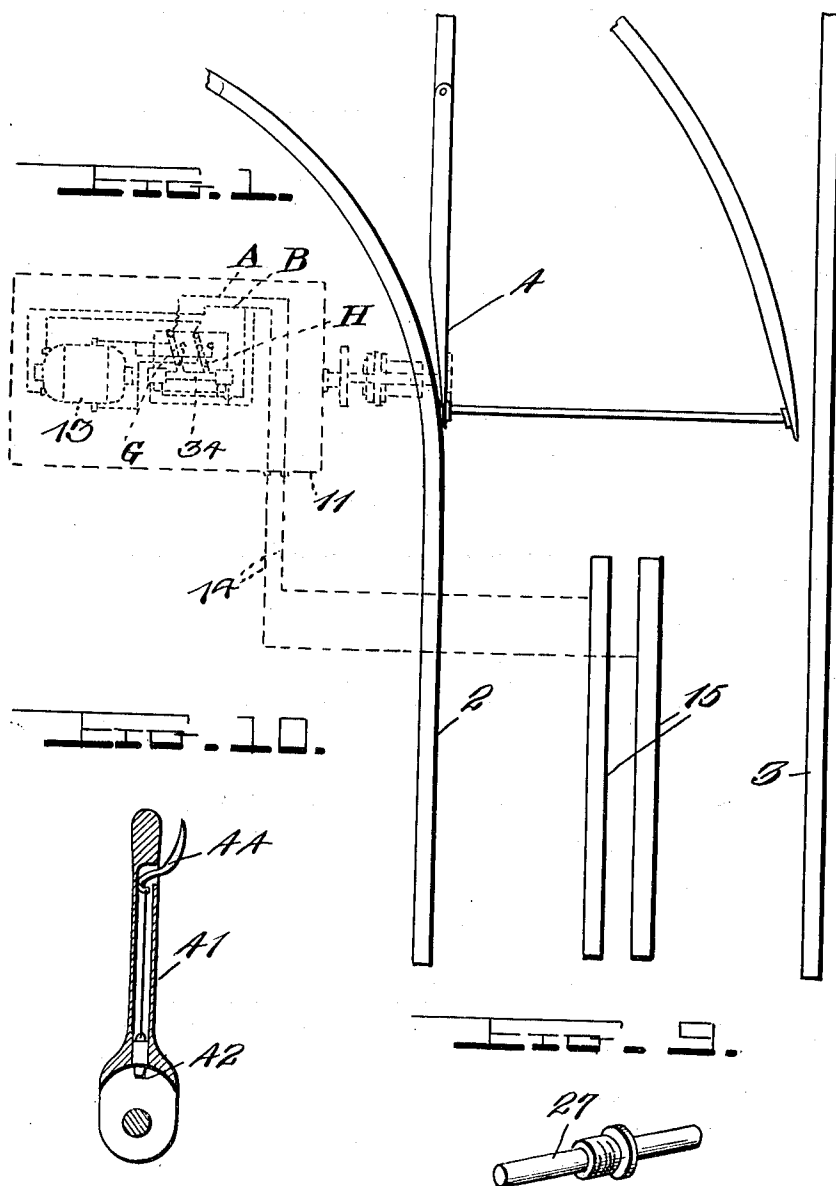


1,051,812.

Patented Jan. 28, 1913.

4 SHEETS--SHEET 1.



Inventor

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Witnesses

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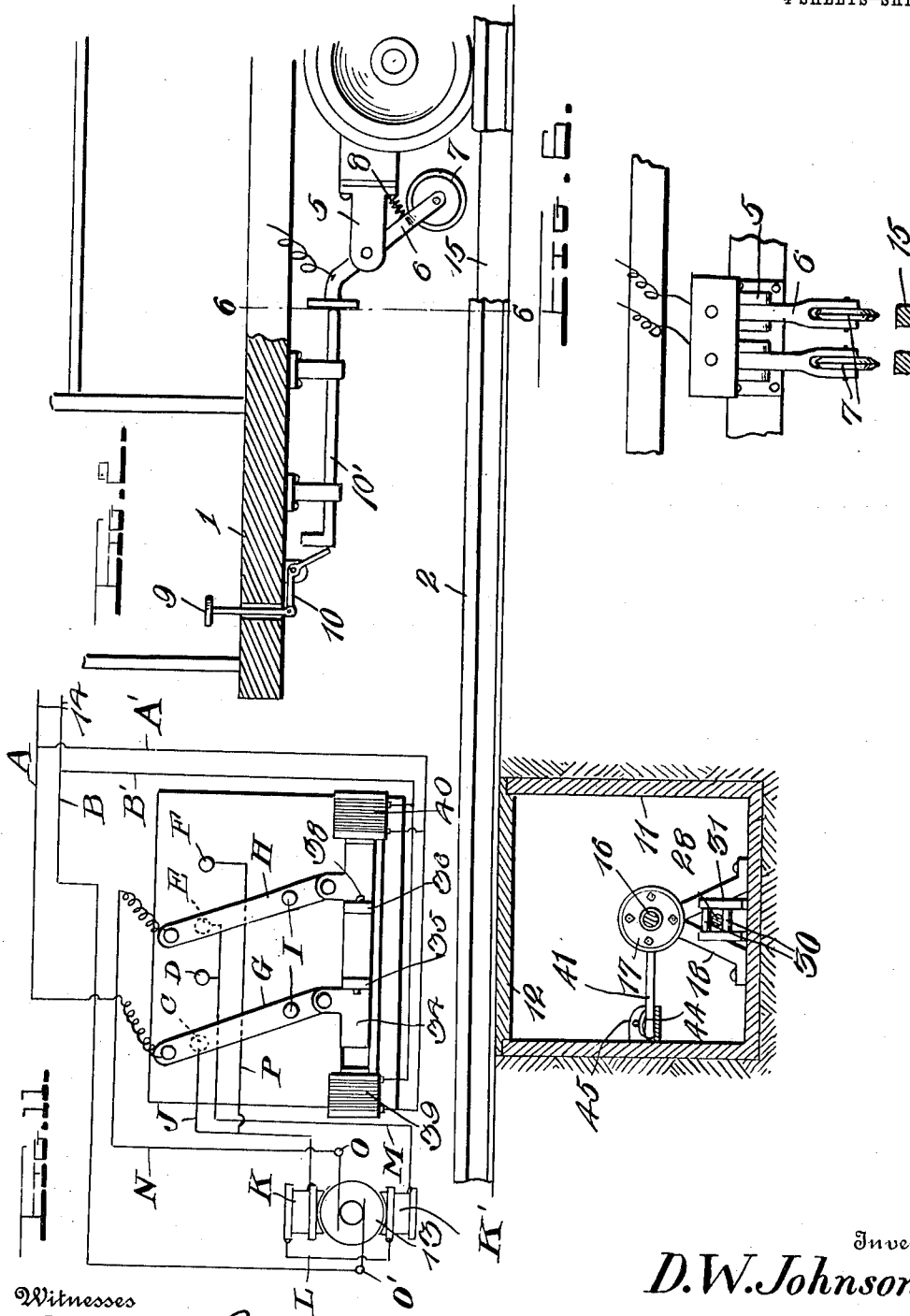
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D. W. JOHNSON.
ELECTRIC RAILWAY SWITCH.
APPLICATION FILED JULY 15, 1911.

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4 SHEETS—SHEET 2.



Witnesses

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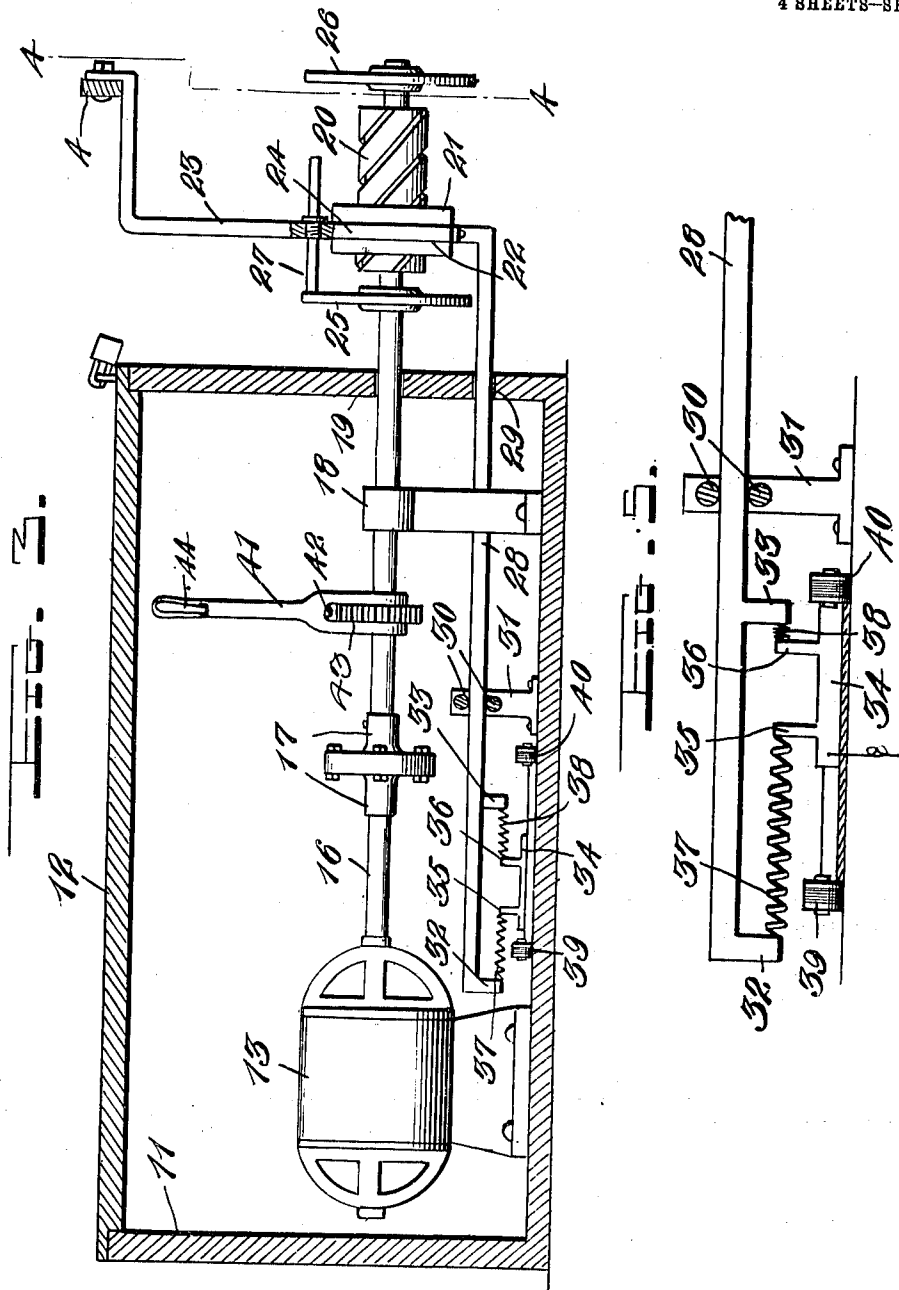
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4 SHEETS—SHEET 3.



Witnesses

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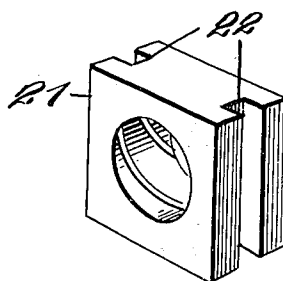
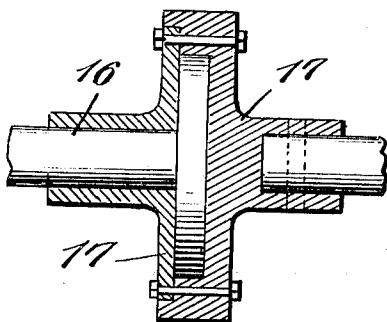
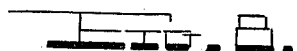
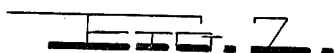
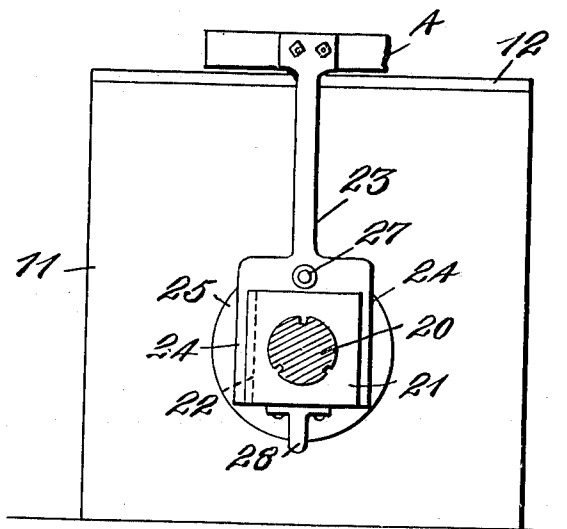
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4 SHEETS-SHEET 4.



Witnesses

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UNITED STATES PATENT OFFICE.

DANIEL WILLIAM JOHNSON, OF SAGINAW WEST SIDE, MICHIGAN.

ELECTRIC RAILWAY-SWITCH.

1,051,812.

Specification of Letters Patent.

Patented Jan. 28, 1913.

Application filed July 15, 1911. Serial No. 638,681.

To all whom it may concern:

Be it known that I, DANIEL WILLIAM JOHNSON, a citizen of the United States, residing at Saginaw West Side, in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Electric Railway-Switches, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to new and useful improvements in railway switches and more particularly to an electric railway switch, and my object is to provide a switch of this character which is controlled from the moving object.

A further object of the invention resides in providing means for the mechanical operation of the device in case of necessity.

A further object of the invention resides in providing a motor concealed under ground, and a pair of metallic strips electrically connected thereto, and a further object resides in providing means on the moving object adapted for engagement with said strips to conduct a current thereto and correspondingly to the motor.

A further object of the invention resides in providing means for automatically operating the switch through the operation of said motor.

A still further object resides in providing a device which is comparatively simple in construction and very safe and effectual in operation.

With these and other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter referred to and more particularly pointed out in the specification and claims.

In the accompanying drawings forming a part of this application, Figure 1 is a top plan view of the switch showing the strips between the rails. Fig. 2 is a fragmentary side elevation of a car on the rails adjacent the switch, showing a portion of the switch operating mechanism in section. Fig. 3 is a longitudinal section through the casing carrying the switch operating mechanism. Fig. 4 is a section as seen on line

4—4, Fig. 3. Fig. 5 is an enlarged detail side elevation of the motor reversing mechanism. Fig. 6 is a rear elevation of the pivoted arms suspended from the platform of a car. Fig. 7 is a section through the clamping means for the sections of the drive shaft. Figs. 8 and 9 are perspective views of details of the invention. Fig. 10 is a section through the hand-operated lever on the drive shaft, and Fig. 11 is a plan view of the plate upon which the switch arm is mounted, showing in diagram the electrical connections thereof.

In carrying out my invention, I shall refer to the drawings in which similar reference characters designate corresponding parts throughout the several views and in which—

1 indicates a car of the usual street railway type movably mounted on the rails 2 and 3, and 4 indicates a switch in the line of the rails, to the operation of which my invention particularly refers. Extending from the front and rear trucks of said car, is a brace arm 5, upon which is pivotally mounted the additional arms 6, said additional arms having the lower or free ends thereof provided with rotatably mounted rollers 7. The lower ends of said arms 6 are held some distance above the ground by means of coil springs 8 each of which has one end thereof engaged with an arm and the other to the brace arm 5, and in order to lower the free ends of said arms, a foot pedal or the like 9 extending through the platform of said car, has connection with the upper ends of said arms by means of the leverage 10, and the slidable rod 10' whereby the operator of the car may, at will, place his foot on the pedal and cause the lower ends of said arms to be lowered.

Concealed beneath the ground at a point immediately adjacent the switch 4, is a casing or the like 11 having a removable top 12 within which is stationarily mounted an electric motor 13 of the usual or any preferred type, said motor being connected by means of the wires 14 to a pair of metallic strips 15 which are mounted in the ground between the rails 2 and 3 adjacent said switch 4. The motor 13 is provided with a sectional drive shaft 16, the sections of which

are frictionally engaged with one another by means of the clamping members 17, one of the sections of said drive shaft being properly supported within the casing by means of a bearing 18 and extended through an opening 19 in one end of said casing. The end of the shaft 19 beyond the casing 11 has keyed thereon, a worm screw 20 which has engaged therewith, a nut or the like 21 said nut having two of its faces provided with channels or grooves 22, and an angularly designed arm or the like 23 has the lower end thereof bifurcated to form arms 24, which arms are adapted to be disposed vertically in the channels 22 of the two faces of said nut 21. The upper end of the arm 23 is adapted to be removably secured in any desired manner to the movable arm or switch point 4, whereby it will be observed that when the worm 20 is rotated, the nut will travel from one end thereof to the other and correspondingly move said arm 4, and in order to limit the movement of the nut 21 on the worm 20, a pair of disk-like stops 25 and 26 are provided and keyed, respectively, to the shaft at opposite ends of said worm 20. The angular arm 23 has also removably carried thereon above the bifurcated lower end, an arm 27, the ends of which project beyond the faces thereof and the nut, whereby as said nut travels on the worm 20, said arm 27 is adapted to contact with either the disk-like stop 25 or the stop 26, and thus limit the movement of said nut on said worm.

Secured to the lower face of the nut 21 as the same is properly positioned on the worm 20, is a bar or shaft 28 which extends through an opening 29 in the adjacent end of the casing 11, said bar or shaft being guided within said casing between a pair of rollers 30 carried on a support or the like 31. This bar 29 extends within the casing to a point adjacent the motor 13 and is provided with a pair of depending projections 32 and 33, respectively, said projections being disposed on opposite sides of the electric switch-throwing arm 34. This arm 34 is preferably of an elongated type having the upstanding arms 35 and 36 thereon, which arms are, respectively, engaged with the projections 32 and 33 of the bar by means of the coil springs 37 and 38, respectively, and said arm 34 is preferably formed of metal and movable between a pair of magnets. When the switch arm 34 is in contact with one of the magnets and the motor is started, the latter will run in one direction, which, in this instance, will cause the nut on the worm 20 and the bar 29 to travel in the direction opposite that in which the arm 34 is disposed, and when said arm is attracted to the opposite magnet, the motor will operate reversely, thereby reversing the movement of the nut 21 and car 29 and correspondingly

reversing the movement of the switch point 4 connected therewith.

The pivot arms 6 suspended from the platforms of the car are connected with the motor circuit, and when lowered at a point adjacent the switch on the track, the same will contact with the metallic strips 15 between the rails and the current passing through said arms will be conducted to said strips through the rollers or wheels 7, from which strips, said current will be passed to the motor 13 through the medium of the wires 14. As the current is passed to said motor, the same will be caused to rotate, whereby the sectional drive shaft 16 carrying the worm screw 20, will likewise be rotated to cause the nut 21 on said worm to travel one way or the other, as the case may be. In this connection, it must be stated that as the motor is energized, the magnets 39 and 40 will be simultaneously energized and the arm 34 will be attracted to the magnet in the field in which said arm is disposed at the time said magnets are energized. For convenience of illustration by description, it will be supposed that the arm is drawn to the magnet 40 upon the energizing of the motor and the worm and nut have been so arranged on the drive shaft of the motor that when the arm 34 is attracted to this particular magnet, said nut will travel in an opposite direction toward the magnet 39. The arm 28 traveling likewise in that direction and the arm 34 remaining in contact with the magnet 40, will, of course, cause the spring 37 connecting the arm 32 of the bar 28 and the arm 35 of said switch arm 34 to be expanded, and upon the raising of the pivoted arms 6, which may be accomplished by the motorman of the passing car, to disconnect the current between said arms and strips 15, the motor 13 will discontinue its rotation and the magnets 39 and 40 will be deenergized. The extension of the spring 37 upon the disconnecting of the current will cause the arm 34 to be drawn in the opposite magnetic field, and when the current is again caused to pass through the motor, as before stated, by a second passing car, said arm 34 will be attracted to the opposite magnet 39 which will cause the motor 13 to rotate in a reverse direction, thereby causing the switch point or arm 4 to be directed in the opposite direction from which it was thrown by the previously passing car. In this manner, it will be seen that every other car may be switched in the same direction which is the usual manner in which the traction companies operate the cars.

In describing the path of the circuit I shall, for convenience, refer to the two wires 14 as positive wire A and negative wire B. These wires A and B, positive and negative respectively, are connected in parallel to

the magnets 39 and 40 by the wires A' and B', said latter wires being connected to the wires A and B, respectively, whereby it will be understood that said magnets will always be energized as soon as the current passes through said wires A and B.

The reversing switch is provided with the four contact points C, D, E and F which are adapted to be engaged in alternate pairs by the switch levers G and H, said latter levers being pivoted at their inner ends to the movable arm 34 and fulcrumed intermediate their ends to the base or back plate upon which the movable arm is mounted, as shown in Fig. 11. The wire A is connected to the free end of the lever G which, as shown in Fig. 11, is contacting with the point C, said latter point being connected by wire J to one terminal of one field coil K, the other terminal of the coil K being connected by wire L to one terminal of another coil K'. The other terminal of said latter coil K' connects by the wire M to the second contact point D, said latter point being also adapted to be engaged by the lever G, when thrown in the opposite position to that shown in Fig. 11. The contact point E which is shown in the drawing as being engaged by the lever H, is also connected to the wire M which, as stated above, connects with the last referred to terminal of the coil K', and said lever H is connected at its outer end by a wire N to the one brush terminal O' of motor 13. The other brush terminal O is connected directly with the negative wire B and the last contact point F, which is also adapted to be engaged by the lever H, is connected by a wire P to the aforesaid wire J, the latter wire extending to the field coil K. As the strips 15 are energized to cause the current to pass through the wires A and B, the magnets 39 and 40 will, of course, also be energized and should the reversing switch be in the position shown in Fig. 11, the current passing through the positive wire A will be conducted to the contact point C through the lever G. From the point C, the current will be conducted through the wire J to the field coil K from where it is conducted through the wire L to the other field coil K' and from this latter field coil, the wire M conducts the current to the contact point E. The lever H being in engagement with the latter contact point will receive the current and pass the same through the wire N to the one brush terminal O of the motor 13 and after passing through the motor to the opposite brush terminal O' the current is conducted directly to the negative wire B thereby completing the circuit. Upon the energizing of the motor through the completion of the circuit, the switch will be operated in the manner hereabove described.

From the above description of the move-

ment of the arm 34 upon the deenergizing of the motor and magnets it will be understood that the levers G and H will be disposed in contact with the points D and F. Thus when the strips 15 are again energized, the current passing through the wire A will be conducted to the point D through the medium of the lever G from where the same is conducted to the field coil K' through the wire M. The current is then conducted to the coil K through the medium of the wire L and from the coil K, the same is passed to the wire J and in turn to the wire P to be passed to the contact point F. As the lever H is in engagement with the point F, the current will be passed therethrough to the wire N to be conducted to the one brush terminal O of the motor 13 and the current after passing through the motor 13 to the opposite brush terminal O', is passed directly to the negative wire B to complete the circuit. It will be noted in the tracing of these circuits, that the current in both instances passes from the brush terminals O to O' in the same direction, but in passing from one field coil to the other, opposite courses are taken.

I have also provided means for the manual operation of the switch in case of the motor burning out or other injury occurring thereto, and to this end, I provide a lever 41 which is loosely mounted on the drive shaft 16 within the casing 11. The lever is provided with a spring-forced detent 42, and the shaft 16 has keyed thereto, a ratchet wheel or the like 43, which is adapted to receive in engagement therewith, the spring detent 42 of the lever. A gripping member 44 pivoted on the handle of the lever 41, is connected with said detent 42 so that said detent may be drawn upwardly out of engagement with the teeth of the ratchet wheel 43, and in order to hold the same out of engagement with said ratchet wheel, a clamping member or the like 45 may be provided on the inner wall of the casing, and in this manner, the shaft 16 may be rotated without affecting the lever and adjunctive parts, whatsoever. Should it become necessary, however, to operate the shaft by hand, the spring detent may be lowered into engagement with the teeth of the ratchet wheel 43 and by swinging the lever, said shaft 16 will be rotated to operate the worm and nut 20 and 21, respectively, which will correspondingly throw the switch point in the desired direction.

From the foregoing, it will be seen that I have provided an electrically operated railway switch which is controlled entirely by the operator of the car, and thus, considerable time, labor and expense are saved through the use of the same. It will further be seen that the switch cannot be elec-

trically or automatically operated except by the lowering of the pivoted arm of the cars into engagement with the metallic strips between the rails. It will still further be seen 5 that in view of the particular construction of the device, the same will operate in a direction opposite to that in which it operated previously, if operated to completion each time. It will further be seen that I have 10 provided a device which is simple and economical in construction and in every way safe and effective in operation.

Although I have particularly described in the manner of operating this device that the 15 switch may be thrown in opposite directions each time the motor is energized and correspondingly dispose every other car in the same direction, it will be understood that the switch may be thrown in any direction by a 20 car not in motion and immediately over the metallic strips, whereby said car may be switched in any direction desired.

What I claim is:—

1. The combination with a pair of rails 25 having a switch in the line thereof, a motor concealed below the rails adjacent the switch, a drive shaft for the motor, means to support the same, the free end of said drive shaft being provided with a worm screw, a 30 nut in engagement with said worm, an arm having one end thereof in engagement with said nut, the opposite end of said arm being secured to the movable arm of the switch, and means to limit the movement of said nut 35 on the worm; of means to conduct an electric current to said motor.

2. The combination with a pair of rails 40 having a switch in the line thereof, a motor concealed below the rails adjacent the switch, a drive shaft for the motor, means to support the same, the free end of said drive shaft being provided with a worm screw, a 45 nut in engagement with said worm, said nut having two of the opposed faces thereof provided with grooves, an arm having one end thereof bifurcated and entered in the grooves 50 of said nut, the opposite end of said arm being secured to the movable arm of the switch, and means to limit the movement of said nut on the worm; of means to conduct an electric current to the motor.

3. The combination with a pair of rails 55 having a switch in the line thereof, a motor concealed below the rails adjacent the switch, a drive shaft for the motor, means to support the same, the free end of said drive shaft being provided with a worm screw, a nut in engagement with said worm, 60 said nut having two of the opposed faces thereof provided with grooves, an arm having one end thereof bifurcated and entered in the grooves of said nut, the opposite end of said arm being secured to the movable arm of the switch, and means to limit the

movement of said nut in the worm; of means 65 to conduct an electric current to the motor, and additional means coöperating with said nut, whereby the rotation of said motor may be reversed.

4. The combination with a pair of rails 70 having a switch in the line thereof, a motor concealed below the rails adjacent the switch, a drive shaft for the motor, and means coöperating with one end of said drive shaft and the movable arm of the 75 switch to throw the latter upon the rotation of said motor; of means to conduct a current to said motor, a pair of electro-magnets adapted to be energized upon the charging of said motor, an electric switch-throw 80 ing arms disposed between said magnets and adapted to be held by the same, and means to dispose said electric switch arm into positions to be alternately held by said magnets.

5. The combination with a pair of rails 85 having a switch in the line thereof, a motor concealed below the rails adjacent said switch, a drive shaft for the motor provided with a worm screw on the free end thereof, means to support said drive shaft, a nut in engage- 90 ment with said worm, and connecting means between said nut and movable arm of the switch; of means to conduct a current to the motor, a pair of magnets in connection with the motor and energized when said motor is 95 energized, an electric switch arm disposed between said magnets and adapted to be held by the same when energized, and means coöperating with said nut to dispose the last referred to switch arm in positions to be 100 alternately held by said magnets.

6. The combination with a pair of rails 105 having a switch in the line thereof, a motor concealed below the rails adjacent said switch, a drive shaft for the motor provided with a worm screw on the free end thereof, means to support said drive shaft, a nut in engagement with said worm, and connect- 110 ing means between said nut and movable arm of the switch; of means to conduct a current to said motor, a pair of magnets adapted to be energized upon the energizing of the motor, an electric switch arm for the motor disposed between said magnets, 115 an arm connected with said nut and movable therewith, and spring members connecting said arm with the electric switch arm from opposite sides thereof.

7. The combination with a pair of rails 120 having a switch in the line thereof, a motor concealed below the rails adjacent said switch, a drive shaft for the motor provided with a worm screw on the free end thereof, means to support said drive shaft, a nut in engagement with said worm, and connecting 125 means between said nut and movable arm of the switch; of means to conduct a current to said motor, a pair of magnets adapt-

ed to be energized upon the energizing of
the motor, an electric switch arm for the
motor disposed between said magnets, an
arm connected with said nut and movable
5 therewith, the free end of said arm being
disposed adjacent said magnets and pro-
vided with a pair of spaced depending pro-
jections, said projections being disposed on
opposite sides of the electric switch arm,

and a pair of coil springs connecting said 10
projections with the electric switch arm.

In testimony whereof I hereunto affix my
signature in the presence of two witnesses.

DANIEL WILLIAM JOHNSON.

Witnesses:

LEOPOLD L. PEARSON,
ROBT. H. RICE.