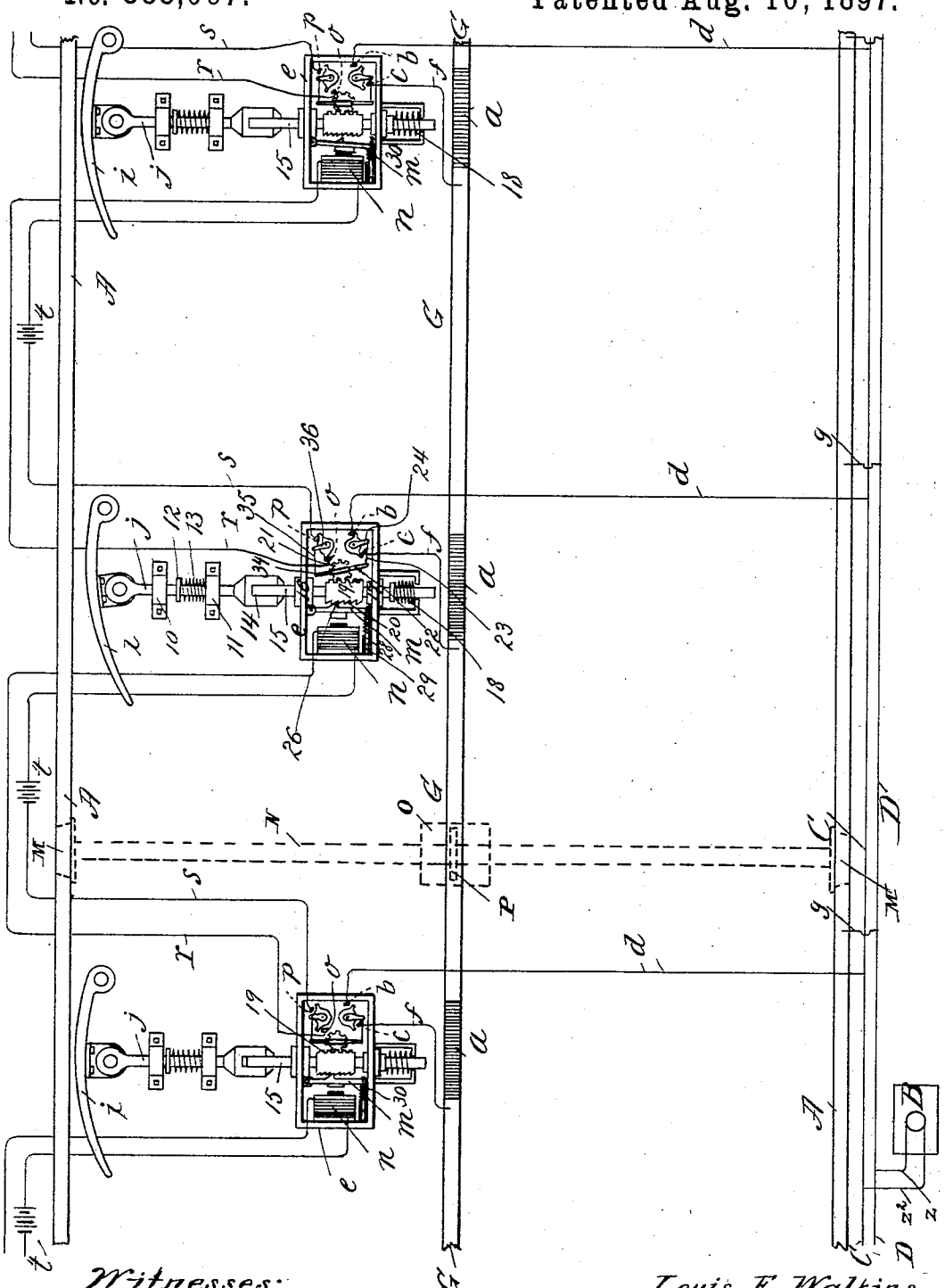
(No Model.)

L. E. WALKINS.

ELECTRIC RAILWAY SYSTEM.

No. 588,097. Patented Aug. 10, 1897.



Witnesses:
M. A. Campbell
E. J. Carrigan

Louis E. Walkins,
Inventor,
by Wm. E. Bellows Attorney.

UNITED STATES PATENT OFFICE.

LOUIS E. WALKINS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO FRANCKE W. DICKINSON, OF SAME PLACE.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 588,097, dated August 10, 1897.

Application filed April 15, 1897. Serial No. 632,257. (No model.)

To all whom it may concern:

Be it known that I, LOUIS E. WALKINS, a citizen of the United States, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Electric-Railway Systems, of which the following is a specification.

This invention relates to electric-railway systems, and more particularly to those designed for long distances and heavy traffic where the railway is exclusively used as such and as distinguished from a street-railway where carriages and pedestrians pass along or across the tracks.

The objects of the invention are to provide an improved system of electrical distribution and transmission whereby the current from the line or feed wire may be caused to pass through comparatively short track-circuits, each, say, of a thousand feet, as the car comes into such short section or circuit, the car causing the current to be in that circuit comprising the portion of the track over which it is passing to economically utilize the electric power and to aid in the operation of an electric railway of greater length than ordinary with a given generated power, and to provide a system which may be easily and cheaply maintained and one which will be practical and operative under all conditions.

The present invention contemplates the use of the ordinary track-rails, a suitable generator or power station, a feed or line wire extending throughout the system with a return conductor to the power-station, a third rail or conductor which preferably and most advantageously runs between the track-rails, being divided into insulated separate sections or blocks of suitable length—as, for instance, a thousand feet each—and electrical connections and devices whereby the motor-car or electric locomotive automatically, through one of its car-wheels, switches in a feed-circuit including the portion of the track upon which the car is running and also including its motor, the car at substantially the same time cutting out the feed-circuit, including the third-rail section over which the car has next last passed. This is done almost instantaneously while the shoe of the trolley connected with the car-motor is upon the short insulated section of the third rail, so that there is no current alive when the switch devices are operated to cut out the last circuit and to cut in the next feed-circuit in advance and whereby therefore there is no sparking at the switches to result in destructive effect thereupon.

The invention consists in an electric-railway system employing a generator or power station, a line or feed wire, a return-wire, and a third rail or conductor divided into insulated sections of suitable length, a series of successively-operating feed-circuits for supplying electrical power to the motor of the car, while on a given third-rail section are switch devices for bringing each circuit into connection with the line-wire and the section of the third rail, through the car-motor as the car comes upon such third-rail section, switch-releasing circuits each comprising an electromagnet, a pair of contacts and a switch for connecting them, and wires running from the electromagnet adjacent one section to the contacts in the next section in advance, comprising in their course a source of electrical energy therefor, a movable part for each section adapted to be actuated by the wheel of a passing car, and mechanism operated by said car-operated part for placing the switch in bearing against said contacts, said movable part also operating the switch for the feed-circuit, whereby the line-wire is always in connection with that section of the third rail upon which the car is running, an armature for each said electromagnet having a locking engagement with each said wheel-actuated switch-operating device and adapted to release same when the switch-releasing circuit becomes active, permitting said wheel-operated part to resume its normal position and the adjacent switches to open; and the invention furthermore consists in improved electro-mechanical switch mechanism comprised in this railway system, all substantially as will hereinafter fully appear, and be set forth in the claims.

Reference is to be had to the accompanying drawing, in which the figure is a view in the

nature of a plan and diagram showing the arrangement of the electric and mechanical devices comprised in the invention.

In the drawing, A A represent the usual car-track rails. B represents the power station or generator. C represents the line or feed wire, connected by wire z from the generator and running along the railway, this being understood as supported on poles, and D represents the return-wire, connected by wire z^2 back to the generator.

G represents the third rail or conductor, located on the road-bed, preferably between the track-rails A A, and formed in "blocks" or sections of any suitable length desired—as, for instance, one thousand feet each. These third-rail sections are separated at their contiguous ends by sections a, of insulating material, which in practice are about three feet long. Adjacent each insulated section a are provided two contacts b and c, and an electric wire d runs from the feed-wire to each contact b, and a second electric wire f runs from the contact c to a section G of the third rail next in advance of the separating insulation a. Wires g g connect one of the track-rails A with the return-wire D at suitable intervals, preferably one or more within the length of every third-rail section.

h represents a switch respectively provided for each pair of the contacts b c, which when in bearing thereagainst establishes conditions for a circuit, as follows: from the line-wire C through wire d, through the switch, and through the wire f to the third-rail section next in advance of the position of the switch, and the current thence passes from said third-rail section through the shoe, which is understood as carried by the motor-car or electric locomotive, and thence through the motor and the axle and car-wheel to the usual track-rail, and therefrom by the wire g to the return-wire G, back to the generator.

The switches between the contacts b c are normally open, leaving the several successive circuits such as just described throughout the railway system open, except that the switch h last passed by the car is by the latter closed, so that the circuit will be complete through the third-rail section upon which the car is running and, of course, through the car-motor.

Each switch h is automatically closed by the passing car through mechanism as follows: i represents a lever, tongue, or frog pivoted inside of one of the track-rails A and having connected thereto a thrust-bar j, playing through guide-blocks 10 11 therefor and having a shoulder 12, against which bears one end of the spring 13, the other end of this spring being seated against the block 11. The thrust-bar j has at its inner end the socket 14, in which plays the extremity of a second thrust-bar 15, guided through bearings 16 17 therefor at the opposite sides of a casing k, the spring 18 serving also to exert a pressure against the thrust-bar 15 to force it toward the lever i. The said bar 15 has at its portion within said casing k, formed thereon or attached thereto, at one side the series of rack-teeth 19 and at its other edge the series of ratchet-teeth 20. A pinion 21 meshes in said rack-teeth and has the arm 22, which through connecting-rod 23 engages a lever or crank-arm 24 of the switch h, so that when the car-wheel passes the lever i and by its flange forces it inward the inward thrust of the bars j 15 will cause a partial rotation of the pinion 21 and through the connections described a closing of the switch to unite said contacts b and c.

Within the casing is mounted to swing the lever m, which is the armature to the electromagnet n, said armature having a projection or latch 26, which coacts with the ratchet-teeth 20 to confine the thrust-bar 15 in its inward set position, the lever-tongue i and its connected rod j being free to return by the reaction of its spring to its normal position adjacent the rail immediately the car-wheel has passed by reason of the form of engagement shown at 14 between thrust-bars j and 15.

The armature-lever m has engaged at its lower end the rod 28, which plays in a guide-socket 29 therefor and which rod has surrounding it the spring 30, which exerts a bearing against the armature to maintain it in its engagement with the ratchet-teeth 20.

The switch h, after having been set in the manner described, will remain set until the armature has been attracted to the adjacent electromagnet by reason of the latter becoming energized by the establishment through it of an electric current, and for the establishment of such electric current this system comprises series of what are herein termed "unlocking-circuits," which will now be described as follows: Adjacent the insulated contacts b c and the switch h are a second pair of insulated contacts o and p and a switch q. From the contact o an electric wire r runs to connection with one pole of the electromagnet n, which is in the casing or group of devices adjacent the switch-tongue i at the section next to the rear of the one at which said wire r has its connection with the contact o, and a second electric wire s runs from the other contact p also rearwardly to the aforesaid electromagnet which is next to the rear, and one of these wires r or s comprises in its course a source of electric energy for the circuit of which it forms a part and which, as represented at t t, consists of a battery having the electrical energy therein maintained through said connecting-wire 32 from the feed-wire C.

The pinion 21 has thereon a second arm 34, which by connecting-rod 35 operates the switch q through its crank-arm 36.

It will be apparent that both switches are simultaneously closed, are both held closed for the same length of time and are simultaneously opened, and that so soon as the car reaches a given lever-tongue i, as its shoe is

passing over an adjacent insulating portion *a* between two of the third-rail sections and the feed-circuit comprising the third-rail section onto which the car is about to run is closed or established, the unlocking-circuit for the release of the latching-armature (which has been holding the feed-circuit of the next section to the rear closed) is also established, so that the electromagnet draws the armature out of engagement with the ratcheted portion of the thrust-bar 15, permitting the latter to return to its normal position, and through the mechanical connections described opening the switches *h* and *q* and opening the feed and unlocking circuits next to the rear of those which have been most lately established.

In the drawings here provided the position of the car-wheels, their axle M, the motor O, and the bearing-shoe P, which is connected with the motor and which runs on the third rail, is indicated as having just passed onto the beginning of a section, here the middle one of the three sections comprised in these illustrations, showing the switches closed for the establishment of the feed-circuit in this middle section and for the establishment of the unlocking-circuit which has become active to cut out the previous feed-circuit and release the thrust-bar 15; and of course it will be understood that when the electric car passes the left-hand tongue a new set of circuits are established, and the feed and unlocking circuits now shown to be closed will then have been opened, and so on in succession.

Of course it is understood that the contacts *b c* and *o p* are insulated one from another and that the switches *h* and *q* are suitably insulated, the particular manner of accomplishing this not being necessary to illustrate or describe, being within the province of the electrician and involving no subject-matter of invention.

It will be perceived that by reason of the lengths of the insulations *a* between the third-rail sections G being considerable—as, for instance, about three feet each in practice—there will be no live circuits at the time the switches are being operated, and hence there will be no jumping of currents and sparking to destructively affect the apparatus or to constitute a factor of danger.

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

1. In an electric-railway system in combination, the usual track-rail and third-rail section separated at intervals by insulating material, a generator or source of electrical energy and a line-wire, contact *b c* provided to correspond to each third-rail section and a switch to unite them, a wire *d* running from the feed-wire to the one contact, and a wire *f* running from the contact *c* to the adjacent third-rail section; a second set of contacts *o p*, and a switch for uniting them, an electromagnet in proximity to the two pairs of contacts for each section and an armature therefor, electric wires running from the contacts *o p* to the electromagnet adjacent the group of contacts for the section next in advance, comprising in their course a battery or the like, a movable device provided at each third-rail section actuated by the wheel of a passing car, and in turn operating to set the switches against the contacts *b c* and *o p*, the armature for the adjacent electromagnet having a locking engagement with said switch-actuating movable part to hold the switches closed until released by the circuit through the electromagnet as the car passes onto an advanced third-rail section, substantially as described.

2. In an electric-railway system in combination, the usual car-track rails, and separate third-rail sections, a generator or source of electrical energy, a line-wire, and a return-wire connecting the line back to the generator, contacts *b c* provided to correspond to each third-rail section and a switch to unite them, wires *d* running from the feed-wire to one contact and a wire *f* running from the contact *c* to the adjacent third-rail section; a second set of contacts *o p*, and a switch for uniting them, an electromagnet in proximity to the two pairs of contacts for each section and an armature therefor, electric wires running from the contacts *o p* to the electromagnet adjacent the group of contacts for the section next in advance, comprising in their course a battery or the like, and return-conductors connecting the car-track rails with said first-named return-wire, a movable device provided at each third-rail section actuated by the wheel of a passing car, and in turn operating to set the switches against the contacts *b c* and *o p*, the armature for the adjacent electromagnet having a locking engagement with said switch-actuating movable part to hold the switches closed until released by the circuit through the electromagnet as the car passes onto an advanced third-rail section, substantially as described.

3. In an electric-railway system in combination, the usual car-track rails, and a series of third-rail sections, separated by a length of insulating material, a generator or source of electrical energy, and a line-wire, contacts *b c* provided to correspond to each third-rail section and a switch to unite them, wires *d* running from the feed-wire to the one said contact and a wire *f* running from the other said contact to the adjacent third-rail section; an adjacent second set of contacts *o p*, for each section and a switch for uniting them, an electromagnet in proximity to the two pairs of contacts for each section, and an armature therefor, electric wires running from the contacts *o p* to the electromagnet adjacent the group of contacts for the section next in advance, comprising in their course a battery or the like, a movable device provided at each section opposite said length of insulating material actuated by the wheel of a

passing car, and in turn operating to set the switches against the contacts *b c* and *o p*, the armature for the adjacent electromagnet having a locking engagement with said switch-actuating movable part to hold the switches closed until released by the circuit through the electromagnet as the car passes onto an advanced third-rail section, and all whereby said switches may be operated and released at times when the car-motor is in connection with said length of insulating material, for the purpose set forth.

4. In an electric-switch mechanism, in combination, a part movably mounted and adapted to be operated by a passing object as a wheel of a car, two pairs of electric terminals or contacts for different circuits, and two switches movable to connect and disconnect the contacts of both pairs, a switch-operating part receiving movement from said wheel-operated part, and connections between it and both said switches, actuated by said switch-operating part, whereby both switches are simultaneously operated, an armature arranged to normally engage said switch-operating part, and an electromagnet adjacent the armature, substantially as described.

5. In an electric switch in combination, a part movably mounted and adapted to be operated by a passing object as a wheel of a car having a retracting-spring therefor, two pairs of electric terminals or contacts for different circuits, and two switches movable to connect and disconnect the contacts of both pairs each having a crank-arm, a part movably mounted and having a movement in one direction by said wheel-operated part and having rack-teeth, a pinion engaged by said rack-teeth, arms carried by said pinion, and connections between said arms and the switch-arm whereby both switches are simultaneously operated, an armature adapted to engage said rack-provided part, an electromagnet adjacent thereto and a retracting-spring for said rack-provided part, substantially as described.

6. In a switch mechanism in combination, the lever *i* pivotally mounted adjacent a track and adapted to be moved by a passing car, the thrust-rod *j* connected to said lever having a retracting-spring, a second thrust-rod having an engagement with the first rod whereby it is moved thereby in one direction but whereby said first thrust-rod may have its return movement without moving the second rod, said second rod having the series of rack-teeth and the series of ratchet-teeth and the retracting-spring, the two pairs of contacts or terminals for two circuits, switches applied thereto and movable to connect and disconnect said contacts, a pinion meshing said rack-teeth and connections between said pinion and said switches whereby the latter are simultaneously operated, the armature having a catch engagement with said ratchet-teeth and an electromagnet adjacent the armature, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 2d day of April, 1897.

LOUIS E. WALKINS.

Witnesses:
WM. S. BELLOWS,
M. A. CAMPBELL.