

(No Model.)

5 Sheets—Sheet 1.

G. J. FORREY.
ELECTRIC RAILWAY SYSTEM.

No. 571,435.

Patented Nov. 17, 1896.

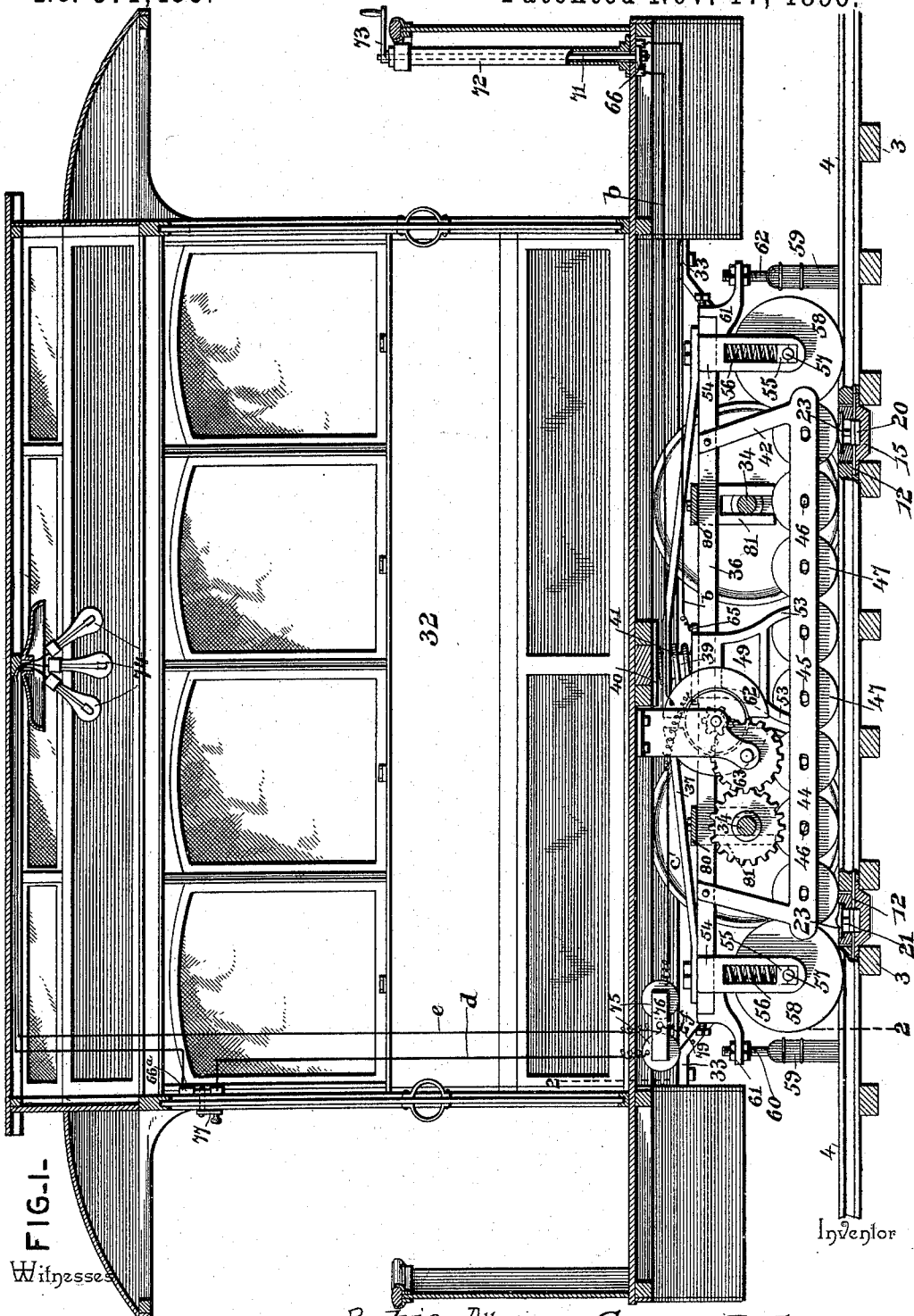


FIG. 1-

Witnesses

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FIG. 2.

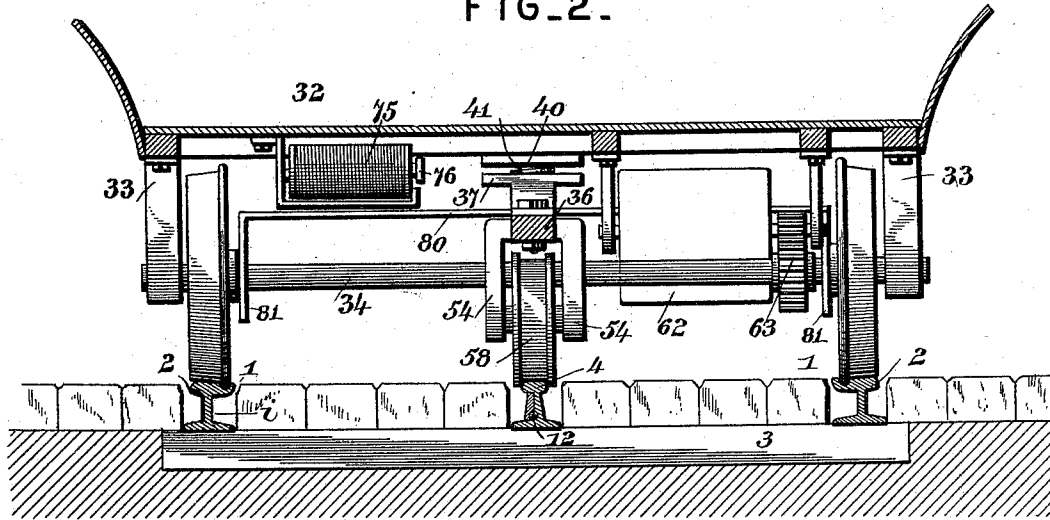


FIG. 5.

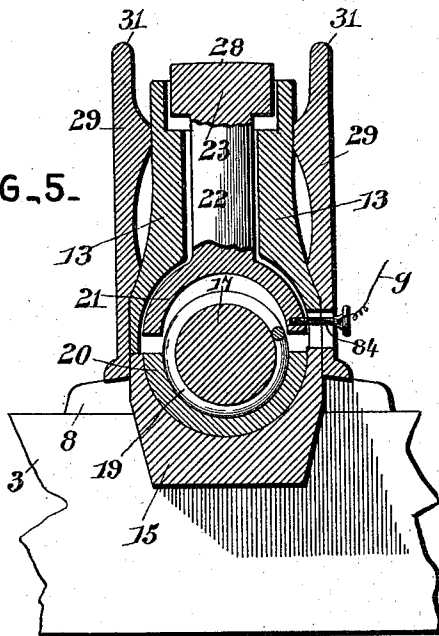
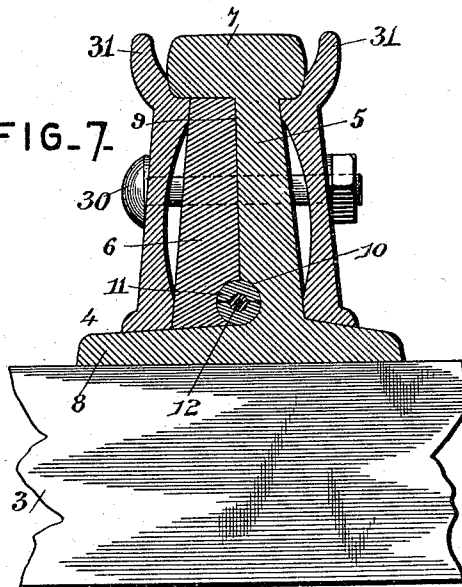


FIG. 7.



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5 Sheets—Sheet 3.

G. J. FORREY.
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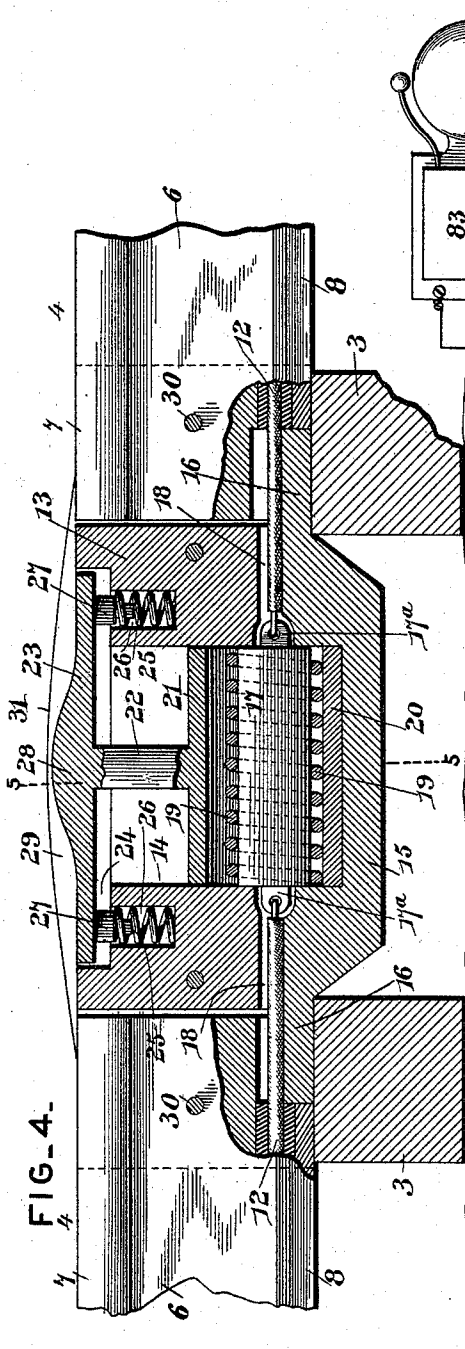


FIG. 4.

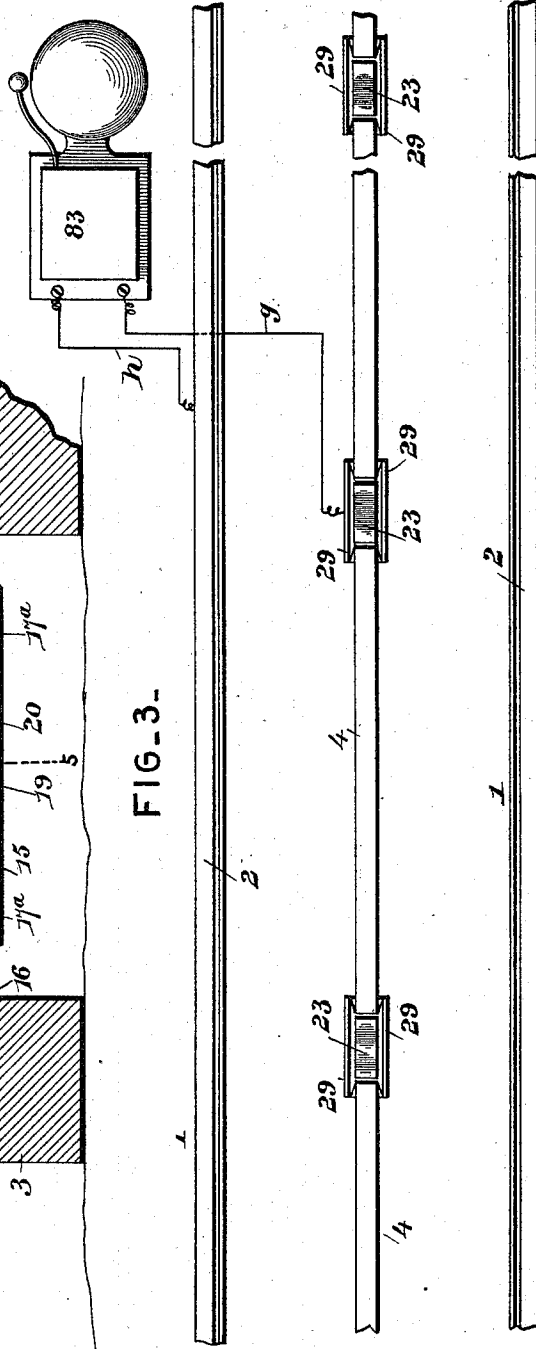


FIG. 3.

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5 Sheets—Sheet 4.

G. J. FORREY. ELECTRIC RAILWAY SYSTEM.

No. 571,435.

Patented Nov. 17, 1896.

FIG. 6-

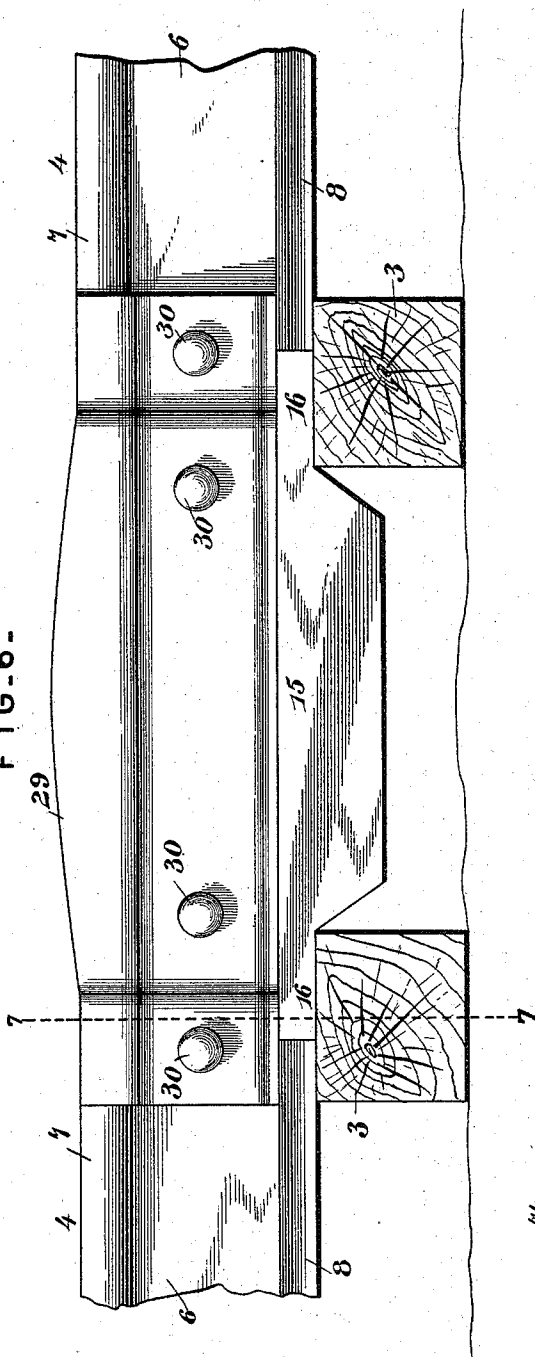
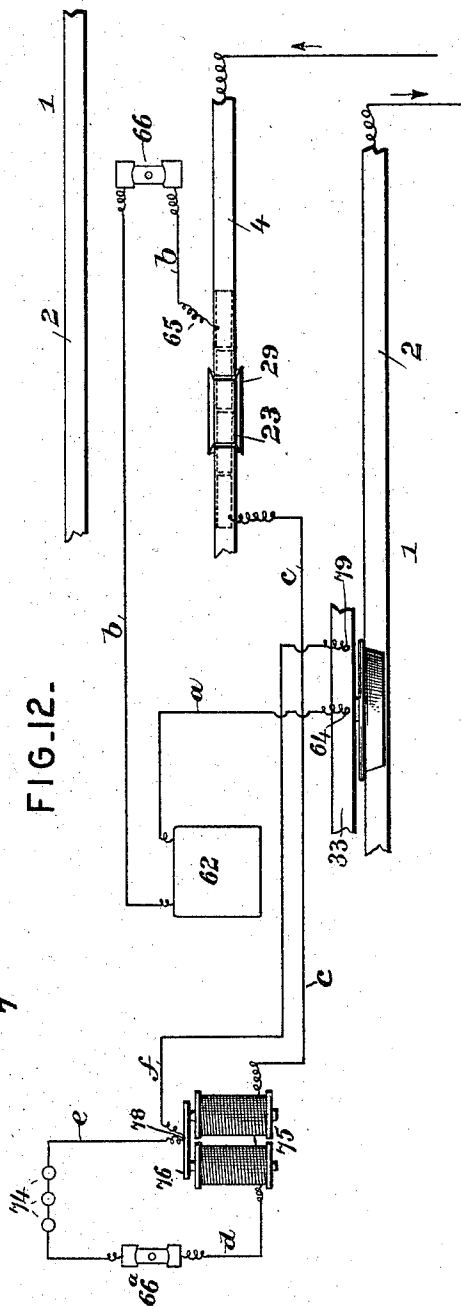


FIG. 12-



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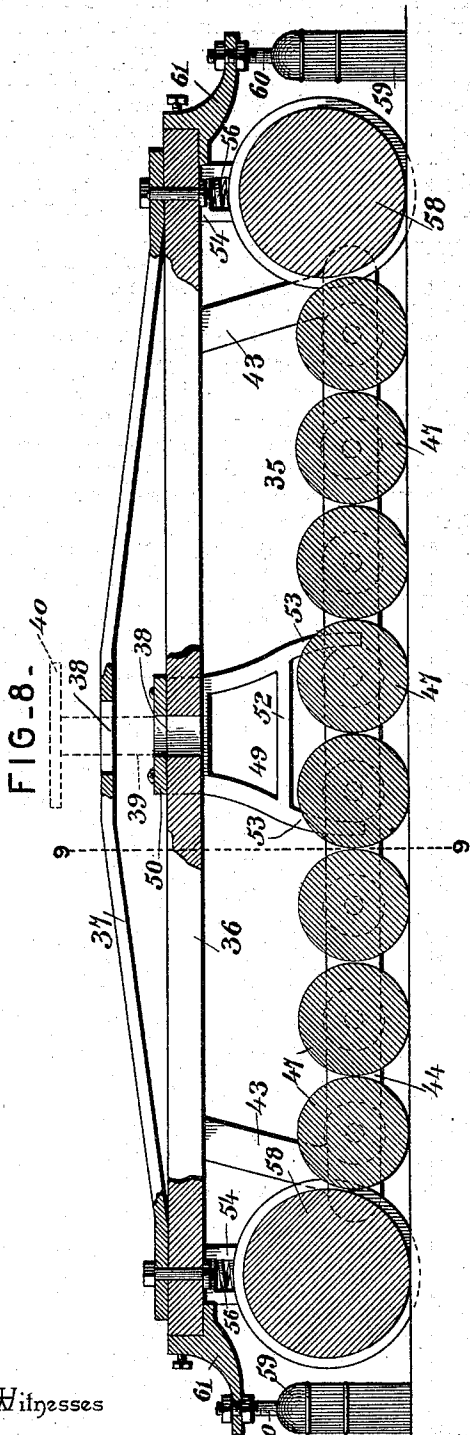


FIG. 10-

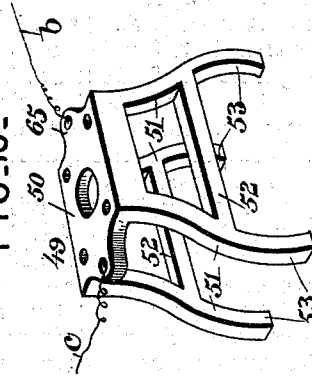


FIG. 11-

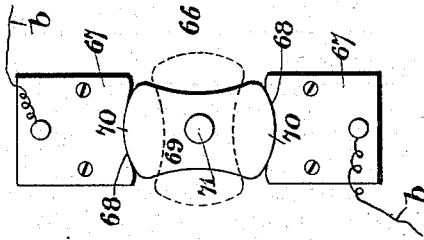
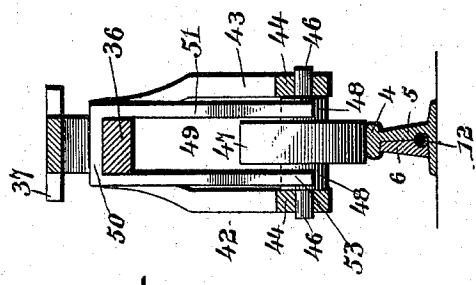


FIG. 9-



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UNITED STATES PATENT OFFICE.

GEORGE JONNATHAN FORREY, OF CARLISLE, PENNSYLVANIA, ASSIGNOR
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ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 571,435, dated November 17, 1896.

Application filed February 29, 1896. Serial No. 581,332. (No model.)

To all whom it may concern:

Be it known that I, GEORGE JONNATHAN FORREY, a citizen of the United States, residing at Carlisle, in the county of Cumberland and State of Pennsylvania, have invented a new and useful Electric-Railway System, of which the following is a specification.

This invention relates to electric-railway systems; and it has for its object to effect certain improvements in the manner of arranging the main conductor and the means for distributing the current to the motor and lighting devices of the motor-car.

To this end the invention further contemplates an improved railway system wherein the main conductor is so arranged that no current whatever will be above the surface of the track, except directly under the motor-car, while at the same time obviating the possibility of danger from electrical storms, driving over the tracks, or persons coming in contact with the distributing-contacts of the main conductor. In connection with the arrangement of the main conductor and its distributing-contacts the invention provides means whereby leakage of the electric current is reduced to a minimum, so that there will practically be no loss of electrical energy or potential, thereby obviating the many disadvantages to the ordinary underground-conduit system wherein there is usually a great leakage of current and always the liability of grounding or short-circuiting of the current on account of the conduit becoming filled with water, snow, or other interfering mediums.

A further object of the invention is to provide a new and useful electric-railway system that can be adapted for use in connection with an ordinary surface track without material alteration thereof and at a small expense, compared with the expense of building conduits and similar systems, and in the attainment of these several objects the invention also contemplates constructing the various parts of the system of as few and of as simple parts as possible, so that the different parts of the system can be readily repaired at a trifling expense.

The invention also has as an object the provision of a system wherein a very simple arrangement of wiring is required for light-

ing and signaling purposes and wherein the signals for crossings and other places are operated automatically by the motor-car.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a vertical sectional view of a motor-car and railway-track equipped in accordance with the system contemplated by this invention. Fig. 2 is a detail sectional view on the line 2 2 of Fig. 1. Fig. 3 is a plan view of a section of track equipped with a central third rail and distributing-contacts constructed in accordance with this invention. Fig. 4 is an enlarged vertical sectional view of one of the distributing contact devices for the main conductor and the adjacent ends of the third-rail sections. Fig. 5 is a transverse sectional view of one of the distributing contact devices on the line 5 5 of Fig. 4. Fig. 6 is an enlarged side elevation of the construction illustrated in Fig. 4. Fig. 7 is a detail sectional view on the line 7 7 of Fig. 6. Fig. 8 is an enlarged central longitudinal sectional view of the collecting-plow for the motor-car. Fig. 9 is a transverse sectional view on the line 9 9 of Fig. 8. Fig. 10 is a detail in perspective of the distributing-saddle for the electric plow. Fig. 11 is a plan view of one of the controlling-switches for the motor and lighting circuits. Fig. 12 is a diagrammatic view of the motor and lighting circuits employed in connection with the motor-car.

Referring to the accompanying drawings, the numeral 1 designates an ordinary surface track comprising the opposite parallel track-rails 2 and the transverse rail-ties 3, on which the track-rails are secured in the usual manner. In connection with the ordinary track-rails 2, the present invention contemplates the use of a central third rail 4, arranged centrally between and parallel with the rails 2 of the track 1. The central third rail 4 is, more properly speaking, a conductor-rail for use in connection with the main conductor or feed-wire of the system, and is preferably made sectional and comprises the registering

rail sections or members 5 and 6, respectively, as clearly illustrated in Fig. 7 of the drawings. As illustrated in the drawings, the section or member 5 of the third rail 4 is formed with the usual rail-tread 7 and the base-flange 8, which is fastened on the rail-ties 3 in the usual manner, and said section or member 5 of the third rail is recessed at one side, as at 9, to snugly receive therein the other section or member 6, which section or member is a continuous plate and practically forms a removable side plate for the third rail to close in the longitudinal wire-pocket 10, extending continuously throughout the length of the third rail and formed between the meeting faces of the rail members 5 and 6 at the lower inner edge of the plate member 6. The said longitudinal pocket 10 in the third rail 4 is designed to have snugly fitted therein a wooden core or casing 11, which is cylindrical to conform to the contour of the longitudinal pocket 10, and is preferably prepared in a suitable way, so as to positively prevent moisture or variations in temperature affecting in any way the insulated main conductor or feed-wire 12, which is incased within the wooden core or casing 11 and runs longitudinally in the direction of the length of said third rail 4 throughout the entire length of such rail, and therefore the entire length of the track, including, of course, the curves of the track and wherever the same runs.

By reason of the particular manner of stringing and mounting the main conductor-wire 12 it will be observed that it is practically impossible for any material leakage of the current from the wire, which would thereby lower the potential or energy of the current, while at the same time the said conductor-wire is disposed below the surface of the track and entirely out of the way, although it is to be noted that the wire is readily accessible for the purposes of repair and the like.

The central, third, or conductor rail 4 is laid between the main-track rails 2 in sections of equal length, as clearly illustrated in Fig. 3 of the drawings, and between the adjacent ends of the longitudinally-alined sections or lengths of the third rail 4 are arranged distributing contact devices for conducting the current from the main conductor 12 to the electric plow of the motor-car as the same runs thereover, as will be fully described. The distributing contact devices referred to are arranged at regularly-spaced intervals apart and in lineal alinement with the sections of the central, third, or conductor rail 4, and each of said distributing contact devices essentially comprises a closed contact-box 13, principally consisting of the superposed upper and lower box-sections 14 and 15, respectively, the lower of which box-sections 15 is provided at its opposite ends with the off-standing supporting-arms 16, which rest on the upper sides of the adjacent ties 3 to provide a rigid support for the box 13. The box

13, including the sections 14 and 15, is hollowed to receive therein a cylindrical conductor-core 17, of a diameter greatly exceeding the diameter of the wire 12, and having suitably connected with its opposite ends, as at 17^a, the adjacent terminals of the wire 12, which terminals of the wire enter the ends of the box 13 through the wire-receiving openings 18, which openings afford a ready means of connection between the conductor-wire and the ends of the enlarged core 17 within each contact-box.

The enlarged conductor-core 17 of each distributing contact device is encircled by a coil of contact-wire 19, extending from end to end of the core 17, and normally resting in contact with and within the lower semicylindrical fixed contact-cup 20, seated within the lower section or half 15 of the contact-box 13 and arranged above the coil 19, and working in conjunction with the fixed contact-cup 20 is a semicylindrical movable contact-cup 21, which has an up-and-down movement within the lower part of the upper box-section 14. Both of the contact-cups 20 and 21 are of the same length as the core 17 and the wire coil thereon, and the upper movable contact-cup 21 is carried at the lower end of a movable adjusting-post 22, on the upper end of which post is fitted an elongated surface contact-plate 23, arranged to work within a plate-recess 24, formed in the upper side of the contact-box 13 of the contact device. The elongated surface contact-plate 23 is normally supported in an elevated position by means of the adjusting-springs 25, seated within the spring-recesses 26, formed within the upper section 14 of the box 13, near its opposite ends, and having their upper ends engaging with the plate-studs 27, depending from the under side of the plate 23, near its opposite ends, and guided within the upper ends of the spring-holding recesses 26, as plainly illustrated in Fig. 4 of the drawings.

The surface contact-plate 23 of each distributing contact device is provided at a central point between its ends with an elevated portion 28, which is normally projected by the springs 25 above the plane of the tread of the central, third, or conductor rail 4. With the surface contact-plate 23 elevated as just described it will also be observed by reference to Figs. 4 and 5 that the upper movable contact-cup 21 of the contact device is held elevated above and out of contact with the wire coil 19 on the core 17, so that normally the surface plate 23 is uncharged, and liability of an accident on this account is therefore reduced to a minimum. On the other hand, when the surface contact-plate 23 is depressed the movable cup 21 is carried downward onto the wire coil 19 and also into registering contact with the lower fixed cup 20, thereby completing a cylindrical contact with the coil 19 at all points, so that the mechanical contact with the main conductor-wire will be as nearly perfect as possible to insure the ready con-

ducting or discharge of the electric current upward through the surface contact-plate 23, which has been depressed, as will be more particularly referred to.

At the joint connection between each of the spaced contact-boxes 13 and the adjacent ends of the third rail 4 are arranged the opposite side guard-plates 29, which are fitted against the outer sides of the contact-box 13 and the opposite sides of the adjacent ends of the rail 4, and said oppositely-located side guard-plates 29 are securely bolted to the rail ends 4 and to the contact-box 13 of the distributing contact device by means of the transverse joint-bolts 30. The opposite side guard-plates 29 are provided at their upper edges with the longitudinal guard-flanges 31, which are curved outwardly from the opposite sides of the tread 7 of the rail 4 and from opposite upper sides of the box 13, and said guard-flanges 31 project upwardly above the top surface of the contact-box 13 and above the plane of the elevated portion 28 of the surface contact-plate 23 to prevent injury to the contact-plate and also to prevent the accidental or unavoidable depression of such plate by vehicles crossing the same, as will be readily understood by those skilled in the art.

Arranged to travel on the track 1, and directly over the third rail 4 and the distributing contact devices arranged in a line with the third rail, is the motor-car 32, which may be of any approved construction and mounted on the usual truck 33, carrying the wheeled axles 34. In the present invention the motor-car 32 is equipped with an electric collecting-plow, which is designed to cooperate with the spaced distributing contact devices of the third rail to provide for the transmission of the electric current from the main conductor to the motor and lights of the car, and this electric plow will now be particularly referred to. The electric plow 35 (illustrated in detail in Fig. 8 of the drawings) is provided with a main supporting-beam 36, arranged longitudinally beneath the bottom of the car 32 and extending nearly the entire length of the same. The main supporting-beam 36 has bolted on the upper side thereof an arched brace-bar 37, and said beam 36 and bar 37 are provided at a central point with vertically-alined openings 38, which loosely receive therein the depending king-bolt 39, the upper end of which bolt carries an attachment-plate 40, suitably fastened to the under side of the car or to a suitable point on the truck. The said bolt 39 has arranged thereon between the beam 36 and the bar 37 a spring 41, which allows for a slight upward movement of the electric plow to pass obstructions, while at the same time normally pressing the same downward with sufficient force to hold the plow into firm contact with the third rail and to provide for the depression of the surface contact-plates 23 as the car travels over the track.

The main supporting-beam 36 of the plow has connected therewith a depending bear-

ing-rack 42, essentially comprising a pair of spaced depending frames 43, having the horizontal bearing-bars 44 provided with a longitudinal series of alined bearing-openings 45, which loosely receive the spindle extremities 46 of the copper collecting-spools 47, which are arranged in a continuous series and are designed to roll on the third rail 4 in direct contact therewith, and also with the surface contact-plates 23 of the distributing contact devices. The collecting-spools 47 may of course be made of any suitable conducting material, and are preferably provided with opposite cylindrical hub portions 48, which serve to assist in freely discharging the current collected from the plates 23 to the metallic frames 43 of the rack 42, and thence to the distributing-saddle 49 of the plow.

The distributing-saddle 49, of the plow essentially consists of a top plate 50, suitably secured on the main supporting-beam 36 of the plow at a central point, and a pair of braced conductor-arms 51, depending from opposite side edges of the plate 50. Each pair of the spaced conductor-arms 51 are connected by an intermediate brace-bar 52, and at their lower extremities the said arms 51 are provided with curved contact portions 53, which extend to a point at the inner sides of the horizontal bearing-bars 44 and contact with the cylindrical hub portions 48 of the collecting-spools 47 immediately below the distributing-saddle 49 of the plow, thereby completing a contact connection between the saddle 49 and the entire rack of spools, whereby the current collected by said spools will be directly transmitted to the said saddle and from thence distributed to the motor and lights of the car in the manner to be described.

Suitably connected with and depending from each end of the main supporting-beam 36 of the plow 35 is a pair of vertically-slotted bearing-hangers 54. The vertically-slotted bearing-hangers 54 have mounted therein the vertically-movable bearing-boxes 55, pressed downward by the springs 56, arranged in the slots of said hanger, and receiving the spindle extremities 57 of the peripherally-grooved pilot-wheels 58, which straddle the tread of the third rail 4. By reason of the arrangement of the hangers 54 a pilot-wheel 58 is located at each end of the rack of collecting-spools 47 to provide for a proper guiding of the electric plow and the depressing of the surface contact-plates 23 when the motor-car travels in either direction, and arranged in advance or in front of each of the pilot-wheels 58 is a steel broom or brush 59, having a shank portion 60 suitably fastened in the outer end of a bracket-arm 61, connected to the adjacent end of the main beam 36 of the plow, said brooms providing means for cleaning the surface contact-plates before the pilot-wheel and the succeeding collecting-spools pass thereover.

Suitably arranged under the motor-car is an ordinary motor 62, geared with one of the axles

34 by means of the gearing 63, and one of the wires *a* from the motor is connected with the truck of the car at the point 64, while the other motor-wire *b* leads from the distributing-saddle 49, and is connected with such saddle at the point 65. Interposed in the line of the motor-wire *b* is a controlling-switch 66, which switch is preferably mounted under the front platform of the motor-car, as illustrated in Fig. 1 of the drawings. The switch 66 essentially consists of the spaced switch-plates 67, having inner curved contact-faces 68, and a rotating switch-plug 69, having rounded contact ends 70 adapted to be turned in contact with the faces 68 to complete the circuit through the plates 67, and said plates have respectively connected thereto two terminals of the motor-wire *b*. The switch 66 as adapted for use in controlling the current fed to the motor 62 has the rotating plug 69 thereof mounted at the lower end of the adjusting-rod 71 working in the hollow post 72, mounted on the front platform of the car, and having attached to its upper end the handle 73, which is manipulated by the motorman for the purpose of closing and opening the switch, and thereby opening and closing the motor-circuit at will for the purpose of starting and stopping the car.

The receiving-saddle 49 of the electric plow 35 also provides for distributing the electric current to electric lamps 74 within the car and to provide for a proper circuit with the lamps 74, the lamp-circuit wire *c* is connected at one terminal with the saddle 49 and at its other terminal with a pair of electromagnets 75, which magnets are provided with an armature-bar 76, and said magnets are circuited with the lamps 74 by means of the circuit-wire *d*, in the line of which circuit-wire is interposed a controlling-switch 66^a. The controlling-switch 66^a is of identically the same construction as the switch for the motor-circuit and has the rotating plug 69 thereof suitably connected with an adjusting-handle 77, mounted conveniently at one end of the car-body, so as to be readily accessible to the conductor or other operator for turning the lights on and off. The return-circuit wire *e* from the lamps 74 connects with the magneto armature-bar 76 at the point 78, and with this bar 76 is also connected one terminal of the main return-circuit wire *f*, the other terminal of which connects with the truck of the car at the point 79.

The wires *e* and *f* are illustrated as being connected with the armature-bar 76; but it will be understood that the electromagnets simply operate in the capacity of a mere resistance and are placed in series with the circuit for the lamps to prevent fluctuations in the current from affecting the lamps.

The electric plow 35, as it travels over the third rail 4, provides for the depression of the surface contact-plates 23 as the car passes over such contact-plates, and at this point it will be noted that the plow is prevented from having undue lateral motion by the em-

ployment of a pair of inverted-U-shaped brace-bars 80, located, respectively, at opposite sides of the center of the main supporting-beam 36 of the plow. The said inverted-U-shaped brace-bars 80 are suitably attached to the beam 36 and are provided in their depending portions with the vertical bifurcations or notches 81, which loosely take over the axles 34 of the car-truck at the inner sides of the wheels of the truck, and thereby provide for such a positioning of the brace-bars as to positively prevent undue lateral motion.

In connection with the system it is designed to employ suitable electric signals wherever the track intersects a crossing or other dangerous place, and in carrying out this object an electric bell or other suitable electric signal 83 is located at a point within sounding distance of the crossing or other place where it is desired to give the signal of an approaching car. One of the bell or signal wires *g* is connected at the point 84 with the movable part of one of the contact devices at a safe distance from the crossing or other place, so that the alarm will be sounded a sufficient length of time before the car reaches the crossing or other place, and the other signal-wire *h* is connected to one of the track-rails 2, which forms the return-conductor for the electric current.

It will be obvious that when the motor-car passes over the contact device, having a connection with the signal-wire *g*, a signal-circuit will be immediately completed through the wire *g*, the bell or signal 83, the wire *h*, and one of the rails 2, as will be readily apparent to those skilled in the art, and at this point it will be observed that the signals may be arranged in any desired number and at any desired point without in any way interfering with the free working of the system.

In the operation of the system it is to be understood that the contact devices in the line of the third rail 4 are spaced at such distances apart that the electric plow of the car will be constantly passing over one of said contact devices, so that a constant current will be transmitted to the motor of the car, and it will be further observed that when the electric plow is passing over one of the contact devices and depresses the movable part thereof the current passes directly from the main conductor 12 through such contact device, the electric plow, and motor of the car; and thence back to one of the rails 2 of the track, and in connection with this rail may be employed a separate main return-circuit wire *i*, which will insure the proper grounding of the current or the return thereof to the generator, as will be readily understood by those skilled in the art.

Changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what

is claimed, and desired to be secured by Let-
ters Patent, is—

1. In an electric-railway system, the combi-
nation with a surface track; of a third rail
5 arranged centrally between the main-track
rails, said third rail being sectional and com-
prising separate registering members, one of
which members is formed with a rail-tread
and base-flange, and both of which members
10 have formed between their meeting faces a
longitudinal wire-pocket, an insulated main
conductor or feed-wire incased in said longi-
tudinal wire-pocket, and suitable contact de-
vices having metallic connections with the
15 main conductor or feed-wire, substantially as
described.

2. In an electric-railway system, the combi-
nation with a surface track; of a third rail
20 arranged centrally between the main-track
rail and having a continuous longitudinal
wire-pocket, a wooden core or casing fitted in
the wire-pocket of the third rail, an insulated
main conductor or feed-wire incased in said
wooden core or casing, a series of circuit-
25 closing contact devices interposed in a line
with the third rail and having connections
with the main conductor or feed-wire, and
the car carrying a plow traveling over the
third rail and said contact devices, substan-
30 tially as set forth.

3. In an electric-railway system, the combi-
nation with a surface track; of a third rail
arranged centrally between the main-track
rails, said third rail being sectional and com-
35 prising separate registering members one of
which members is formed with a rail-tread
and base-flange, and both of which members
have formed between their meeting faces a
longitudinal wire-pocket, a wooden wire core
40 or casing fitted in said wire-pocket of the
third rail, an insulated main conductor or
feed-wire incased in said wooden core or cas-
ing, suitable contact devices having connec-
tions with said main conductor or feed-wire,
45 and the car carrying a plow traveling over the
third rail and said contact devices, substan-
tially as set forth.

4. In an electric-railway system, a track
50 having a central third rail arranged in spaced
sections or lengths, contact-boxes interposed
between the adjacent ends of the third-rail
sections, circuit-closing devices arranged in
each contact-box, and having a surface con-
55 tact-plate normally projected above the plane
of the upper side of the contact-box and the
tread of the third rail, separate side guard-
plates fitted against the opposite sides of each
contact-box and the directly-adjacent rail
ends, said side guard-plates being provided
60 at their upper edges with longitudinal guard-
flanges curved outwardly and projected up-
wardly above the plane of the normally-elev-
ated surface contact-plate of the contact de-
vices, and transverse joint-bolts connecting
65 the opposite side guard-plates with the con-
tact-boxes and also with the adjacent rail
ends, substantially as described.

5. In an electric-railway system, the track
having a central third rail arranged in spaced
sections or lengths, and a series of regularly-
70 spaced contact devices interposed between the
adjacent ends of the third-rail sections, each
of said contact devices comprising a contact-
box, a fixed contact-cup seated within the
box, an enlarged conductor-core arranged
75 within the fixed contact-cup and having feed-
wire connections with its ends, and a nor-
mally-elevated surface contact-plate fitted
within and projecting above the upper side of
the box and carrying a movable contact-cup
80 adapted to be depressed directly over and
onto said enlarged conductor-core, and also
adapted to have a registering contact with the
fixed cup, substantially as set forth.

6. In an electric-railway system, the track
85 having a central third rail, the main con-
ductor or feed-wire incased in and insulated
from the said rail, and a series of regularly-
spaced contact devices interposed between the
ends of the third-rail sections, and each com-
90 prising a contact-box, a lower semicylindrical
fixed contact-cup seated within the lower part
of said box, an enlarged cylindrical con-
ductor-core arranged within said fixed con-
tact-cup and having feed-wire connections
95 with its ends, a wire coil encircling said con-
ductor-core, and a normally-elevated surface
contact-plate seated within and projecting
above the upper side of the box and having
a depending adjusting-post carrying at its
100 lower end an upper movable semicylindrical
contact-cup adapted to work onto said con-
ductor-core and to have a registering contact
with the lower fixed contact-cup, substan-
105 tially as set forth.

7. In an electric-railway system, the combi-
nation of a track having a central third rail
and spaced contact devices in lineal aline-
ment with said rail, and an electric plow
yieldingly mounted at the under side of a
110 motor-car and essentially comprising a rack
of collecting-spools, and a separate current-
distributing saddle having metallic connec-
tion with the entire series of spools, and a
bearing-contact with the hubs of certain of
115 said spools, and circuit-wire connections with
said distributing-saddle, substantially as set
forth.

8. In an electric-railway system, the combi-
120 nation of a track having a central third
rail and spaced contact devices in lineal aline-
ment with said rail, and an electric plow es-
sentially comprising a main supporting-beam
yieldingly suspended from the under side of
the motor-car, a depending bearing-rack con-
125 nected with said beam, a series of alined col-
lecting-spools mounted within said bearing-
rack and riding on the third rail, a current-
distributing saddle mounted on said main
supporting-beam and having metallic con-
130 nection with the entire series of spools, a pair
of hangers depending from each end of the
main supporting-beam at each end of the
rack of spools, spring-depressed peripherally-

grooved pilot-wheels mounted in each pair of hangers and traveling on the third rail in advance of the rack of spools, a cleaning broom or brush supported at one side of each
5 pilot-wheel and contacting with the third rail, and transversely-arranged brace-bars connected with said main supporting-beam and the axles of the motor-car to limit the lateral play of the plow, substantially as set
10 forth.

9. In an electric-railway system, the combination of a track having a central third rail and spaced contact devices in lineal alignment with said rail, and an electric plow essentially comprising a main supporting-beam
15 yieldingly suspended from the under side of the motor-car, a depending bearing-rack connected with said beam, a series of alined collecting-spools having opposite cylindrical
20 hub portions and spindle extremities journaled in the opposite side portions of said bearing-rack, a distributing-saddle mounted centrally on the beam and having opposite pairs of depending spaced conductor-arms
25 provided at their lower extremities with curved contact portions arranged within said bearing-rack and contacting with the cylindrical hub portions of the collecting-spools

immediately below the saddle, and the motor and lighting circuits for the car having wire
30 connections with said distributing-saddle and also with the metallic truck of the car, substantially as set forth.

10. In an electric-railway system, the combination with a surface track; of a third rail
35 arranged centrally between the main-track rails, a series of circuit-closing contact devices interposed in the line of said third rail and each having movable contact portions provided with surface plates normally elevated above the plane of the tread of the
40 third rail, a motor-car carrying a collecting-plow adapted to travel over the third rail and said surface contact-plates, and an electric signal having wire connections respectively
45 with one of the main rails of the surface track and with the movable contact portion of one of said contact devices, substantially as set forth.

In testimony that I claim the foregoing as
50 my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE JONNATHAN FORREY.

Witnesses:

MERKEL LANDIS,
JOS. B. HAVERSTICK.