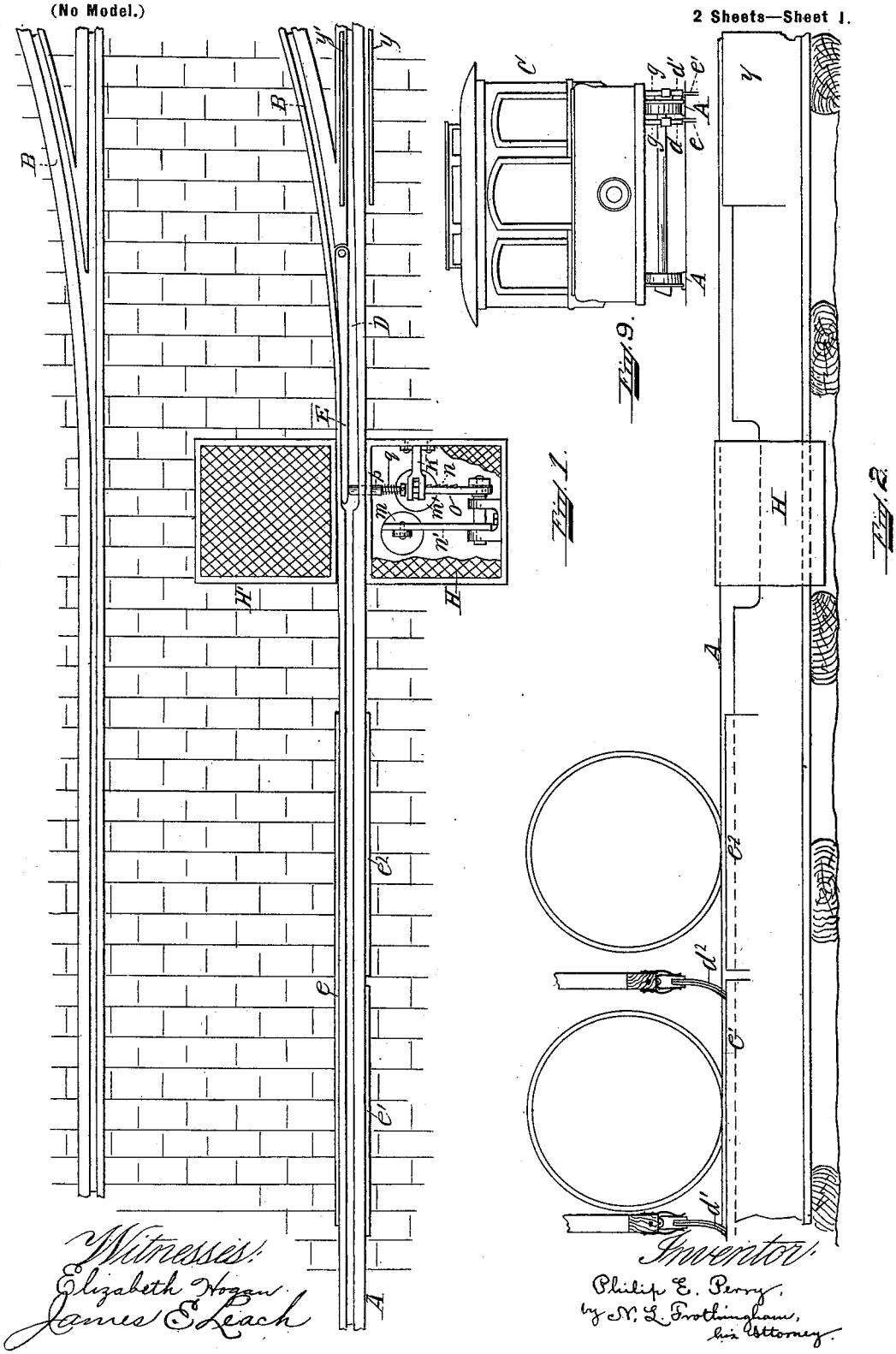
No. 646,155. Patented Mar. 27, 1900.

P. E. PERRY.

ELECTRICAL RAILWAY SWITCH.

(Application filed Aug. 17, 1899.)

(No Model.) 2 Sheets—Sheet 1.



Witnesses:
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James E. Leach.

Inventor:
Philip E. Perry,
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his Attorney.

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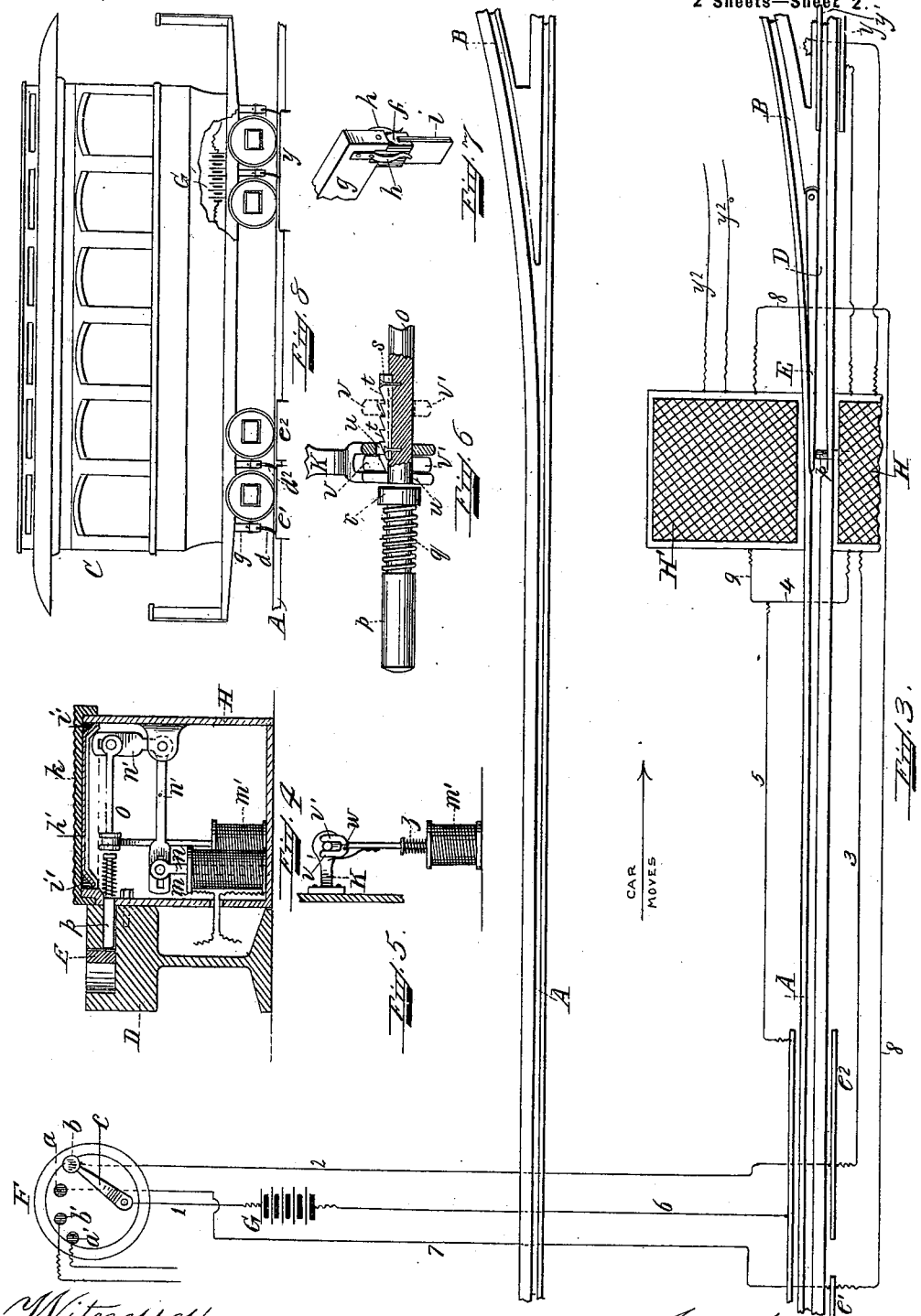

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UNITED STATES PATENT OFFICE.

PHILIP E. PERRY, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO RANDOLPH C. SURBRIDGE, OF CAMBRIDGE, MASSACHUSETTS.

ELECTRICAL RAILWAY-SWITCH.

SPECIFICATION forming part of Letters Patent No. 646,155, dated March 27, 1900.

Application filed August 17, 1899. Serial No. 727,512. (No model.)

To all whom it may concern:

Be it known that I, PHILIP E. PERRY, a citizen of the United States of America, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electrical Railway-Switches, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to that class of electrical railway-switches which are controlled directly from the moving car or other vehicle, and has for its object to provide a simple and efficient means for operating and controlling said switches without the necessity of stopping the car or other vehicle and without the operator being obliged to alight therefrom.

The invention consists in the novel features of construction hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

The invention is shown and described as being applied to the ordinary electric street-railway car.

Referring to the drawings, Figure 1 is a plan of the road-bed, partially broken away. Fig. 2 is a side elevation of the same, showing a portion of car-truck and brushes. Fig. 3 is a diagram of the wiring with brushes omitted. Fig. 4 is a vertical transverse section of the switch and box containing switch mechanism. Figs. 5 and 6 are detail views of the push-pin and locking mechanism. Fig. 7 is a perspective view of the brush. Fig. 8 is a side view of the car, partially broken away; and Fig. 9 is a view of the rear end of same.

Like letters and numerals of reference refer to like parts throughout the several views.

A A represent the main line of a railway, B B a branch thereof, and C a car adapted to move thereon.

D is the bed-plate of an ordinary switch, and E the switch-tongue.

F is a switchboard located on the dash-board of the car and provided with the buttons or knobs a b a' b', and c the switch-handle, said handle being connected with the battery G, which furnishes a current entirely independent from that employed in propelling the car, and also with the brush d, which is adapted to come in contact with or wipe along the contact-plate e, located in the road-bed inside the rail. The buttons a b are connected, respectively, with the brushes d' d^2, which are adapted to come in contact with or wipe along the contact-plates e' and e^2, located in the road-bed outside the rail. The connections of the buttons a' b' with the brushes on the other side of the car are not shown, as it will be readily understood that they belong to that part of the mechanism which is employed for operating a switch located on the left side of the main line instead of the right, as shown in the drawings.

In order to avoid repetition and duplication, the invention is shown and described only for operating a switch on the right-hand side of the main track and with the car proceeding in the direction indicated by the arrow in Fig. 3. The brushes d, d', and d^2 are attached to any convenient part of the trucks, the two former being attached, preferably, to a cross-bar g at or near the rear wheel and the latter to the truck about midway between the wheels. These brushes are preferably made as shown in Fig. 7 and consist of a wooden portion f, hinged to the cross-bar g or other portion of the truck, the springs h h, and a brass portion i, let into and bolted to the portion f. The contact-plates e, e', and e^2 are made of suitable conductive material and are connected with the solenoids or long-pull magnets, as hereinafter set forth. In practice these contact-plates are located in the road-bed about forrty feet approximately from the switch to be operated—that is, when the ordinary double-truck car is used. It would not be necessary to have them located so far away from the switch if a car with a shorter wheel-base line were used, it being necessary to have them far enough from the switch so that the latter may be thrown before the wheels reach it. The contact-plate e is substantially equal to the sum of the lengths of the contact-plates e' and e^2 and arranged, as shown in Figs. 1 and 2, so that the brush d' will remain in contact with the plate e' at the same time the brush d is traveling over and along the first half of the contact-plate e and that the brush d^2 will remain in contact with the contact-plate e^2 during the time that the brush d is traveling along

the last half of the contact-plate *e*. In this way the circuits are formed, as hereinafter stated, by the simultaneous contact of the brushes with the contact-plates.

H H′ denote boxes located in the road-bed and near each side of the switch to be operated. These boxes, together with their contents, are duplicates, and only one will be described, the mechanism in the box H′ being employed and brought into use when it is desired to send the car in the direction of the branch B B. The box H is waterproof and made of cast-iron and provided with a lip *g*′, extending all the way around the upper part, upon which lip a sheet-steel protection-cap *h*′ tightly fits.

i′ denotes a sealing substance, such as paraffin or other waterproof material, for the purpose of keeping out the moisture, and *k* the cover, the inner side of which fits tightly between the side of the switch and a shoulder *l* on the inner side of the box.

m is a solenoid or long-pull magnet connected with the contact-plate e^2. The solenoid (not shown) in the box H is connected with the contact-plate *e*′, all as shown in diagram in Fig. 3.

n is the soft-iron core of the solenoid, attached to the lower arm of the bell-crank lever *n*′ *n*′, and *o* a plunger attached to the upper arm of said lever. The inner end of the plunger terminates in the push-pin *p*, made, preferably, of phosphor-bronze and adapted to fit snugly into and to slide back and forth through a hole in the side of the switch-plate and when in its normal position having its end substantially flush with the inner side of the switch-plate. It is to be understood that the push-pin is located sufficiently below the top of the switch-rail so that the flange of the wheel will not strike it and that the end of the pin is entirely disconnected and is not in any way attached to the switch-tongue E. The advantage in this construction is manifold in that it permits of the switch being thrown by the ordinary switch-stick independently of the electrical mechanism and therefore without the danger of disarranging such mechanism. Again, the switch-tongue is free to slide freely and smoothly across the switch-plate, the latter being free from all obstructions and free from all holes, slots, or recesses which ordinarily become clogged from various sources, thereby reducing to a minimum the objections which have heretofore existed in switches of this class. Inasmuch as the current used for operating the switch mechanism is entirely independent from the current used for propelling the car, all danger of short-circuiting the latter current is avoided, which danger is present in all devices of this class which utilize the same current for propelling the car and operating the switch. Furthermore, by reason of the arrangement of the brushes and contact-plates as above set forth and illustrated the circuit is produced by simultaneous contact between said brushes and may at all times be depended upon for positively and surely operating the switch mechanism.

q is a recoil-spring, one end of which rests against the side of the box H and the other end against a collar *r* on the plunger *o*. *s* is a rack suitably secured to said plunger and provided with teeth *t t*.

K is a boss suitably attached and extending from the side of the box H and terminating in two similar circular portions *u u*, with a space between them, and provided with central openings through which the plunger *o*, with its rack *s*, is adapted to slide back and forth.

m′ is a small solenoid, the core of which terminates in a fork having tongues *v* and *v*′. The tongue *v* is hinged, as at *w*, and pressed against the plunger *o* by the spring *x*. The tongue *v*′ is rigid and is in contact with the said plunger. The hinged tongue *v* is irregularly shaped on its inner side, as shown in Figs. 5 and 6, and is so constructed that the rack will slide past it when the plunger is moved forward, and when the plunger has reached the limit of its forward movement the inner side of said tongue will engage with the nearest tooth on the rack after the manner of a spring-dog, as shown in dotted lines in Fig. 6, thereby locking the switch mechanism after the switch has been thrown.

The solenoid *m*′ is connected with the contact-plates *y y*′, located in the road-bed a short distance from the switch and made substantially like those heretofore described.

z is a spring having its lower end resting upon the top of the solenoid *m*′ and its upper end pressing against a stud on the solenoid-core. The function of this spring is to keep the tongues *v* and *v*′ in their normal positions and so that the spring-tongue *v* will engage with the teeth *t t* at the proper time, as hereinafter set forth.

The mode of operating the above-described apparatus in so far as it has not already been set forth is as follows: The operator or motorman just before the car reaches the contact-plates *e*, *e*′, and e^2 places the switch-handle *c* upon the button *b*. As soon as the contact-brushes *d* and d^2 come in contact with the plates *e* and e^2 a circuit is formed, including the solenoid *m*, as follows: from battery, wire 1, switch-handle *c*, button *b*, wire 2, brush d^2, contact-plate e^2, wire 3, solenoid *m*, wire 4, wire 5, contact-plate *e*, brush *d*, and wire 6 to battery. The solenoid or long-pull magnet being operated by the current in the circuit, the core of the same pulls down the lower arm of the bell-crank lever *n*′ *n*′, thus causing the upper arm of said lever to push or thrust out the push-pin *p*, carrying with it the rack *s*, thereby throwing the switch-tongue over to the desired position. Shortly after the push-pin has reached the limit of the thrust the said circuit is broken by the brushes *d* and d^2 coming out of contact with their respective contact-plates, and the push-pin commences to

regain its normal position by means of the force of the recoil-spring q, when the spring-dog immediately engages or drops into one of the teeth t on said rack—that is to say, the tooth that is nearest to it—thereby locking the mechanism, so that the switch may not be displaced during the passage of the car over the same. As soon as the brushes d and d^2 come in contact with the plates y and y', respectively, a circuit is formed including the small solenoid m', thereby causing the fork provided with the tongues v and v' to be pulled down, and thus releasing or unlocking the mechanism by disengaging the spring-dog from the tooth t. When this circuit is broken by the brushes coming out of contact with the contact-plates, the mechanism in the box H returns to its normal position, ready to be operated by the next car to come along. If it is desired to have the car proceed in the direction of the branch, it becomes necessary to operate the mechanism in the box H', which is a duplicate of that contained in box H, as above stated. The operator or motorman in this event places the switch-handle c in contact with the button a, thus forming a circuit when the brushes d and d' come into contact, respectively, with the plates e and e', as follows: from battery, wire 1, switch-handle c, button a, wire 7, brush d', contact-plate e', wire 8, solenoid in box H', wire 9, wire 5, contact-plate e, brush d, and wire 6 to battery. The subsequent operation of these parts in connection with the mechanism in box H' is the same as that above described in connection with box H, it being understood that there are also contact-plates similar to y and y' located near the branch track and connected by wires y^2 y^2 with the small solenoid in box H' for the purpose of releasing the locking mechanism.

It will be readily understood that when the car is traveling in a direction opposite to the arrow in Fig. 1 it will be necessary to provide the car with a switchboard and connections similar to those above described on what is now shown as the rear dashboard and that brushes similar to those above described will be provided and located upon what are now shown as the front trucks.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a track, a vehicle adapted to move thereon, a track-switch tongue, electrical means for moving said switch-tongue in one direction, located in box H, electrical means for moving the switch-tongue in the other direction, located in box H', contact-plates e, e', e^2, in the track-bed, contact-brushes d, d' d^2, carried on the vehicle, for forming contact with said contact-plates respectively, an independent electrical generator carried on the vehicle, in open circuit with said contact-plates, brushes, and means for moving the switch-tongue, a current-switch carried on the vehicle for closing the circuit through brushes d, d^2, contact-plates e, e^2, and the tongue-moving mechanism in box H, whereby the switch-tongue is positively moved to form a continuous main line, and for closing the circuit through brushes d, d', contact-plates e, e', and the tongue-moving mechanism in box H', whereby the switch-tongue is positively moved to form continuity with the branch line, substantially as specified.

2. The combination of a track, a vehicle adapted to move thereon, a movable switch-tongue, a push-pin unattached to said switch-tongue, electrical means for moving said push-pin and tongue in one direction, means for automatically locking said push-pin, means for automatically replacing said push-pin when released, electrical means for unlocking said push-pin, contact-plates e, e^2, y, y', in the track-bed, contact-brushes d, d^2, fixed on the vehicle, for forming contact with said contact-plates respectively, an independent electrical generator carried on the vehicle in open circuit with said contact-plates, brushes, means for moving the push-pin, and means for unlocking the push-pin, and a current-switch carried on the vehicle for closing the circuit through brushes d, d^2, contact-plates e, e^2, and the means for moving the push-pin, whereby the switch-tongue is operated and automatically locked, and for closing the circuit through brushes d, d^2, contact-plates y, y', and the means for unlocking the push-pin, whereby the switch-tongue is automatically replaced on the passage of the vehicle, substantially as specified.

3. The combination of a track, a track-switch with movable tongue, contact-plates in the track-bed, a push-pin unattached to the said switch-tongue, a solenoid with movable core connected with said push-pin, locking mechanism for holding said push-pin to its place, electrical means for releasing said locking mechanism, means for restoring the switch-tongue to its normal position when released, contact-brushes, a current-switch, and a source of electrical energy in circuit with said brushes, contact-plates, current-switch, and solenoid, substantially as specified.

4. The combination of a track, a track-switch with movable tongue, contact-plates in the track-bed, a push-pin unattached to the said switch-tongue, a solenoid with movable core connected with said push-pin, locking mechanism for holding said push-pin to its place, a solenoid for releasing said locking mechanism, means for restoring the switch-tongue to its normal position when released, contact-brushes, a current-switch, and a source of electrical energy in circuit with said brushes, contact-plates, current-switch, and solenoids, substantially as specified.

5. A switch mechanism consisting of a movable tongue, an unattached push-pin bearing against the side of the said tongue, a solenoid for operating the push-pin, means for locking the push-pin in position, means for retracting said push-pin when released, and

a solenoid for unlocking the push-pin mechanism, in combination with a traveling current-switch, and a source of electrical energy in circuit with said current-switch and solenoids, substantially as specified.

6. A switch mechanism consisting of a movable tongue, an unattached push-pin bearing against the side of said tongue, a solenoid for projecting the push-pin against the tongue to move the same, a spring for retracting the push-pin when released, a locking mechanism for holding the projected push-pin until released, a solenoid for releasing the locking mechanism, and electrical means under control for operating said solenoids, substantially as specified.

7. A switch-operating mechanism comprising a push-pin for moving the switch-tongue, operative connections for moving said push-pin, a rack, a spring-dog for engaging the teeth of said rack, means for operating and releasing said spring-dog and means for restoring the said pin and dog to their normal positions.

8. A switch-operating mechanism comprising a push-pin for moving the switch-tongue, operative connections for moving said push-pin, a rack attached to said pin, a spring-dog for engaging the teeth of said rack, a solenoid or long-pull magnet for releasing said spring-dog, and means for restoring said pin and dog to their normal positions.

9. In a switch-operating mechanism, a movable switch-tongue, an unattached push-pin for moving said tongue in one direction, a second unattached push-pin for moving the switch-tongue in the opposite direction, independent solenoids for operating each push-pin, automatic means for returning each push-pin, means for locking each push-pin, electrical means for unlocking each push-pin, an electrical generator carried on the vehicle in open circuit with said means for moving and unlocking the push-pins, a current-switch for closing the circuit to operate either push-pin, or to unlock either push-pin, and brushes and suitable track-plate connections in circuit with said current-switch, and generator, and electrical operating means, substantially as specified.

10. In a switch-operating mechanism, a movable tongue, an unattached push-pin for moving said tongue, a spring locking means for holding the push-pin and tongue in the advanced position, a solenoid for releasing the said locking means, a retractile spring for replacing the push-pin, and means for replacing the locking mechanism, substantially as specified.

11. In a switch-operating mechanism, a movable tongue, an unattached push-pin for moving said tongue, means for actuating said push-pin, means for locking said push-pin in the advanced position, a solenoid for releasing said locking means, means for replacing the push-pin when the said locking means is released, and means for replacing the locking mechanism, substantially as specified.

12. In a switch-operating mechanism, a movable tongue, an unattached push-pin for moving said tongue, means for actuating said push-pin, means for locking said push-pin in the advanced position, a solenoid for releasing said locking means, means for replacing the push-pin when the said locking means is released, means for replacing the locking mechanism, and a second unattached push-pin, independent of the former push-pin, for replacing the switch-tongue at any interval of time after the former push-pin has been replaced, substantially as specified.

13. In combination, a railway main and branch track, a vehicle adapted to move on said track, a movable switch-tongue in said track, electrical means for moving said switch-tongue in one direction, independent electrical means for moving the switch-tongue in the opposite direction, automatic means for replacing the switch-tongue, independent locking means for locking the switch-tongue in either position, duplicate independent electrical unlocking means for unlocking the switch-tongue in either position, contact-plates in the track-bed for forming a closed circuit through either operative means for moving the switch-tongue at will, and through either unlocking means, brushes in circuit borne on the vehicle, for making contact with said contact-plates, an electrical generator in circuit carried on the vehicle, and a current-switch for closing circuit at will through either switch-operating device, or through either tongue-unlocking mechanism, substantially as specified.

14. In combination, a railway main and branch track, a movable switch-tongue in said track at the intersection, a vehicle adapted to move on said track, an independent electrical generator borne on said vehicle, fixed brushes on said vehicle, in circuit for forming two different closed circuits, track-plates in the track-bed for forming two different closed circuits in coöperation with said brushes, a current-switch on the vehicle for shifting the current through either closed circuit at will, and independent electromotors for moving the switch-tongue in opposite directions, one in each closed circuit, substantially as specified.

15. In combination, a main and branch track, a vehicle adapted to move on said track, an electrical generator on said vehicle, track-plates in the track-bed, a movable switch-tongue, an electromotor for moving the switch-tongue, fixed brushes on said vehicle adapted to register with two of the track-plates at once, and a current-switch on the vehicle, for forming a closed circuit through the generator, brushes, track-plates, and electromotor, thereby shifting the switch-tongue, substantially as specified.

16. In combination, a main and branch

track, a vehicle adapted to move on said track, an electrical generator on said vehicle, a pair of track-plates in the track-bed, a movable switch-tongue, means for shifting the switch-tongue, means for locking the switch-tongue, means for replacing the switch-tongue when released, an electromagnet for unlocking the switch-tongue, fixed brushes on the vehicle registering with the two track-plates at once, and a current-switch on the vehicle for forming a closed circuit through the said generator, brushes, track-plates, and unlocking electromagnet, thereby permitting the switch-tongue to be replaced, substantially as specified.

In witness whereof I have hereto affixed my signature, this 12th day of August, 1899, in the presence of two witnesses.

PHILIP E. PERRY.

Witnesses:
N. L. FROTHINGHAM,
JAMES E. LEACH.