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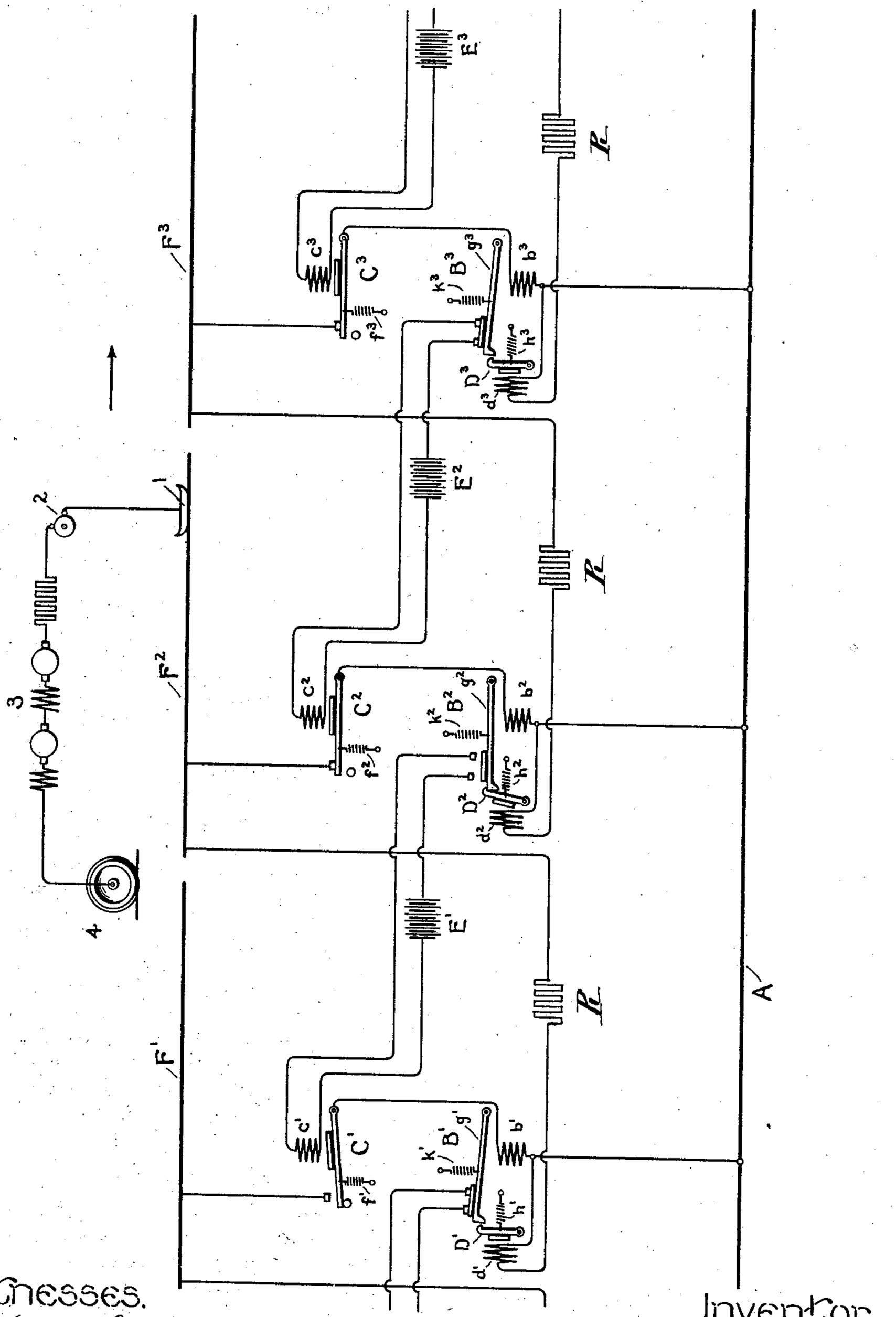
A. CHURCHWARD.

ELECTRIC RAILWAY.

APPLICATION FILED FEB. 20, 1903.

NO MODEL.



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No. 771,533. Patented October 4, 1904.

UNITED STATES PATENT OFFICE.

ALEXANDER CHURCHWARD, OF NEW YORK, N. Y., ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 771,533, dated October 4, 1904.

Application filed February 20, 1903. Serial No. 144,180. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER CHURCHWARD, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

This invention relates to electric railways, and more particularly to sectional-conductor or sectional third-rail electric railways.

The object of this invention is to produce an efficient blocking system whereby a rear section of the sectional conductor is deprived of current when a car is on the next section in advance.

My invention consists of means applied to a sectional-conductor electric-railway system having the sections of its sectional conductor normally connected to the feeder through electromagnetically-actuated switches adapted to deprive a rear section of the sectional conductor of working current when a car is on the section next in advance and to maintain said rear section thus deprived of working current independent of the current flowing through the switch controlling said advance section.

In the accompanying drawing I have illustrated diagrammatically a sectional-conductor electric railway constructed and arranged to act as a blocking system in accordance with my invention.

Referring now to the figure of the drawing, A represents the feeder from a source of current-supply, said feeder being connected to the successive sections F′, F², and F³ of the sectional conductor by means of the electromagnetically-actuated switches C′, C², and C³. The said switches are maintained normally in a closed position against the action of the springs f', f^2, and f^3, respectively, by means of the electromagnets or solenoids c', c^2, and c^3, which are contained in local circuits in series with a local source of power, such as storage batteries E′, E², and E³. The local circuits are controlled by the movable members or armatures g', g^2, and g^3 of the relays B′, B², and B³, the actuating-coils b', b^2, and b^3 of said relays being connected in series with the main switches C′, C², and C³, respectively. Each of said relay-armatures is adapted to open one of said local circuits whenever the actuating-coil of the relay is energized. Catches or dogs D′, D², and D³, which are operated by means of the actuating-coils d', d^2, and d^3 against the action of the springs h', h^2, and h^3, respectively, are employed to hold the armatures g', g^2, and g^3 in position after they have been moved to open the local circuits by their actuating-coils. Each of the catch-releasing coils d', d^2, and d^3 is connected between the feeder A and the advance section.

Each of the main switch-actuating coils c', c^2, and c^3 is controlled by the relay, the actuating-coil of which is in series with the main switch of the next section in advance. For instance, the actuating-coil c' of the main switch C′ is controlled by the relay B², the actuating-coil b^2 of which is in series with the switch C², which controls the connection between the feeder A and the section F² of the sectional conductor.

The collector-shoe carried by the car is represented by 1, the motor-controller on the car by 2, the car-motors by 3, and the car-wheel through which the return-circuit is completed is represented by 4.

The operation of the system will now be described. Considering the car to be moving in the direction indicated by the arrow and taking current from the section F² of the sectional conductor, the circuits may be traced as follows: the car-motors receiving current from the feeder A through the actuating-coil b^2 of the relay B², the electromagnetically-actuated switch C², section F² of the sectional conductor, collector-shoe 1, controller 2, motors 3 to the car-wheel 4 and return, it being understood that the switch C² is normally maintained in its closed position by means of the actuating-coil c^2 against the action of the spring f^2, since the armature of the relay B³ is normally in such position as to maintain the local circuit through the battery E² and the said actuating-coil c^2 closed. While the current is flowing through the actuating-coil

b^2 of the relay B^2 the armature of said relay is actuated to open the local circuit, which includes the switch-actuating coil c', thereby deenergizing the said coil c' and allowing the switch C′ to open by the action of the spring f'. This operation deprives the section F′ of working current—that is, current of sufficient strength to operate the motors of a car on the section F′—and any car or train approaching the car which is now taking current from the section F^2 will be deprived of working current immediately upon reaching the section F′. As the car now on section F^2 moves forward onto the section F^3, the circuit through the relay-actuating coil b^2 and the switch C^2 being broken, the said relay-actuating coil b^2 will be deënergized and the armature of the relay B^2 will be moved by the spring k^2, so as to close the local circuit through the switch-actuating coil c', thereby permitting the section F′ to be returned to its normal condition, directly connected to the feeder through switch C′ and the low-resistance coil b'.

In order to render this system more positive in its action and also to have it act efficiently as a blocking system when a train stops at a station or if for any other reason the circuit through the motors while the car is on the section F^2 is opened in such a manner that the current flowing through the relay-actuating coil b^2 is insufficient to maintain the armature of the relay B^2 in its open position against the action of the spring k^2, the catch or dog D^2 is provided to hold the said armature in its open position until the car leaves the section F^2. Immediately after the said armature is opened against the action of the spring k^2 the said catch operates to maintain it in its open position independent of the current flowing through the coil b^2. When the car moves onto the advance section F^3, a circuit is completed from the feeder A through the catch-releasing coil d^2, resistance R, conductor-section F^3, through the collector-shoe 1 and the car-motors to the return, thus operating the catch D^2 against the action of the spring k^2 to release the armature of the relay B^2 and close the local circuit through the switch-actuating coil c' of the switch C′. The catch-releasing coils should be of high resistance to prevent the advance sections from being supplied with working current through said coils. As an additional safeguard the resistance R may be inserted in circuit with said catch-releasing coils, as illustrated in the figure of the drawing.

I do not wish to be limited to the specific details of the system herein shown and described, since a number of modifications can be made therein without departing from the spirit and scope of my invention. For instance, the current which is utilized in the local circuits containing the storage batteries E′, E^2, and E^3 could be obtained from a shunt-circuit from the feeder to ground or from any other desired source of supply.

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

1. In a railway system, a sectional conductor, a feeder, electromagnetically-actuated switches for connecting the sections of said conductor to said feeder, means for maintaining said switches normally closed, means for causing a rear section of said sectional conductor to be deprived of working current when a car is on a section in advance, and means for maintaining said rear section thus deprived of working current independent of the current flowing through said advance section until the car has left said advance section.

2. In a railway system, a sectional conductor, a feeder, electromagnetically-actuated switches for connecting the sections of said conductor to said feeder, means for maintaining said switches normally closed, means for causing a rear section of said sectional conductor to be deprived of working current when a car is on a section in advance, means for maintaining said rear section thus deprived of working current independent of the current flowing through the section in advance until the car has left said advance section, and means for permitting said rear section to be returned to its normal condition when the car moves onto the second section in advance.

3. In an electric railway, a sectional conductor, a feeder, and electromagnetically-actuated switches for normally connecting the feeder to the sections of said conductor, the actuating-coils of each of said electromagnetically-actuated switches being controlled by a relay the actuating-coil of which is in series with the switch of the next section in advance, whereby each switch-actuating coil is deënergized when current is being taken from the next section in advance.

4. In an electric railway, a sectional conductor, a feeder, electromagnetically-actuated switches for connecting the feeder to the sections of said conductor, relays for controlling the actuating-coils of said electromagnetically-actuated switches, the actuating-coil of each of said relays being in series with the switch of the next section in advance whereby a rear section of said sectional conductor is deprived of working current when current is being taken from said advance section, and independent means for maintaining said rear section thus deprived of working current until the car passes onto a section in advance of said advance section.

5. In an electric railway, a sectional conductor, a feeder, electromagnetically-actuated switches for normally connecting the feeder of the sections of said conductor, local circuits in each of which the actuating-coil of one of said electromagnetically-actuated switches is located, a relay for controlling each local circuit, the actuating-coil of each relay being in

series with the switch of the next section in advance whereby the switch-actuating coil in the local circuit controlled by each relay is de-energized when current is taken from the next section in advance, a catch for holding the armature of each of said relays in such position as to maintain the local circuit controlled by each relay open independent of the operation of the relay-actuating coil, and means for releasing said catch.

In witness whereof I have hereunto set my hand this 17th day of February, 1903.

ALEXANDER CHURCHWARD.

Witnesses:

M. L. COFFIN,

L. C. FOSS.