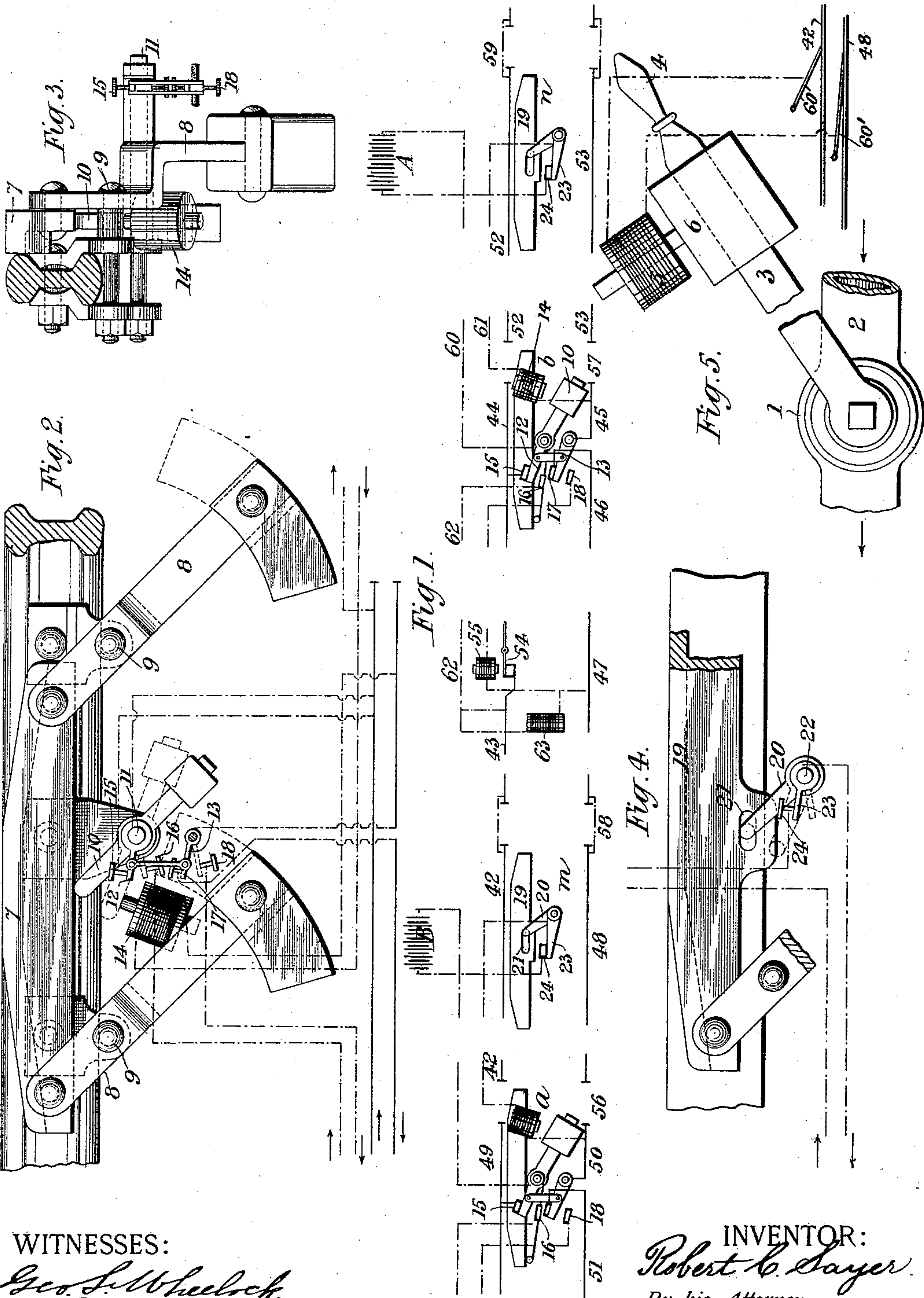


R. C. SAYER.
ELECTRIC CONTROL OF RAILWAY TRAINS.

No. 481,062.

Patented Aug. 16, 1892.



WITNESSES:

Geo. L. Wheelock.
Walter Allen

INVENTOR:

Robert C. Sayer.
By his Attorney
Herbert W. Jenner.

(No Model.)

2 Sheets—Sheet 2.

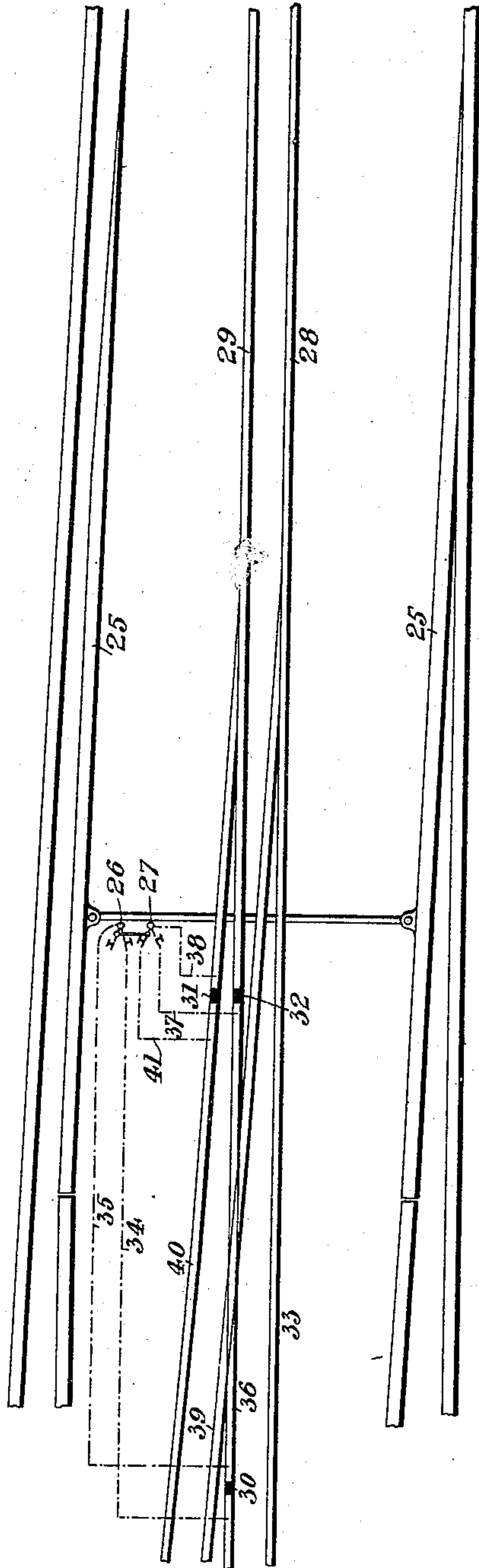
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Fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT COOKE SAYER, OF BRISTOL, ENGLAND.

ELECTRIC CONTROL OF RAILWAY-TRAINS.

SPECIFICATION forming part of Letters Patent No. 481,062, dated August 16, 1892.

Application filed March 10, 1892. Serial No. 424,382. (No model.) Patented in Belgium September 23, 1891, No. 96,506.

To all whom it may concern:

Be it known that I, ROBERT COOKE SAYER, a subject of the Queen of Great Britain and Ireland, residing at Redland, Bristol, in the county of Gloucester, England, have invented certain new and useful Improvements in the Electric Control of Railway-Trains, (for which Letters Patent have been granted in Belgium September 23, 1891, No. 96,506;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention for improvements in the electric control of railway-trains has for its object to control the motion of the train automatically by electrical means; and it consists, essentially, in leading the power to the motors driving the train through a valve, an electric switch, or other means to suit the power, which is so held against the resistance of a spring or weight by means of a current passing to the train from conductors laid parallel to the permanent way that the power can pass freely to the said motors, and in interrupting the current to the train at desired places and under desired circumstances, so that the valve or switch is automatically operated to shut off the power from the said motors and must be again replaced by the driver or guard and held by the magnet before power is again admitted to the train.

Figure 1 is a diagrammatic view showing the electrical connections on a line of railway. Fig. 2 is a side elevation of an electric switch, hereinafter called the "blocking-switch," to be actuated by a passing train suitable for interrupting the current, and thus the power to a following train for a portion of the section passed until the first train reaches a certain determined point forward. Fig. 3 is an end elevation of the same. Fig. 4 is a side elevation of an electric switch, hereinafter called the "unblocking-switch," to be actuated by the passing train for releasing the blocking-switch when the train has reached the determined point. Fig. 5 shows a valve for admitting steam to the driving-motor and controlled by the electric current. Fig. 6 is an elevation of an electric switch operated by the railway-points, so that

the current, and thus the power to the train, is interrupted unless the points are properly placed.

Referring to Fig. 5, the power is admitted to the control of the driver of the train through a valve 1 in the pipe 2, or in the case of an electric railway through an electric switch. The valve 1 is situated in the steam-pipe (when the train is drawn by an ordinary locomotive) between the boiler and the usual drivers or regulator-valve and is operated by the counterweighted lever 3, which tends by means of its weight 6 to close it, (or in the case of an electric switch to open it,) so as to cut off the power from the drivers or regulator-valve of the train. The lever 3 is placed by hand in the position shown by means of the handle 4, and is retained in position by means of the attraction of the electro-magnet 5 on the weight 6 so long as a current is passing through the magnet 5. When, however, the current is cut off from a train, as hereinafter described, by a train in front, the magnet releases the lever 3, which then falls and closes the valve 1 and shuts off the power from the drivers or regulator-valve, and so from the motors, and the lever must be replaced by hand to open the valve and be retained by the magnet before the train can proceed. The means by which a front train cuts off the current from a following train, so as to close its valve 1, as above described, and re-establishes the current are as follows:

Referring to Figs. 2 and 3, the pedal-bar 7 is supported parallel to the permanent way and so as to be depressed by the flanges on the wheels of a passing train by the counterweighted levers 8, fulcrumed at 9 to brackets secured to the ordinary rails. The counterweighted lever 10, fulcrumed at 11 to a bracket secured to the rail, is on the depression of the pedal-bar 7 operated by its under side and actuates the electric switches 12 and 13, and is retained in this position by the attraction of the magnet 14 so long as a current is passing through it. The switches 12 13 each close one or the other of two circuits through the contact-pieces 15 16 17 18. Referring to Fig. 4, the pedal-bar 19, supported similarly to the bar 7, is connected to the lever 20 by means of a pin on the lever

sliding in a slot 21 in the bar. The lever is fulcrumed at 22 to a bracket secured to the ordinary rails and operates the electric switch 23, which closes or opens a circuit by means of the contact-piece 24.

Referring to Fig. 6, the permanent-way points 25 are connected to the electric switches 26 and 27. The conductor 29 and its extension in the siding are interrupted and blocks of insulating material inserted at 30 31 32. Ordinarily the current passes by the conductor 28 to that part or continuation of the said conductor 28 which is marked 33, through the train back by 34, 26, 35, 36, 37, 27, and 38 to 29. When the permanent-way switches are set for the branch, the current passes from 28 to the corresponding conductor of the branch which forms a continuation of the said conductor 28 and is marked 39 through the train to 40, 41, 27, and 38 to 29. Thus the current is cut out from the magnet 5 of trains on the one line and admitted to those on the other line, according to the position of the points 25. In the intermediate positions of the switches 26 and 27 the current is cut off from both lines.

Referring now more particularly to the diagram, Fig. 1, 42 43 44 45 46 47 48 represent one complete section of the electric conductors supplied with electricity from a station A, and serving to convey the current to the train by means of sliding contact-pieces 60', carried by the train and bearing on these conductors. The sliding contact-pieces are electrically connected to the magnet 5, Fig. 5. The conductors 49 50 51 are similar to 44 45 46 and form a part of another section supplied from the station B. The conductors 52 53 are similar to the conductors 42 48 and form part of another section. At the end of each section is a blocking-switch *a* or *b*, Fig. 1, (shown in detail in Figs. 2 and 3,) and at any desired distance in front of this is an unblocking-switch *m* or *n*, Fig. 1. (Shown in detail in Fig. 4.) At the required distance behind is an electric switch 54, actuated by the electro-magnet 55. Between each of the sections is an opening 56 or 57, during the passage of which by the sliding contact-pieces conveying the current from the stationary conductors to the train no current is conveyed to the train, and immediately beyond the unblocking-switches *m* and *n* the conductors are opened and connected, as shown at 58 and 59, so that the sliding contact-pieces conveying the current from the conductors to the train receive no current as they pass these openings.

The working is as follows: Supposing a front train to be on the section 42 48, supplied with the electric current from the station A, the current passes from A to the conductor 60, switch 12 of *b*, contact-piece 15, conductor 44, switch 54, conductors 43 42, through the magnet 5, Fig. 5, on the train, returning by the conductors 48 47 46, contact 17, switch 13, conductor 45, magnet 14, conductor 61, switch

23 of *n* contact 24, back to A. As the train leaves this section it depresses the pedal-bar at *b* and actuates the switches 12 13, which then make contact with the contacts 16 18, respectively, and are retained in this position by the attraction of the magnet 14 on the lever 10. If there is a following train on the section 42 48, the current then flows from A by the conductor 60, switch 12 of *b*, contact-piece 16, conductor 62 to the conductors 43 42, through the magnet 5 on the train, and returns by the conductors 48 47, the magnet 55, contact 18 of *b*, switch 13, conductor 45, magnet 14, conductor 61, switch 23 of *n*, contact 24 back to A. The magnet 55 thus attracts the switch 54, so that the current is cut off from the conductors 44 and 46, so that if a following train arrived at these conductors its magnet 5 will receive no current, and consequently its power would be shut off. Thus the following train cannot pass beyond the switch 54. In order that the switch 12 13 be retained in the above position even when the following train has not arrived at the section 42 48 before the front train has left, the circuit is completed through the resistance 63, which allows sufficient current to pass to enable the magnet 14 of *b* to hold the lever 10. As the front train passes from the section 42 48 to the section 52 53 it encounters the opening 57 between the sections, and the current is cut off momentarily from the magnet 5, which thus allows the lever 3 to fall, and the power is shut off from the train by the valve 1, which must be replaced by hand by the driver, who is thus made acquainted with his position. As the front train passes the pedal-bar 19 at *n* it depresses it and breaks during the passage of the train the circuit from A and the contact 24, and the magnets 14 at *b* and 55 release their switches, and after the train has passed the pedal-bar the current passes from A to the section 42 48, as first described, and allows the following train to proceed. The circuit to the front train is again interrupted by the opening 59 in the main conductors, and, as before, the driver must replace the valve 1 and is again made acquainted with his position.

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

1. The combination, with two conductors arranged in sections parallel with the rails and a separate current-generator connected to each section, of a blocking-switch provided with a magnet and arranged at the rear end of each section, an unblocking-switch arranged in advance of each blocking-switch, an electric switch provided with a magnet and arranged between each said blocking and unblocking switch, an automatic lever for controlling the motor on the train, a magnet carried by the train and normally arranged in circuit with the said conductors and adapted to hold the said lever in a position to permit the said motor to work, and intermediate conductors arranged substantially as set forth, whereby the front train actuates each said

blocking-switch and shunts the current through the said electric switch of the same section and subsequently restores the original circuit by actuating the unblocking-switch of the next section over which it passes, substantially as set forth.

2. The combination, with the two main-line conductors 28 and 29 and the two branch-line conductors 39 and 40, connected to them, of the blocks of insulating material 30, 31, and 32, inserted in the conductors 29 and 40, substantially as shown, the switches 26 and 27, operatively connected with the points, the intermediate conductors 34 and 35, connecting the switch 26 with the conductor 29 on opposite sides of the block 30, the intermediate

conductor connecting the switch 27 with the conductor 40, the intermediate conductor connecting the switch 27 with the conductor 29 between the blocks 30 and 32, and the intermediate conductor 38, connecting the switch 27 with that part of the conductor 40 between the block 31 and the conductor 29, substantially as described and shown.

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

ROBERT COOKE SAYER.

Witnesses:

LIONEL A. WILSON,

A. E. A. PREREAT,

*Clerks with Messrs. Clarke & Sons, Solicitors,
Bristol.*