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H. M. BRINCKERHOFF.

SWITCH OR CROSSOVER SYSTEM FOR ELECTRIC RAILWAYS.

No. 547,873. Patented Oct. 15, 1895.

Witnesses.
Wm. M. Rheems
Mary Darling

Fig. 1

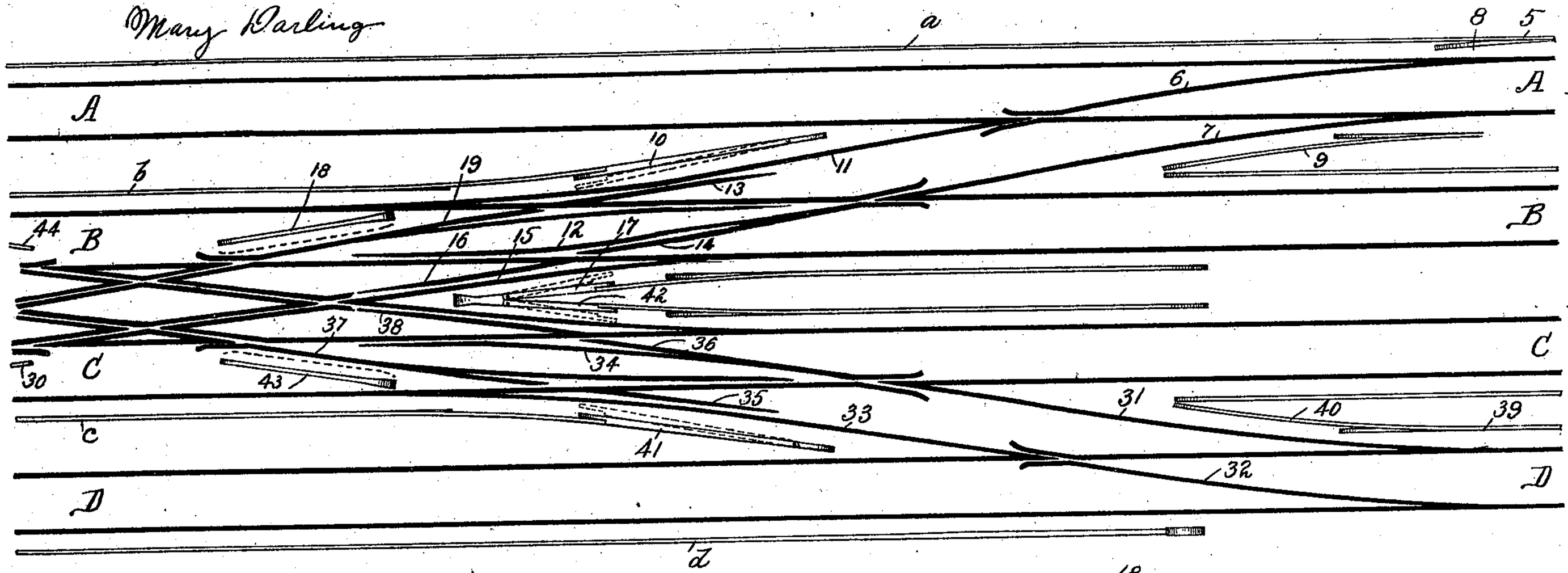

Fig. 2.

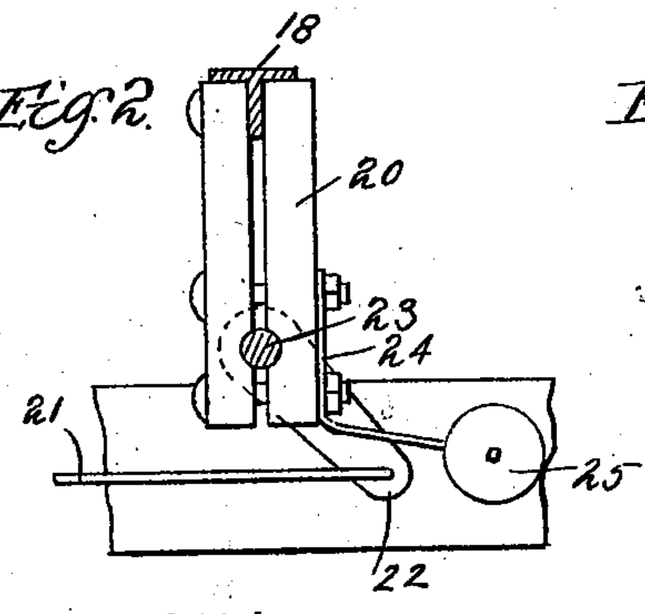

Fig. 3.

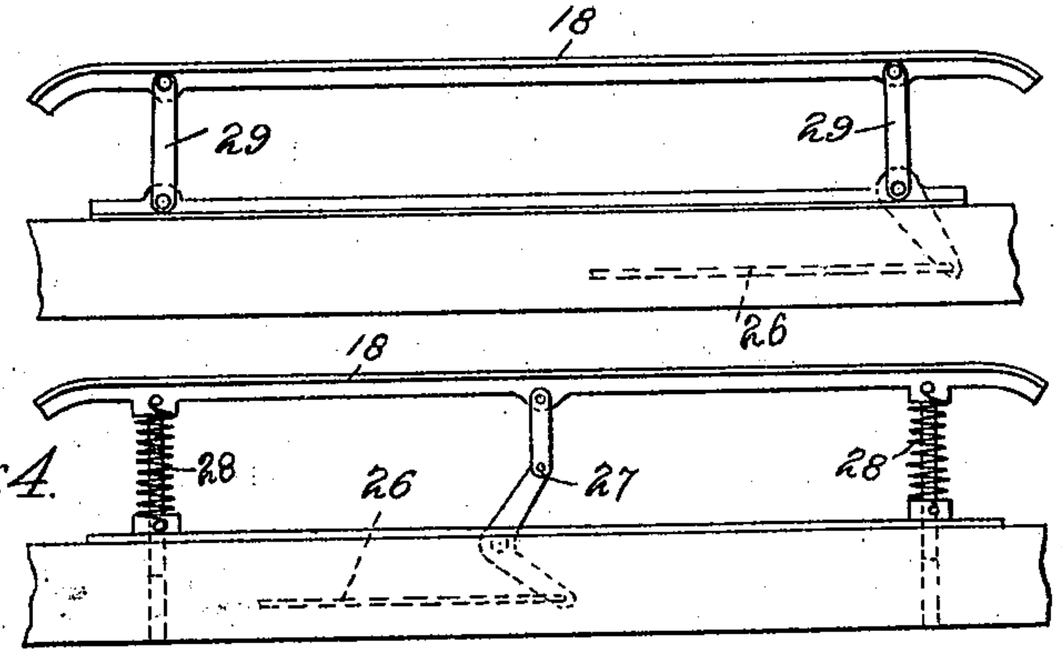

Fig. 4.

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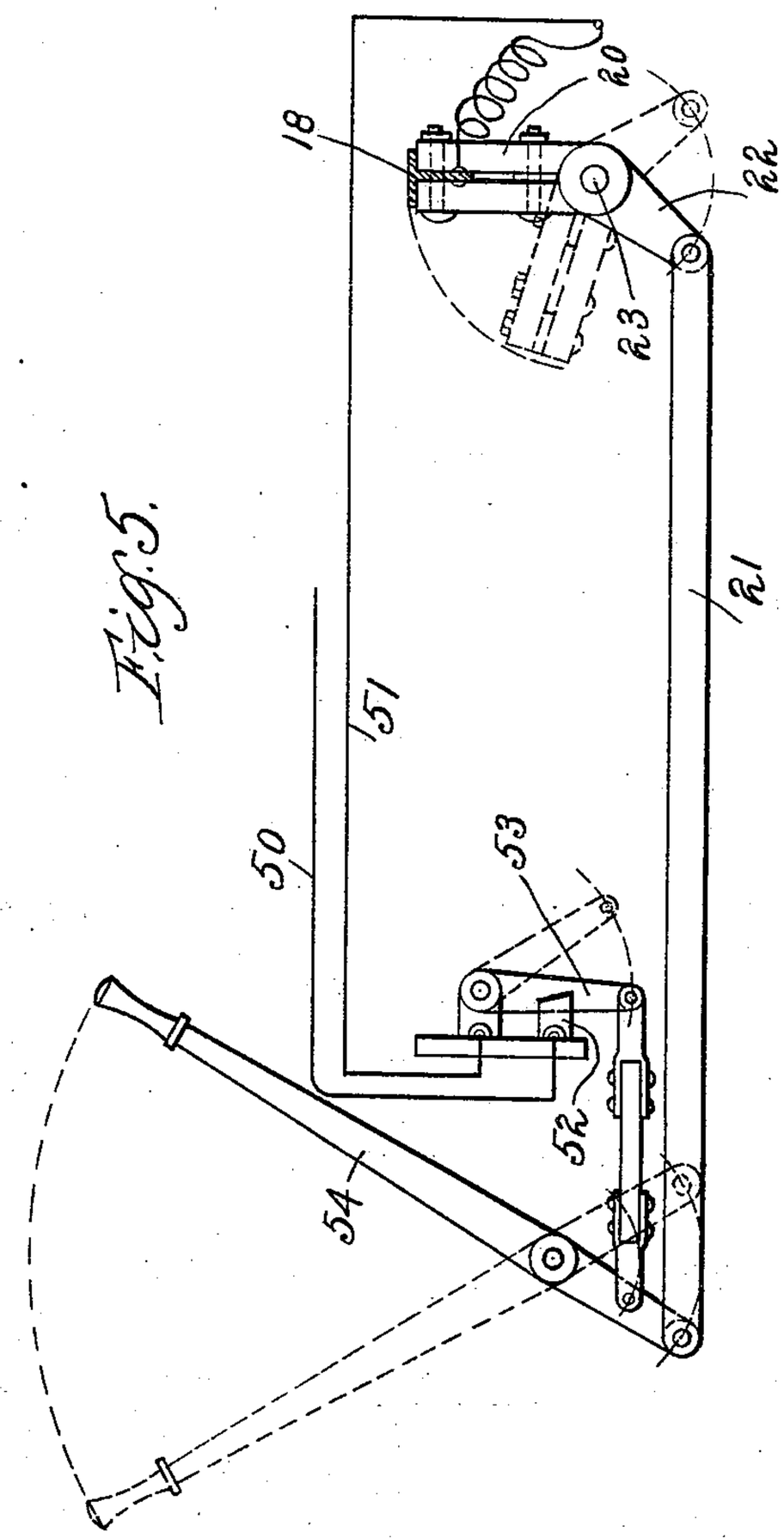
Fig. 5.



Witnesses.

Wm. M. Rheem.

Wm. F. Fleming

Inventor

Henry M. Brinckerhoff

by Brown & Darby

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UNITED STATES PATENT OFFICE.

HENRY M. BRINCKERHOFF, OF CHICAGO, ILLINOIS, ASSIGNOR TO CARTER H. FITZHUGH, OF SAME PLACE.

SWITCH OR CROSS-OVER SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 547,873, dated October 15, 1895.

Application filed June 13, 1895. Serial No. 552,626. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. BRINCKERHOFF, 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 Switch or Cross-Over Systems for Electric Railways, of which the following is a specification.

This invention relates to switch or cross-over systems for electric railways.

The object of the invention is to provide a switch or cross-over system for electric railways whereby cars can be switched from one track to another.

While the invention is adapted for use in electric railways generally, it is particularly adapted to electric railways embodying the third or contact rail principle—such, for instance, as used in elevated-railway structures.

The invention consists, substantially, in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter described, as shown in the accompanying drawings, and, finally, more specifically pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a view in plan of a switch or cross-over system embodying the present invention. Fig. 2 is a detail view in end elevation, parts being in vertical transverse section, of an auxiliary movable contact-rail employed in connection with my invention. Fig. 3 is a detail view in side elevation of a modified form of auxiliary movable rail. Fig. 4 is a detail view in side elevation of a modified form of auxiliary rail adapted for use in connection with my invention. Fig. 5 is a view illustrating an arrangement whereby the auxiliary movable contact-rail is cut in and out of working circuit when moved to operative or inoperative position.

Reference-signs A, B, C, and D designate, respectively, the tracks of four parallelly-arranged lines of railroad.

a designates the third or contact rail for supplying cars traveling upon tracks A, said contact-rail being arranged, as shown, outside of its corresponding track-rails.

d designates the third or contact rail for supplying current to the cars passing along the rails of track D, said contact-rail being also arranged outside of instead of between its corresponding track-rails.

Throughout that portion of the road or system where no switch or cross-over is provided, but where the several tracks A, B, C, and D are arranged parallel with each other, it will be understood that tracks B and C will each be provided with one or more third or contact rails similar in all respects to the third or contact rails *a d* above mentioned and similarly arranged. When, however, it is desired to introduce into the road a switch or cross-over to enable cars to be transferred from one track to another or from one track across an adjacent track, the presence of the usual and necessary frogs, switches, and slip-rails so interferes with the location and relative arrangement of the third or contact rails of the intermediate tracks and the cross-over tracks that it is necessary to construct and arrange said contact-rails for the intermediate tracks and for the switch-tracks in sections in suitable electrical connection with each other, as will more fully hereinafter appear, in order to economize space and to permit of the proper placing and spacing of the switch-rails, frogs, and cross-over tracks. It will be understood that in electrical railways employing the third or contact rail it is usual to mount upon each car to be supplied with current from said rail a pair of contact-shoes or trolleys at each end of each car, the contacts or trolleys of each pair being arranged on opposite sides of the car. It will also be understood that if any one of the four contact-shoes or trolleys is in contact with a supply or third rail sufficient current is supplied to the car, the additional contact of one or more of the other contact-shoes or trolleys with a contact-rail merely insuring a proper and sufficient supply of current to the car.

In order to more fully understand the principle and mode of operation of the further details of my invention, I will now describe the operation and action when the car passes from one track to the next adjacent track—as, for instance, from track A to track B. The contact-shoe upon the right side of the front end of the car travels upon the contact-rail *a* until it reaches the point 5, where the trucks leave the right-hand rail of track

A for the switch-rail 6, and the left-hand truck at the front end of the car leaves the left-hand rail of track A for the switch-rail 7. When this point is reached, the contact-shoe on the right-hand side of the front of the car leaves the contact-rail *a* and proceeds upon the short section 8, and when said shoe or trolley leaves said short section 8 the trolley or shoe on the left-hand side of the front end of the car will have come in contact with the the short section of conducting-rail 9. When the front end of the car shall have progressed along the switch-rails 6 7 until the shoe or trolleys carried upon the front end of the car upon the left side thereof has been moved out of contact with section 9 of the supply-conductor, the shoe or trolley upon the right-hand side on the rear end of the car will be in contact with the conducting-rail *a* or short section 8, and when this short section 8 is cleared the shoe or trolley upon the left-hand side of the rear end of the car will contact with section 9 of the conducting-rail and will remain in contact therewith until the car has proceeded far enough for the shoe or trolley upon the right-hand side of the front end of the car to contact with conductor 10, which will continue to supply current to the car while the trucks thereof continue their travel along the slip-rails 11 12 onto the rails of track B, which, extending in a straight line from that point onward, is paralleled by contact or third rail *b*, from which the current is supplied to the car through contact-shoes or trolleys carried by the car. As is usual in such cases of a simple switch from one track to an adjacent track, the switch or slip rails 11 12 are necessarily and usually slightly curved to effect the necessary switching of the car, and since the trolleys or contact-shoes carried by the car are usually and preferably mounted in fixed relation upon the car it will be seen that the section 10 of the contact-rail or supply-conductor should be set to a fixed gage relative to the curve or bend in the switch-rail 11, to the end that said rail be constantly in position to be engaged by the trolley or contact-shoe carried by the car as said car passes along said rails 11 12 and the rails of track B. Now, suppose, instead of crossing from the rails of track A to the rails of track B, it is desired to cross from the rails of said track A across the rails of track B to the rails of track C, for instance. In such a case the trucks of the car, instead of proceeding upon the curved rails 11 and 12, are received upon the switch-rails 13 14 upon suitable and proper manipulation of the switches, and hence the contact-shoes or trolleys depart from the line of travel adapting them to contact with the contact-rails 10 *b*, said contact-rails being set to gage with the curved rails 11 and 12, as above explained. All the available space at this point is occupied by the switch-rails, making it impossible to arrange a contact-rail for the contact-shoes or trolleys upon the car to properly gage with the switch-rails 13 14. Moreover, this difficulty is increased by reason of the fact that said rails 13 14 are movable, while the slip-rail 11 is fixed. It is exceedingly objectionable to depend upon the momentum of the car to pass this point without the contact-shoes or trolleys carried thereby making contact with any conductor, for the reason that in such cases a break is made in the continuity of the current supplied to the car, thus cutting out the lighting and heating currents where the lighting and heating apparatus of the car are supplied from the same source as the car-motor, and, moreover, such an arrangement is objectionable by reason of the fact that extraordinary care and attention on the part of the motorman are required in order to cut out of circuit the motor when such a break is made, for otherwise the full strength of the motor-current would be suddenly cut off from the motor and then as suddenly again supplied thereto when the car has progressed far enough upon its way for the contact-shoes or trolleys or one of them carried thereby to again come in contact with the supply-conductor, hence imposing injurious strains upon the motor. In order to overcome these objections and to provide a construction and arrangement wherein a continuous current is supplied to the car, whether for lighting, heating, or motor purposes, during the cross-over of the car, and in order to adapt the section of contact or conductor rail 10 for use when the car is passing along the rails 11 12, and also for adapting the same section for use when the car is passing along the rails 13 14, I pivot said section 10 at one end thereof, as indicated in dotted lines, said rail being adapted to be thrown into one position—as, for instance, the position indicated in full lines in Fig. 1—adapting it to co-operate with contact or conducting rail *b* and adapted to be thrown into the position indicated in dotted lines, to be used in connection with the cross-over track-rails 13 14. In practice the section 10 of the conducting-rail is mounted to be moved co-operatingly with the movable switch-rail 13—that is to say, when said movable rail 13 is moved either into or out of position for the trucks of the car to pass thereover the section 10 is also moved into or out of position, respectively, before the switching is completed to enable the car to properly proceed. Similarly to the pivoted section 10, I provide, also, the pivoted section 17, which may be moved into position adapted to be used when the car is moving along the fixed curved section 15 of the cross-over track from the rails of track B to those of track C, and also into position as indicated in dotted lines when the trucks of the car are traveling along the section 16, in order to effect a crossing of the rails of track C in making the passage from tracks A or B to track D, the pivoted section 17 of the conducting-rail being mounted to have a movement from the switch-moving apparatus simultaneous with the movement of the switch-

rail section 16, similar in all respects to that above described with respect to pivoted section 10. By arranging the conductor-rails of the several pairs of track-rails outside of instead of between the members of their respective pairs of track-rails I avoid the necessity of providing a sectional conductor, except under extraordinary circumstances or for raising such sections into operative position or lowering the same out of the way of passing trains, as will be understood.

Supposing it is desired to effect a cross-over of the car from the rails of track A to those of track C, the switch-rails 13, 14, and 16 are properly thrown into position to make a continuous track from the rails of track A to the rails of track C. At the same time pivoted sections 10 and 17 of the conductor are correspondingly moved into proper gage with reference to the rails of the cross-over track. The car proceeds along the tracks of the cross-over, as above described, until the contact-shoe mounted upon the right side of the front truck contacts with the section 10 of the conductor. This contact is made before the contact-shoe or trolley upon the left side of the rear end of the car leaves the section 9 of the conductor, and hence the car is continuously supplied with current until it passes the length of section 10. Before the contact-shoe or trolley on the right side of the front truck leaves section 10 the contact-shoe or trolley upon the left side of the front truck contacts with section 17, which, as above described, has been thrown into proper gage, as indicated in dotted lines in Fig. 1, with reference to the cross-over tracks along which the car is traveling. When the front truck of the car arrives in position corresponding to the extremity of the section 17 of the conductor, the available space between the tracks B and C is so occupied and taken up with the switch-plates and switches as to leave no room for additional section of contact-rail, and hence it frequently becomes necessary in order to bridge over the distance from this point to the point where contact can be made from the car with the regular conductor *c* of the track C to supply a section of conductor. The difficulty of accomplishing this result lies in the fact that such a conductor must be arranged between the rails of one or the other of the tracks—as, for instance, between the two rails forming track B—whereas the conductors above described are, as stated, outside of and not between the members of any pair of track-rails, and in effecting such an arrangement a further difficulty is experienced by reason of the fact that such an independent conductor must be normally maintained in position to permit a car to pass along the rails of track B without contacting with said section. In order to accomplish the result stated and to avoid the difficulties noted, I provide an independent movable section of conductor 18 and arrange the same between the two rails forming track B, said section of conductor being suitably connected electrically to a convenient live conductor—as, for instance, conductor *b* of track B—the electrical connection being such that when the movable section 18 is in position to supply with current a car passing along the switch-tracks when arranged, as before described, to permit a car to pass from the rails of track A to those of track C the electrical connection with the live conductor *b* is made; but when said movable section 18 is moved to its normal or inoperative position such electrical contact is broken, thereby avoiding danger of short-circuiting or grounding the current when said section is in its retracted or inoperative position, the gage of said movable section 18 corresponding with the gage of cross-over track 19 when said movable section 18 is in its operative position. In Figs. 2, 3, and 4, I have shown various forms of construction and arrangement of means for moving the independent or auxiliary section 18 of the conductor into or out of operative position. As shown in Fig. 2, said auxiliary or independent section is carried by pivoted standards 20, said standards adapted to be folded down into position for said section 18 to be retracted beneath the surface of the rails or tracks B by means of a suitable rod 21, connected to a crank-arm 22, mounted upon a shaft or pivot 23, upon which are mounted the supporting-standards 20. In order to normally maintain the auxiliary conductor-section 18 in its retracted position, I secure a bar 24 to a standard 20 and adjustably mount thereon a suitable weight 25, so arranged as to normally tend to rock pivot 23, and hence to tend to fold supporting-standards 20 into their retracted or horizontal position.

In Fig. 5, I have shown an arrangement for cutting in and out of working circuit the auxiliary movable contact-rail 18 when said rail is moved into or out of operative position to receive the contact device on the car. In this arrangement it will be seen that the movable conductor-rail 18 is included in a circuit 50 51, which is suitably connected electrically with a live conductor or other suitable electrical source, the portion 50 of such circuit terminating in a suitable insulated contact 52, adapted to be engaged by a lever or other suitable contact-rail circuit. The movable part 53 is connected to move synchronously with the lever 54, by which the contact-rail 18 is moved, it being understood that the contact part 53 is insulated from said lever 54, and also that the same movement of said lever can be made to effect the movement of the switch-rails. The operation of this feature will be readily understood from the illustration. It will be evident that many other forms of apparatus and mechanism are equally well adapted for accomplishing this result. For instance, the auxiliary conductor-section 18 may be moved directly vertical, as shown in Fig. 4, by means of the connecting-rod 26 and link connections 27, suitable springs 28 serving to maintain

said conductor-section 18 in normally-retracted position. Again, said independent auxiliary conductor-section 18 may be caused to move longitudinally and vertically in a curved path by means of the toggle-joint connections 29. (Shown in Fig. 3.)

From the foregoing description and in the example given by the time the car reaches the point where the contact-shoe or trolley upon the left side of the front truck leaves the section 17 of the conductor the contact-shoe or trolley upon the right side of the same end of the car has come into contact with the auxiliary conductor-section 18, from which the car-circuits are supplied with current. Before the entire length of auxiliary section 18 is traversed the contact-shoe or trolley upon the right side of the rear end of the car is contacted with section 10 of the conductor, thereby supplying current to the car until the length of said section 10 is traversed, when the shoe or trolley upon the left side of the rear end of the car contacts with the movable section 17 of the conductor and continues to supply current to the car until the contact-shoe or trolley upon the right side of the rear end of the car contacts with the auxiliary conductor-section 18, and before said auxiliary conductor-section is cleared by the shoe or trolley upon the rear end of the car the shoe or trolley at the front end of the car is engaged with conductor-section 30, which is similar in all respects to the auxiliary conductor-section 18, as above described. From thence the car will proceed upon its way, the arrangement being from this point onward a mere duplication of the arrangement above described, arranged in reverse order, until the car has finally been received upon the rails of track C or track D, as the case may be. In identically the same manner a cross-over is effected from the rails of track D to those of track C, B, or A, along track-sections 31 32 33 34 35 36 37 38 and so on, current being supplied to the car by the conductor-sections 39 40, pivoted sections 41 42, and auxiliary movable conductor-sections 43 44 in a manner similar in all respects to that above described with reference to the cross-over from the rails of track A to those of tracks B, C, or D.

From the foregoing description, manner of construction, and use the principles of my invention will be fully understood by persons skilled in the art.

Many variations and changes in the specified details of construction, arrangement, and location of the several parts would readily suggest themselves to persons skilled in the art under the varying conditions of each particular case and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described; but,

Having now explained the principles of my invention and a manner of its practical application, what I claim as new and of my own invention, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway, two or more tracks, each provided with a conductor, a switch track from one of said tracks to one or more of the others, comprising stationary and movable track sections, a conductor for said switch track sections, provided with a movable portion adapted to be moved to gage with either of said switch track sections at will; as and for the purpose set forth.

2. In an electric railway, two or more tracks, each provided with a conductor, arranged on the outside thereof, a switch track from one of said tracks to one or more of the others, said switch track comprising a stationary and a movable track section, and provided with a conductor having a movable portion adapted to be moved to gage with either of said track sections at will; as and for the purpose set forth.

3. In an electric railway, two or more tracks, each provided with a conductor, a switch track from one of said tracks to one or more of the others, comprising a stationary and a movable track section, a conductor for said switch track sections, having a pivoted portion, said pivoted portion adapted to be swung about its pivot to gage with either of said switch track sections at will; as and for the purpose set forth.

4. In an electric railway, two or more tracks, each provided with a conductor, a switch track comprising a stationary and a movable track section, an independent sectional conductor for said switch track, one or more of said sections being movable to gage with said stationary and said movable switch track sections; as and for the purpose set forth.

5. In an electric railway, two or more tracks, a conductor for each track, a switch track, a conductor therefor normally maintained out of circuit and also out of operative position, and means for moving said conductor into circuit and also into cooperative position; as and for the purpose set forth.

6. In an electric railway, two or more tracks, a conductor for each track, a switch track, a conductor therefor normally maintained out of working circuit, and also out of operative position, and means for simultaneously moving said conductor into working circuit and also into operative position with the setting of said switch track; as and for the purpose set forth.

7. In an electric railway, two or more tracks, conductors therefor, a switch track, a conductor therefor comprising a movable section, a pivotally mounted support therefor, means normally maintaining said support in folded or retracted position, whereby said conductor is held out of working circuit and also in inoperative position, and means for rocking said support to move said section into working circuit and operative position; as and for the purpose set forth.

8. In an electric railway, two or more tracks, conductors therefor, a switch track, a conductor therefor comprising a movable section, pivotally mounted standards supporting the same, an arm, adapted when actuated to rock said standards, whereby said conductor section is moved into or out of operative position, and is cut out or in the working circuit, and an adjustable weight arranged to normally retain said conductor section in inoperative position and out of working circuit; as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 10th day of June, 1895.

HENRY M. BRINCKERHOFF.

Attest:

S. E. DARBY,

JUDSON LATTIN.