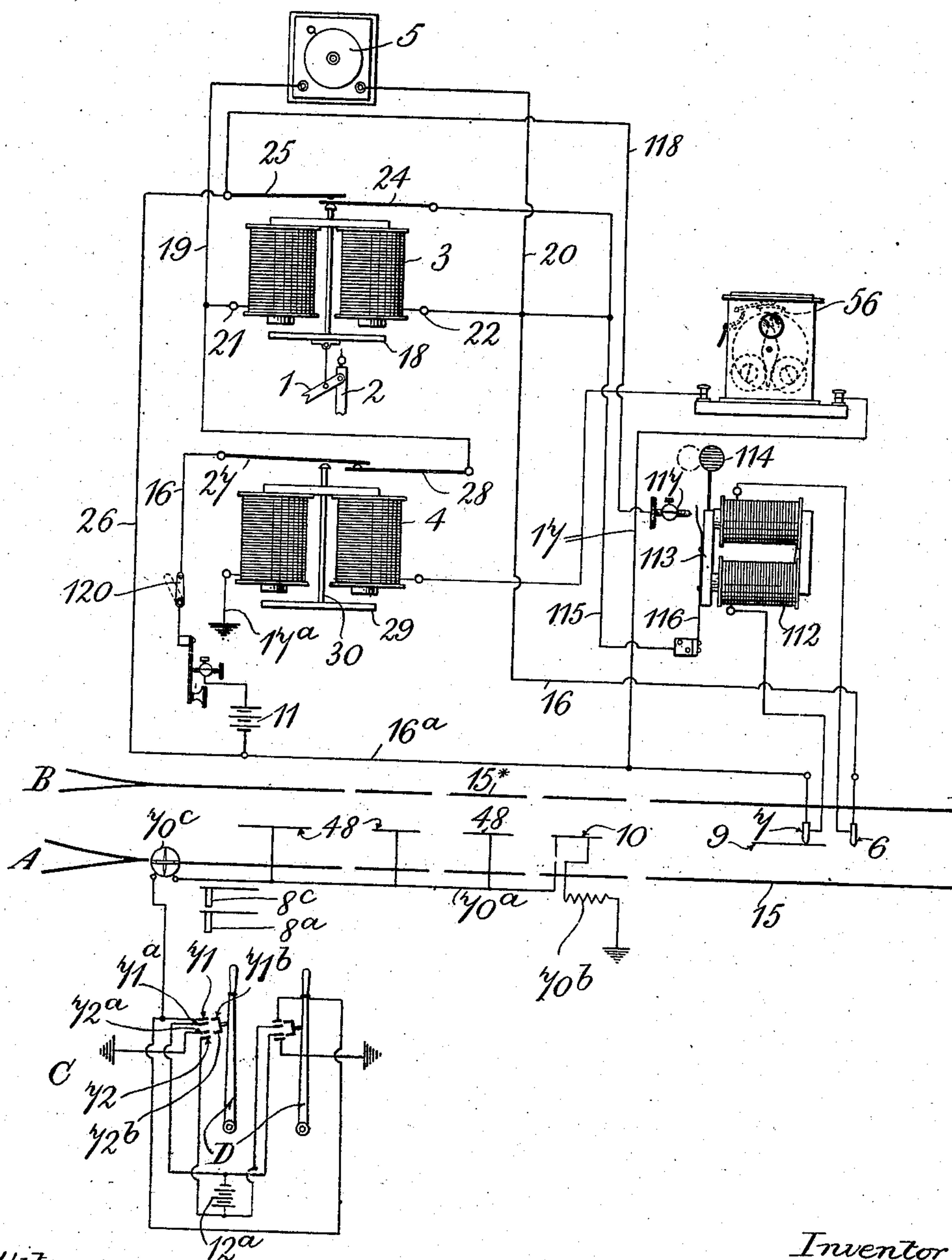


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V. L. RAVEN.
RAILWAY SIGNALING APPARATUS.

APPLICATION FILED APR. 23, 1907.



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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNALING APPARATUS.

No. 867,151.

Specification of Letters Patent.

Patented Sept. 24, 1907.

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To all whom it may concern:

Be it known that I, VINCENT LITCHFIELD RAVEN, a subject of the King of Great Britain and Ireland, residing at Darlington, in the county of Durham, England, have invented Improvements in Railway Signaling Apparatus, of which the following is a specification.

In the specification of another application for Letters Patent filed by me dated April 18 1907 and numbered 368,897, I have described various constructions of railway signaling apparatus according to which there are provided on an engine or other vehicle (hereinafter referred to as an engine), visual and audible signals that are under the control of electro-magnetic apparatus the circuit or circuits of which is or are arranged to be closed by the action or influence of metallic bars respectively called Nos. 9 and 10 arranged on the track behind and in the neighborhood of the line signal the position of which it is desired to indicate to the engine driver, the arrangement being such that upon an engine approaching a line signal, the visual and audible signals on the engine will, by reason of the presence of the bars, be first operated so as to indicate danger and call the attention of the driver to the fact that he is approaching a line signal, and if the line signal be in the "on" or "danger" position, the visual and audible signals will, as the engine continues to travel towards the line signal, such as the home signal, at which he must stop if such signal be at danger, continue to indicate "danger" so as to necessitate the engine coming to rest, whereas should the line signal have been moved into the "off" or "line clear" position, the visual signal will be automatically returned to its normal or "line clear" position and the audible signal will cease to sound, thus indicating to the driver that the line signal is in the "line clear" position so that he may continue to advance. Bar No. 9, which may or may not be insulated, serves to close, as by the aid of brushes, or equivalent devices, and without attention, the circuit of an electric battery through a main electro-magnetic device and cause the visual and audible signaling devices to operate when the engine passes over the said bar, the several devices mentioned, excepting the bar, being on the engine. Bar No. 10 is however under the control of the signalman through a line switch and is arranged to have no effect, or only the same effect as bar No. 9, on the signaling devices on the engine, if the line signal be at "danger" but to cause the closing of the circuit of a second battery arranged either on the line, or on the engine, preferably the former, through a releasing electro-magnetic device on the engine, when the line signal is in the "line clear" position and the engine passes over the said bar, and thereby cause the visual signal to return to its normal or line clear position and the audible signal to cease sounding.

Now an object of the present invention is to adapt signaling apparatus of the kinds referred to in the said former specification for use in cases where, for instance, there may be no distant line signal but where it is desired to give a signal, both in clear and foggy weather, at a part of the line where a distant signal would ordinarily be located and which is hereinafter called for distinction, the distant signaling point, the signal in this case being given by the signaling means upon the engine, the arrangement being such that the engine driver will be informed when he is passing the distant signaling point, by the operation of the signaling devices on his engine, whether the corresponding home signal is in the "danger" or "line clear" position. For this purpose, the line switch for determining the action of bar 10, as above described, is operated or controlled from the hand lever used in the signaling cabin for working the home signal; or from the connections used for operating such signal; or it may be worked from a special or independent lever in the signaling cabin but this will usually be unnecessary. When the second battery for use with bar 10 is a stationary one, as is preferred, it may be placed in the signaling cabin and may have in circuit therewith an indicating device and a high resistance device. In other respects the apparatus is or may be constructed and arranged to work substantially as described in the former specification.

The accompanying illustrative drawing shows, diagrammatically, railway signaling apparatus embodying the present invention.

1 is the visual signal carried by a post 2; 3 the main magnet; 4 the releasing magnet; 5 the bell or audible signal; 6 and 7 brushes; 11 an electric battery having one pole connected by the conductor 16^a to the brush 7 and its other pole connected to the other brush 6 through the main magnet 3 by means of the conductors 16 and supplementary switch 27—28; 19 and 20 conductors by which the bell 5 is connected in a shunt to the terminals 21 and 22 of the main magnet; 24 and 25 a second supplementary switch and 26 a conductor forming together a supplementary circuit for maintaining the circuit of the main magnet 3 and bell 5 closed after the brushes 6 and 7 have been short circuited, and 17, 17^a are conductors by which the releasing magnet 4 is connected to the brush 7 and to earth through the frame of the engine, the above mentioned parts being on the engine. 9 and 10 are bars fixed on the track, and 15, 15^x are the track rails. The several parts above mentioned are arranged and operate in the manner described in my said former specification in connection with Fig. 2 thereof, except as to the way in which bar 10 is connected to earth, and that the circuit of the releasing magnet 4 is, in the present instance, shown as being completed through a polarized indicating device 56 for indicating which of the two home

signals 8^a, 8^c at a junction of two lines A and B may have been moved into the "line clear" position, as described in my said former specification in connection with Fig. 5 thereof.

5 In the present example, bar 10 is arranged to be connected through a wire 70^a and one set of contacts 71, 71^a and 71^b of a double line switch to one pole of a line battery 12^a the other pole of which is arranged to be connected to earth through another set of contacts 72, 72^a
10 and 72^b, the bar 10 being also connected to earth through a resistance 70^b. The line switch and battery 12^a are arranged in the signaling cabin at C and the movable contacts 71^b and 72^b of the double line switch are insulated from each other and carried by the hand lever D
15 used for working the home signal 8^a. The arrangement is such that when the home signal is at danger and the corresponding hand lever D is consequently in the normal or inoperative position shown, the double line switch 71—72^b will be open and the bar 10 will act
20 like the bar 9 to maintain the visual and audible signals 1 and 5 on the engine in the danger condition, but upon moving the home signal 8^a into the "line clear" position by the hand lever D, the movable contacts 71^b and 72^b will be inserted between the fixed contacts 71—71^a
25 and 72—72^a respectively so as to connect the insulated bar 10 through the battery 12^a to earth, so that when brush 7 bears against bar 10, the circuit of the battery will be completed through the releasing magnet 4 and earth, and the armature 29 and rod 30 of such magnet
30 thereby caused to open the supplementary switch 27—28 and so open the circuit of the main magnet 3 and bell 5 and put the visual and audible signals 1 and 5 on the engine out of operation.

At a railway junction, as in the arrangement shown,
35 there would be a double switch, such as described, for each of the two hand levers D for the two home signals 8^a, 8^c, the switch for one hand lever being arranged to cause current to flow from the battery 12^a in one direction through the releasing magnet 4 and polarized
40 indicating device 56, and that for the other hand lever being arranged, as shown, to cause current to flow from the battery in the reverse direction through the releasing magnet 4 and polarized indicating device 56, so that the engine driver can determine for which line A or B
45 the home signal has been moved into the "line clear" position.

70^c is an indicating device arranged in the circuit of the conductor 70^a for indicating the passage of an electric current, and the direction thereof, through the said
50 conductor.

The resistance 70^b serves to reduce the current flowing through the circuit of the battery 12^a after the hand lever D, or one of such hand levers, has been moved into the "line clear" position and the brush 7 is not in
55 contact with bar 10, and yet allow of sufficient current passing to operate the current indicating device 70^c to show that the apparatus is in working condition.

48 are intermediate bars connected to the conductor 70 and arranged between the bar 10 and the home signal 8^a, or home signals 8^a, 8^c, to enable the signals 1
60 and 5 on the engine to be returned to the inoperative or normal condition upon moving the home signal into the line clear attitude after the engine has passed over bar 10, so as to obviate bringing the engine to rest unnecessarily.
65

Means may be provided on the engine for giving an indication to the engine driver in the event of inability; on account of displacement or other cause, of the contact brushes 6, 7 or equivalent, to fulfil their function, or of failure of the battery 11, or of the electro-magnetic
70 signaling apparatus 3, 4 and 5 on the engine. For this purpose, an electro-magnetic indicating device may be used comprising, as shown, an electro-magnet 112 having a high resistance winding connected in shunt directly to the brushes 6 and 7, and the armature 113 of
75 which carries a visual indicator 114, the winding of the electro-magnet being so connected to the brushes, as shown, that should the latter, or either of them, be completely displaced by accident, the connection to the said winding will be broken. The armature 113,
80 which serves as a movable contact, is connected by conductor 115 to one terminal of the electric bell 5, to one terminal 24 of the supplementary switch 24—25, and to one terminal 22 of the main magnet 3, and is adapted to bear, it may be under the action of a spring
85 blade 116, or equivalent, when not attracted by the electro-magnet 112, against a fixed switch contact 117 that is connected, as by a conductor 118 and the conductor 26, through the battery 11 to the opposite terminals of the said bell 5 and main magnet 3. The arrangement is such that, normally, the electro-magnet
90 112 is connected in a high resistance shunt circuit directly across the brushes 6 and 7 and the armature 113 thereby held in a position in which the visual indicator 114 is out of view, or indicates that the brushes and
95 connections are intact, but upon the brushes 6 and 7, or either of them, being completely displaced by accident, or upon failure of the battery 11, or of the circuits of the electro-magnetic signaling apparatus 3 or 5 to which the brushes 6 and 7 are connected, the ar-
100 mature 113 will be released and moved by its spring 116, or equivalent into a position, as for example behind an aperture 119 in the indicating device, to bring the visual indicator 114 into position to notify such fact. If the battery 11 be intact, the said movement
105 of the armature 113 of the indicating device will also complete the bell and main magnet circuits and thereby give an audible signal, and will also raise the miniature semaphore arm 1 of the signaling apparatus to the danger position. A switch 120 is or may be placed in
110 the battery circuit for opening such circuit and preventing waste of current in the failure indicating device when the engine is out of use.

In other respects signaling apparatus according to the present invention may be like that described in
115 the said former specification.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is:
120

1. In a railway electrical signaling system, the combination with a signal on the vehicle and electromagnetic means for causing the same to be maintained at danger position after being moved to such position, of means for automatically causing the said signal to be so moved
125 to indicate danger while the vehicle is at a point on the track distant from the home signal, and means governed by a track device in accordance with the operation of the home signal to alter the vehicle signal to line clear when the home signal is operated to indicate line clear.
130

2. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an

electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal and adapted to close said circuit and cause the vehicle signal to indicate danger when the vehicle passes over said bar, means for maintaining said circuit closed after the vehicle has passed over said bar, a second track bar between the first bar and the home signal and adapted when energized to cause said vehicle signal to indicate line clear, and a source of electric supply adapted to be connected to and disconnected from said intermediate track bar in accordance with the operations of the home signal.

3. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal, a second track bar intermediate such bar and the home signal, an electromagnetic device arranged in the vehicle signal circuit and adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device arranged on the vehicle in a normally open circuit adapted to remain open when the vehicle passes over the first track bar and over the second intermediate track bar while the home signal is at danger and adapted when closed to energize the second electro-magnetic device and thereby cause the vehicle signal to return to the line clear condition, a source of electric supply disconnected from the second track bar while the home signal is at danger, and means for connecting such electric source with the second bar aforesaid when moving the home signal to line clear, and thereby cause the second electro-magnetic device to be energized when the vehicle passes over said second bar.

4. In a railway electrical signaling system, the combination with a signal on the vehicle and electro-magnetic means for causing said signal to be maintained in a condition to indicate danger after being caused to so operate, of means for causing the said signal to be moved to indicate danger when the vehicle passes over a part of the track distant from the home signal, and means on the vehicle for indicating that the circuit conditions are normal.

5. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal and adapted to close said circuit and cause the vehicle signal to indicate danger when the vehicle passes over said bar, means for maintaining said circuit closed after the vehicle has passed over said bar, a second track bar between the first bar and the home signal and adapted when energized to cause said signal to indicate line clear, a source of electric supply adapted to be connected to the intermediate track bar while the home signal indicates line clear, an earthed resistance device connected to said intermediate track bar for permitting a small current to flow through the circuit, and a device for indicating such flow of current.

6. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal and adapted to close said circuit and cause the vehicle signal to indicate danger when the vehicle passes over said bar, means for maintaining said circuit closed after the vehicle has passed over said bar, a second track bar between the first bar and the home signal and adapted when energized to cause said vehicle signal to indicate line clear, contacting devices connected to the circuit of the vehicle signaling device and adapted to engage the track bars, and a normally energized electro-magnetic indicator connected in shunt across said contacting devices.

7. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal and adapted to close said circuit and cause the vehicle signal to indicate

danger when the vehicle passes over said bar, means for maintaining said circuit closed after the vehicle has passed over said bar, a second track bar between the first bar and the home signal and adapted when energized to cause said signal to indicate line clear, contacting devices connected to the circuit of the vehicle signaling device and adapted to engage the track bars, a normally energized high resistance electro-magnetic indicator connected in shunt across said contacting devices, and a circuit including an audible signal adapted to be closed simultaneously with the operation of the indicator aforesaid.

8. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal, a second track bar between the first mentioned bar and the home signal, an electro-magnetic device arranged in the vehicle signal circuit and adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device arranged on the vehicle in a normally open circuit adapted to remain open when the vehicle passes over the first track bar and over the second intermediate track bar while the home signal is at danger and adapted when closed, to energize the second electro-magnetic device and thereby cause the vehicle signal to return to the line clear condition, a source of electric supply disconnected from the second track bar while the home signal is at danger, means for connecting such electric source with the second bar when moving the home signal to line clear, and thereby enable the second electro magnetic device to be energized when the vehicle passes over the second bar, means for continuously establishing a circuit while the connection is established between the second track bar and source of current, and means for indicating that current is flowing in such circuit.

9. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal, a second track bar between the first bar and the home signal, an electro-magnetic arranged device in the vehicle signal circuit and adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device arranged on the vehicle in a normally open circuit adapted to remain open when the vehicle passes over the first track bar and over the second intermediate track bar while the home signal is at danger and adapted when closed to energize the second electro-magnetic device and thereby cause the vehicle signal to return to the line clear condition, a source of electric supply disconnected from the second track bar while the home signal is at danger, and a line switch in the signaling cabin adapted to be operated by movement of the lever controlling the home signal to connect and disconnect said electric source with the second track bar.

10. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal, a second track bar between the first bar and the home signal, an electro-magnetic device arranged in the vehicle signal circuit and adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device arranged on the vehicle in a normally open circuit adapted to remain open when the vehicle passes over the first track bar and over the second intermediate track bar while the home signal is at danger and adapted, when closed, to energize the second electro-magnetic device and thereby cause the vehicle signal to return to the line clear condition, a source of electric supply disconnected from the second track bar while the home signal is at danger, a line switch in the signaling cabin adapted to be operated by movement of the lever controlling the home signal to connect and disconnect said electric source with the second track bar, an earthed resistance device connected to the

second track bar for permitting a small current to continuously flow from the source of supply when the latter is connected to the bar, and a device for indicating whether such current is flowing or not.

5 11. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal, a second
10 track bar between the first bar and the home signal, an electro-magnetic device arranged in the vehicle signal circuit and adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device
15 arranged on the vehicle in a normally open circuit adapted to remain open when the vehicle passes over the first track bar and over the second intermediate track bar while the home signal is at danger and adapted, when closed, to energize the second electro-magnetic device and thereby
20 cause the vehicle signal to return to the line clear condition, a source of electric supply disconnected from the second track bar while the home signal is at danger, a line switch in the signaling cabin adapted to be operated by movement of the lever controlling the home signal to connect and disconnect said electric source with the second
25 track bar, an earthed resistance device connected to the second track bar for permitting a small current to continuously flow from the source of supply when the latter is connected to the bar, a device for indicating whether such current is flowing or not, contacting devices connected to the circuit of the vehicle signaling device and adapted to engage the track bar, a normally energized high resistance electro-magnetic indicator connected in shunt across said contacting devices, and a circuit including an audible signal adapted to be closed simultaneously with the operation of the indicator aforesaid.

12. In a railway electrical signaling system, the combination with a pair of home signals for a track at a junction, and audible and visual signals on a vehicle for
40 running over said track, of a normally open electric circuit, for said vehicle signals a track bar located on the track at a point distant for the home signals, another bar between such bar and the home signals, an electro-magnetic device in the vehicle signal circuit adapted to be energized whenever the vehicle passes over the first
45 distant track bar and to thereafter maintain itself energized, a second electro-magnetic device also arranged on the vehicle in a normally open circuit and adapted to remain deenergized while the vehicle passes over the first track bar and also over the second intermediate bar while either of the home signals is at danger, a source of electric supply disconnected from the second track bar while the home signals are at danger, a line switch for each signal operating lever in the signaling cabin adapted
55 to supply current of reversed polarities alternatively to the second electro-magnetic device which is arranged to be energized through the second track bar and to then cause the vehicle signals to indicate line clear, and a route indicator arranged to be operated when said second electro-magnetic device is energized, to indicate which home signal has been moved to the line clear position.

13. In a railway electrical signaling system, the combination with a pair of home signals for a track at a junction, and audible and visual signals on a vehicle for
65 running over said track, of a normally open electric circuit, for said vehicle signals, a track bar located on the track at a point distant from the home signals, another bar between such bar and the home signals, an electro-magnetic device in the vehicle signal circuit adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device also arranged on the vehicle in a normally open circuit and adapted to remain deenergized while the vehicle passes over the first track
70 bar and also over the second intermediate bar while either of the home signals is at danger, a source of electric supply disconnected from the second track bar while the home signals are at danger, a line switch for each signal operating lever in the signaling cabin adapted
75 to supply current of reversed polarities alternatively, to

the second electro-magnetic device which is arranged to be energized through the second track bar to alter the condition of the vehicle signals when the vehicle runs over said second bar and a polarized indicator connected in circuit with the electro-magnetic device for indicating
85 which home signal has been moved to indicate line clear.

14. In a railway electrical signaling system, the combination with a pair of home signals on a track at a junction, and audible and visual signals on a vehicle for
90 running over said track, of a normally open electric circuit for said vehicle signals, a track bar located on the track at a point distant for the home signals, another bar between such bar and the home signals, an electro-magnetic device in the vehicle signal circuit adapted to be energized whenever the vehicle passes over the first distant track bar and to thereafter maintain itself energized, a second electro-magnetic device also arranged on the vehicle in a normally open circuit and adapted to remain deenergized while the vehicle passes over the first track
95 bar and also over the second intermediate bar while either of the home signals is at danger, a source of electric supply disconnected from the second track bar while the home signals are at danger, a line switch for each signal operating lever in the signaling cabin adapted to supply current of reversed polarities alternatively to the second
100 electro-magnetic device which is arranged to be energized through the second track bar when the vehicle passes over such bar to alter the condition of the vehicle signals to indicate line clear, contacting devices connected to the circuit of the vehicle signals and arranged to engage the track bars, a polarized indicator connected in circuit with the second electro-magnetic device for indicating
105 which home signal has been moved into the line clear condition, an earthed resistance device connected to the second track bar for permitting a small current to continuously flow from the source of supply when the latter is connected to the bar, and a device for indicating whether such current is flowing or not.

15. In a railway electrical signaling system, the combination with the track and a home signal thereon, of an electrically operated signal on a vehicle, a normally open electric circuit for the latter signal, a bar located on the track at a point distant from the home signal and adapted to close said circuit and cause the vehicle signal to indicate danger when the vehicle passes over said bar, means
120 for maintaining said circuit closed after the vehicle has passed over said bar, a plurality of insulated track bars between the first bar and the home signal and adapted when energized to cause said vehicle signal to indicate line clear, and a source of electric supply adapted to be connected to and disconnected from said intermediate track bars in accordance with the operations of the home signal.

16. In a railway electrical signaling system, the combination with the track, a home signal thereon and apparatus located in a signaling cabin for operating said home signal, of a normally open circuit on a vehicle designed to travel over said track, electrically operated audible and visual signals arranged in said circuit and adapted to indicate danger when said circuit is closed, a
135 bar arranged on said track at a distant signaling point and adapted to close said circuit when the vehicle passes over it, means for maintaining said circuit closed after the vehicle has passed over said bar, a second bar arranged in advance of the first bar, a plurality of bars intermediate the second bar and the home signal, a second electro-magnetic device arranged in a second normally open circuit on said vehicle for opening the first mentioned circuit when closed, said second bar and each of the intermediate bars being adapted, when energized, to close said second circuit, a conductor arranged to energize said second bar and each of said intermediate bars when its circuit is closed, an electric generator, and a switch located in said signaling cabin and adapted when closed to complete the circuit of said conductor through
140 said generator, said switch being arranged to be closed and opened when the home signal is operated to respectively indicate line clear and danger.

17. In a railway electrical signaling system, the combination with the track, a home signal thereon, and apparatus located in a signaling cabin for operating said home signal, of a normally open circuit on a vehicle designed to travel over said track, electrically operated audible and visual signals arranged in said circuit and adapted to indicate danger when said circuit is closed, a bar arranged on said track at a distant signaling point and adapted to close said circuit when the vehicle passes over it, means for maintaining said circuit closed after the vehicle has passed over said bar, a second bar arranged in advance of the first bar, a plurality of bars intermediate the second bar and the home signal, a second electro-magnetic device arranged in a second normally open circuit on said vehicle for opening the first mentioned circuit when closed, said second bar and each of the intermediate bars being adapted, when energized, to close said second circuit, a conductor arranged to energize said second bar and each of said intermediate bars when its circuit is closed, an electric generator, and a switch located in said signaling cabin and adapted when closed to complete the circuit of said conductor through said generator, said switch being arranged to be closed and opened when the home signal is operated to respectively indicate line clear and danger.

- ratus located in a signaling cabin for operating said home
 signal, of a normally open circuit on a vehicle designed to
 travel over said track, electrically operated audible and
 visual signals arranged in said circuit and adapted to indi-
 5 cate danger when said circuit is closed, contacts connected
 to said circuit, a bar arranged on said track at a distance
 from said home signal and against which said contacts
 bear and close said circuit when the vehicle passes over it,
 means for maintaining said circuit closed after the vehicle
 10 has passed over said bar, a second and insulated bar ar-
 ranged on the track in advance of the first bar, a plurality
 of insulated bars arranged on the track and intermediate
 the second bar and the home signal, a second electromag-
 netic device arranged in a second normally open circuit on
 15 the vehicle for restoring, when energized, the vehicle sig-
 nals to normal or line clear condition, said second circuit
 having one end connected to a contact adapted to engage
 said second bar and each of the intermediate bars, and its
 other end earthed, a conductor connected to said second
 20 bar and each of said intermediate bars and having one end
 earthed through a resistance device, an electric generator
 having one pole earthed, a switch located in the signaling
 cabin and arranged to connect the second pole of said
 generator to the second end of said conductor when the
 25 home signal is operated to indicate line clear and to dis-
 connect said generator from said conductor when said
 home signal is moved to indicate danger, and a current
 indicator in the circuit of said conductor.
 18. In a railway electrical signaling system, the combi-
 30 nation with a track at a junction, two home signals one
 for each branch of the track, and separate hand operated
 mechanism located in a signaling cabin for separately op-

erating said home signals, of a normally open circuit on a
 vehicle designed to travel over said track, electrically op-
 erated audible and visual signals arranged in said circuit 35
 and adapted to indicate danger when said circuit is closed,
 a bar arranged on said track at a distant signaling point
 and adapted to close said circuit when the vehicle passes
 over it, means for maintaining said circuit closed after the
 vehicle has passed over said bar, a second bar arranged in 40
 advance of the first bar, a plurality of bars intermediate
 the second bar and the home signal, a second electro-mag-
 netic device arranged in a second normally open circuit
 on said vehicle for opening the first mentioned circuit when
 closed, said second bar and each of the intermediate bars 45
 being adapted, when energized, to close said second circuit,
 an indicating device arranged in said second open circuit
 for indicating which home signal has been operated, a
 conductor arranged to energize said second bar and each
 of said intermediate bars, when its circuit is closed, an 50
 electric generator, and two switches located in said signal-
 ing cabin and each arranged when closed to complete the
 circuit of said conductor through said generator, said
 switches being arranged to be closed and opened by the
 respective signal operating mechanism in said cabin when 55
 the respective home signals are operated to indicate line
 clear and danger respectively and to reverse the connec-
 tions of said generator to said conductor and earth.

Signed at Newcastle-on-Tyne, England, this ninth day of
 April 1907.

VINCENT LITCHFIELD RAVEN.

Witnesses:

W. H. NIXON,
 ARTHUR C. STAMER.