No. 679,331.

Patented July 30, 1901.

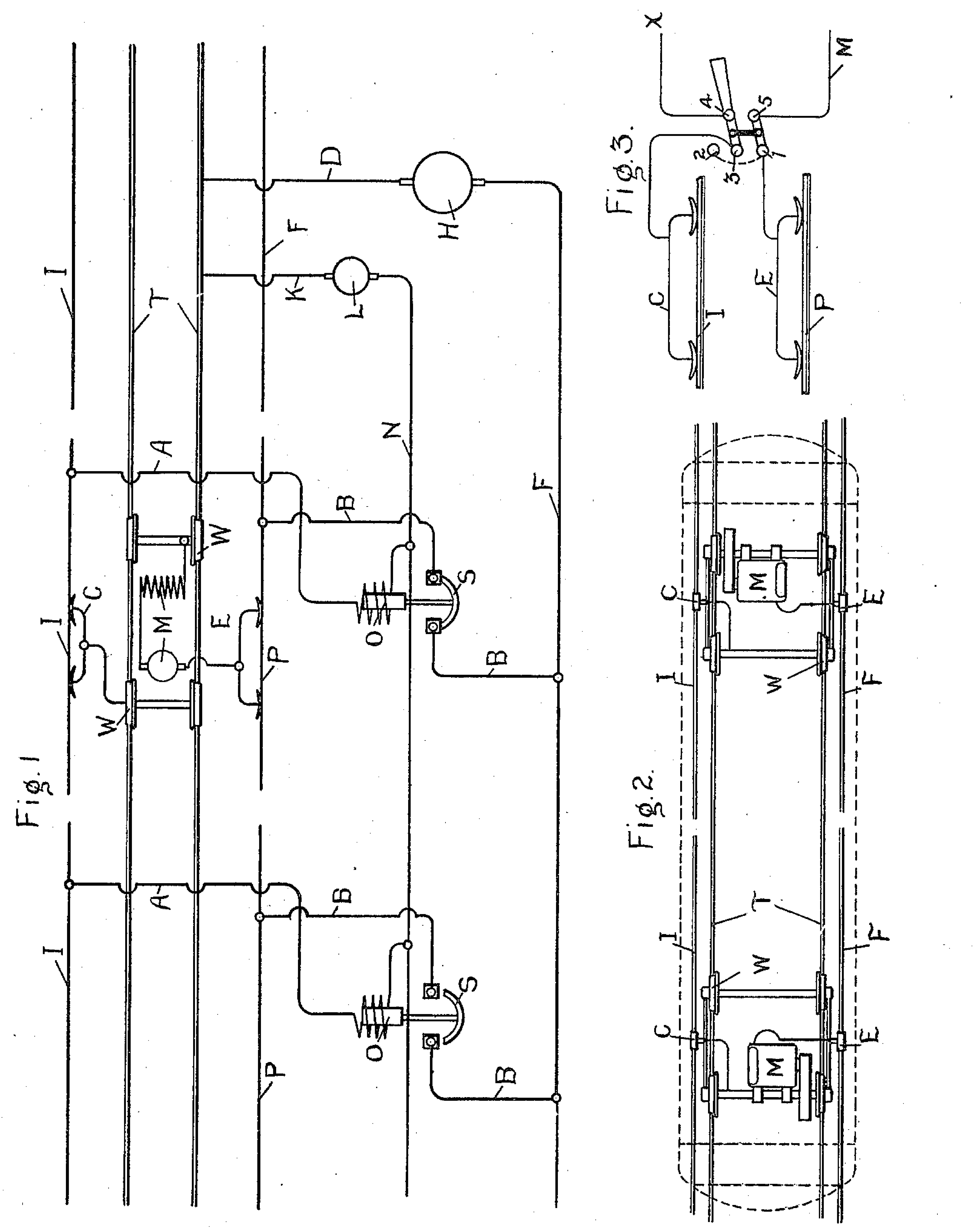
W. B. POTTER.

ELECTRIC RAILWAY SYSTEM.

(Application filed Feb. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

Rob't C. Chapman

Benjamin B. Hull.

Inventor.

William B. Potter.

by Albert G. Davis, Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 679,331.

Patented July 30, 1901.

W. B. POTTER.

ELECTRIC RAILWAY SYSTEM.

(Application filed Feb. 28, 1901.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 4.

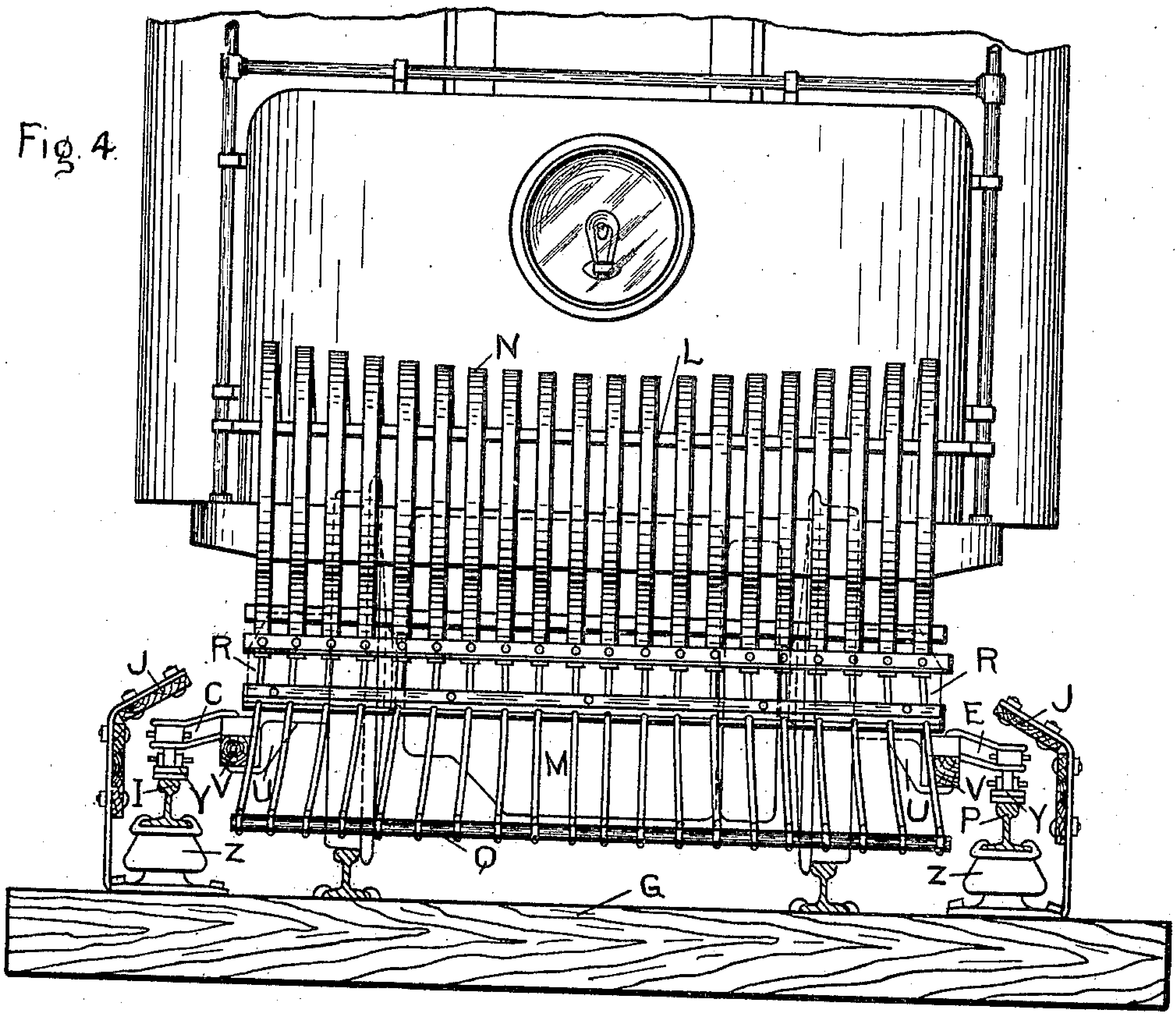
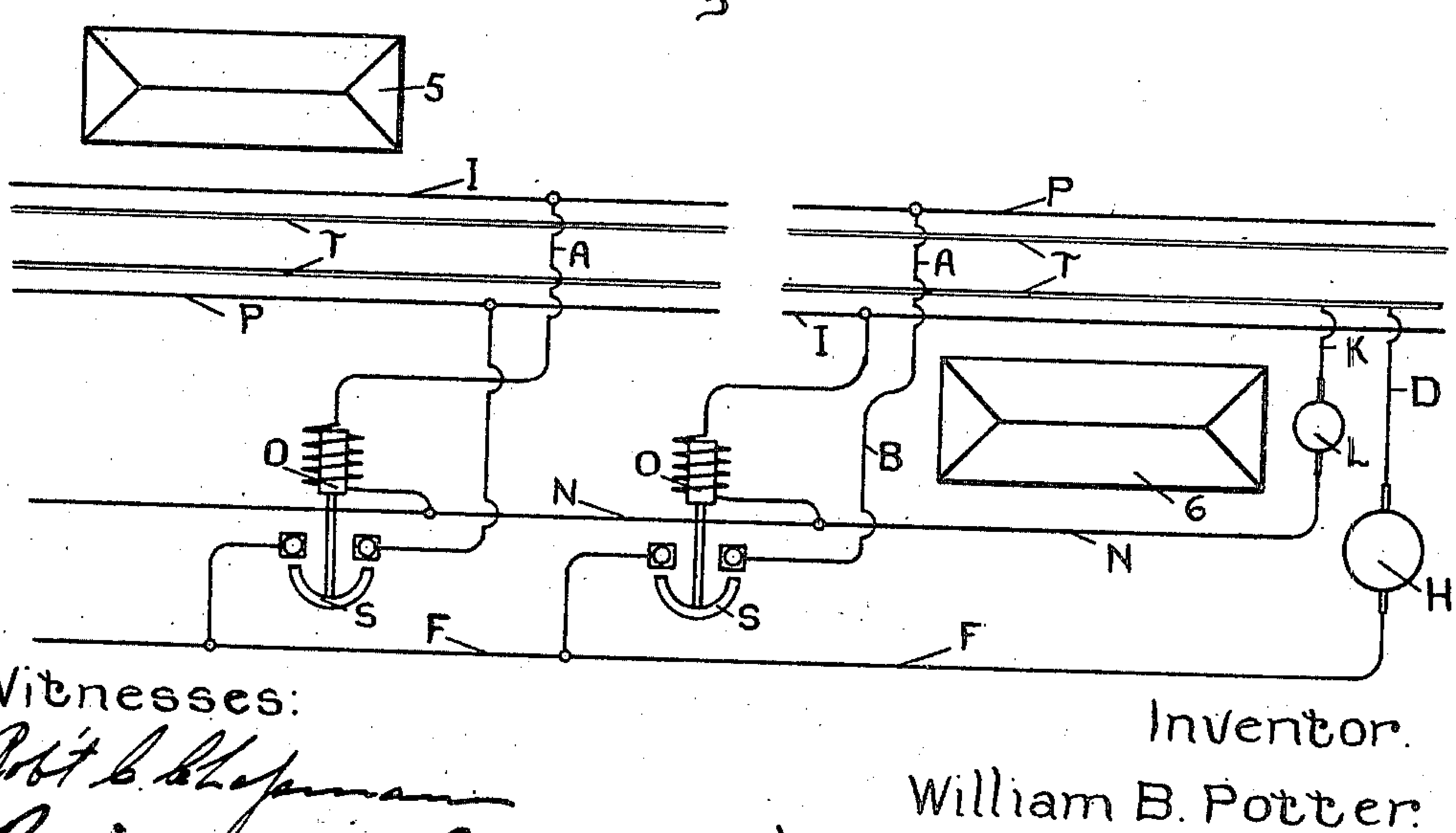


Fig. 5.



Witnesses:

Rob't C. Chapman

Benjamin B. Hull.

Inventor.

William B. Potter.

by Albert G. Davis

Att'y.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM B. POTTER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, OF NEW YORK.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 679,331, dated July 30, 1901.

Application filed February 28, 1901. Serial No. 49,218. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric-Railway Systems, (Case No. 1,743,) of which the following is a specification.

This invention relates to improvements in sectional-conductor railway systems.

The aim of the invention is to provide a system having section-switches which are certain to open and close when required, which system shall possess other advantages hereinafter described, all making toward a practical and commercially operative railway.

Of the drawings, Figure 1 is a working drawing of the circuit connections of a system embodying the invention. Fig. 2 is a plan view of a car equipped in accordance with the invention. Fig. 3 is a plan of a switch carried by the car and shows the connections controlled by the switch. Fig. 4 is a front elevation of a car-truck and a section of the road equipment; and Fig. 5 is a diagram of circuits, showing how the sectional conductors are reversed under certain circumstances.

The car-motors are typified at M and are suitably mounted on the car which moves along the track-rails T. On one side of both track-rails is located a line of power-conductor sections P, which are connected by electromagnetically-actuated gravity-opening switches S with a feeder F, which is connected to one terminal of a high-potential generator H, which may be adapted to generate current having an electromotive force of substantially five hundred volts for ordinary service. A collecting device E is carried at one side of the car to engage with the power-conductor sections P and is connected through the car-motors M and the car-wheels to the traffic-rails or other suitable return. The connection D between the generator H and the track T completes the power-circuit.

Suitably supported on the opposite side of the car is a collecting device C, which is connected through the car-wheels with the track-rails or other suitable return and which is adapted to engage pick-up or switch-energizing conductor-sections I, each of which is permanently connected through a switch-coil O with a feeder N, which is connected to one side of a low-potential generator L. The connection K between the track T and the low-potential generator L completes the energizing or pick-up circuit.

In the position of the car shown in Fig. 1 the right-hand switch S is in position to close the high-potential circuit through the car-motors, the low-potential circuit is closed by the engagement of the collector C with the section I, and the car-motors are being supplied with current through the collecting device E. The circuits can be readily traced as follows: The pick-up collector C being in engagement with the energizing-section I and being connected to the track return through the car, completes the circuit of the low-potential generator L, the coil O of the switch S being energized thereby to raise the switch S against the action of gravity to close the bridge in the branch B from the feeder F, thus causing current to flow from the feeder F through the branch B, power-section P, collector E, car-motors M, and the track return and connection D to the other terminal of the high-potential generator H. It will be noted that the pick-up sections I are permanently connected with the low-potential feeder N; but as the current generated by the machine L has a potential of only about fifty volts there is no danger to life from the continuously-alive sections I. This arrangement dispenses with the use of an auxiliary pick-up source carried by the car and insures a flow of current through the car-motors as long as both feeders F and N are supplied with current. As the main-feeder current is not relied on in any case to close the magnetic switches, the current-flow to the motors will not be interrupted in cases of high-speed trains, which has been a difficulty hitherto. In such cases if a good contact were not made by the car-collector with the switch-energizing section, the motor connection would be broken and it would be necessary to resort to an auxiliary source of current on the car to close the feeder-switch. Furthermore, in the present system no auxiliary source on the car is necessary to initially close the switches when the car is about to start from a position of rest. This system provides also against the danger of short circuits across from the conductor-rails to the track and provides remedies for various structural difficulties.

Since the switch-energizing sections I are continuously alive, it is essential that they be placed a sufficient distance from the track-rails to prevent short circuits, for if the latter condition should occur it would of course be impossible to close a feeder-switch. It is also essential that the high-potential sections P should be as far removed as is practicable from the track-rails, for if a short circuit occurs at this point a great loss of current will result, the car-motors will be cut off from their supply, and it would be impossible to close the feeder-switches, as the potential of the sections I is so much lower than that of the section P. Even if the different conductor-sections are mounted on insulated supports it is just as important that they should be as widely separated from the track-rails as is practicable, for the possibility of short-circuiting must be prevented at any cost. In installing systems of this sort I have usually mounted the conductor-sections upon insulating-supports, which are themselves somewhat higher than the track-rails, the insulating-supports being usually mounted, as is well known, upon the same ties with the track-rails.

Since it is necessary to provide the front car of the train with a pilot or fender which must come within a short distance of the road-bed in order to be effective, it is impracticable to place the conductor-rails mounted on high insulators between the track-rails. Hitherto collectors or shoes have been usually mounted so that they are located directly beneath the center of the car-body, which would necessarily be the case if the conductor-rails were located between the track-rails. This is a very disadvantageous construction, as shoes so located are not easily accessible for removal or repairs, which is essential, as they rapidly wear out or become inoperative, owing to the rough usage to which they are subjected. In addition to these reasons it is essential in the system disclosed herein, as noted above, to provide means for preventing either the high or low potential current from being short-circuited around the car-motors from the conductor-sections to the track-rails, and in order to fulfil all the required conditions I have conceived the construction above outlined. As the high and low potential sections are arranged on opposite sides of the track-rails, it is not necessary that the corresponding collectors on either side extend out beyond the sides of the car any farther than the distance deemed necessary to separate the conductor-sections from the track-rails. The conductor-rails can thus be separated a greater distance from the track-rails than they could be if located between such rails, and at the same time important structural advantages are obtained. With this construction the collectors are readily accessible for inspection or repairs, and the conductor-sections, mounted on the high insulating-supports, are located so that they interfere in no manner with any of the appurtenances of the lower portions of the car-body. In addition, as it is usually demanded that the conductor-sections be guarded by a roof or box in order to protect the rails from ice, storms, &c., this construction has the advantage of being adapted for such additional protection, which would be impossible in case the sections were located between the track-rails.

In Fig. 4 third-rail insulators Z are shown bolted to the same ties G to which the traffic-rails are secured. The conductor-sections I and P are mounted on these insulators considerably higher than the traffic-rails and higher than the fender or pilot Q, which extends as close to the traffic-rails as is safe. In addition the guards J are provided to protect the conductor-sections from snow and ice and prevent persons from contact with the sections. The pilot-rod L is secured in the usual manner to the car and is provided with the vertical pilot-springs N. Cast integral with each oil-box R is a bracket U, and on the two brackets on each side of the car is mounted a collector-beam V. Mounted on each beam V is one or more collecting devices C and E, which carry suitable collector-shoes Y, which engage with the conductor-sections. By this means the conductor-sections can be properly supported, insulated, and protected without in any wise interfering with the car apparatus. A strong and simple support for the collecting devices is provided, and they are readily accessible for inspection and can be easily and quickly removed and replaced. Without the necessity of long collector-arms the conductor-sections can be located a sufficient distance from the track-rails and from each other to effectually prevent any short circuits.

In Fig. 5 is shown a safety arrangement adapted to be employed at stations 5 6 along the way. Stations are located sometimes on one side of the road and sometimes on the other, and it is desirable to have the power conductor-sections in all cases as far distant from the station-platform as possible, while the low-potential conductor-sections may be located in any suitable place. With the arrangement shown in Fig. 5 the power conductor-sections at a station are always placed on the side of the track-rails farthest away from the station-platform, no matter on which side they are placed in the rest of the length of the road. At one station they may be, as shown, at one side of the track-rails and at another station, which may be on the opposite side of the track-rails, the position of the power-section will be reversed. In both cases the sections I will be correspondingly changed, so that they lie next the station.

In order that the car connections can be changed to correspond to the change in location of the conductor-sections, the switch shown in Fig. 3 is carried on the car and is adapted to be operated manually. The contact 1 is connected to the collector E and contacts 1 and 2 are connected together, the contact 3 is connected with the collector C, and the contacts 4 and 5 are connected to the return and car motors, respectively. The contact 4 is connected through the lead X with the return—as, for example, the wheel W of Fig. 1, which travels on a grounded rail T. The contact 5 is connected with the motor-circuit M, also shown in Fig. 1. In the position of the switch shown, the conductor-sections being located as shown in Fig. 1 and in the left-hand part of Fig. 5, the current will flow from the section P through the collector E to contact 1, the lower switch-piece, and the contact 5 to the car-motors. Current will also flow from the section I through the collector C to the contact 3, the upper switch-piece, and the contact 4 to the return X. When the connections to the conductor-sections are reversed, as shown at the right-hand part of Fig. 5, the switch of Fig. 3 will be moved so that the left-hand end of the upper switch-piece engages the contact 2 and the left-hand end of the lower switch-piece engages the contact 3. As the power-section P of Fig. 3 is now connected as the energizing low-potential section I of Fig. 5, and the section I of Fig. 3 is connected as the power-section P of Fig. 5, current will flow to the car-motors from the collector C of Fig. 3, through contact 3, the lower switch-piece and contact 5. Current will also flow from the low-potential section through the collector E of Fig. 3, the contact 1, the connection between contacts 1 and 2, the contact 2, and the upper switch-piece to the contact 4 and the return X. When the car leaves a station-section, the switch will be returned to its original position if the conductor-sections are connected as they were on the other side of the station.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway, the combination with a high-potential or power feeder, of a low-potential pick-up feeder, power conductor-sections, electromagnetic switches for connecting the high-potential feeder with the power-sections, pick-up or switch-energizing conductor-sections connected through the switch-coils with the low-potential feeder; and collecting means carried by the car to engage said power and pick-up conductor-sections, and a common return for the high and low potential feeders.

2. In an electric railway, the combination with a high-potential or power feeder, of a low-potential or pick-up feeder, power conductor-sections, electromagnetic switches for connecting the high-potential feeder with the power conductor-sections, pick-up or switch-energizing conductor-sections permanently connected through the switch-coils with the low-potential feeder, collecting means carried by the car to engage said power and pick-up conductor-sections, and track-rails serving as a common return for the high and low potential feeders.

3. A contact system for electric railways, which comprises a feeder, power conductor-sections located on one side of both track-rails, electromagnetic switches for connecting the feeder with said sections, and pick-up or switch-energizing conductor-sections located on the other side of both track-rails and connected to the switch-coils.

4. A contact system for electric railways, which comprises a line of switch-energizing conductor-sections located at one side of both track-rails, and a line of power conductor-sections located at the other side of both track-rails; in combination with a collecting device carried on one side of the car to engage with the energizing conductor-sections, and a collecting device carried on the other side of the car to engage with the power conductor-sections.

5. In an electric-railway system, the combination with a feeder, of power conductor-sections located at one side of both track-rails, electromagnetic switches for connecting the feeder with said sections, switch-energizing sections located on the other side of both track-rails, and connected with the switch-coils, a collector carried on one side of the car and engaging the power conductor-sections to convey current therefrom to the car-motors, and a collector carried on the other side of the car to engage the switch-energizing sections and connect the switch-coils to ground through the car.

6. In an electric railway, the combination with a high-potential or power feeder, of a low-potential or pick-up feeder, power conductor-sections located at one side of both track-rails, and electromagnetic switches for connecting the high-potential feeder with the power-sections, pick-up or switch-energizing sections located on the other side of both track-rails, and connected with the low-potential feeder through the switch-coils; and collecting means carried by the car to engage said power and pick-up sections respectively.

7. In an electric railway, the combination with a high-potential or power feeder, of a low-potential or pick-up feeder, power conductor-sections, electromagnetic switches for connecting the high-potential feeder with the power conductor-sections, pick-up or switch-energizing conductor-sections connected with the low-potential feeder through the switch-coils, and collecting means carried by the car to connect the high and low potential feeders through the car to the return, and a common return for the high and low potential feeders.

8. In an electric railway, the combination

with a high-potential or power feeder, of a low-potential or pick-up feeder, power conductor-sections located at one side of both track-rails, electromagnetic switches for connecting the high-potential feeder with the power-sections, pick-up or switch-energizing conductor-sections located on the other side of both track-rails, and connected with the power-feeder through the switch-coils; and collecting means carried on both sides of the car for connecting the high and low potential feeders through the car to the return.

9. In an electric railway, the combination with power conductor-sections located at one side of both track-rails at one part of the road, of switch-energizing conductor-sections located on opposite sides of the track-rails respectively, collecting means on opposite sides of the car to engage with the power and energizing conductor-sections, and a switch on the car for changing the connections of the collecting devices.

10. In an electric car, the combination with collecting devices on opposite sides of the car, of a switch on the car for reversing the connections of said collecting devices.

11. In an electric car, the combination with a collecting device mounted on one side of the car and connected to the return, of a collecting device mounted on the other side of the car and connected through the car-motors to the return, of a switch on the car for reversing the connections of said collecting devices.

In witness whereof I have hereunto set my hand this 25th day of February, 1901.

WILLIAM B. POTTER.

Witnesses:

BENJAMIN B. HULL,

EDWARD WILLIAMS, Jr.