No. 686,541. Patented Nov. 12, 1901.

C. SCHLECHTIGER & R. BINGHAM.

THIRD RAIL SAFETY SYSTEM FOR ELECTRIC RAILROADS.

(Application filed Mar. 19, 1898. Renewed Aug. 29, 1901.)

(No Model.) 4 Sheets—Sheet 1.

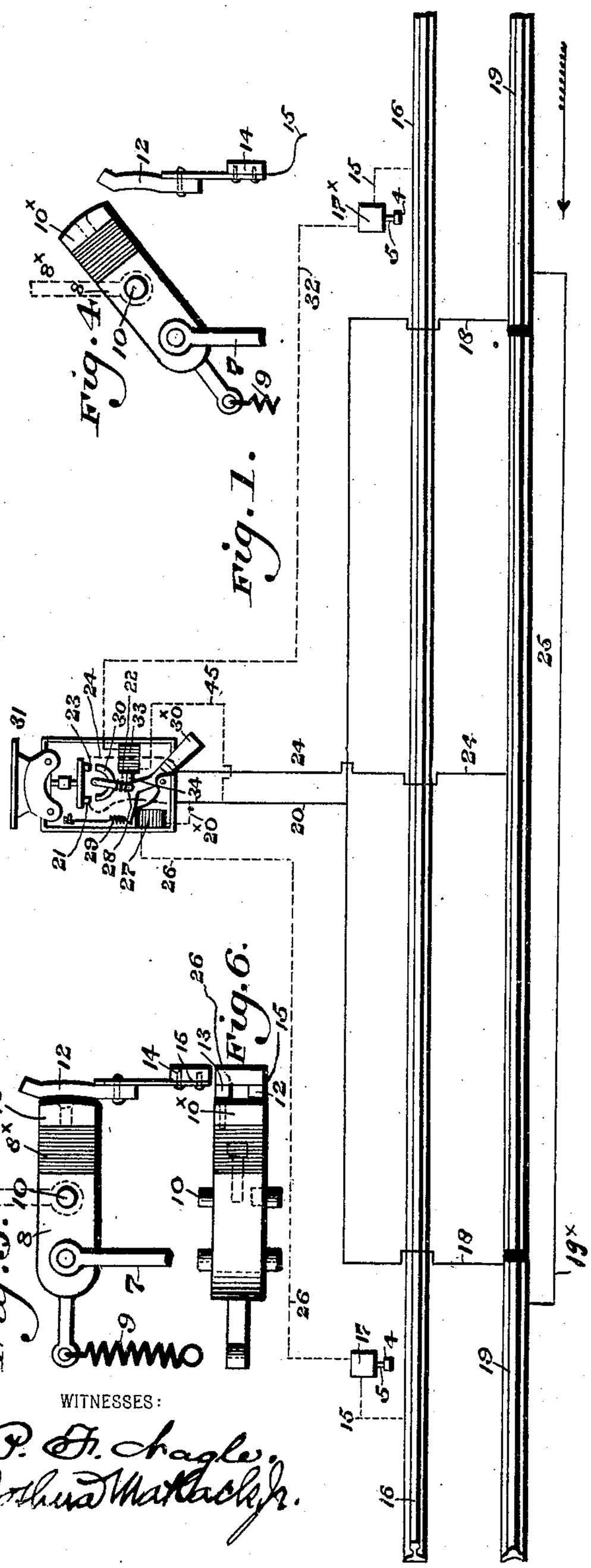

Fig. 1.

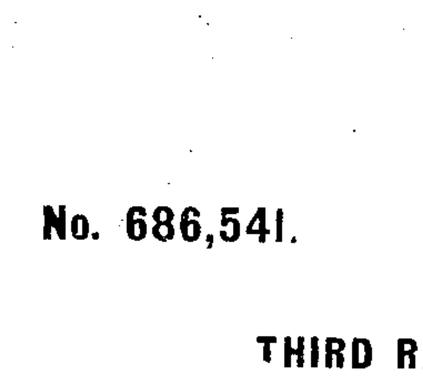

Fig. 4.

Fig. 5.

Fig. 6.

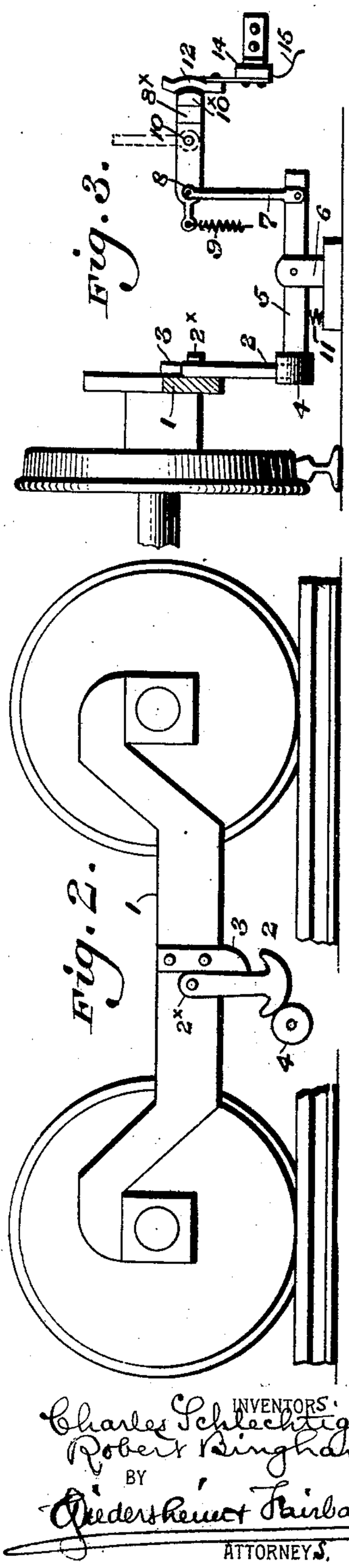

Fig. 3.

Fig. 2.

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Fig. 7.

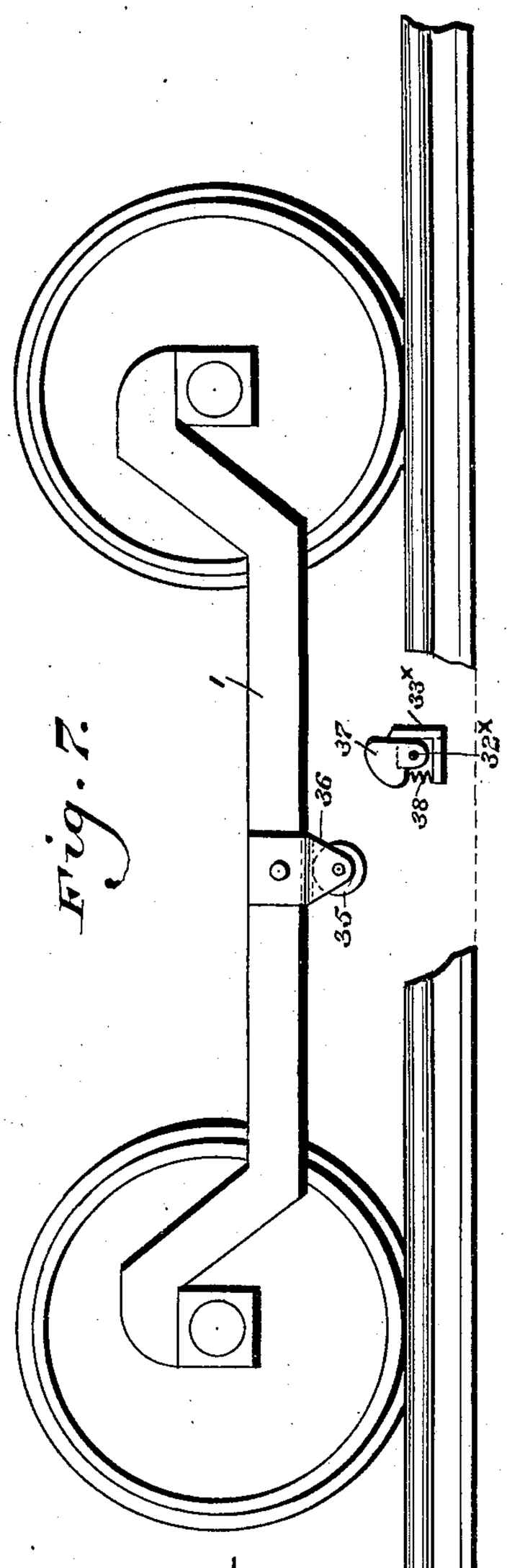
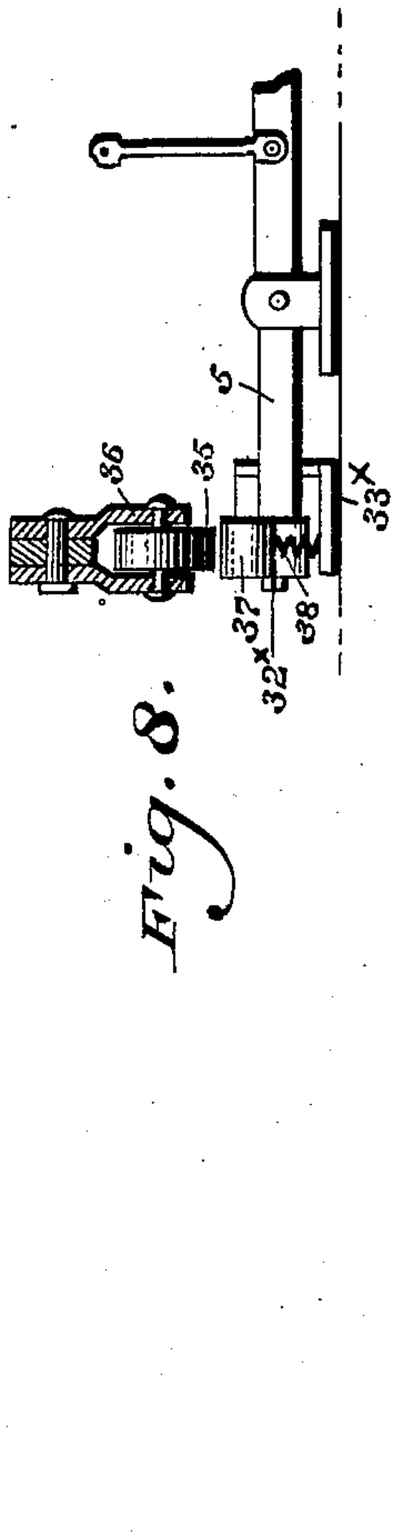


Fig. 8.



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(Application filed Mar. 19, 1898. Renewed Aug. 29, 1901.)

(No Model.) 4 Sheets—Sheet 3.

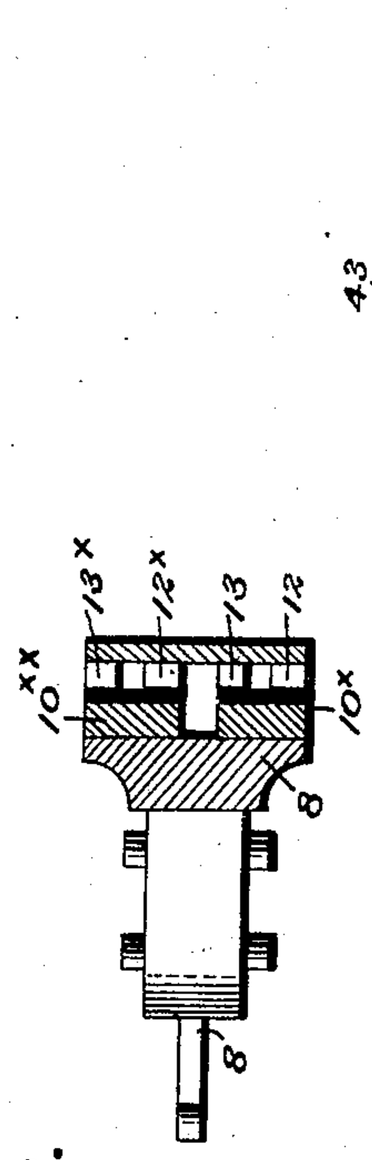

Fig. 9.

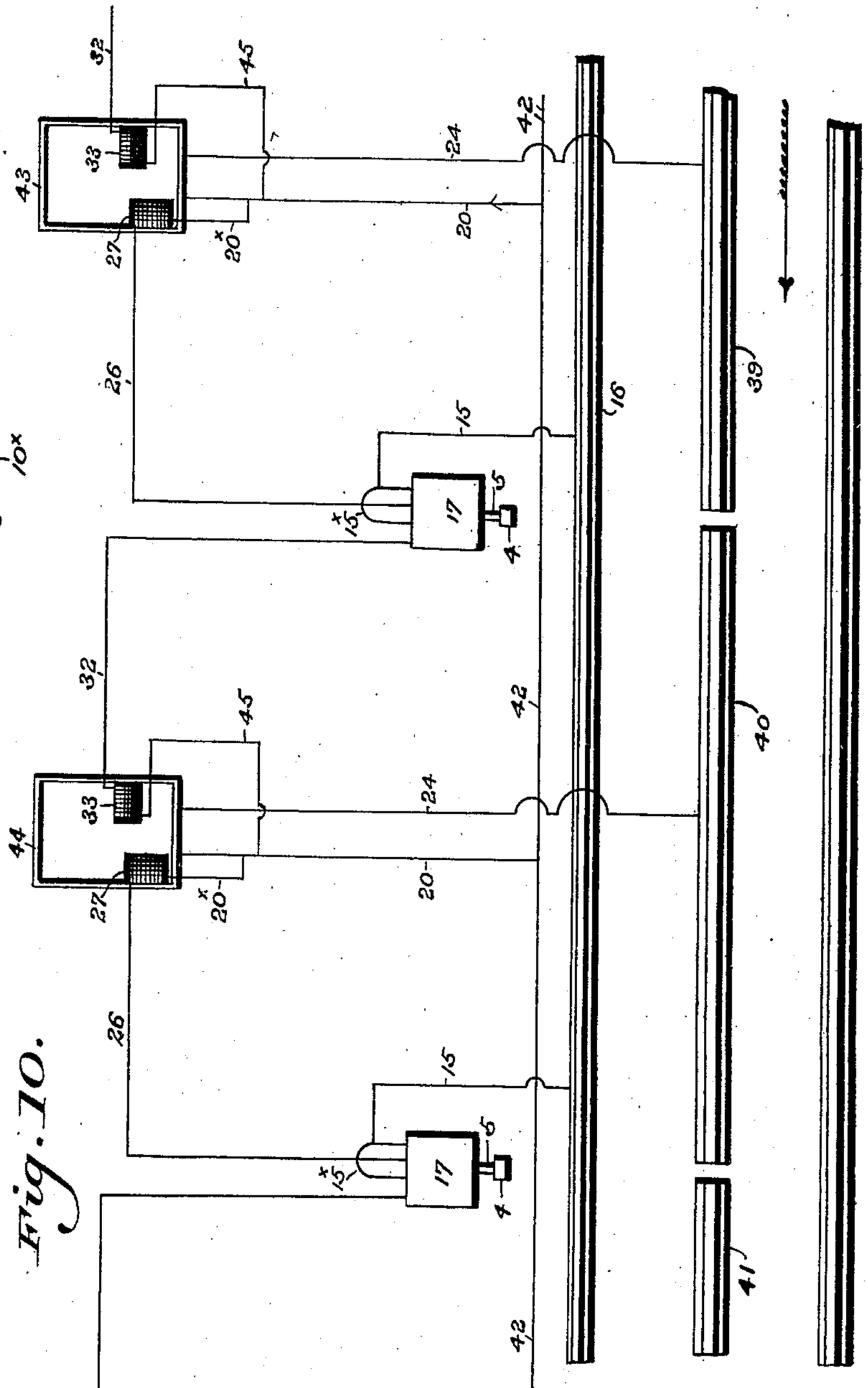

Fig. 10.

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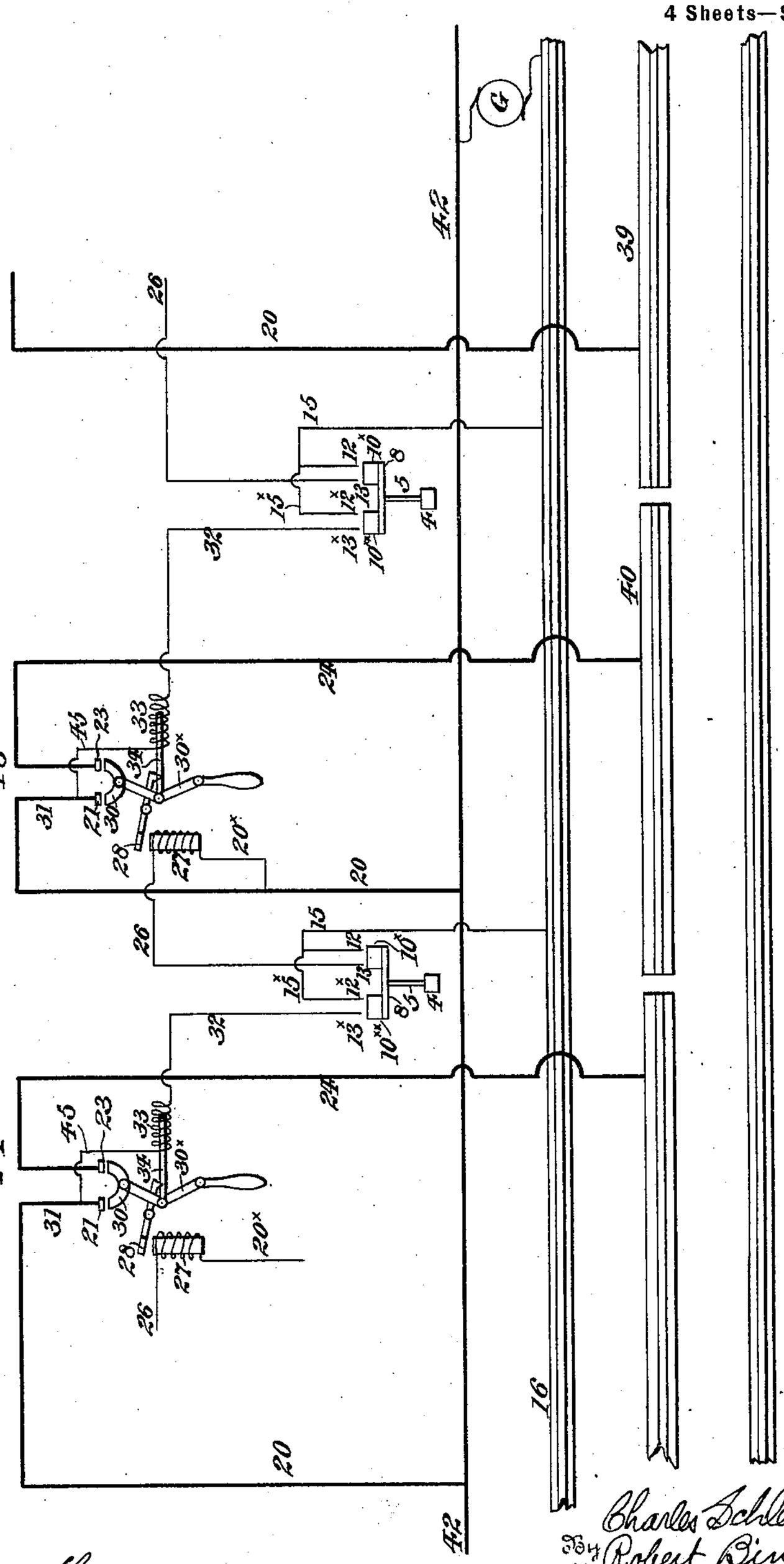
(No Model.) 4 Sheets—Sheet 4.

Fig. 11.



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THIRD-RAIL SAFETY SYSTEM FOR ELECTRIC RAILROADS.

SPECIFICATION forming part of Letters Patent No. 686,541, dated November 12, 1901.

Application filed March 19, 1898. Renewed August 29, 1901. Serial No. 73,697. (No model.)

To all whom it may concern:

Be it known that we, CHARLES SCHLECHTIGER, residing at Nantasket, county of Plymouth, State of Massachusetts, and ROBERT BINGHAM, residing in the city and county of Philadelphia, State of Pennsylvania, citizens of the United States, have invented a new and useful Improvement in Third-Rail Safety Systems for Electric Railroads, which improvement is fully set forth in the following specification and accompanying drawings.

Our invention relates to a safety system for transmitting electrical energy for what is known as "the third-rail system of electric railroads."

The object of our system is to have a continuous third-rail electrical conductor whereby we overcome the difficulties of and objections to the present dangerous system of transmitting the electrical energy.

The present method of overcoming the danger of an exposed electrically-charged rail is to omit it at all highways and street-crossings and where in other places it might be considered a menace to the safety of the public. In operation these methods are found to be objectionable because these intervals in the electrical conductor cause considerable loss of speed in operating the cars, are a source of danger to the electrical equipment, and where these intervals are necessarily very long there is great danger of the car or train being left without power.

Our invention admits of any design of rail for electrical conductor, which rails may be cut up and insulated into any number of sections or any desired length of sections and only one section of the electrical conductor will be charged or energized at one time and that is while the train is passing over it. It will be understood from the foregoing that the sectional conductors at all grade or highway crossings can thus be completely insulated from the main conductor and can be connected to the main conductor or third rail through circuit making and breaking devices by metallic feeders. The opening and closing of the main-circuit making and breaking devices are positively effected by the operation of a series of shunt-circuits. The shunt-circuits in their turn are controlled by quick-operating or quick making and breaking switches. The mechanism to operate these switches are designed to effectively operate in one direction only. The quick making and breaking switches, with their mechanical parts, can be located in suitable housings near the outer rail. The main-circuit making and breaking devices can be located in any convenient place and can be operated from the present tower systems, connecting or disconnecting any number of sections, whether for a continuous track, switches, sidings, freight-yard, or passenger-depots, our systems being applicable to all the requirements of the present system of railroad service. The main-circuit breakers are designed to operate automatically or by hand. They may operate different signals electrically from the main-circuit breaker, which may be placed in the present lookout-towers, and thus render valuable assistance to the present block-signal systems.

Our invention consists of suitable mechanical devices attached to the car-trucks or motor-car trucks, which devices are adapted to electrically energize the third rail.

It further consists of novel devices and combinations, the details of construction and the proper methods of connecting which will be hereinafter fully set forth and specified, and particularly pointed out in the claims.

Referring to the drawings, Figure 1 represents a diagram or plan view of our third-rail safety systems for electric railroads, the same having a continuous third rail, broken only by a section for a crossing or the like. Fig. 2 represents a side elevation of a motor-car truck, attached to which are mechanical device for electrically energizing the insulated sections of the third-rail conductor at the desired intervals. Fig. 3 represents a front elevation of Fig. 2, showing a portion of a quick making and breaking switch in operative position. Fig. 4 represents, on an enlarged scale, a part of Fig. 3 and shows a side elevation of the quick making and breaking switch in a different position, the switch in this figure being open, while in Fig. 3 it is closed. Fig. 5 represents, on an enlarged scale, a side elevation of the quick making and breaking switch, showing the parts in

substantially the same relative position to each other as seen in Fig. 3. Fig. 6 represents a plan view of Fig. 5. Fig. 7 represents a side elevation of a motor-car truck, showing a different form of device from Fig. 2 for operating the quick making and breaking switch shown in Fig. 3. Fig. 8 represents an end view of Fig. 7, showing these mechanical parts in the same relative position as shown in Fig. 3. Fig. 9 represents a plan view of a detached portion of a double quick making and breaking switch in operative position and with contacts closed, the side elevation being shown in Figs. 3 and 5. Fig. 10 represents a diagram or plan view of our safety systems for electrically charging and disconnecting insulated sections of third-rail electrical conductors, wherein the third rail is made up of a plurality of insulated sections normally disconnected from the main feeder. Fig. 11 represents a diagram of the same, showing the switches in detail and on an enlarged scale.

Similar numerals of reference indicate corresponding parts throughout the several views.

In the drawings, 1 designates a side hanger or other suitable portion of a motor-car truck, the same having properly attached thereto a cam 2, said cam being capable of moving freely in one direction, but having its extent of movement in the opposite direction prevented by a stop 3.

4 designates a roller or abutment attached to an end of the lever 5, which is fulcrumed to any suitable support 6, the opposite end of said lever having pivotally attached thereto near its extremity a link 7, the other end of the latter being pivoted to the lever or switch 8, which lever acts as a quick making and breaking switch, as illustrated in Figs. 3, 4, 5, 6, and 9. This switch or lever is fulcrumed at 10 and held in an inclined position by means of the springs 9 and 11, as shown in Figs. 3 and 4, the operative and inoperative positions of the lever 5 being assured by means of the spring 11.

8 represents a switch containing a non-conducting portion 8. The contact-piece $10^{\times}$ is attached thereto, being adapted to connect the contact-pieces 12 and 13. 12 and 13 are suitably supported by 14, the contact-piece 12 having a conductor 15 leading from it to the rail 16, while the contact-piece 13 has the conductor 26 leading therefrom to magnet 27, as will be best understood from Figs. 6 and 11, since the location of the contact-piece 13 and the conductor 26 is invisible in Figs. 3, 4, and 5.

17 and $17^{\times}$ denote housings inclosing the mechanical parts shown in Fig. 3.

31 denotes the main-circuit making and breaking device, which may be located to suit requirements.

In the example shown in Fig. 1 the third rail and main feeder 19 are continuous between the ends of the track, being provided, however, with an insulated section 25—for instance, at a crossing—the rail 19 on opposite sides of said section 25 being electrically connected by the conductor $19^{\times}$.

If we assume a car to be moving in the direction of the arrow at the right of Fig. 1, the parts attached to side hangers 1 will depress the lever 5, seen at the right of said Fig. 1, the switch 8, inclosed in housing $17^{\times}$, will be rocked from the position seen in Fig. 4 to the position seen in Figs. 3 and 5, and the circuit will be closed between the contact-pieces 12 and 13 by means of the contact-piece $10^{\times}$, and as a result the current will flow from 19 by the conductors 18, 20, and 45 to the magnet 33, thence by the wire 32, contact-pieces $13^{\times}$, $10^{\times\times}$, and $12^{\times}$ to the conductor 15, and thence to the return-rail 16.

The passage of the shunt-current as above described will cause the magnet 33 to attract the armature 34 to the required position, and it will be apparent that the movement of said armature will actuate the lever $30^{\times}$ of the main-circuit making and breaking device 31, so that the contact-points 21 and 23 will be electrically connected by contact-pieces 30. The contact 21 is connected with the conductor 20, and contact 23 is connected with the insulated section 25 of the third rail by conductor 24, thus connecting said section 25 with the rail 19 to be charged thereby. This charges the section 25 when the car reaches the same to supply the desired current to the car-motor.

In substantially the same manner as already described when the lever 5 at the left hand of Fig. 1 is depressed by the cam 2, attached to side hanger 1, as the car leaves said section 25 the circuit is closed from rail 19 by means of the quick-breaking switch 8, inclosed in the housing 17, the current passing through the wire 20 to the wire $20^{\times}$ to the magnet 27, thence by the wire 26 through contact-pieces 12, $10^{\times}$, and 13 to the wire 15 and to the return-rail 16, the required position of armature 28 being regulated by the spring 29.

The closing of the shunt-circuit as herein described energizes the magnet 27, thus attracting the armature 28, which armature actuates lever $30^{\times}$ and in turn breaking the electrical connections between points 21 and 23 of the main-circuit making and breaking devices 31, and thus leaving the section 25 of third rail electrically disconnected.

It will of course be understood that if a car is moving in a direction opposite to that shown by the arrow on the right of Fig. 1 the circuit making and breaking devices will not be operated, since the cam 2, being pivotally attached at $2^{\times}$ to side hanger 1, will ride freely over abutments 4, as will be best understood by referring to Figs. 2 and 3.

In Figs. 7 and 8 is shown a different form of device from Fig. 2 for operating the quick making and breaking switch shown in Fig. 3.

Referring to Figs. 7 and 8, a roller 35 is journaled in a hanger 36, which hanger is rigidly attached to side hanger 1. A cam 37

is mounted on an end of the lever 5 and pivoted at $32^{\times}$. A stop $33^{\times}$ is suitably placed to allow the cam to be effectively operated in one direction only. It will be understood if a car moves in the direction of the arrow seen at the left of Fig. 7 the roller 35 will depress the lever 5 and operate the quick making and breaking switch by reason of the cam being held in position by the spring 38 and the stop $33^{\times}$; but if a car moves in the opposite direction to the arrow in Fig. 7 the roller 35 will pass freely over the lever 5, not operating the quick making and breaking switch by reason of the pivotal connection of the cams with the lever 5, the spring 38 allowing for the required depression of the cam 37, but not operating the lever 5.

In Fig. 9 is shown a portion of a double switch for simultaneously opening and closing the shunt-circuits. This switch is adapted to connect the contact-pieces $13^{\times}$, $10^{\times\times}$, and $12^{\times}$, also 12, $10^{\times}$, and 13, as shown in Fig. 11.

Fig. 10 shows a diagram or plan view of our safety arrangement for controlling and distributing the electrical energy to our third-surface-rail electric-service system, said third rail consisting of insulated sections to be successively connected with and disconnected from a main feeder or distributer. These systems are adaptable to all classes of third-rail electric-railroad service. In these cases the main electric feeder is suitably placed alongside the tracks and conductors lead therefrom through the different main-circuit making and breaking devices to the sectional third-rail electrical conductor.

Referring to Figs. 1, 3, 5, 9, 10, and 11, if we assume a car moving in the direction of the arrow, as indicated in Figs. 1 and 10, the parts attached to side hanger 1 will depress lever 5. (Seen in Fig. 10.) The switch 8, as shown in Fig. 9, inclosed in housing 17, Fig. 10, will be rocked from the position seen in Fig. 4 to the position seen in Figs. 3 and 5 and the shunt-circuits will be closed simultaneously between the contact-pieces 12, 13, $12^{\times}$, and $13^{\times}$ by means of the contact-pieces $10^{\times}$ and $10^{\times\times}$. As a result the current will flow from the main conductor 42 by the wires 20 and then by the shunt-rail 45 to the magnet 33, thence by the wire 32, contact-pieces $13^{\times}$ $10^{\times\times}$, and $12^{\times}$ to the shunt-conductors $15^{\times}$ and 15, thence to the return-rail 16. The passage of the shunt-current as above described will cause the magnet 33 to attract the contact-pieces 34. This armature will actuate the lever $30^{\times}$, so that the contact-points 21 and 23 will be electrically connected by the armature 30. By this means the main current will flow from the generator to the main 42, feeder 20, contact-pieces 21, 30, and 23, and feed 24, thus charging a section of the third rail 25 as required. The circuit being closed between the contact-pieces 12 and 13 by means of the contact-piece $10^{\times}$ the current will flow from the main conductor 42 by the conductors 20 and $20^{\times}$ to the magnet 27, to the wire 26, to contact-pieces 13, $10^{\times}$, and 12, and through the wire 15 to the return-rail 16.

The closing of the shunt-circuit as herein described energizes the magnet 27, thus attracting the armature 28, which latter armature actuates lever $30^{\times}$, and in turn breaking the electrical connections between points 21 and 23 of the main-circuit making and breaking device 31, and thus leaving the required section of third rail electrically disconnected.

It will be readily understood from the foregoing and by reference to Figs. 9, 10, and 11 that the simultaneous closing of the shunt-circuits by the double switch seen in Fig. 9 will also simultaneously operate the main-circuit making and breaking devices 43 and 44. This will at the same instant cut off the main current from the third-rail section 39 and electrically charge the third-rail section 40. This arrangement can be continued over the entire road.

It will be apparent that changes may be made by those skilled in the art to which our invention appertains, and we do not therefore desire to be limited in every instance to the exact details of construction we have herein shown and described.

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

1. In an apparatus of the character named, a main feeder, an insulated section of a third-rail conductor, main-circuit making and breaking devices connected with said main feeder and insulated section, a return-conductor, magnets for moving said circuit making and breaking devices in opposite directions, each of said magnets being connected with the return-conductor and with the main feeder, switches in the circuit between each of said magnets and the return-conductor, and means for operating said switches during the progression of a car or train.

2. In an apparatus of the character named, a car truck or frame having cams pivotally mounted thereon, means for permitting said cams to move freely in one direction and means for limiting the movements of said cams in the opposite direction, in combination with quick-operating switches adapted to be operated by said cams, main-circuit breakers, third-rail sections of electrical conductors having circuits leading to said main-circuit breakers, said third-rail electrical conductor having insulated sections, and a conductor leading therefrom also to said main-circuit breakers.

3. In a third-rail system for electric railways, a third rail serving as a main feeder, a section of said third rail insulated from the adjacent sections thereof, main-circuit breakers having contact-points 21 and 23, conductors connecting the contact-points 23 and said sections, conductors connecting the contact-points 21 and said main feeder, the magnets 27 suitably supported, connections from said

magnets to the conductors leading from the contact-points 21, the conductors 26 leading from said magnets to quick-operating switches, the latter having the conductors leading therefrom to the return-conductor, and means for operating said quick-operating switch during the progression of a car or train.

4. In a third-rail system for electric railways, the main-circuit breakers containing the contact-points 21 and 23, magnets 27 and 33, armatures 28 and 34 mounted on levers $30^{\times}$, the armatures 30 adapted to close the circuit between the points 21 and 23, the third-rail sections having an insulated section therein, conductors 24 leading from the points 23 to the third-rail sections, a conductor 20 leading from the contact-point 21 to the third rail 19 on either side of an insulated third-rail section or main feeder-wire, a quick-operating switch 8 adapted to be operated by the progression of a car or train and located in proximity to the ends of said sections, conductors 15 and $15^{\times}$ connecting the return-conductor and said quick-operating switch, conductors 26 leading from the latter to the magnets 27, conductors leading from the latter to the conductors 20, conductors 45 leading from said conductors 20 to the magnet 33, conductors 32 leading from the latter to the quick-operating switches, and conductors 15 connecting said last-mentioned switches and said return-conductor.

5. In an apparatus of the character named, a car truck or frame, a roller carried thereby, a pivoted lever, a cam mounted thereon, means for permitting said cam to move freely in one direction and means for limiting the movement of said cam in the opposite direction, in combination with a quick-operating switch adapted to be operated by said cam and roller, a main-circuit breaker, a third rail having a circuit leading to said main-circuit breaker, said third rail having an insulated section and a conductor leading therefrom also to said circuit-breaker.

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