(No Model.) 2 Sheets—Sheet 1.

J. M. MURPHY & A. F. PIERCE.

ELECTRIC RAILWAY SYSTEM.

No. 566,786. Patented Sept. 1, 1896.

Fig. 1.

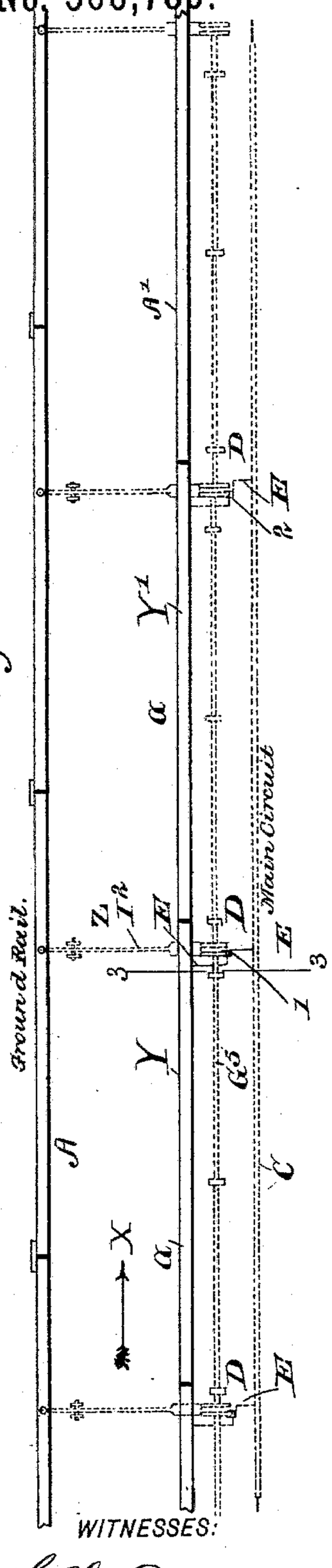
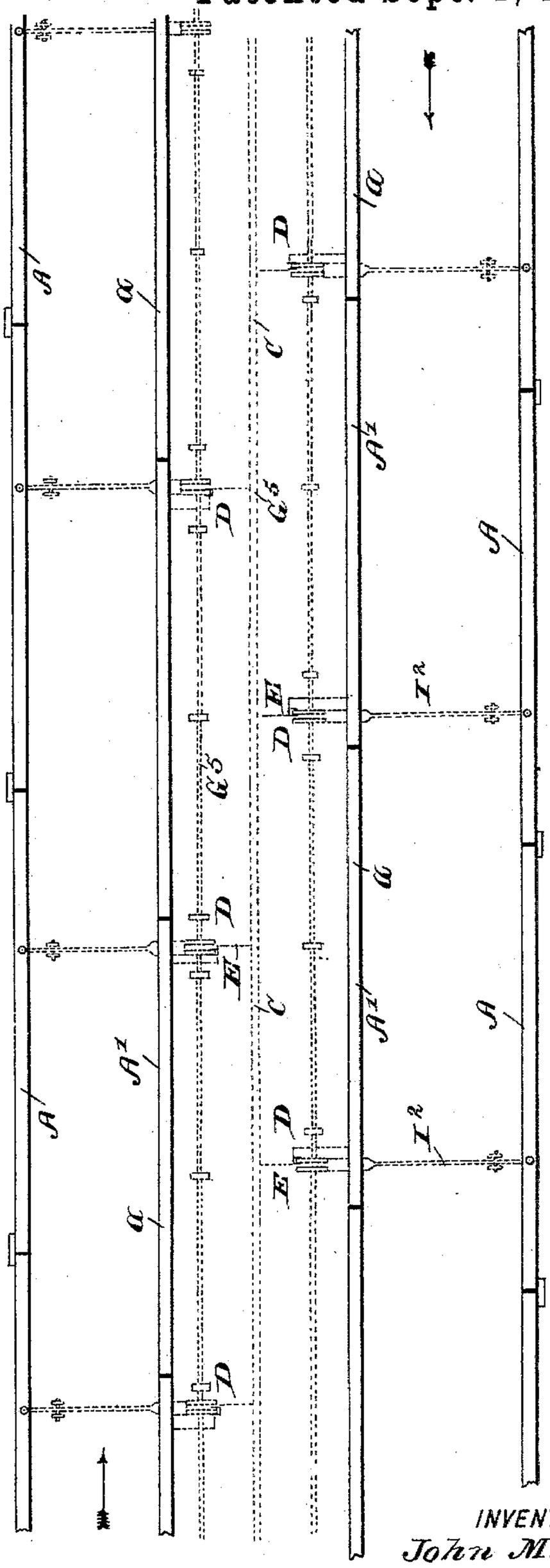


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

J. M. MURPHY & A. F. PIERCE.

ELECTRIC RAILWAY SYSTEM.

No. 566,786. Patented Sept. 1, 1896.

Fig. 3.

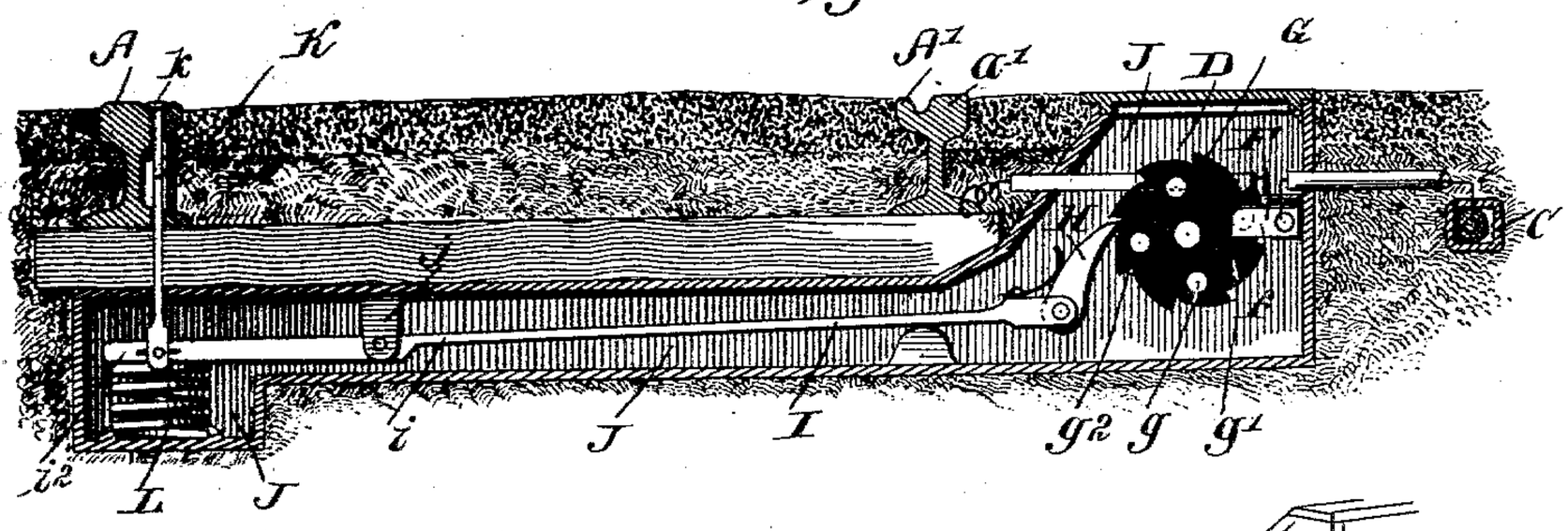


Fig. 4.

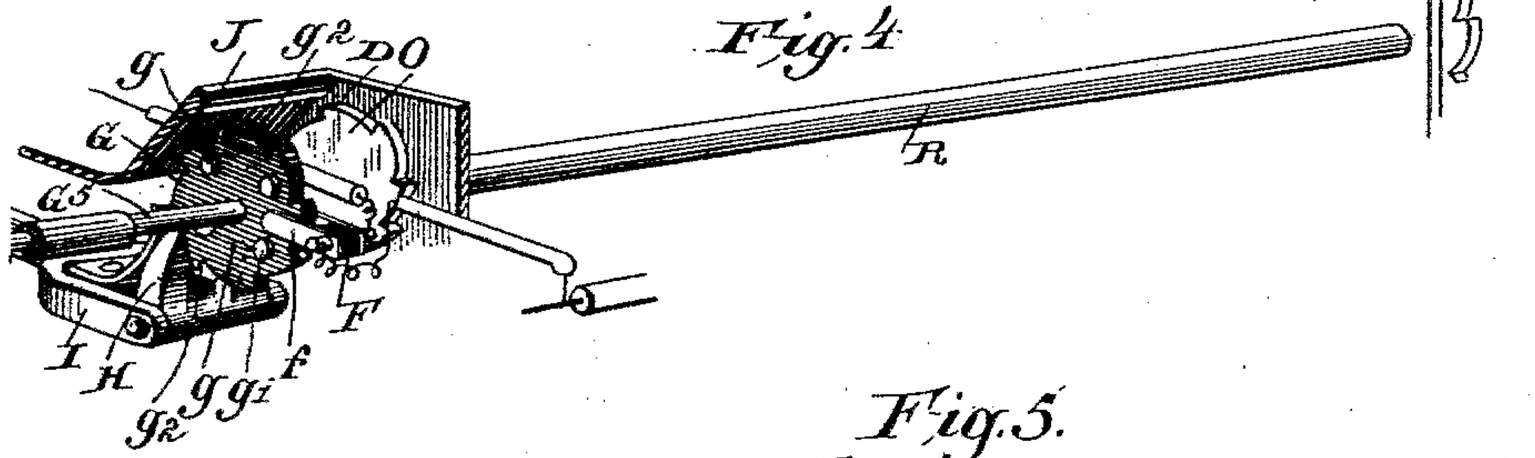


Fig. 5.

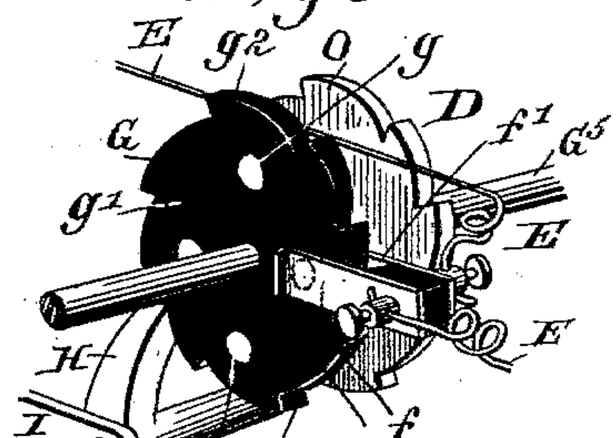


Fig. 6.

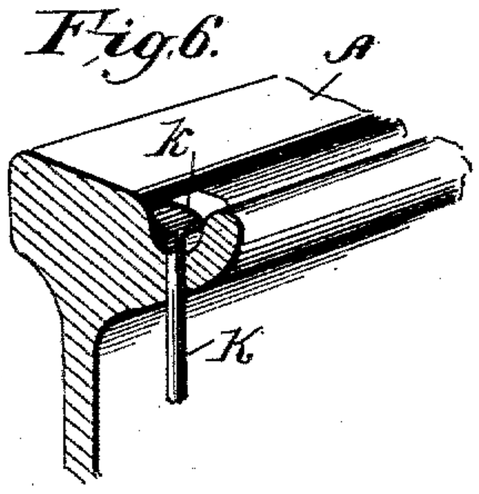


Fig. 7.

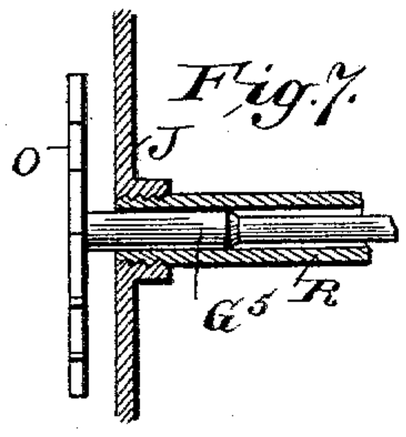


Fig. 8.

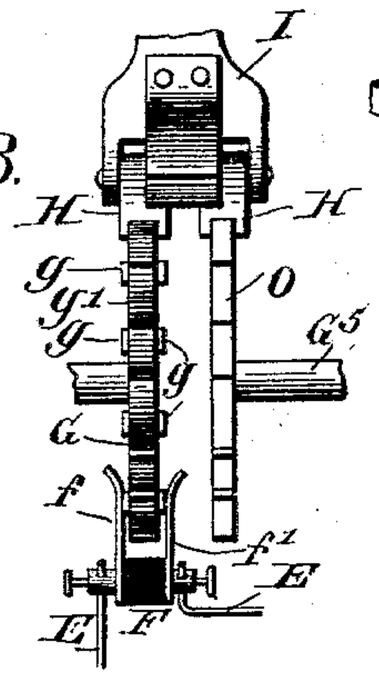
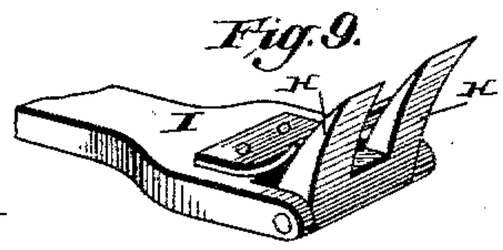


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN M. MURPHY AND ALBERT F. PIERCE, OF DANBURY, CONNECTICUT, ASSIGNORS TO THE INTERNATIONAL ELECTRICAL COMPANY, OF WEST VIRGINIA.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 566,786, dated September 1, 1896.

Application filed September 10, 1895. Serial No. 562,047. (No model.)

To all whom it may concern:

Be it known that we, JOHN M. MURPHY and ALBERT F. PIERCE, residing at Danbury, in the county of Fairfield and State of Connecticut, have invented a new and Improved Electric-Railway System, of which the following is a specification.

Our invention relates to that class of electric-railway systems wherein a main-line conductor and a series of sectional conductors are employed, through which, by suitable mechanism, the current is shunted, successively, as the car sets in operation switch devices for setting the sectional conductors. In this class of railway systems the current is shunted from the main wire to the sectional conductors by electromagnetic means or by mechanical devices carried by the car for operating the switch and cut-off mechanism. In the practical application of electromagnetic devices it has been found that such devices require a careful adjustment and arrangement and numerous subcircuits, which, particularly during wet or wintry weather, frequently get out of order, if not entirely inoperative.

Our invention primarily has for its object to provide a simple and inexpensive electric system of the kind stated in which all of the wires are practically insulated and in which the switch mechanism is operated by direct transmission of power from the passing car.

Our invention further has for its object to provide an insulated main-line wire having insulated laterals, which have cut-off devices, and operating mechanism for such devices having means projected up through the track-rail adapted to be engaged by the flange or tread-face of the wheel and thereby transmit a direct power to shift the cut-off devices.

Furthermore, our invention has for its object to provide in a system of the kind mentioned switch or cut-off mechanism which will effectively serve to shunt the current from one conductor-rail to the other, and which is operated by the movement of the car in either direction on the rail.

With other minor objects in view, which will hereinafter appear, our invention consists in an electric-railway system embodying the novel combination and peculiar arrangement of parts such as will be first described in detail, and be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic plan view illustrating our system as a single-track line. Fig. 2 is a similar view illustrating the same as a double-track line. Fig. 3 is a transverse section, taken practically on the line 3 3 of Fig. 1, showing the cut-off or switch devices and the operating means therefor. Fig. 4 is a detail perspective view, parts being in section to illustrate the arrangement of the switch or cut-off devices the more clearly. Fig. 5 is a detail view illustrating one of the cut-offs and the switch-block connected therewith. Fig. 6 is a detail view illustrating the push-pin head and its relation to the track-rail, and Figs. 7 and 8 are detail views hereinafter specifically referred to. Fig. 9 is a detail view of the double pawl hereinafter referred to.

By referring to Figs. 1 and 2 the general arrangement of our improved system will be clearly understood.

In the construction of our system the rails A A′ are insulated from each other and the rail A′ arranged in the nature of a sectional conductor comprising members *a a*, which may be of any length desired, it being manifest that by providing a system of cut-offs and switches, as hereinafter described, the lengths of the sectional conductors may vary as the conditions may require. For instance, in a city on a crowded street the sectional conductors may be of the length of a single rail, or two rails, or more, it being manifest that when a sectional conductor is formed of two or more rails the several rails forming such conductor are electrically connected. In suburban districts, especially where the trackway is on a downgrade, the sectional conductors may be much longer than in a city or on an up or level grade.

C indicates the main-line or feed wire, which is insulated its entire length and preferably held in a conduit or piping, as shown.

While we have shown our current-supply devices and operating mechanism as buried underground, we desire it understood that

we do not confine ourselves to the use of the said devices as shown, as practically the same arrangement may be used as an overhead system with but a slight modification of parts. The main wire C runs parallel with the track, preferably at one side thereof, whereby a great leverage or throw power of the cut-off-operating devices can be obtained with a minimum depression of the push-rod hereinafter referred to.

D indicates the shunting devices, which are arranged in the laterals E, which connect the sectional conductors with the live wire, as most clearly shown in Fig. 3, such shunting devices comprising a rotary cut-off G, and a switch-block F, connected therewith, having its terminals f f' connected with the sectional conductor or rail A' and the main wire C, respectively. The cut-off G is in the nature of a disk formed of non-conducting material, such as hard rubber, and provided with a series of contacts g g, spaced regularly apart, whereby to provide alternate contact and insulated portions g g'. The peripheries of the cut-offs G have a number of ratchet-teeth g^2, preferably one for each space g g', with which is adapted to engage a spring-pawl H, pivotally held on the end of a swing-lever I, which extends transversely under the track-bed, it being pivoted at its outer end, as at i, to a pendent bracket j in a housing J, provided for the said lever and the cut-off and switch mechanism. In practice such housing J at a point above the cut-offs has a covered manhole, as shown. For each of the sectional conductors a cut-off and switch mechanism (shown in Fig. 3) is provided, and each of the levers I has its outer end i^2 connected to a push or presser rod K, which extends up through the housing J and has a head k, which, when a grooved rail is used, seats in the groove of such rail a little above the base thereof. It will be noticed the member K passes up through the outside or ground rail, such arrangement being provided to obtain a sufficient sweep or throw of the pawl H and lever I to operate the rotary cut-offs with a minimum depression of the member K, whereby to keep the said member K practically out of sight and in a plane with the upper face of the rail, so as not to form an obstruction for vehicles.

We prefer to use in our system the grooved rail, as the head of the rod K will then be practically protected from being depressed and operated by heavy vehicles passing over the same.

To hold the member K from being depressed by light vehicles, whose wheels may run in the groove of the rail, or by mischievous persons, such member is normally held spring-pressed to its upper position by a powerful coil-spring L, the tension of which in practice is regulated to be overcome by the weight of the car-body.

So far as described it will be readily seen that should the cut-off be in the position shown in Fig. 4 the current from the main line to the rail will be broken and the sectional conductor connected to the cut-off be dead. When in this position, should the car-wheel flange engage the member K, such member will be depressed and the lever I, through its pawl, will rotate the cut-off G one space and move the contact-points g into engagement with the terminals to the position shown in Fig. 3 and thereby throw the sectional conductor into electric connection with the main line, it being obvious that, when so charged, the current will, as the car passes over the charged conductor, pass up through the motor and out through the ground-rail.

To provide for cutting off the current from each section as the car leaves the same and also for making any section operate independent of the others, in either direction of movement of the car, we provide each cut-off G with a shaft G^5, which extends back to the preceding conductor-section and has a toothed wheel O, corresponding in size and shape to the cut-off G of such preceding conductor, it being preferably held in close relation to but not in contact with such cut-off G. The object in thus locating the wheel O is to obtain duplex action, one for the section to be cut out and the other for the section to be made a live section. For this purpose the pawl on each lever I is a double pawl, one member of which engages the cut-off G, while the other engages the wheel O. At this point it should be stated the several cut-offs G have their contacts g g arranged alternately, *i. e.*, when one contact is in electric connection with the main wire the other is out of electric connection therewith.

By the construction shown and described it will be clearly apparent that should the car be at X in Fig. 1 the cut-off 1 will be in the position shown in Fig. 3, and all others in the position shown in Fig. 4, the conductor-section Y at this time being in electric connection. Now should the car reach the point marked Z it will depress the lever I^2, which will cause the cut-off 1 to move to the position shown in Fig. 4, and at the same time, through the wheel 3, turn cut-off 2 to its connected position and make the section Y' the live one, the section Y, as all others, being non-electric. Thus a very simple and positive switch mechanism is provided, which will effectively serve to electrify the conductor-rails, such mechanism being operative no matter in which direction the car moves, and each cut-off mechanism being independent of the other it follows that should one or more of the cut-off mechanisms get out of order it would not materially interfere with the running of the cars. As a convenient means for protecting the shafts G^5 of the cut-offs G and wheels O the same are held in tubular bearings R, which are connected at the ends to the housing J, as shown.

While we have not illustrated our system as an overhead one, it is manifest that prac-

tically the same arrangement of devices, inverted, may be used for such purposes, a trolley being made to run on an overhead track, which will serve to operate the lever-operating members K the same as the flanges of the car-wheel operate the ground system.

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

1. In a sectional-conductor electric-railway system comprising a main circuit or conductor, a series of rail-conductors, laterals connecting such rail-conductors and the main conductor, switch devices each connecting a pair of laterals having a step-by-step movement and adapted at each operation to alternately cut out one lateral and close the circuit in the other, a pivoted lever-arm extended under the track, having at one end a pawl mechanism arranged to operate the switch devices of each pair of laterals, and having at the other end a tread or presser member extended up adjacent the track, to be engaged by the passing car-wheel as set forth.

2. In an electric-railway system as described, the combination with the main-line circuit, the section-conductors, and the laterals connecting such conductors and main line, of rotary cut-offs, having alternate contact and insulated spaces and a peripheral ratchet or tooth portion for each space, the lever I and pawls H, and the presser K projected up through the ground-rail all arranged substantially as shown and specified.

3. In an electric-railway system substantially as described, the combination with the main line, the sectional conductors and the laterals, of the rotary cut-offs in such laterals having alternate contact and insulated spaces, a pivoted lever held transversely of the rails, having a normal spring resistance, a presser member for the short end of the lever adapted to be engaged by the passing car, and a pawl carried on the long end of the lever adapted to engage the cut-off G and turn it one space at each depression of the presser member substantially as shown and described.

4. In a system as described, the combination with the sectional conductors the main line, the laterals having cut-off devices and the pivoted-lever mechanism for shifting the cut-offs, of the grooved-rail sections, and the presser-rods passing down through the said rail-sections and connected with the shifting-lever, and having head portions fitting and movable in the groove in the rail, and normally held from projecting above the tread-face of the said rail-sections as specified.

5. In an electric-railway system, as specified, the combination with the main line, the sectional conductors and the laterals connecting such conductors and main line, of the rotary cut-offs G, for governing the laterals, each having a rearwardly-extending shaft having a correspondingly-shaped rotary toothed wheel, disposed adjacent the cut-off of the preceding lateral and a pivoted-lever mechanism operated by the passing car, for each cut-off, having a supplemental pawl adapted to engage the toothed wheel adjacent the cut-off, the several cut-offs having their contact-points arranged alternately, whereby as one cut-off is rotated by the lever to a cut-out position, the next succeeding cut-off will be moved to close the circuit in the lateral with which it is connected as specified.

6. In a system as described the combination with the main electric wire, the sectional conductors and laterals, of the rotary cut-offs G, having shafts G^5 provided with toothed wheels O corresponding in shape to the cut-offs G, the lever I, pawls H and presser K, the housing J, and the tubular connections for the housing J forming bearings for the shafts G^5 all arranged substantially as shown and for the purposes described.

7. An electric-railway system comprising a trackway having the rails at one side formed into a series of sectional conductors, an insulated main-line wire, held outside of and adjacent the sectional-conductor rail, a series of rotary switch devices disposed between the main-line and the conductor rail arranged to operate successively in pairs and at one operation to cut out the last conductor-section and electrify the next forward section, a pivoted lever disposed under the track having a predetermined swing, and connected with a pair of switch devices, as shown, and a push member connected with the outer end of the said lever projected up adjacent the return or ground rail member all arranged substantially as shown and for the purposes described.

JOHN M. MURPHY.
ALBERT F. PIERCE.

Witnesses:
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LEVI P. TREADWELL.