H. E. McDONNELL.

ELECTRIC CONTROLLING AND SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED JAN. 26, 1907.

939,154.

Patented Nov. 2, 1909.

2 SHEETS—SHEET 1.

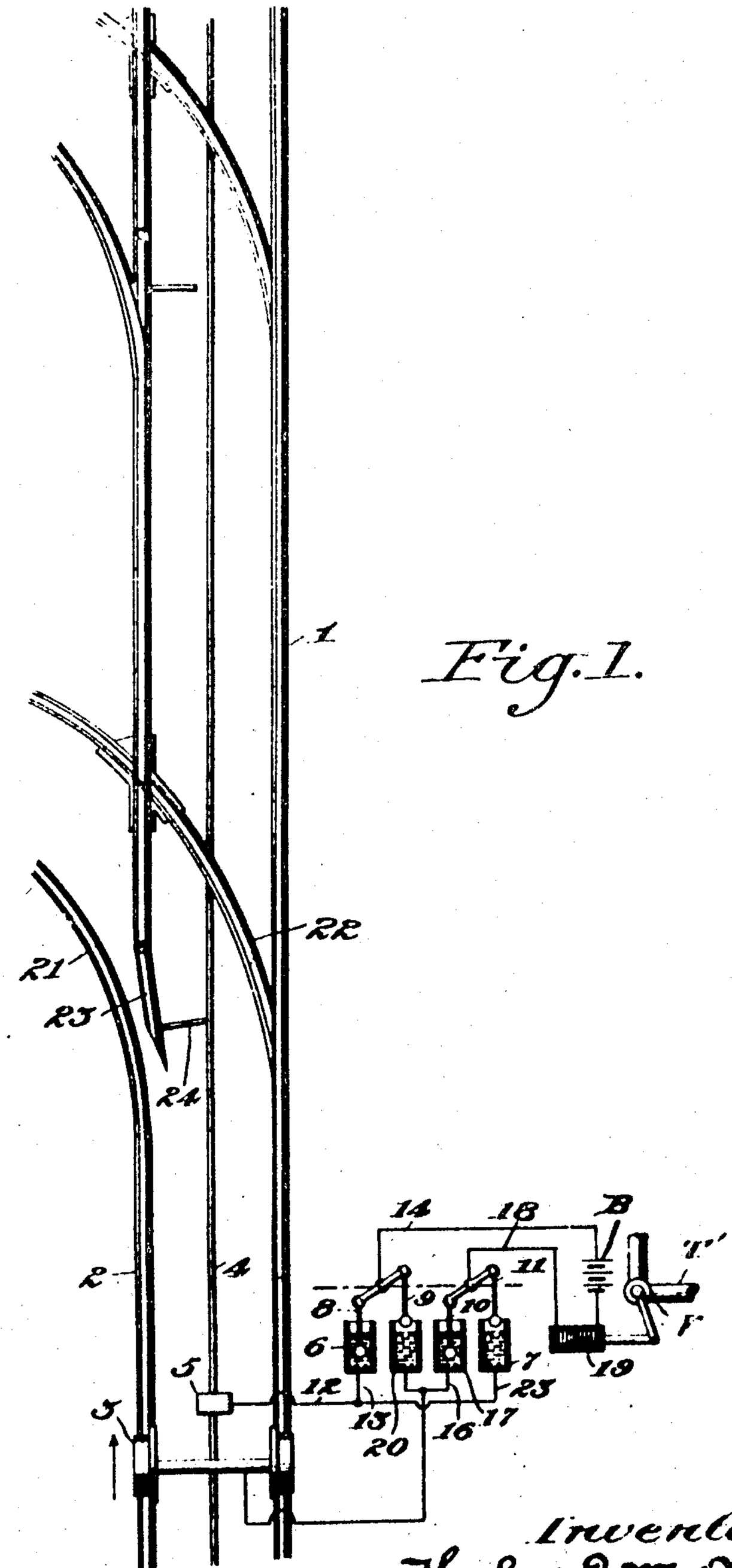



Fig. 1.

Witnesses.
James A. Marr
Edmonds Jr.

Inventor:
Herbert E. McDonnell
by Edwards & Clement
Atty.

H. E. McDONNELL.

ELECTRIC CONTROLLING AND SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED JAN. 26, 1907.

939,154.

Patented Nov. 2, 1909.

2 SHEETS—SHEET 2.

Fig. 2.

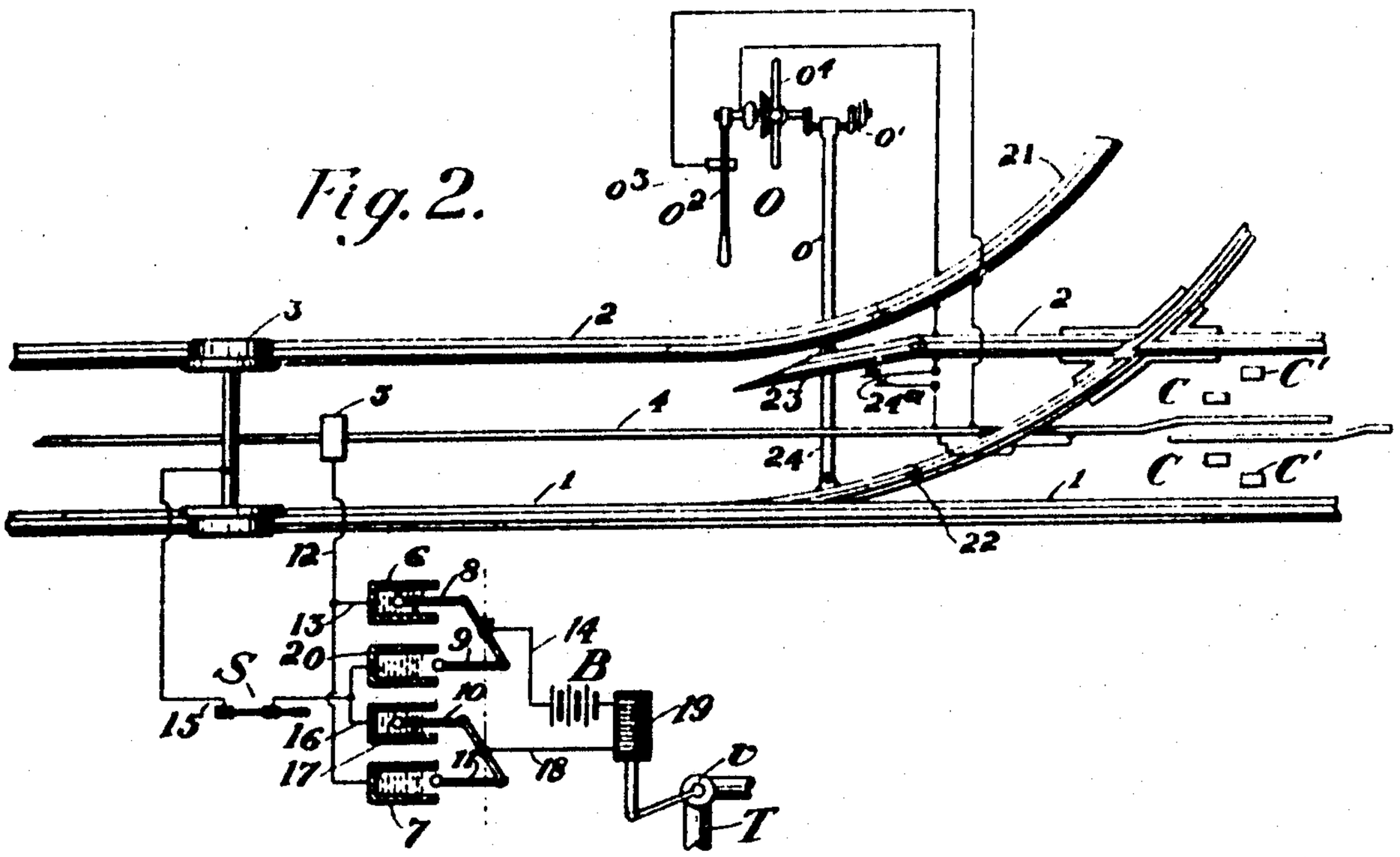
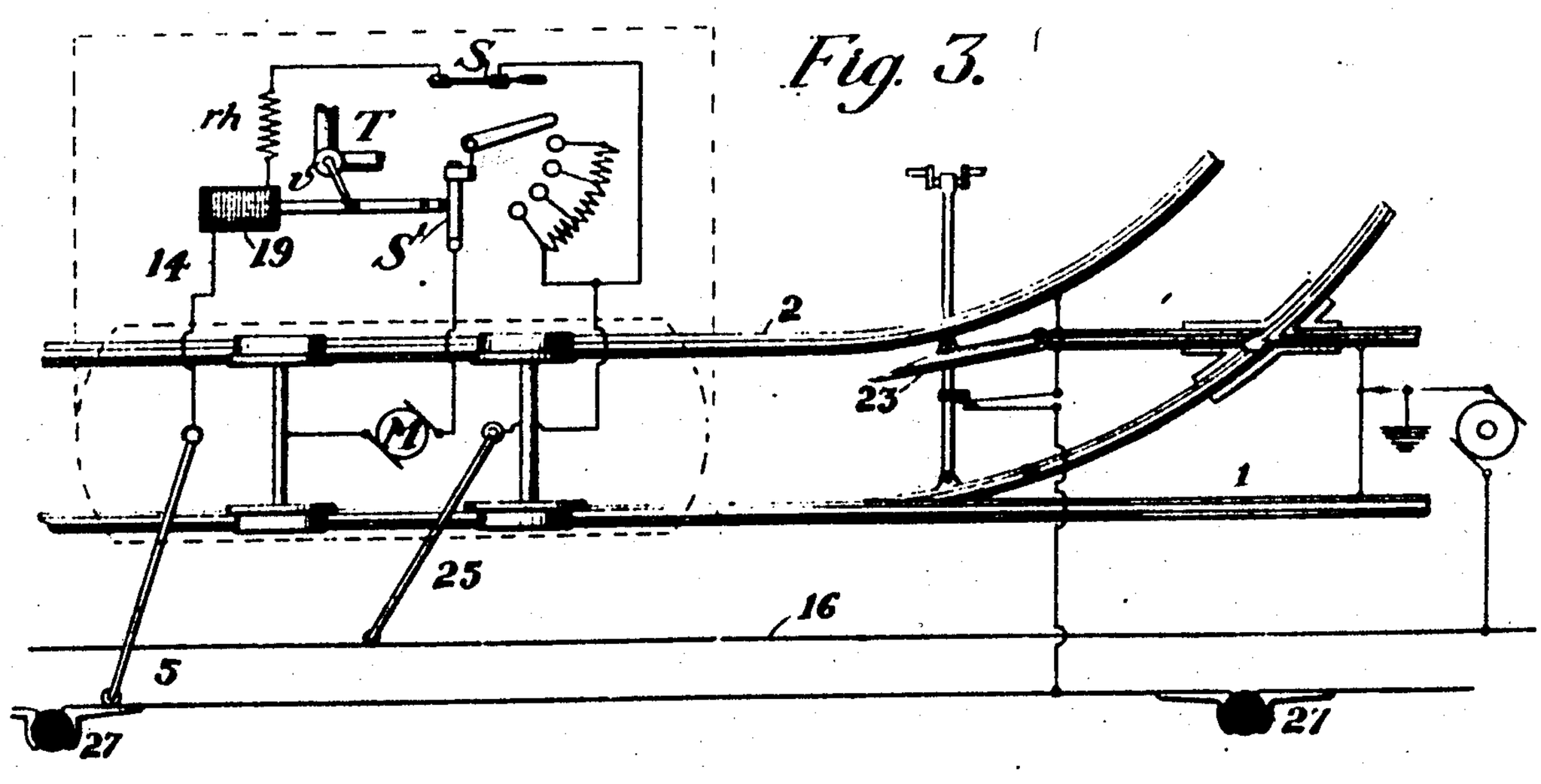



Fig. 3.




Witnesses
H. J. Löwenstein.
James A. Marr.

Inventor
Herbert E. McDonnell
By Edward S. Clement
Attorney

# UNITED STATES PATENT OFFICE.

HERBERT E. McDONNELL, OF LEOMINSTER, MASSACHUSETTS.

## ELECTRIC CONTROLLING AND SIGNALING SYSTEM FOR RAILWAYS.

939,154. Specification of Letters Patent. Patented Nov. 2, 1909.

Original application filed August 7, 1906, Serial No. 329,606. Divided and this application filed January 26, 1907. Serial No. 354,258.

*To all whom it may concern:*

Be it known that I, HERBERT E. McDONNELL, a citizen of the United States, residing at Leominster, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Electric Controlling and Signaling Systems for Railways, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electric controlling and signaling systems for railways and is divided out of my copending application, Serial No. 329,606, filed August 7, 1906.

The object of the invention is the improvement of such systems and their application in such fashion as to automatically control safety devices upon trains or other vehicles.

Briefly stated, my invention comprises a third rail which is disposed preferably between the ordinary rails and insulated therefrom, together with a contact member carried by a switch tongue or actuated by any movement of the switch which completes a short circuit and operates controlling mechanism upon a car. Assuming the vehicles to be fitted with air-brakes in accordance with standard practice, my invention contemplates a controlling valve for the usual train pipe or "emergency pipe", and a valve or switch controlling the motive force, these valves or switches to be operated by an electromagnet or electromagnets in a circuit governed by the switch tongue.

In order to guard against open switches, misplaced signals and the like, I provide means whereby a switch tongue when open will short circuit the signaling conductor with the running rails or the power wire or rail, thereby completing the operating circuit for the vehicle that comes on to that block. The same effect is produced when a signal is falsely thrown, wire connections being preferably carried from the signaling conductor and one or both of the running rails or sources of power to contacts adjacent to the signal parts so that when the latter are operated the contacts are closed together. Thus the signal cannot be falsely set without stopping the vehicles. Various combinations of these two effects can be made.

It will be apparent after reading the following specification that my invention can be applied to electric railways as well as to steam and other roads; and the supply of current for working the signal and controlling devices may be from a main central office or power house as well as from batteries or generators on the trains or cars. The changes required for this adaptation of the invention are only such as result from the change in the nature of the power employed. The intermediate wire or conductor for an electric traction road would preferably be located overhead paralleling the trolley wire and a circuit completed from the switch to the overhead conductor, or to the rails as would be necessary to complete the circuit.

In the accompanying drawing Figure 1 is a diagrammatic view showing a portion of a rail track with two switches, one open and the other closed, and a vehicle carrying safety devices and approaching the open switch; Fig. 2 is a detail showing control of a signal by the switch stand or signal lever; and Fig. 3 shows the application of the invention to an electric trolley system.

In Fig. 1, 1 and 2 represent the ordinary track rails, 3 the wheels of a vehicle adapted to run thereon, and 4 an insulated third rail or intermediate conductor which preferably runs along between the track rails 1 and 2. A pair of spur or switch rails 21, 22, branch off from the main track and are controlled by a switch tongue 23 which is provided with a contact 24 adapted to engage the intermediate conductor 4 when the switch tongue is open. Any form of contact arm may be used and I have only shown it in Fig. 1 in a diagrammatic way. A brush 5 forms the other terminal of an operating circuit and is carried by the car so as to travel along the intermediate conductor 4. The circuit utilized for operating the controlling magnet 19 is shown as including a pole changing switch, which is part of the complete circuit described in my copending application, of which this is a division. The safety devices are shown as a train pipe or emergency air pipe T controlled by a valve V through a lever connection with the solenoid or electromagnet 19.

The operation of the device will be easily understood. Assuming that the switch tongue 23 has been carelessly left open, and that the vehicle is approaching in the direction of the arrow, a short circuit exists, as already stated, which is indicated in Fig. 1 by the contact 24 touching the con-

ductor 4. This completes a circuit not only to the switch and the rail 22 behind it, but to the connected rails forward as well as back from the switch. The conductor 4 is divided into insulated sections and as soon as the vehicle arrives in the section which is thus short circuited, a circuit will be completed through the solenoid 19 as follows: battery B, 14, 8, 6, 13, 12, 5, 4, 24, 23, 2, 22, 1, 3, 15, S, 16, 17, 10, 18, 19, and back to battery. The electromagnet 19 thereupon becomes energized and as indicated in Fig. 1, its energization operates the valve V, releases the air in the train pipe, cuts off the steam or other power, and sets the brakes. The vehicle thereupon stops, avoiding the open switch. There is a switch S in the engine cab by which the engineer can cut off the operating current when it is necessary to use the open switch.

In Fig. 2 I have shown a switch stand or operating mechanism O, with a link or connecting rod $o$ secured at one end to the operating crank $o'$, and passing thence to the switch point. The operating lever $o^2$ and a coöperating contact $o^3$ are connected to the rails 2, and to the middle conductor 4, respectively, so that when the lever $o^2$ is thrown to put the signal target $o^4$ to danger, the rails 2 and 4 are connected whether the switch points are actually open or not. Conversely, the same closure will obviously be produced by the switch point 23 closing the contacts $24^a$, whether the target is set to danger or not.

In Fig. 3 I have shown a pair of rails 1 and 2, and have indicated in dotted lines a car body supposed to carry a trolley pole 25, the switch point 23 being adapted when open to connect the supplemental trolley wire $4^a$ with the rails 1—2, just as conductor 4 in Fig. 1 is similarly connected with the rails when the switch point 23 is open. The electromagnet 19 is shown in this case connected on one side to the trolley wheel 5 and on the other side to the source of supply through the switch S the same as in Fig. 1: In addition to controlling the train pipe or brake mechanism indicated at T, the electromagnet 19 in this case also controls the source of current supply to the motor or motors M, this being diagrammatically indicated by a switch S'. The conductor $4^a$ is located as convenience and economy may require, being preferably carried on the same supports or in the same conduit as the main trolley wire 26. The insulated sections are produced by interposing suitable strain insulators at proper intervals as indicated at 27.

I am aware that various changes in matter of detail may be made and the present illustration and description herewith is typical and diagrammatic only, all practical details which are non-essential in explaining the invention being omitted. All these details, however, are of necessity well known and will immediately occur to the skilled engineer or railroad man, and it should be clearly understood that I contemplate making use of them in practicing my invention, hence they are to be borne in mind in construing the following claims.

Having thus described my invention what I claim and desire to secure by Letters Patent is—

1. In a railway signaling system, a pair of track rails, an insulated conductor divided into sections, a vehicle traveling upon the track rails, a motor and braking appliances on said vehicle, an electromagnet controlling said motor and braking appliances, a movable switch point in the track rail, a circuit closing device adapted to be directly actuated by said switch point, a source of current supply connected to one side, as by grounding, to the track rails, and on the other side through a feeder or supply conductor paralleling the rails to the controlling electromagnet, connections from the sectional insulated conductor to the circuit closing device, and thence to the track rails, and means whereby the controlling electromagnet on the vehicle when approaching the switch, will be brought into connection with the section of the conductor adjacent to the switch, and if the latter is open, will have its circuit completed to the track rail, and will act to stop the vehicle, substantially as described.

2. In a railway signaling and safety system, a pair of track rails, a switch point therein, a circuit closer directly operated by said switch point, an actuating device for the switch, a signal operated by said actuating device, a supplementary circuit closer controlled in the actuation of said signal, and a vehicle traveling on said track rails, with means carried upon said vehicle adapted to be controlled by both of said circuit closers, and to act directly upon the motor and braking appliances on the vehicle, to stop the same if the switch is open, or the signal misplaced or both, substantially as described.

3. In a railway signaling and safety system, a pair of track rails, a vehicle traveling thereon, a motor and braking appliances on said vehicle, a controlling electromagnet therefor also on the vehicle, a source of supply, a continuous supply conductor extending along the track rail and a supplementary conductor extending parallel therewith but divided into insulated sections, a switch point in the track rail and a circuit closer controlled thereby, with connections from said circuit closer to the adjacent track rail and the contiguous insulated section of the supplementary conductor, the connections being such that when the switch point is dis-

placed and the switch opened, current will be supplied from said continuous conductor to the controlling electromagnet on the approaching vehicle, thence to the insulated section on the supplementary conductor and thence through the switch-controlled circuit closer to the track rail and through the same or the return conductor to the source of supply, substantially as described.

4. In an electric railway signaling and safety system, a pair of track rails, a continuous supply conductor, a sectional insulated supplementary line conductor, a vehicle running on the track rails, an electric motor and braking device on said vehicle, a traveling conductor thereon adapted to convey current from the supply conductor to the said motor and thence through the wheels to the track rails, an electromagnet controlling the motor circuit and the braking means, a branch circuit for said electromagnet extending from the said traveling conductor to another traveling conductor adapted to make contact with the sectional supplementary line conductor, and a switch point in said track rails controlling in its movement a connection therefrom to the contiguous section of the supplementary conductor, substantially as described.

5. In an electric railway signaling and safety system, a pair of track rails, a continuous supply conductor, a sectional insulated supplementary line conductor, a vehicle running on the track rails, an electric motor and braking device on said vehicle, a traveling conductor thereon adapted to convey current from the supply conductor to the said motor and thence through the wheels to the track rails, an electromagnet controlling the motor circuit and the braking means, a branch circuit for said electromagnet extending from the said traveling conductor to another traveling conductor adapted to make contact with the sectional supplementary line conductor, and means controlled in switching from the main track rails to a branch to establish a connection therefrom to the contiguous section of the supplementary line conductor and stop the approaching vehicle or vehicles, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HERBERT E. McDONNELL.

Witnesses:
HERBERT W. SANGSTER,
BRUCE T. GRAHAM.