3,



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4 Sheets—Sheet 3.

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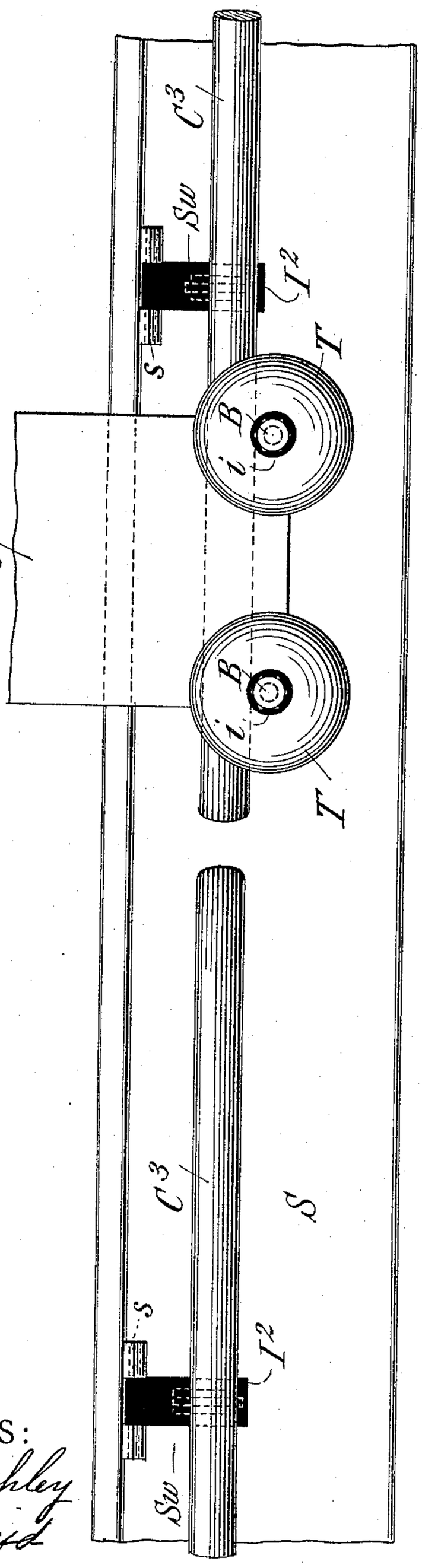
Fig. 4.



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4 Sheets—Sheet 4.

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Fig. 5,

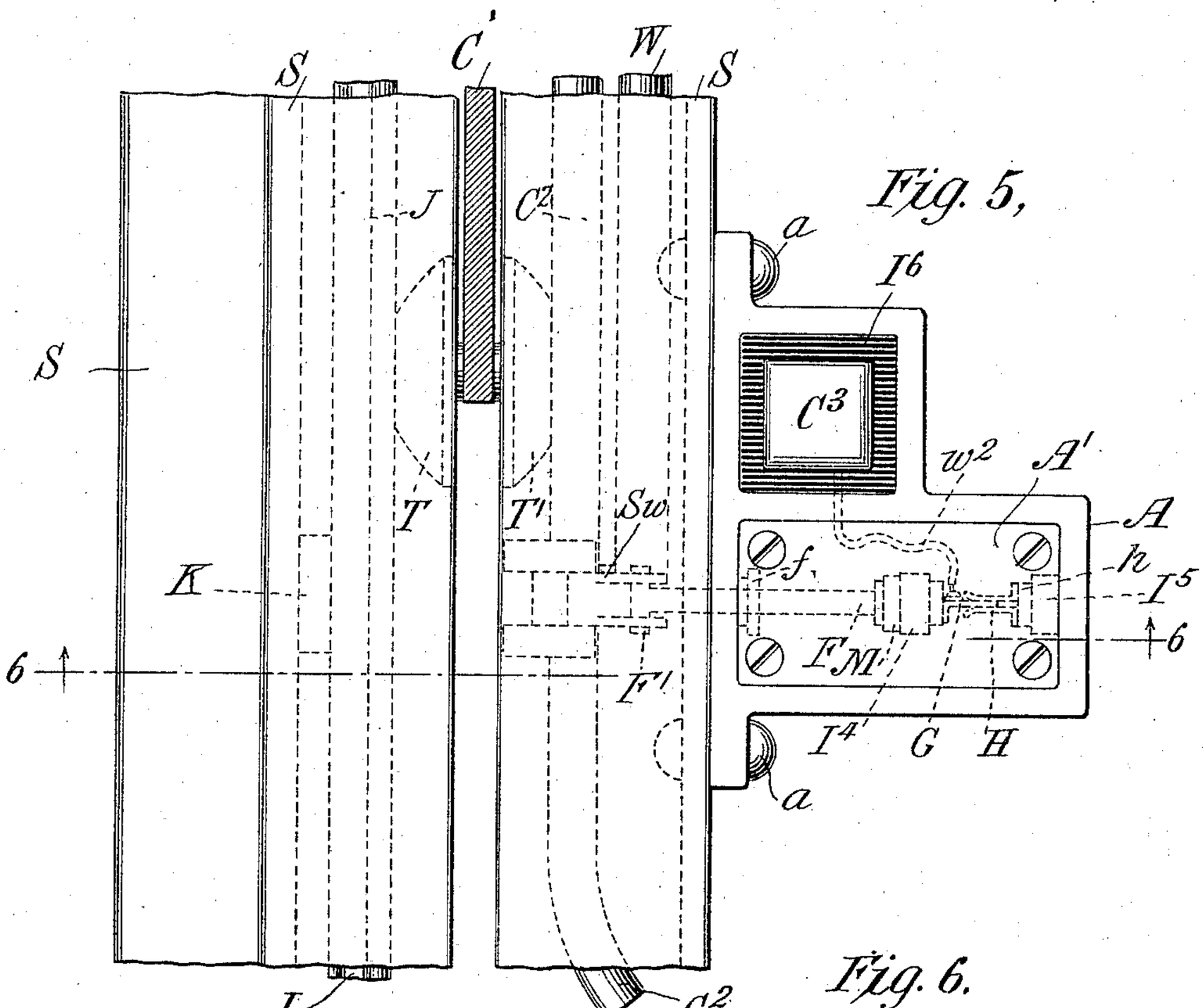
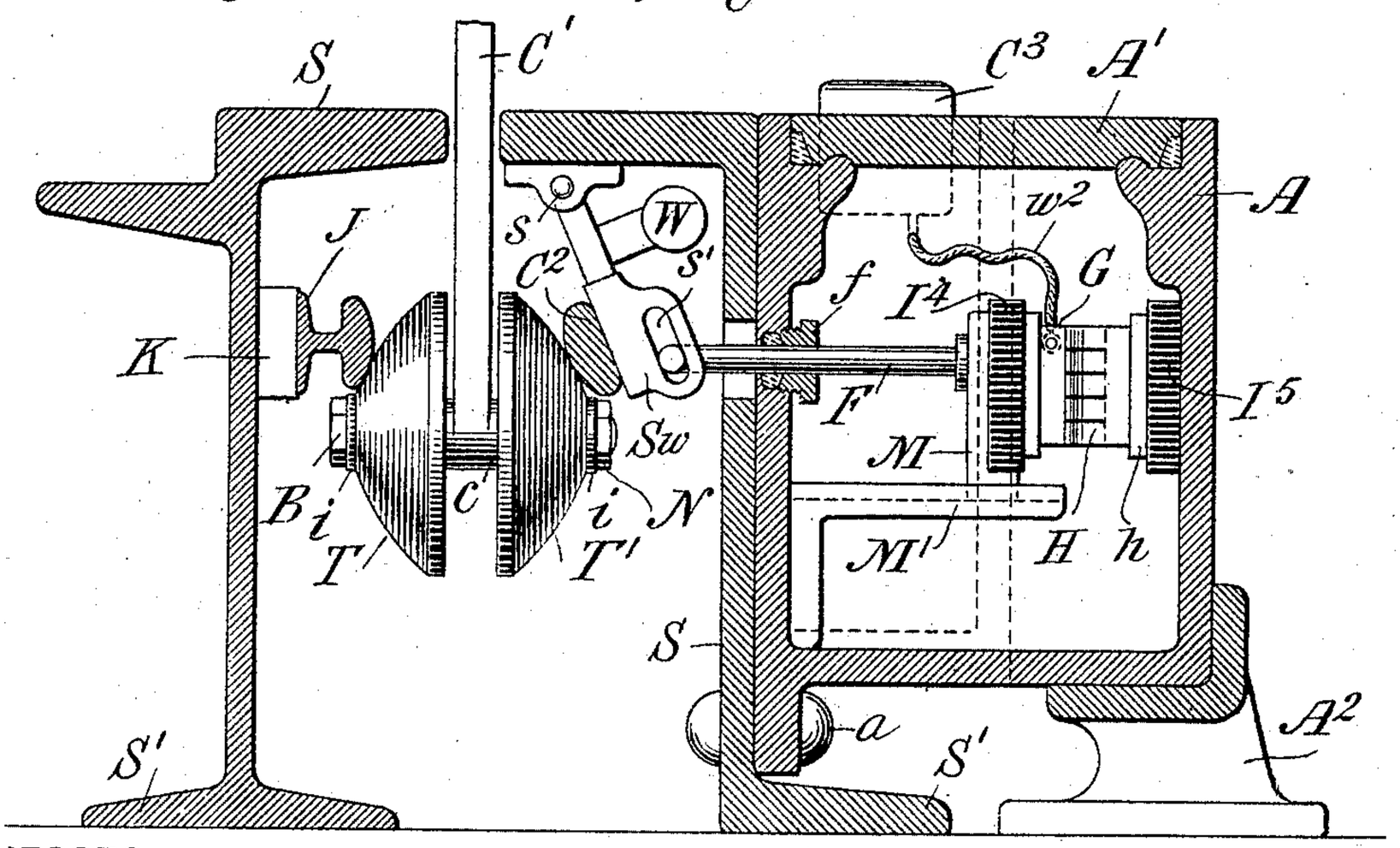


Fig. 6.



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UNITED STATES PATENT OFFICE.

THEODORE W. KLOMAN, OF MONTCLAIR, NEW JERSEY.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 584,511, dated June 15, 1897.

Application filed April 30, 1896. Serial No. 589,627. (No model.)

To all whom it may concern:

Be it known that I, THEODORE W. KLOMAN, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have made a new and useful invention in Electric Railways, of which the following is a specification.

My invention is directed particularly to that type of electric railways in which sectional conductors are used and are automatically connected to an insulated current feeder or main as a car or vehicle passes over said conductors; and it has for its objects, first, to readily apply such a system of sectional conductors to well-known forms of cable-railway conduits, and, second, to effect the automatic connection of the sectional conductors to the current-main to and through the propelling-motor carried by a car or vehicle with a minimum amount of mechanical wear and tear upon the current-controlling switches.

Prior to my invention mechanically-actuated switches have been devised for automatically connecting sectional conductors with a buried or insulated current feeder or main as a car or vehicle passed over said sectional conductors. All of such devices with which I am acquainted have, however, been open to the objection that owing to the strain put upon the mechanical parts as a car rapidly passes over the route they were liable to be broken or damaged in such way as to render them in many instances inoperative or impracticable. It was with a view of overcoming these mechanical defects that the present invention was devised by me.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 illustrates in transverse section a well-known form of cable-railway conduit, together with one of the supporting-yokes for the same and the tram-rails, a road-bed of a tramway, the slit of the conduit, and one form of my improvement attached thereto. Fig. 2 is a transverse section of a conduit-slit shown in full size, illustrating also my improvement attached thereto, together with a trolley-arm extending into the slit and provided with my improved form of trolley for operating the switches with as little mechanical wear and tear as possible. Fig. 3 is a detail side elevational view of my improved trolley, together with a portion of the sustaining-arm and the current-supply conductors which run to the motor. (Not shown.) Fig. 4 is a side elevational view of the interior of the slotted conduit, illustrating my improved sectional conductors suspended therein, together with my improved trolley as it appears in action. Fig. 5 is a part plan, part sectional, view of a modified form of my invention, the major portion of the mechanical and electrical connections being shown in dotted lines; and Fig. 6 is a transverse sectional view of this modified form of the invention, taken through Fig. 5 on the broken line 6 6 and as seen looking in the direction of the arrows from the bottom toward the top of the drawing.

Referring now to the drawings in detail, and first to Fig. 1, Y represents a well-known form of cast-metal yoke, such as is used in cable-railways for simultaneously sustaining the conduit C and tram-rails R R.

S S represent the usual form of angle-irons which constitute the slit and are sustained in the usual way above the conduit C. My improvement is especially applicable to this type of conduits, and a current main or feeder (not shown) is either buried in the road-bed or laid in the bottom of the conduit and connected by insulated branch feeders at intervals of preferably about ten (10) feet apart to stationary switching-contacts D D D through the agency of binding-nuts *d*. These stationary switching-contacts are electrically insulated from the angle-iron S by insulation I, as shown.

Sw are switching-arms pivotally secured to the under face of the angle-iron S at *s s* and in alinement with the stationary contacts D D, D′ D′ being movable contacts carried by the switching-arms *Sw* and adapted to pass between the stationary contacts D D when in the position shown in full lines in Figs. 1 and 2. These switching-arms *Sw* are insulated from their pivoted supports by insulating material I^2.

C^3 C^3 are sectional conductors secured to the lower ends of the switching-arms *Sw*, there being one of such conductors for each pair of arms *Sw* *Sw*. The ends of these sec-

tional conductors C^3 C^3 are turned slightly outward, as shown in Fig. 4 of the drawings, for a purpose which will be explained later on. The united weight of each sectional conductor C^3 together with the metallic portions of the movable switches D′ is such that when left in their normal position they will assume by gravity the position shown in dotted lines in Fig. 2.

C^2 is a conducting T-rail which extends throughout the conduit and is secured thereto at definite distances in any preferred manner, but insulated therefrom by insulating material I^3. This return rail or conductor C^2 and the sectional conductors C^3 are located in the same horizontal plane when the latter hang in the vertical positions shown in dotted lines in Fig. 2.

C′ represents the trolley-arm, which extends downward into the slotted portion S of the conduit C and is so constructed as to afford protection to insulated inleading and outleading wires *w w′*, which run to the propelling electric motor carried by the car, but not shown.

T T′, T T′ represent my improved form of trolley, which is composed of two pairs of cup-shaped metallic parts journaled upon and insulated from supporting-bolts B B, provided with nuts N for securing the parts together and to the trolley-arm C, *i i′* being insulating washers and sleeves for insulating the parts of the trolley from the trolley-arm.

T^2 T^2 represent curved contact-brushes secured to the opposite sides of the trolley-arm C by screws *t t′*, but insulated from said arm, the free ends of said contact-brushes T^3 T^4 pressing outward against the inner faces of the cup-shaped trolleys T′ T. These brushes T^2 are connected one to an inleading wire *w′*, running to the electric motor, and the other to the contacting wire *w*, running to the return-rail C^2. This trolley-arm C and the supported cup-shaped trolley-rollers are rigidly attached to the car at its under side in such manner as to cause the cup-shaped parts to exert a lifting and outward wedging action, as will be clearly understood in connection with the description of the mode of operation.

The operation is as follows: The current from the current feeder or main (not shown) is conveyed through the branch feeders to the several stationary contacts D, from which the swinging contacts D′ D′ are normally disconnected owing to the weight of the sectional conductors and switching-contacts. As the car or vehicle carrying the trolley-arm C′ passes over the route one portion of the cup-shaped trolley T T′ bears continuously on the return conducting-rail C^2, while the other portion T′ of said trolley is brought successively in contact with the curved ends of the sectional conductors C^3 as it approaches the same, thereby causing the swinging switching-levers *Sw* to be forced outward under the action of the cup-shaped portions until the movable contacts D′ at the nearest end is forced into the position shown in full lines in Fig. 2. When this takes place, current flows from the current feeder or main and the branch feeder by the binding post or nut *d* to the fixed contact D, through the movable contact D′, the sectional conductor C^3, the right-hand cup-shaped trolley T′, the free end T^3 of the right-hand curved contact-brush T^2, thence by the conductor *w′* to the motor on board of the car, through the return-conductor *w* to the other stationary contact-brush T^2, thence by the contact T^4 to the remaining cup-shaped trolley T, thence by the remaining cup-shaped trolley T, thence by the return-conductor C^2 to the generator. As the car advances, therefore, the next switch *Sw* at the other end of the sectional conductor C^3 is forced into contact with its corresponding fixed contact D, and as the trolley T T′ passes from under that sectional conductor C^3 and makes mechanical contact with the curved end of the next sectional conductor the last sectional conductor C^3 is released and by its own weight assumes its normal position, as shown in dotted lines in Fig. 2, thereby rupturing the current between it and the current feeder or main at the stationary contacts D D. With such an arrangement of double cup-shaped trolley and stationary return-rail C^2, together with the pivoted sectional conductors C^3, provided with curved ends, I am enabled to cause the sectional conductors to be successively connected and disconnected from the current feeder or main without any objectionable mechanical jar or wear and tear.

By arranging two pairs of cup-shaped trolleys T T′ in the manner shown in Fig. 4 I am enabled to make contact with the next succeeding sectional conductor C^3 before contact is broken with the sectional conductor last passed.

I will now describe the modified form of my invention, illustrated in Figs. 5 and 6 of the drawings, in which all of the electrical switching-contacts are inclosed in metallic switch-boxes, but insulated therefrom. S S′ represent the slitted conduit, as before, and J a T-rail secured to the inner wall thereof by a key K or in any preferred manner, but not insulated therefrom, as was the equivalent return-rail C^2 in my other modified form.

C′ represents the trolley-arm, and T and T′ the cup-shaped trolley, secured to the trolley-arm C′, as before, but in this instance it is designed to act solely in a mechanical way, the electrical connections being effected in the switch-box, as will be described.

Sw *Sw* represent the switching-arms, pivoted at *s s* and attached to the opposite ends of sectional rods C^2 C^2, which, however, in this instance need not necessarily be of conducting material, as their function is purely mechanical.

s′ s′ represent slots in the lower end of the pivoted switching-arms *Sw* *Sw*.

W represents a metallic rod or weight of

the same length as the sectional rods C^2 and secured at its opposite ends to the switching-levers *Sw*, its function being to aid, by gravity, in restoring the switching-levers to their normal position after the trolley has passed under them.

A represents a water-tight switch-box, preferably of metal, secured by bolts *a* to the part S, and sustained also by a yoke A^2, which is mechanically connected with the ties or yokes which support the conduit.

A′ is a removable cover adapted to afford access to the interior of the switch-box A.

C^3 is one of a series of electrical contacts firmly secured to but insulated from the switch-box A by insulating material I^6, as clearly shown in Fig. 5. These contacts C^3 are located in alinement with each other and extend slightly above the level of the road-bed and are adapted to make contact with a conducting trolley-shoe which spans the distance between successive pairs of said contacts and is adapted to convey the current therefrom to the motor on board of a car, which motor is connected in any well-known manner by a return-conductor through the tram-rails to the current-generator at the power-station. Each of these stationary contacts C^3 is connected by a wire w^2, located within the switch-boxes A, to a moving switching-contact G, secured to an operating-rod F, having longitudinal motion in an arm M, supported by a bracket M′, and a stuffing-box *f*, the inner end of the arm F being operatively connected with the slot *s*′ in the lower end of the switch-actuating lever *Sw*. These movable contacts G are insulated from the operating-arm F by insulating material I^4.

H represents fixed switching-contacts secured to the inner face of the switch-boxes A at *h*, but insulated therefrom by insulating material I^5, said fixed contacts being connected to the insulated current feeder or main, (not shown,) which in turn is electrically connected to the generator or source of current at the power-house.

The operation of this modified form is as follows: As the car or vehicle carrying the trolley-arm C′ moves over the road-bed the cup-shaped trolley T T′, having frictional bearing with the T-rail J on one side, is brought successively into mechanical connection with the curved ends of the sectional switching-rods C^2 on the other side and thereby causes the switching-levers *Sw* to move inward, thus imparting motion to the switching-rods F until the movable switching-contacts G are brought into electrical connection with the stationary contacts H, as shown in dotted lines in Fig. 5, thereby connecting the exposed trolley-contact C^3 with the current feeder or main. Current is thus conveyed through the trolley-shoe (not shown) to the motor, and as the car proceeds the double cup-shaped trolley T T′, acting upon the outwardly-curved ends of the sectional rails C^2, gradually forces in succession the movable contacts into contact with the fixed contacts, and as said trolley leaves the sectional rails the weight W of each of said sectional switches causes the circuit to be interrupted between the movable contacts and the fixed switching-contacts in the box A, thereby leaving the exposed contacts C^3 dead or disconnected.

Although I have described both forms of my invention as operated by a double cup-shaped trolley T T′ from the under side of the stationary rails C^2 or J and the sectional rails C^2 or C^3, it is obvious that the same might be operated by downward pressure from above and still come within the scope of my invention, such an arrangement being entirely within the skill of those versed in the art, and my claims are designed to be broad enough to cover such a structure, the essential novelty of my invention lying in the operation of the mechanical switches through the agency of means which is free from damaging wear and tear.

I am aware that a two-part cup-shaped trolley pivotally secured to the under side of a car has heretofore been devised for use in connection with two continuous stationary conductors or feeders, as disclosed in United States patent to Thomas, No. 288,513, granted November 13, 1883, and I make no claims hereinafter broad enough to include such a structure, my claims being directed to the combination of elements hereinafter specified, in which are included in each instance one continuous rail or conductor attached to one side of the conduit and a series of pivoted conductors attached to the other side of said conduit and in the same horizontal plane, so that the rigid or fixed cup-shaped trolley shall always exert a wedging action between the continuous and the pivoted sectional conductors.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway a continuous stationary rail attached to one side of a slitted conduit; a series of sectional rails or conductors provided with curved ends, said rails or conductors being pivotally supported by the opposite side of the conduit and in the same plane with said stationary rail and provided with means for connecting movable contacts with fixed contacts attached to a current feeder or main, in combination with a rigidly-supported two-part cup-shaped trolley, one part of which is adapted to bear continuously against the stationary rail, the other part being adapted to yieldingly lift the sectional rails in such manner as to operatively connect the current feeder or main through circuit connections and a propelling-motor carried by a car, said sectional rails being provided with means for restoring them to normal position by gravity after the trolley has passed from beneath them.

2. A slitted conduit having a continuous stationary rail permanently attached to the

inner side thereof; a series of sectional rails pivotally attached to the under surface of said slitted conduit, said sectional rails being normally held by gravity in substantially the same plane as the stationary rail; fixed or stationary contacts, one or more pairs for each sectional rail; a two-part cup-shaped trolley adapted to bear continuously in an upward direction against the continuous rail and the sectional rails as it passes thereunder, said trolley being rigidly attached to a car or vehicle in such manner as to exert a lifting action between the stationary rail and the sectional rails, in combination with a current feeder or main, and movable connections under the control of the sectional rails whereby the current feeder or main is automatically connected with a motor carried by the car as the latter passes over said sectional rails.

3. A slitted conduit provided with a stationary rail extending throughout its length; a series of sectional conductors or rails parallel therewith; a series of stationary contacts connected to a current feeder or main; a series of movable contacts mechanically connected with the sectional conductors or rails, said fixed and movable contacts being inclosed in water-tight switch-boxes; a series of exposed or surface contacts electrically connected with the movable contacts and a two-part cup-shaped trolley rigidly supported by a car or vehicle and adapted to bear continuously upon the stationary rail and successively upon the sectional rails, said sectional rails being provided with means for restoring them, by gravity, to their normal position after the trolley has passed from under them, substantially as described.

4. A slitted conduit provided with a stationary rail extending throughout its length; a series of pivotally-supported sectional rails located normally in the same plane with the stationary rail; a series of fixed and movable contacts inclosed in water-tight switch-boxes; a series of surface or exposed contacts electrically connected to the movable contacts; mechanical connections between the movable contacts and the pivoted sectional rails and a two-part cup-shaped roller-trolley carried by a trolley-arm rigidly attached to a moving vehicle, one part of said cup-shaped trolley having upward and lateral pressure against the continuous rail and the other successive upward and lateral pressure against the sectional rails as the car or vehicle moves over the route, said sectional rails being provided with means for normally restoring them, under the action of gravity, to their normal positions and thereby rupturing the circuit between the fixed and the movable contacts.

In testimony whereof I have hereunto subscribed my name this 29th day of April, 1896.

THEODORE W. KLOMAN.

Witnesses:
C. J. KINTNER,
M. M. ROBINSON.