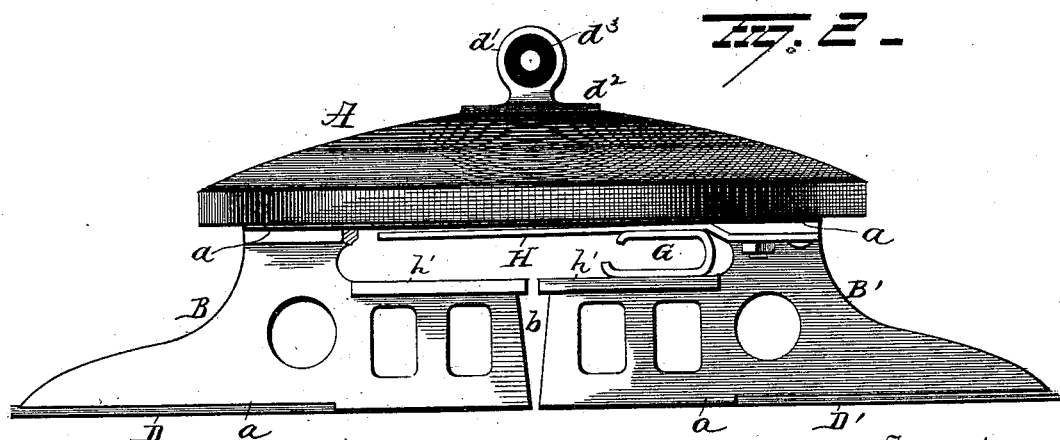
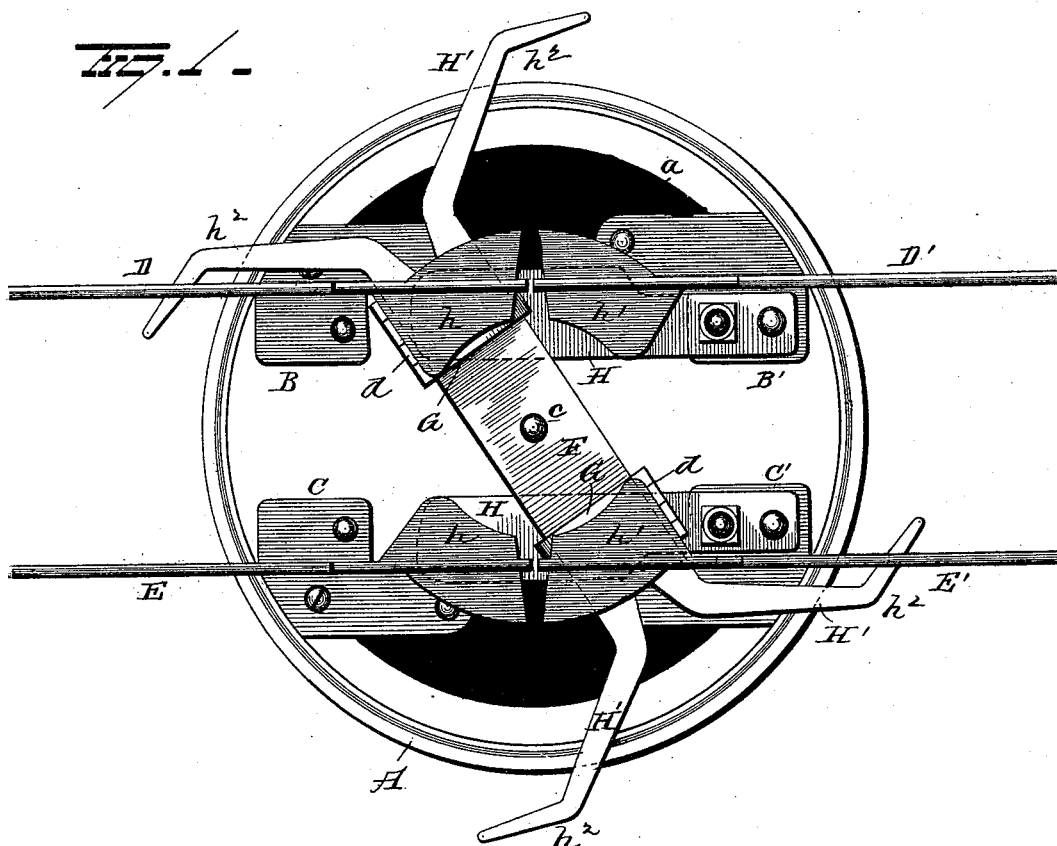


4 Sheets—Sheet 1.

No. 419,618.

Patented Jan. 21, 1890.



Witnesses
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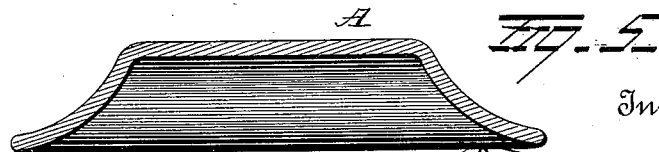
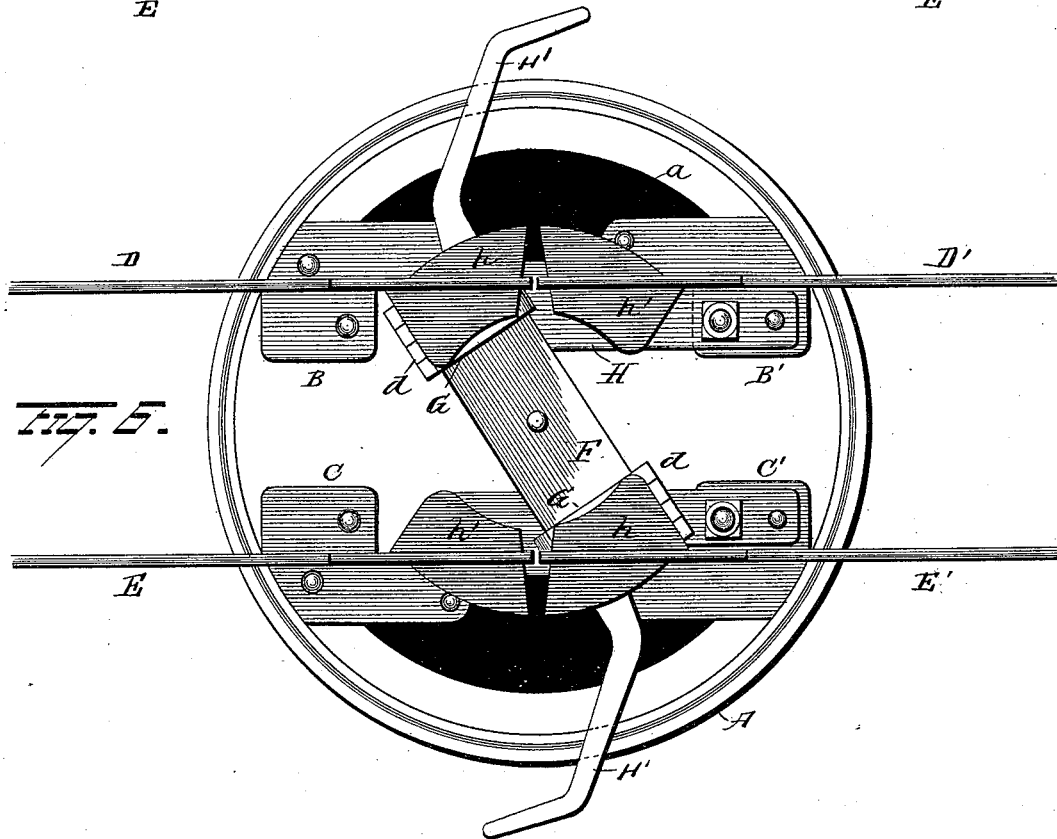
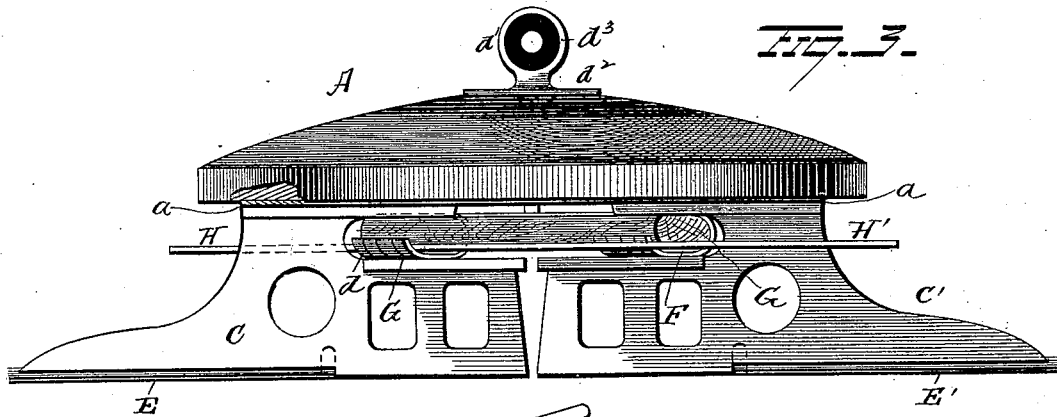
(No Model.)

4 Sheets—Sheet 2.

T. E. ADAMS.
ELECTRIC RAILWAY SYSTEM.

No. 419,618.

Patented Jan. 21, 1890.



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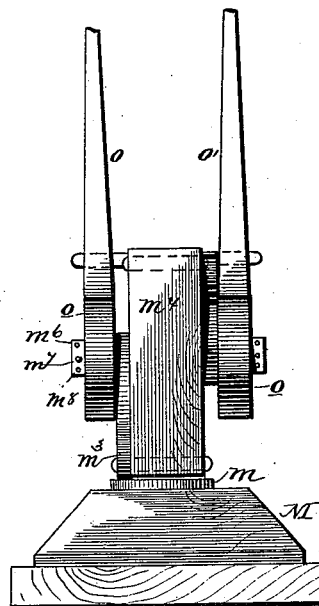
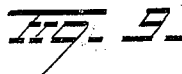
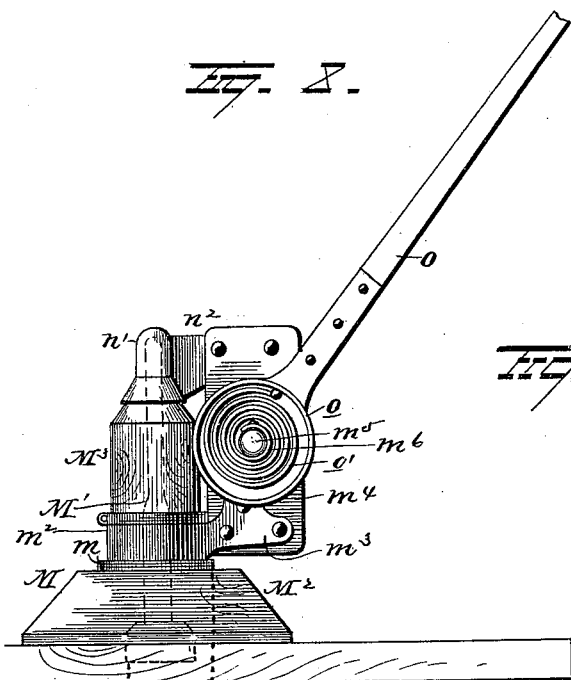
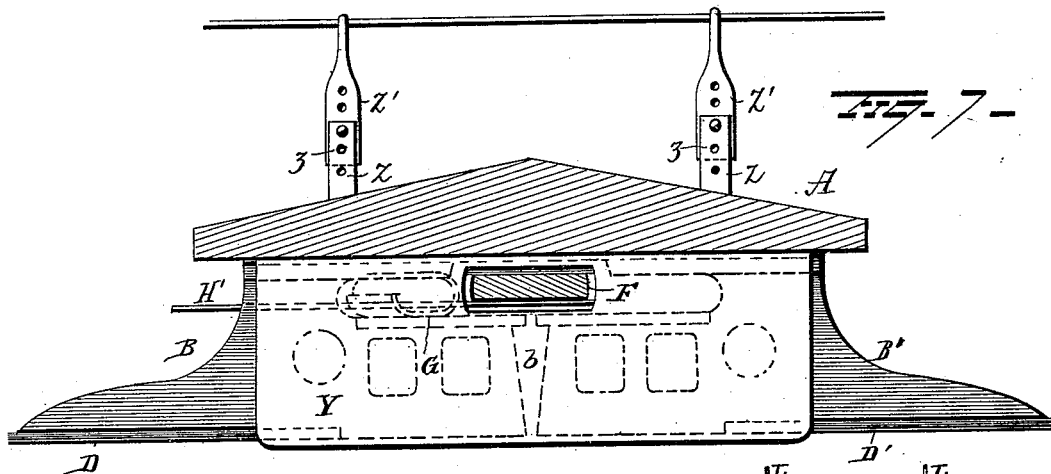
(No Model.)

4 Sheets—Sheet 4.

T. E. ADAMS.
ELECTRIC RAILWAY SYSTEM.

No. 419,618.

Patented Jan. 21, 1890.



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UNITED STATES PATENT OFFICE.

THOMAS EDGAR ADAMS, OF CLEVELAND, OHIO.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 419,618, dated January 21, 1890.

Application filed July 24, 1889. Serial No. 318,552. (No model.)

To all whom it may concern:

Be it known that I, THOMAS EDGAR ADAMS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric-Railway Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in electric-railway systems and line-switches, the object of the invention being to provide a series system for electric railways with switches for simultaneously breaking the circuit of one conductor and closing the circuit of the other conductor.

A further object is to provide the switch governing the circuits comprising the starting-block of the system, with targets or signals for indicating the adjustment of all the other switches of the system, and thereby enable the trolley-pin by which the switches are automatically actuated to be properly adjusted.

A further object is to provide a station or car-starter switch of such construction that the current may be either shunted around the car to allow the latter to remain on the starting-block in a state of rest, or to so direct the current as to actuate a lamp in the car or other signal to indicate the starting time of the car.

A further object is to provide an improved construction of switch for electric-railway system.

With these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the lower side of my improved switch. Fig. 2 is a side view of the switch with the switch-bar removed to more clearly illustrate the contacts. Fig. 3 is a side view of the switch. Fig. 4 is a view of the switch-cover, the switch being detached therefrom. Fig. 5 is a side elevation of a modified form of switch-cover. Fig. 6 is a plan view of the under side of a switch in which each end of the switch-bar is provided with one projection only. Fig. 7 is a view of a modified con-

struction of switch which is provided with a partition of refractory material and also with adjustable supports. Fig. 8 is a view in side elevation, and Fig. 9 is a view in end elevation, of my improved trolley-poles and trolleys. Fig. 10 is a diagrammatic illustration of my improved electric-railway system; and Fig. 11 is a side view of a switch provided with targets.

A represents the top plate or cover of my improved switch. The cover is preferably made of wood and circular in form, it being sufficiently large to project at its edges and protect the operative parts of the switch. To the under side of the cover are fastened the depending brackets B B' and C C', which are preferably made of cast-brass. The brackets B B' are located parallel to the brackets C C'. The brackets composing each pair B B' and C C' are separated from each other at their adjacent ends. Each bracket is separated from the cover by a strip *a* of vulcanized material, asbestos, mica, or other refractory material, which serves to protect the insulating frame or cover from arcs that might occur in operating the switch. To the lower edges *a'* of the brackets B B' are secured the adjacent ends of the line-conductors D D', while to the lower edges of the brackets C C' are secured the adjacent ends of the line-conductors E E'.

The conductors D E and D' E' constitute the ends of two adjacent sections or blocks. It will be observed that the conductors are so secured to the lower edges of the brackets that the latter are flush with the lower surfaces of the conductors and form an intervening trackway between their adjacent ends, on which the trolley may travel without interruption in passing the switch. The two sets of brackets to which the conductors are secured operate to separate the ends of two adjacent blocks or sections of the conductor, each pair of brackets being separated by a space *b*.

F is a switch-bar, made of wood or other non-conductor, and is centrally pivoted by the pin or bolt *c* to the underside of cover A. To each end of the bar F is secured double contact-plate G, which is preferably made of copper, and with its ends subdivided into fingers or springs *d*. The upper portion of

such contact G bears against a spring contact-plate H, which is of such length as to extend over the contact-surface $h h'$, formed on the brackets of each pair. One contact-plate H is secured at one end to bracket B', its free end projecting over the surface h' on bracket B. The other contact-plate H is secured to bracket C', the free end of the contact projecting over the surface h' on bracket C.

When the switch-lever is in the position shown in Fig. 1, the circuit will be closed from conductor D' through bracket B', contact-plate H, spring contact-plate G, bracket B, to conductor D, while the circuit through conductors E E' is broken. By shifting the switch-lever in the opposite direction the circuit between the conductors D D' will be broken and the circuit between the conductors E E' will be closed. To each end of the switch-bar is secured a fork H', consisting of the two bent arms h^2 , with which engages a pin or other suitable device carried by the trolley, for automatically operating the switch, as will be hereinafter described.

To the cover of the switch is fastened a ring d' by a suitable flange d^2 . Within the ring is placed an insulated perforated disk d^3 , through which is inserted a bar or wire for supporting the switch and line-conductors attached thereto.

The switch-cover, instead of being of the shape illustrated in Fig. 1, may be of the form shown in Fig. 5, which resembles an inverted wash-bowl, and the cover, instead of being made of wood, may be made of vulcanite or other non-inflammable material.

In Fig. 6 I have represented a switch in which a single tine or arm is attached to each end of the switch bar or lever, and this construction will serve the purpose when it is not desired to operate the switch when backing through it. The outer end of the tine or projection is constructed with a return-bend y to provide for the ready and complete throw of the switch.

In Fig. 7 I have represented another modification of switch, in which Y represents a partition of refractory material, which is located between the parts that carry current, and serves to prevent the flame of any arc reacting from one conductor to the other, and in a driving rain shield and protect one side of the switch. This partition may be secured to the cover and be provided with a central slot for the operation of the switch-lever. In this construction the cover is furnished with upwardly-projecting ears Z on each side, which are provided with a series of holes z , to allow of their adjustable attachment to the lugs Z', attached to the supporting-wire. This method of attachment allows the switch to be maintained level, although the suspending-wire is not level.

Fig. 10 illustrates the line-conductors of an electric-railway system embodying my invention. The letters A² represent my improved switch, each provided with the forks H' H'.

It will be observed that the complete circuit is subdivided into blocks or sections 1 2 3, &c., and that at the ends of the conductors of the adjacent blocks or sections is located a switch A². In the drawings I have represented two cars, the car I being connected with section 2 and car I' with section 4 of the conductors. J J' represent two trolleys carried by each car, and K the conductor connecting the trolleys and including in its circuit the car-motor. The trolley J of one car is provided with a switch-actuating pin L, while the trolley J' of the other car is provided with a pin L'.

I have illustrated one suitable form of trolley and trolley-pole in Figs. 8 and 9 for use in my improved electric-railway system. M represents a trolley-stand, which is secured to the roof of the car or to a plank fastened to the roof. Within the stand is located a metal pivot M', which is encircled by the wooden blocks M² M³. A brass sleeve m encircles the wooden block M³ and is electrically connected with the car-motor by a wire m' . Surrounding the brass sleeve is a bracket-ring m^2 , which is formed integral with a bracket m^3 , fastened to a wooden block m^4 . The bracket m^3 is constructed with a journal or trunnion m^5 , on which is placed a sleeve m^6 , which may be secured in any desired rotary adjustment by a pin m^7 , extending through the sleeve and fitting into any one of the series of holes m^8 , formed in the outer end of the journal m^5 . The pivot M' is electrically connected with the car-motor by a conductor n . The upper end of the pivot has supported thereon a bearing n' , which is formed on a bracket n^2 , which is constructed like the bracket m^3 .

O O' are trolley-poles, each being constructed as follows: A housing o , secured to the lower end of the pole, is journaled on the bracket-sleeve m^6 . A spiral spring o' is located within the housing, one end of the spring being secured to the sleeve and the other end to the housing. By varying the rotary adjustment of the sleeve m^6 the tension of the spring may be varied as desired. The trolley-pole is preferably constructed of steel at its lower end and wood at its upper end. J is a trolley-shoe pivoted to the upper end of the trolley-pole. The shoe is made trough-shaped for the reception of the line-conductor, and is provided with an oil-chamber o^4 , for lubricating purposes.

L is a pin detachably secured to the trolley, and serves to actuate the switches. I make no claim in this patent to the trolley-stand, trolley-poles, or trolleys, as such improvements constitute the subject-matter of another application, Serial No. 313,822, filed June 11, 1889, but refer to them for the purpose of imparting a clear conception of the invention of this patent.

Referring again to Fig. 10, P represents a dynamo, one pole of which is connected by the conductors $p p'$ with the two line-con-

ductors D E, while the other pole is connected to the pivotal bar q of the switch-lever q' of a controlling-switch Q. Upon the frame or base-plate q^2 of the switch, which part is preferably made of wood or other good non-conductor, are secured the contacts q^3 and q^4 , the latter being connected with the line-conductor E by a conductor q^5 , while contact q^3 is connected with the line-conductor D by a conductor q^6 . The switch-lever q' is provided with a contact r , which is held in contact with either of the contacts q^3 or q^4 by a spiral spring r' .

The controlling-switch is located in the car-starter's room at the terminal of the railway. By shifting the switch to one position the current will be shunted past a car standing on section 1, and thereby go to line without passing through the motor or other translating device on the car. By shifting the switch-lever to its other position the current may be sent through a lamp in the car and motor or operate any other signal which will serve to notify the driver to proceed on his trip. In order that the driver may know on which side or with which trolley to connect the trolley-pin, I provide switch No. 1 with targets T T', which are attached to the fork-arms in such a manner that the target is only visible on the side the pin should be placed. In order to actuate the switches properly, the switch-pin on the trolley should be on the side opposite to that of the next preceding car and the next car to follow.

Having described the construction and arrangement of parts composing my improvement, I will now briefly describe its operation.

We will assume that a car has already started and has automatically shifted the switches along the line so that they will stand in one direction. A car is standing on section 1, and switch No. 1 is in the position indicated by the dotted lines, in which position the target T is visible to the driver. This position of the target causes the driver to attach the switch-pin to the trolley U, if, in fact, it is not already attached to that trolley, as it will be understood that where an even number of motors are on the line the trolley or switch-pins need not be changed or shifted to the opposite trolley at the commencement of each trip, this being required only when an odd number of motors are used. The car-starter may now shunt the current past the motor by shifting the controlling switch-lever into engagement with the contact q^4 . When the starter desires to notify the driver to proceed, he throws the switch-lever into engagement with the contact q^3 , and thereby sends the current through a lamp or other signaling device in the car, so that the driver by operating the switch connected with the motor causes the current to pass through and operate the motor and propel the car. When the trolley or switch-pin engages the fork on switch No. 1, it automatically shifts the switch

and throws it into the position indicated in full lines, which serves to close the circuits of the inside conductor and breaks the current of the outside conductor, and thereby causes the current to flow through the inside conductor until it reaches the inside trolley and passes through the latter and the car-motor back to the outside conductor, and from thence to the next preceding motor. In this way any number of motors may be operated in series, each motor being provided with a device for automatically shifting the switches so as to cause the current to pass through it.

The switches are durable and simple in their construction, and are so arranged as to quickly and simultaneously break one circuit and close the other. They also serve the double purpose of switches and conductor-supports.

As it is evident that many changes in the construction and arrangement of parts might be resorted to without avoiding the spirit of my invention, I would have it understood that I do not restrict myself to the particular construction and arrangement of parts shown and described; but,

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

1. In an electric-railway system, the combination, with two line-conductors subdivided into sections or blocks, of switches arranged to support the conductors at the adjacent ends of the sections or blocks, said switches being each provided with a horizontally-movable switch-bar provided at its opposite ends with contacts, by means of which the circuit between the adjacent ends of one line-conductor is opened and the circuit between the adjacent ends of the other line-conductor is closed, substantially as set forth.

2. In an electric-railway system, the combination, with two line-conductors subdivided into separate blocks or sections, of suspended switches having the ends of the conductors of the adjacent blocks or conductors attached thereto, said switches being each provided with a cover which protects the circuit-connections and switch mechanism, and with a horizontally-movable switch-bar having each end provided with a contact for opening and closing the circuits of the two line-conductors, substantially as set forth.

3. In an electric-railway system, the combination, with two line-conductors, of a switch at the starting-station provided with targets, substantially as set forth.

4. In an electric-railway system, the combination, with two line-conductors, of a switch at the starting-station provided with targets, and trolleys furnished with a removable trolley or switch-pin, substantially as set forth.

5. In an electric-railway system, the combination, with two line-conductors, each divided into blocks or sections, and switches constructed to simultaneously close the circuit between the adjacent ends of one line-con-

ductor and open the circuit between the adjacent ends of the other line-conductor, of a switch interposed between the generator and starting sections or block, conductors for connecting the two contacts of the switch with the two line-conductors of the starting-section, and a switch-lever constructed and connected to electrically connect the generator with either of said line-conductors, and thereby divert the current either around the motor on the starting-section or through the car or motor mounted thereon, substantially as set forth.

6. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of switches located at the adjacent ends, with two separate and independently-adjustable trolley-poles, each being provided with a trolley, substantially as set forth.

7. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of a switch for opening and closing the circuits of said conductors and provided with forks on the opposite ends of the switch-lever, and a trolley-pin for engaging said forks and actuating the switch, substantially as set forth.

8. In an electric-railway system, a switch for supporting the adjacent ends of the sections or blocks of two line-conductors, provided with a switch-bar having a flexible contact mounted on each end, and a rigid and a yielding contact located on each side of the switch-frame, substantially as set forth.

9. In an electric-railway system, the combination, with two line-conductors, of a switch comprising a cover composed of insulating material provided with brackets secured to the under side of the cover so as to be protected thereby, the line-conductors being secured to the lower edges of the brackets, substantially as set forth.

10. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of a switch constructed with insulated brackets to which the conductors are secured, a yielding contact that extends over two brackets at each side of the switch, and a switch-bar carrying contacts, substantially as set forth.

11. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of a suspended switch located at the adjacent ends of two blocks or sections, said switch having a top or cover made of non-conducting material, substantially as set forth.

12. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of a suspended switch comprising a cover of insulating material, stationary contacts, and a horizontally-movable switch-lever and insulated brackets connected to the under side of the cover so as to be protected thereby, substantially as set forth.

13. In an electric switch, the combination, with contacts, of a switch-bar provided with contacts, and with forks having targets attached thereto, substantially as set forth.

14. In an electric-railway system, the combination, with two line conductors, of a switch consisting of a cover of insulating material, contacts, switch-lever, and brackets connected with the under side of the cover so as to be protected thereby, and refractory material interposed between the cover and switch mechanism, substantially as set forth.

15. In an electric-railway system, the combination, with two line-conductors subdivided into blocks or sections, of a suspended switch constructed with a top or cover composed of non-inflammable material, substantially as set forth.

16. In an electric-railway system, the combination, with two line-conductors, of a switch having refractory material interposed between the opposite contacts, substantially as set forth.

17. In an electric-railway system, the combination, with two line-conductors, of a suspended switch provided with two adjustable suspending connections, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS EDGAR ADAMS.

Witnesses:

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JOHN C. DOLPHY.