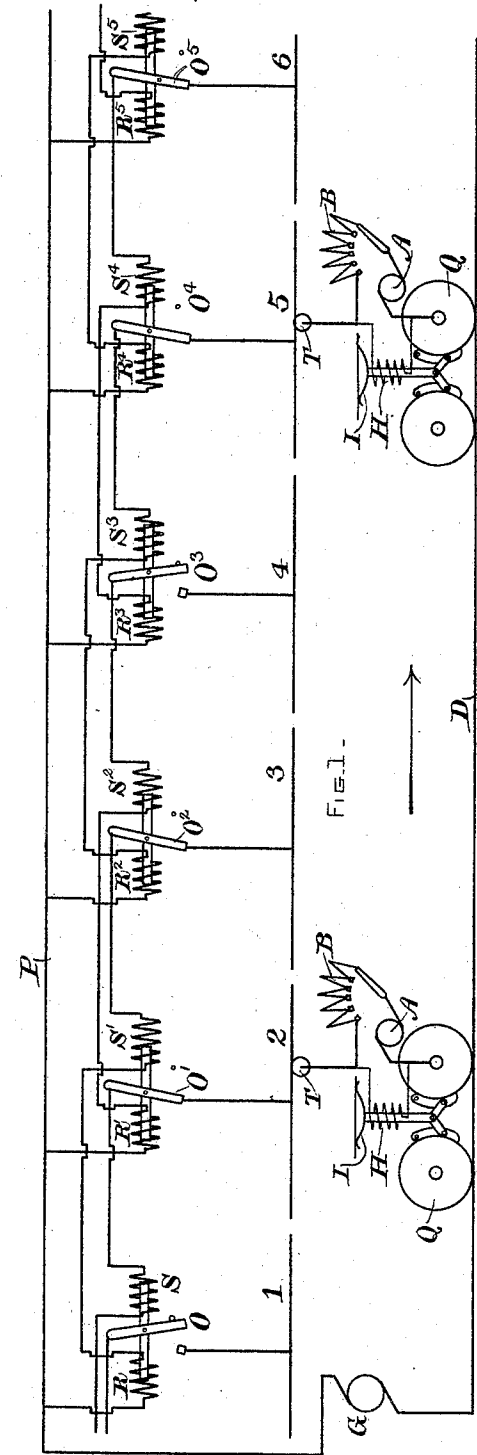


(No Model.)

F. O. BLACKWELL.  
ELECTRIC RAILWAY BLOCK SYSTEM.

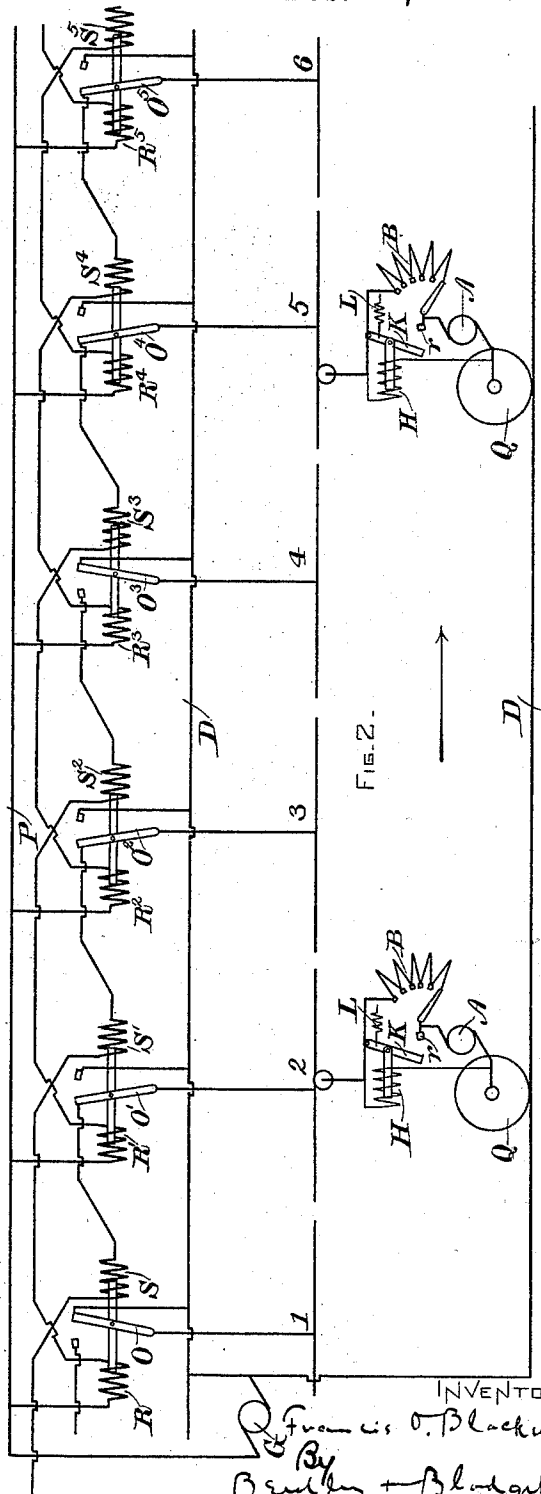
No. 492,457.

Patented Feb. 28, 1893.



WITNESSES.

A. F. Macdonald  
Allene



INVENTOR

From O. Blackwell  
By  
Brentley + Bloodgood  
Also.

# UNITED STATES PATENT OFFICE.

FRANCIS O. BLACKWELL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

## ELECTRIC-RAILWAY BLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 492,457, dated February 28, 1893.

Application filed February 15, 1892. Serial No. 421,507. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS O. BLACKWELL, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented a new and useful Improvement in Electric-Railway Block Systems, of which the following is a specification.

The present invention relates to a block system of electric railways so arranged that each train, whether of one or more cars, automatically cuts off the supply of current from the preceding block, but keeps such block cut out only until the train has advanced on to the next section. In this way the blocks are all normally in circuit, but nevertheless the presence of a dead section in the rear of each train is insured thus avoiding to a large extent the danger of a collision.

The invention may be put to use on any electric railway line, but it is especially important under such service requirements as are found on an elevated road or on suburban lines where it is desired to run trains of a number of cars under short headway.

The general manner in which the result aimed at is secured consists in dividing up the supply conductor into a number of insulated sections of a desired length, all of which are normally in circuit with the generators at the power station and are supplied with current by a system of feeders in the usual manner. Circuit controllers, however, are provided for cutting out these sections temporarily, and these circuit controllers are so arranged that when a train is on a given section the controller corresponding to the preceding section is shifted so as to cut the section out and leave without motive power any train which may come upon it. When, however, the train advances one section farther, the new section just left becomes the cut-out section, and the one formerly cut-out is now coupled up in circuit again and may be safely occupied by a second train. As a further safe-guard against accidents means are provided for short-circuiting the motor, or for applying the brakes, automatically whenever a train runs on to one of the block sections which, as just described, is temporarily out of circuit.

In the accompanying drawings, Figure 1 is a diagrammatic view illustrating one form of

the invention, and Fig. 2 is a similar view showing an arrangement in which the supply conductor sections, instead of being cut-out altogether, are temporarily connected with the return line so that a motor running thereon becomes short-circuited.

In Fig. 1 the supply conductor is divided up into insulated sections 1, 2, 3, &c., in such a manner that the trolley, or whatever contact device is used, may pass uninterruptedly from one to another. Each of these sections is normally connected in circuit with the generator G by a feeder P or a number of feeders, the feeding system itself being immaterial to the invention. Between such sections and the generator, however, are located a corresponding number of circuit controllers, consisting of switches O, O', &c., and double solenoids R, S, R', S', &c., each so arranged that when the left-hand coil is energized the switch is closed and the corresponding conductor section put in circuit with the generator, while on the other hand when the right-hand coil is energized the switch is opened and the conductor section out of circuit.

In order that the circuit controllers may be opened and closed automatically the magnet coils are coupled up in circuit in the following manner: The switch corresponding to any given section is connected to the generator through the opening coil of the preceding section and the closing coil of the second preceding section. For example, in Fig. 1, a train is indicated on block 2, the switch O' is closed, and current is supplied to this section through o' in which is included the coil S of the preceding section, which therefore is energized, and holds the switch O open. When the train on section 2 advances to section 3, current will flow through o<sup>2</sup>, which will energize coil S' opening the switch O' of block 2, and will also energize the coil R closing the switch of the next preceding block 1. A following train may then run on to block 1, and will receive the normal supply of current. The manner of connecting up in circuit the switches for the remaining sections is exactly the same as already described, and the mode of operation will be understood.

The return conductor D is represented as consisting of the track rails so that wheels Q

of the train form a part of the circuit, the car circuit also including the motor A, a suitable regulator B and a contact trolley T. In order that the brakes may be automatically applied whenever a train runs onto a blocked section, there is shown in Fig. 1 a magnet H coupled up in shunt with the motor and holding the brake shoes away from the wheels against the stress of a spring I. If now the magnet be de-energized by failure of the motive current, the spring instantly applies the brakes. In actual practice the brakes may be set in a number of ways.

In Fig. 2 the means for supplying current to the different sections are the same as in Fig. 1, as is also the manner in which the circuit controllers are connected and operated, except that a train, instead of cutting out from circuit altogether the preceding section, couples such section to the return conductor D so that a motor running on this block will be short-circuited. For example, to trace a single circuit, it will be seen that current is fed to the motor on section 5 from the feeding conductor P, through the switch O<sup>4</sup> including, as it does, the closing coil R<sup>2</sup> of switch O<sup>2</sup> and the opening coil S<sup>3</sup> of switch O<sup>3</sup>, hence the switch O<sup>3</sup> is re-set to its normal position putting section 3 in circuit in readiness for a train to proceed thereon. Switch O<sup>3</sup>, however, has been thrown into engagement with a contact connected to the return conductor D, which position the switch will maintain until the train on section 5 advances to section 6. In this modification a switch K is shown on the vehicle adapted to shunt the regulator B by connecting with contact r, and having its movement controlled on the one hand by a magnet H in shunt with the motor, and on the other hand by a spring L which closes said switch when the magnet is de-energized. It will therefore be readily understood that if a motor so arranged comes upon a block system it will be short-circuited and will act as a brake to arrest the train.

I am aware that it has been proposed hitherto to use a sectional supply conductor, the sections of which are normally out of circuit, but which are automatically coupled up in circuit one after another upon the passing of a train over them. The present arrangement, however, is quite different as the sections are normally in circuit, and the circuit controllers are provided, not to temporarily connect that section on which the train is with the feeding conductor, but to insure a blocked section in the rear of the trains and thereby to avoid danger of collision.

A device of this nature is shown in Patent No. 430,329, granted Merle J. Wightman June 17, 1890, but, as indicated above, I do not claim this as my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a sectional power supply conductor, with a feeding conductor

or conductors, circuit controllers normally preserving the power supply conductor sections in circuit with the feeding conductor, and means brought into and kept in action during the presence of a car or train on any given section for cutting out of circuit the preceding section, as set forth.

2. The combination of a power supply conductor divided into insulated sections, with electro-magnetically actuated circuit controllers normally preserving such power conductor sections in circuit with the source of electric supply, and a circuit closed by the presence of a train on any given section for shifting the controller of the preceding section and cutting such section temporarily out of circuit.

3. The combination of a power supply conductor divided into insulated sections, with circuit controllers normally preserving such power conductor sections in circuit with the source of supply, an electro-magnet arranged to open the circuit of a preceding section when energized and a circuit for energizing such magnet automatically closed by the presence of a train on an advance section.

4. The combination of a power supply conductor divided into insulated sections, circuit controllers normally preserving such power conductor sections in circuit with the source of supply, and electro-magnets for shifting such circuit controllers into open and closed positions, and coupled up in circuit so that by a presence of a train on any given section the circuit on the immediately preceding section is opened, and the circuit of the second preceding section closed, as set forth.

5. The combination of a supply conductor divided into insulated sections, with switches normally preserving such sections in circuit with the source of supply, and electro-magnets for shifting such switches each comprising an opening and a closing coil, the opening coil of a given magnet being included in circuit with the preceding section immediately in advance, and the closing coil in circuit with the next section in advance, as set forth.

6. The combination of a supply conductor divided into insulated sections, with switches adapted to connect such sections with either pole of the source of supply, and electro-magnets controlled by the presence of a train on a given section for breaking the normal connection of a succeeding section with the generator and temporarily coupling it to the return conductor, as set forth.

7. The combination of a block electric railway system, having a sectional supply conductor, in which any given section is temporarily cut out of circuit while a train is present on a succeeding section, with means for automatically braking or stopping a train traveling over such railway responsive to, or thrown into action upon, the cessation of the motive current driving the car.

8. The combination of a block electric railway system in which a section of conductor in the rear of the car or train is kept open circuited, as described, with a speed arresting  
5 device for a train traveling over such railway, and means controlled by the motive current for maintaining such device out of action while current is supplied to the section occupied by the train, but for automatically

applying the said device should the supply of motive current cease, as described.

In testimony whereof I have hereto set my hand this 11th day of February, 1892.

FRANCIS O. BLACKWELL.

Witnesses:

E. H. BOOTH,  
JOHN B. BLOOD.