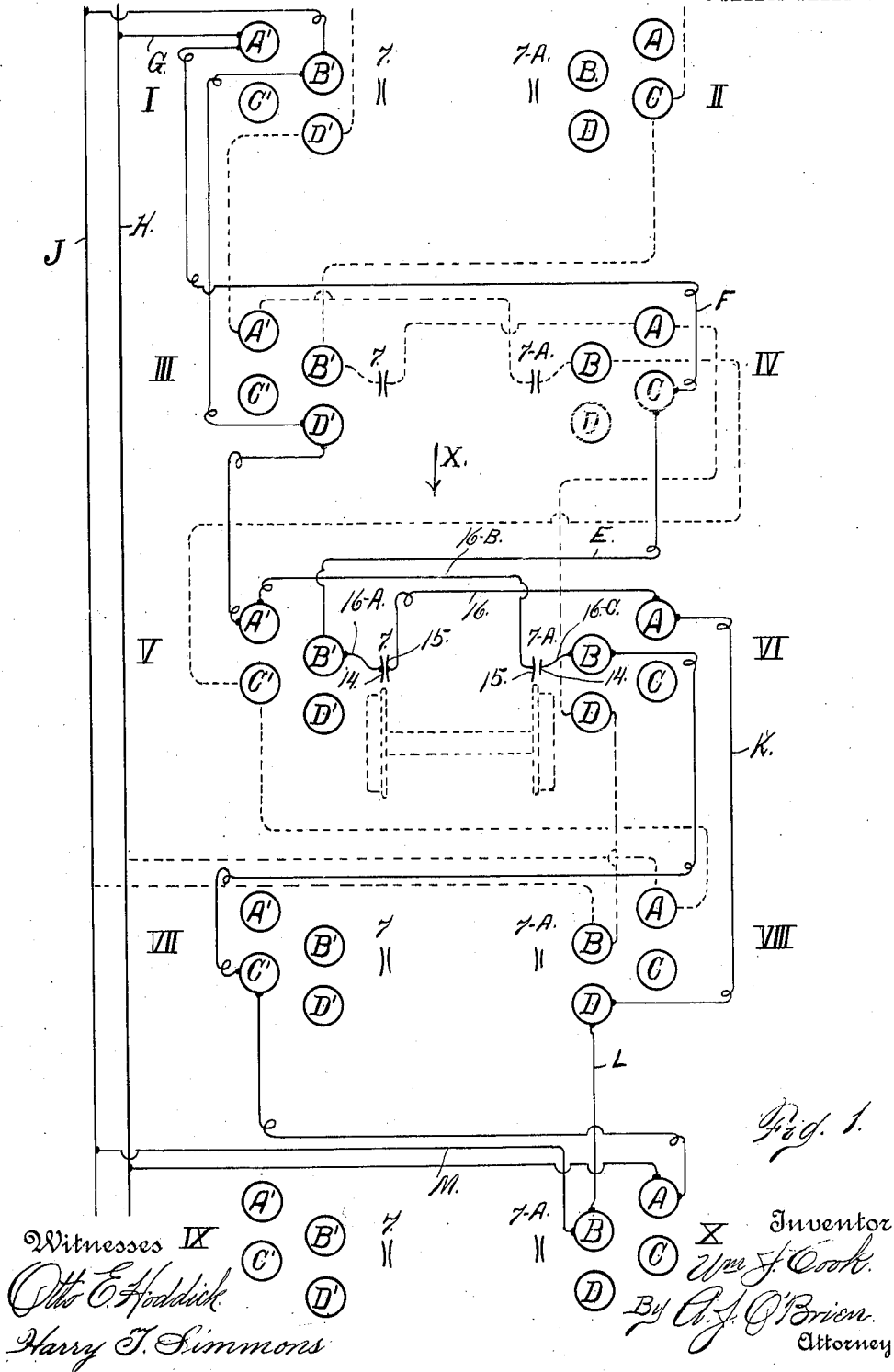


W. J. COOK.
ELECTRIC RAILWAY SIGNALING APPARATUS.
APPLICATION FILED JULY 24, 1909.

1,056,402.

Patented Mar. 18, 1913.

5 SHEETS—SHEET 1.

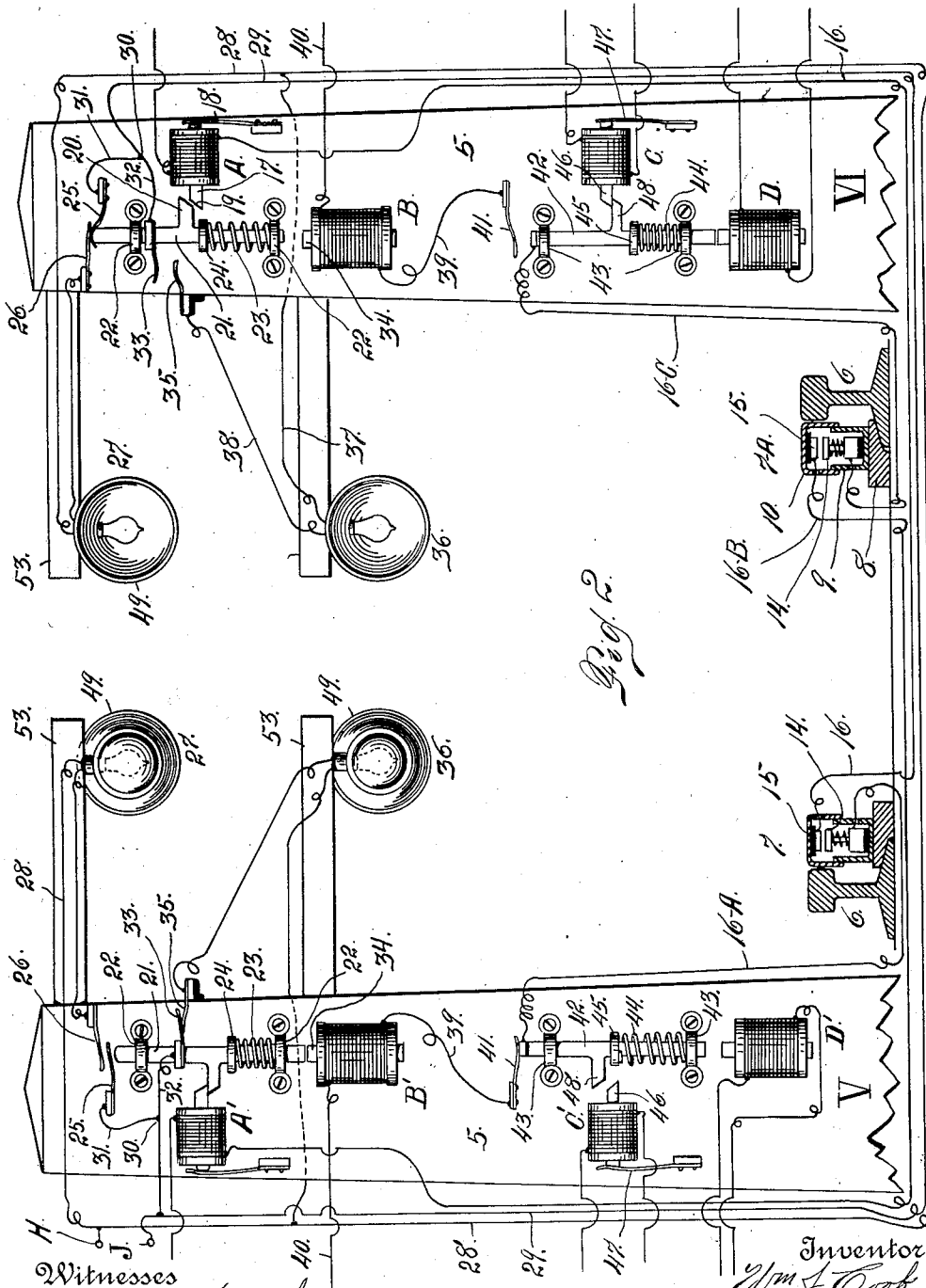


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Witnesses

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By C. J. O'Brien

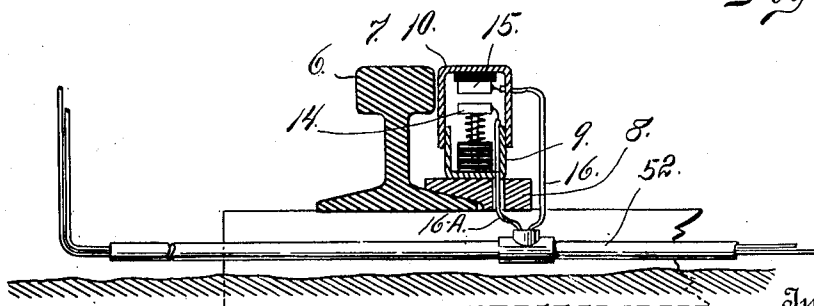
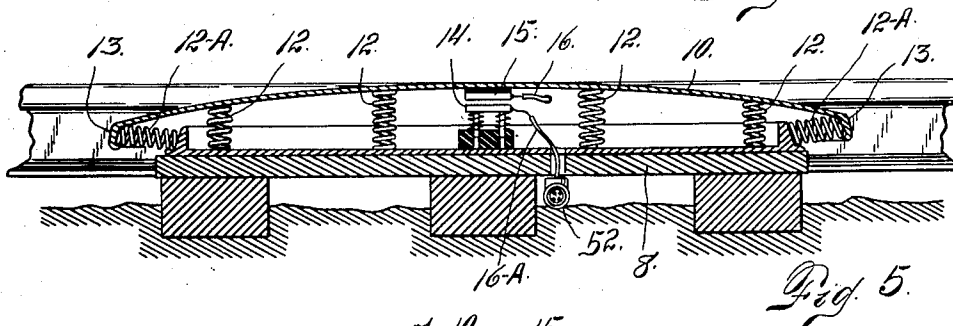
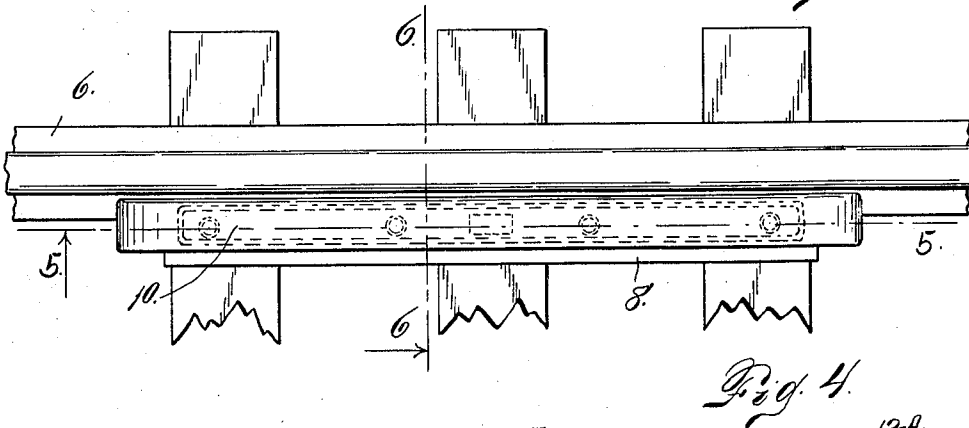
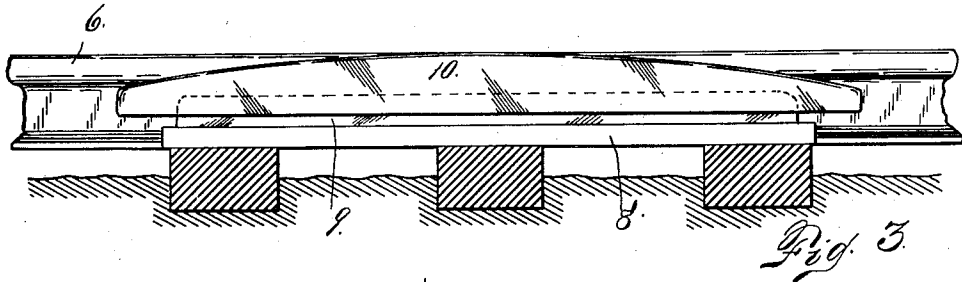
Attorney

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5 SHEETS—SHEET 3.



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1,056,402

6 SHEETS—SHEET 4.

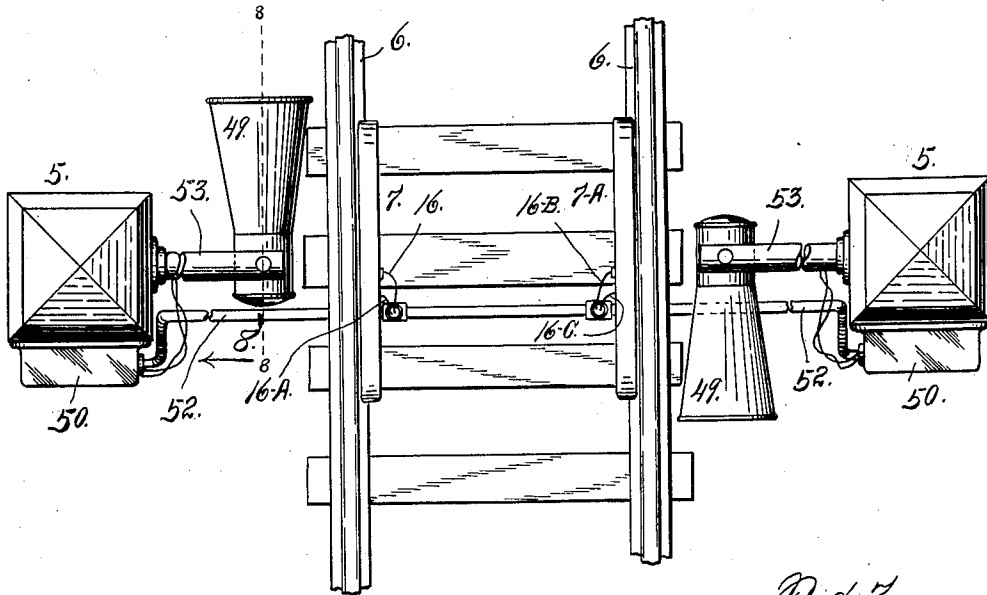


Fig 7

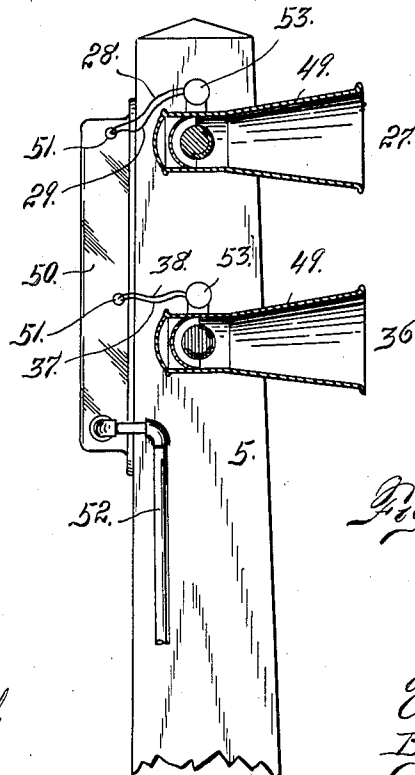


Fig. 8.

Witnesses
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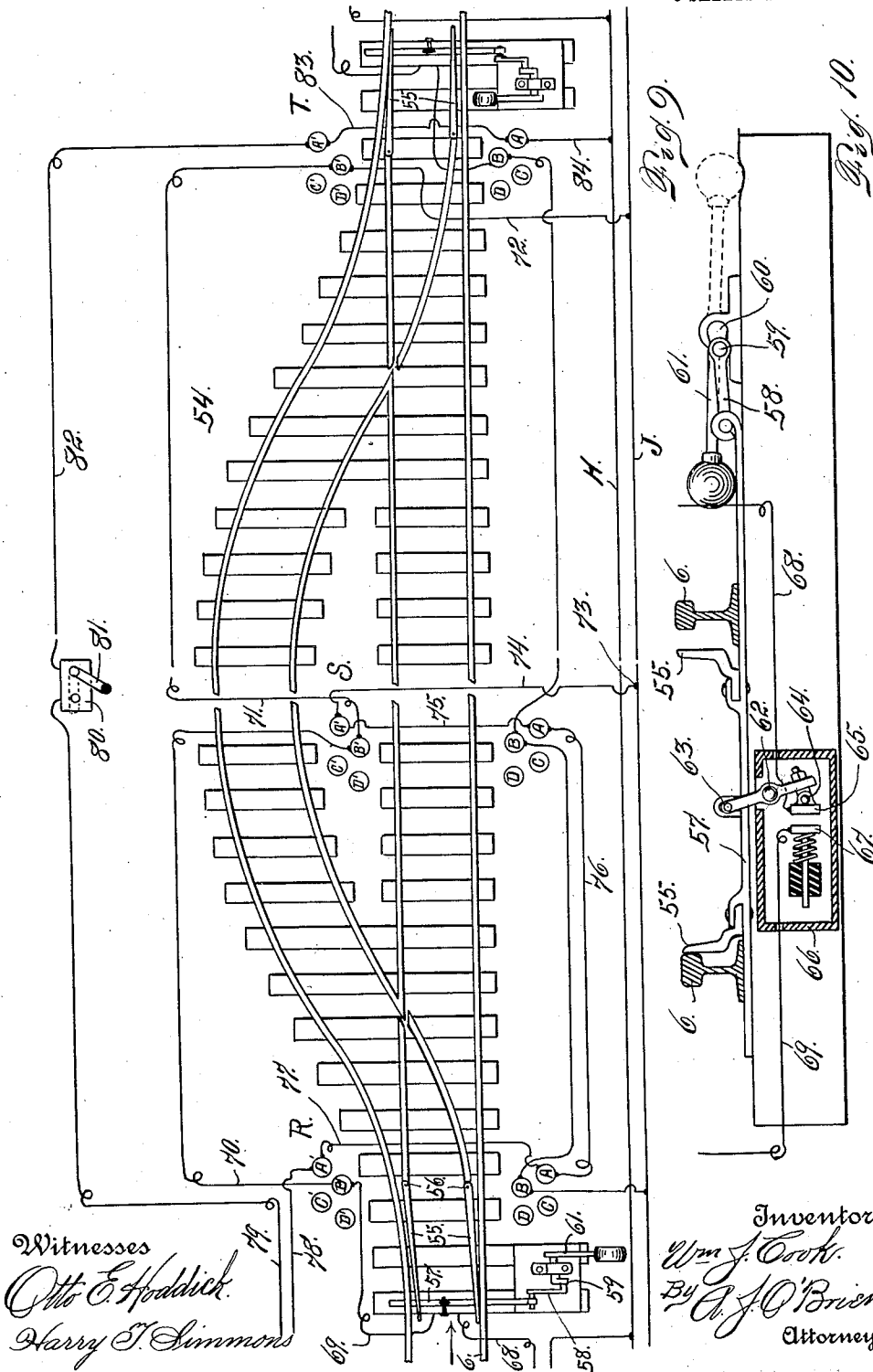
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5 SHEETS—SHEET 5.



UNITED STATES PATENT OFFICE.

WILLIAM J. COOK, OF DENVER, COLORADO, ASSIGNOR TO THE COOK RAILWAY SIGNAL COMPANY, OF DENVER, COLORADO, A CORPORATION OF COLORADO.

ELECTRIC RAILWAY SIGNALING APPARATUS.

1,056,402.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed July 24, 1909. Serial No. 509,446.

To all whom it may concern:

Be it known that I, WILLIAM J. COOK, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Electric Railway Signaling Apparatus; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to electrical railway signaling apparatus, and may be considered an improvement over the construction covered by my previous application, Serial No. 448,980, filed August 17th, 1908, allowed April 19th, 1909.

The special object of my present improvement, is to make it practicable to operate my improved system without special attachments for the train, for the purpose of closing the track contacts or those arranged along the rails. In my improved construction, the flange of any wheel of a train, will act to close the contacts arranged along the track for energizing electro-magnets, through whose instrumentality danger and safe signals may be given. In the special construction disclosed in this application, the signals employed are electric lights; the danger signal lights are red, while the safe signal lights are green. In my improved construction, contacts are arranged along the track at the various signaling stations, there being a separate pair of contacts on each side of the track, and so positioned with reference to the rail, that the two members of the contact will be closed by the flange of any wheel of a passing train. In the proper operation of the system, any train traveling in a given direction, serves, through the instrumentality of the said contacts and electro-magnets, located in the circuits of the contacts, to display danger lights or signals in advance of the train a predetermined distance on the left-hand side of the track, the said danger lights being equipped with reflectors so directed that an approaching train will be warned by the said danger lights, the said lights being on the left-hand side of the train which displays them, and

on the right-hand side of the approaching train, to be warned thereby. As a further result of the closing of the contacts on the right-hand side of the track, a signal light is extinguished a predetermined distance in the rear of the train, and on the right-hand side, the extinguished light being as far in the rear on one side of the track, viz: the right-hand side, as the display or danger light is in advance of the train on the opposite or left-hand side of the track.

It is essential that the track contacts, or those arranged to be closed by a passing train, are duplicated on both sides of the track, but provision must be made, whereby a train moving in either direction will only serve to display or extinguish signal lights, by closing the track contact on one side of the track, viz: on the right-hand side. Hence, as the contacts on both sides of the track are so arranged that the wheels of the train, engaging both rails of the track, will close these contacts, provision must be made for breaking circuits of the electro-magnets, in which the closed contacts on the left-hand side of the track, are located, at points beyond the track, the breaking of the said magnet circuits being automatically accomplished, in advance of the approaching train, so that as soon as the train reaches any station, and its wheels on the left-hand side serve to close the contacts on that side and at that station, the said contact closing act will be non-effective, since the circuit in which the electro-magnets are located, which serve to display danger lights, is broken, the said breaking act having been accomplished by the train when one station in the rear. Provision is also made, whereby the closing of the contacts on the right-hand side of the track, not only serves to extinguish danger lights in the rear on the same side of the track and display danger lights in front on the opposite side of the track, but also restore the circuit of the danger light-controlling magnet at the station immediately in the rear on the opposite side of the track, at the point where said circuit was broken, in advance of the train, as heretofore explained, so that the circuit beyond the track, through the said magnets shall be intact, and in condition to be closed by the wheels of a train moving in the opposite direction. In this way, it will be understood that provision is made for carrying out the system in my aforesaid

previous application, without any special contact-closing attachment carried by the train, the wheels of the regular ordinary construction alone serving to accomplish the said function.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a diagrammatic view, illustrating the electro-magnets, employed at five stations along the track, equipped with my improvements. The wiring is not complete for all of these magnets, since it would to a certain extent be confusing, because of the great number of wires which it would be necessary to illustrate upon the sheet. Fig. 2 is a cross-sectional view of the track, illustrating the apparatus on both sides of the track at a single station, the position of the various elements being such as will occur immediately after the train has passed contacts at that particular station. Fig. 3 is a side elevation of a track rail, showing one of my improved track circuit make-and-break devices in position, to be acted on by the wheel of a passing train. Fig. 4 is a top plan view of the same. Fig. 5 is a vertical longitudinal section taken through the make-and-break device on the lines 5-5, Fig. 4. Fig. 6 is a cross-section taken on the line 6-6, Fig. 4, the parts being shown on a larger scale. Fig. 7 is a top plan view of the track at any station, illustrating the oppositely arranged circuit make-and-break devices, and also poles upon which the signaling apparatus is mounted. In this view, the housing for the various electro-magnets, and the movable contacts employed therewith, is illustrated. Fig. 8 is a section taken through two of the reflectors, employed in connection with the signal lines. This is a view looking in the direction of the arrow in Fig. 7, the section being taken on the line 8-8, of the same figure. Fig. 9 is a top plan view largely diagrammatic illustrating certain mechanism employed wherever a side track is located, whereby the throwing of the switch to enable a train to take the siding permanently closes the circuit through all of the danger lights extending over the section of track controlled by a given train and extending in both directions therefrom. Fig. 10 is a cross-section taken through the track and cutting the box inclosing a make-and-break device controlled by the operation of the switch. This is a view looking in the direction of the arrow at the extreme left of Fig. 9, the parts being shown on a larger scale.

The same reference characters indicate the same parts in all the views.

In Fig. 1 the Roman characters I, II, III, IV, V, VI, VII, VIII, IX and X designate

a corresponding number of sets of electro-magnets, the said sets being arranged in pairs on opposite sides of the track. Each pair of sets is located at a station, and there are five stations illustrated in this view, which will be understood by reference to the apparatus illustrated in Fig. 2, in which is shown a complete set of magnets mounted upon poles 5, secured on opposite sides of the two track rails 6. The position of the various magnets, illustrated in Fig. 2, is the same as those of the central station, designated V and VI, and the last named reference characters are therefore applied to the two posts to designate the corresponding station in the diagrammatic view.

The construction and arrangement of the various magnets A, B, C and D, and A', B', C' and D', disclosed in Fig. 2, is exactly the same as the correspondingly designated magnets at all the stations illustrated in Fig. 1, and it must be assumed in describing the operation of the system, that each of the magnets, indicated by circles in Fig. 1, is accompanied by apparatus, substantially the same as the correspondingly designated magnets in Fig. 2, and with this understanding the mechanism disclosed in the last named view will now be described: Arranged close to each track rail 6, at each station (see Figs. 2, 3, 4, 5 and 6) is a make-and-break device. For convenience, the two oppositely located make-and-break devices at each station will be designated 7 and 7^A, though their construction is substantially identical, and they are only given different reference characters for convenience of distinction. Each of these make-and-break devices is composed of a base 8, which is secured to the base of the track rail in any suitable manner. Upon this base 8 is mounted a stationary housing member 9, coöperating with a vertically movable housing member 10, which is bow-shaped (see Figs. 3 and 5), and supported by vertically disposed coil springs 12, whose lower extremities rest upon the arm of the housing member 9. The extremities 13, of each housing member 10 are also engaged by coil springs 12^A. Centrally located within the housing composed of the two members 9 and 10, are two contacts 14 and 15, the contact 14 being spring supported and resting upon the housing member 9, while the contact 15 is secured to the top of the housing member 10. These two contact members are normally separated; but when a train passes, the flange on any wheel of the train will engage the housing member 10 and depress the latter sufficiently to bring the two contacts 14 and 15 into engagement. From the contact 15 of the make-and-break device 7, leads a wire or electrical conductor 16, to one terminal of the coil of the magnet A, which is of the solenoid form and pro-

vided with a movable core 17, which is normally acted on by a leaf spring 18, to hold the core at its limit of forward movement, the forward end of the core being beveled, as shown at 19, whereby it is adapted to be engaged by the correspondingly beveled extremity of a projection 20, formed on a vertically movable bar 21, mounted in guides 22, and normally held at its upward limit of movement by a coil spring 23, one end of which rests upon the lower guide 22 when its upper end engages a stop collar 24, formed on the bar. When at its upward limit of movement, the upper end of the bar presses a spring contact 25, against a cooperating contact 26, whereby an electric circuit is closed through a lamp 27, which, it will be assumed, is green, and for the purposes of this specification, will be termed a safe lamp.

The opposite terminals of the lamp 27 are connected with wires 28 and 29, which may be termed the main feed wires of the light circuit. The wire 29, is bifurcated at 30, from which point two branches 31 and 32, lead respectively to the spring contact 25, and a second spring contact 33, the latter being mounted upon the bar 21.

When the electro-magnet B is energized, it acts upon the bar 21, to move the latter downwardly, whereby the lower extremity of the bar is brought into engagement with the upper extremity 34 of the magnet B. In this event the spring contact 33, is brought into engagement with a similar contact 35, whereby the circuit is closed through a lamp 36, which will for convenience be referred to as a danger lamp and also as red, since the latter is the color for visual danger signals. The terminals of this lamp are connected with wires 37 and 38, the wire 37 being connected directly with the main feed wire 28 of the light circuit, while the wire 38 is connected with the main feed wire 29, through the medium of the contacts 35 and 33, and the branch wire 32.

The opposite terminals of the magnet B are respectively connected with wires 39 and 40. The wire 39 leads to a contact 41, which is adapted to be engaged by the upper extremity of a vertically movable bar 42, mounted in guides, 43, and normally held at its upward limit of movement by a coil spring 44, one extremity of which rests upon the lower guide 43, while the other extremity engages the stop collar 45. When the magnet D is energized, it acts upon the bar 42, to draw the latter downwardly, whereby the said bar is separated from the spring contact 41, thus breaking the circuit of the magnet B beyond on both track make-and-break devices 7^A.

When the magnet B is energized, and draws the bar 21 downwardly to close the circuit through the danger lamp 36, the projection 20, acts to force the movable core

17, inwardly until the said projection passes below the core 17, when the spring 18, will force the core outwardly, causing the latter to assume a position above the projection 20, whereby the bar is locked in a position to close the circuit through the said danger lamp.

When the bar 42, is brought downwardly by the energizing of the magnet D, the said bar is locked in the said position by the spring actuated core 46, of the magnet C, the said core being acted on by a leaf spring 47, the core occupying a position above the projection 48, with which the bar 42 is provided.

From the lower contact 14 of the make-and-break device 7, leads a wire 16^A, to the upper extremity of a bar 42, which is controlled by the magnet D' and is substantially of the same construction and function as the bar 42 controlled by the magnet D, and is therefore, given the same reference character. It will be understood that the magnets A A', B B', C C' and D D' perform substantially identical functions, but are located on opposite sides of the track. Hence, the apparatus cooperating with these corresponding magnets may be given the same reference characters. Therefore, when the magnet D' is energized, it acts upon the adjacent bar 42 to draw the latter downwardly, breaking the circuit of the magnet B' above or beyond the track make-and-break device 7, the core 46 of the magnet C' serving to lock the bar in the depressed position. When the magnet B' is energized, it serves to draw the adjacent bar 21 downwardly, closing the circuit through the adjacent red or danger lamp 36, and breaking the circuit of the corresponding safe or green lamp, 27, the core 17 of the magnet A' serving to lock the bar 21 in the depressed position.

Attention is called to the fact that the contact 15, of the make-and-break device 7^A, is connected by means of a wire 16^B with one terminal of the magnet A'; while the contact 14 of the make-and-break device 7^A, is connected by means of a wire 16^C, with the upper extremity of the bar 42, adjacent to magnet D, the result being that whenever the contact 41 is in engagement with the bar 42 controlled by either magnet D or D', the magnet B or B', as the case may be, will be energized by the closing of the make-and-break device 7 or 7^A. And my present invention consists in making provision for automatically breaking the circuit above or beyond the track make-and-break device of the magnet B or B', as the case may be, on the left-hand side of the track, one station in advance of the train, the term left-hand side of the track, meaning the side at the left considered with reference to the travel of the train in question, in order to neu-

5 tralize the effect of closing the make-and-break device on the left-hand side of the track, as the train reaches any station. It has been heretofore explained, that any train traveling in a given direction, only utilizes the make-and-break devices on the right-hand side of the track for signaling purposes, the right-hand make-and-break device at any station serving when closed, to close the circuit through a signal light at any desired predetermined distance in the rear of the train, the red or danger lights being displayed on the left-hand side of the track in front and extinguished on the right-hand side of the track in the rear. The make-and-break devices on the right-hand side of the track also serve to display a danger signal on the right-hand side of the track at the station, where the make-and-break device is operated, and to extinguish a red light on the left hand side of the track at the said station.

By virtue of this arrangement, the train always leaves danger lights behind it on the right-hand side of the track, and these danger lights are kept burning until the train is a safe distance in advance, and they are successively extinguished a predetermined distance in the rear, as a train passes the various signaling stations. The make-and-break devices on the right-hand side of the track serve to extinguish the danger lights in the rear and on the right-hand side of the track, by closing the circuit through the magnet A or A', as the case may be, whereby the bar 41 of the magnet B or B', as the case may be, is released and allowed, under the influence of its spring, to break the circuit through the red or danger light, and close the circuit through the green or safe light, by bringing the contacts 20 and 26 into engagement with each other. Hence the energizing of the magnet A or A' serves to break the circuit of a red or danger light, and close the circuit of a green or safe light; the magnet B or B' when energized serves to close the circuit through a red or danger light and break the circuit of a green or safe light; the magnet D or D' when energized serves to break the circuit through the magnet B or B' at a point above or beyond the track make-and-break device; while the energizing of the magnet C or C' serves to release the bar 42, of the magnet D or D' and allow the same to move to a position to close the circuit through the magnet B or B'.

In describing the operation of the device from Fig. 1, the diagrammatic view, the foregoing statements must be borne in mind. In this description it will be assumed that a train has just passed the make-and-break devices 7 and 7^A of the central station shown in the said view or that designated by the Roman characters V and VI. It must then be understood that the various magnets A,

B, C and D, on one side of the track and A', B', C', and D' on the other side of the track are in the conditions illustrated in Fig. 2 and that the various mechanical devices disclosed in Fig. 2 are correspondingly located. In this diagrammatic view, it is assumed that the train is traveling in the direction of the arrow X, the trains being represented by dotted lines indicating a pair of wheels connected by an axle in the said view. Now as the train has just passed the make-and-break devices 7 and 7^A, the contacts of both of these devices have been momentarily closed. When the contacts of the make-and-break device 7 were momentarily closed, the current may be said to pass from the contact 15, of the station V, VI, through the wire 16^A to the magnet B', from the latter through a conductor E to the magnet C of the station III, IV, from the latter through the conductor F to the magnet A' of the station I, II, and thence through a conductor G to one of the main feed wires H of the magnet circuit, the other feed wire being designated by the letter J. The result of this travel of the electric current, is to energize magnet B' of station V, VI, whereby a red or danger light 36 is displayed at this station. The energizing of the magnet C at the station III, IV restores the continuity of the circuit B at this station; while the energizing of the magnet A' at station I, II, releases the bar 21 of the magnet B' at that station, breaks the circuit of the red light 36 at that station and closes the circuit of the green light 27 at the same station; the result being to place the magnet B of station III, IV in condition for use for signaling purposes, when a train is traveling in the opposite direction from arrow X, and to extinguish a red or danger light at station I, II, being two stations in the rear of the location of the train, this being the predetermined distance which it is considered necessary to protect the train in the rear by danger signals. Having now traced the path of the current in the rear of the train and its result when the make-and-break device 7 of the station is actuated to momentarily close its contacts, I will trace the path of the current forward of the train, resulting from the closing of the contacts of the same make-and-break devices: The current may be said to pass from the contact 15 of the make-and-break device 7 of the station V, VI through the conductor 16, to the magnet A of the same station, from the last named magnet through the conductor K, to the magnet D of the station VII, VIII, from the last named magnet, through a conductor L, to the magnet B of station IX, X, and thence from the last named magnet, through the conductor M to the feed wire J of the magnet circuit. The result of this travel of the current, is to release the bar 21 of the

magnet B of the station V, VI, whereby the circuit is broken through the red light 36 of this station, and the circuit closed through the green light 27 of the same station. The energizing of the magnet D at station VII, VIII actuates the bar 42 of the magnet D, to break the circuit of the magnet B of this station at a point above or beyond the track make-and-break device 7^A, so that when the train reaches the station VII, VIII immediately in advance of its present position, the closing of the contacts of the make-and-break device 7^A of the station VII and VIII will produce no result; while the energizing of the magnet B at the station IX, X, results in closing the circuit through a red or danger light 36 at this station, being two stations in advance of the train. It will thus be seen that though both of the make-and-break devices 7 and 7^A at each station are actuated by the train to bring their contacts into engagement, the engagement of the contacts of the make-and-break device 7^A is devoid of results, since the circuit which otherwise would be closed through the magnets B and B', is broken at a point above or beyond the track, this broken condition of this particular circuit being automatically accomplished by the train one station in advance of the latter, while the continuity of this particular circuit is restored automatically by the train one station in the rear thereof, thus leaving the signaling apparatus intact and ready for use by a train traveling in the opposite direction, the last named train utilizing the make-and-break devices on the left-hand side of a train moving in the direction of arrow X, these devices being of course on the right-hand side of a train, traveling in the opposite direction.

In further explanation of my improved signaling apparatus, attention is called to the fact that the signal lights, green and red designated 27 and 36 respectively, at each station, are inclosed in reflectors 49, which are directed in one direction on one side of the track and in the opposite direction on the opposite side of the track, so that each set of lights shall serve as signals to a train approaching from one direction only. By virtue of this arrangement, it becomes practicable for a train traveling in one direction to utilize the signal lights on opposite sides of the track for signaling trains traveling in opposite directions, the train traveling in one direction only receiving signals from the one set of lights or the lights upon a given side of the track.

The magnets A', B', C' and D', as well as the similar magnets A, B, C and D, mounted upon each pole or post 5 (see Figs. 7 and 8); that is to say, each set of four magnets, is inclosed in a casing 50, carried by the pole or post, whereby the said de-

vices are thoroughly protected from injury, due to storms or other cause. The wires leading from the signal lights 27 and 36, pass through openings 51, formed in the casing 50, since the contacts 20, 26 and 33, 35 are also inclosed within the said casing. The wires 16 16^A and 16^B 16^C, after leaving the contacts of the make-and-break devices 7 and 7^A, pass into tubes 52 which pass underneath the track, (see Figs. 5 and 6) to the posts or poles 5, the said tubes being carried upwardly upon the said posts which form their support, the wires being finally passed into the casing 50, and connected with their respective magnets. By virtue of this arrangement, the wires are fully protected. The reflectors 49, of the signal lamps 27 and 36, are mounted upon tubular supports 53, connected with the posts 5, and the circuit wires 28 29 and 37 38, are passed through the said tubular supports 53, whereby the said conductors are also protected from injury.

Wherever it is necessary for a train to pass upon a side track 54, (see Fig. 9), the signaling devices are controlled by special circuits connected with the various magnets, employed in connection with my regular system. These magnets, however, where the side tracks are located are connected with auxiliary circuits for reasons hereinafter explained.

At each end of each side track 54, is located a pair of switch tongues 55, pivoted at 56 in the usual manner. These switch tongues are connected by a rod 57, which is connected by means of a pitman 58, with the crank 59, of a rock shaft 60, operated by a weighted arm 61. If we assume that a train is traveling toward the right in Fig. 1, it will be necessary to throw the switch tongues 55, at the left-hand extremity of the side track 54, to the position shown in Fig. 10. In order to do this, the manipulating arm 61 is thrown to the dotted line position in Fig. 10, whereby the other parts are given corresponding positions also indicated by dotted lines. The movement of the rod 57, during this operation actuates a lever 62 pivotally connected at its upper extremity with the rod 57, as shown at 63, while its lower extremity is pivotally connected, as shown at 64, with a contact member 65, placed within a casing 66, located between the two track rails 6. Also located within the casing 66, is a co-operating contact 67. These two contacts 65 and 67 are brought into engagement when the rod 75, is shifted to throw the switch points to allow the train to run upon the side track. The bringing of these two contacts together, closes an auxiliary circuit including wires 68 and 69 connected respectively with the contacts 65 and 67. The wire 69, after leaving the casing 66, passes to the magnet B' of the station R, being that

farthest to the left in Fig. 9. From the magnet B', a conductor 70, leads to the magnet B' of the central station S. From the last named magnet, a conductor 71, leads to the magnet B' of the third station T, from which last named magnet, the conductor 72, leads to the main feed wire J of the magnet circuit; while the conductor 68 leading from the contact 65 within the casing 66, leads to the other feed wire H of the main circuit, after extending rearwardly from station R, and being connected with any other desired number of magnets. Hence, the result of throwing the switch to allow the train to pass upon the side track, entering from the left-hand extremity thereof, (still referring to Fig. 9), will be to permanently close an auxiliary circuit within which are located all of the magnets B' of the system at a number of stations in the vicinity of the side track. It, therefore, follows that all of these magnets B' will be permanently energized, as long as the switch is open to the side track and the danger or red lights, displayed by energizing the magnets, cannot be extinguished until the switch is reversed or thrown to the straight track position. Hence the danger lights must remain displayed until the switch is thrown for the straight track, to prevent another train from running upon the side track. The trainmen then after the train has passed to the side track must open the switch for the straight track, in which event the circuit will be broken through all of the magnets B'. Then by closing a normally open circuit in which all of the magnets A and A' are located at the three stations R, S and T and at such other stations, as may be desired, the bars 21 of the magnets B', may be released, extinguishing the corresponding red lights and lighting similarly located green or safe lights, thereby indicating to trains approaching from either direction, that the main track is clear.

The following is a description of the circuit in which the magnets A and A' are located: Commencing at a point 73 on the feed wire J, a conductor 74 leads to a magnet A' of the station S, from which last named magnet a conductor 75, leads to a magnet A of the same station. From the last named magnet leads a conductor 76 to a magnet A of station R; from the last named magnet, a conductor 77, leads to magnet A' of the same station, and from this magnet, a conductor 78, leads toward the left to any desired number of other magnets, and it is returned after making the loop, designated 79, which conductor leads to a switch-board or plate 80, upon which is mounted a movable switch arm 81, which is normally in an open position, whereby the auxiliary circuit through the magnets A and A' is normally broken. From the switch-plate 80,

leads a conductor 82, to the magnet A' of station T, from which last named magnet leads a conductor 83 to magnet A of the same station, and a conductor 84 leads from the last named magnet to the main feed wire H, completing the circuit through all the magnets A and A' of the various stations illustrated in Fig. 9. Assuming that the switch points 55, have been thrown to protect a train upon the main track, all of the magnets B' will be deenergized. Then by closing the switch-plate arm 81 momentarily, the current will be passed through all of the magnets A and A' of the various stations in the vicinity of the side track, whereby the bars 21 are released and allowed to move in response to their springs 23, breaking the red or danger light circuits and closing the corresponding green or safe light circuits. By making it necessary to operate the track switch composed of the switch tongues 55, whereby the switch is set for the straight track, before the red or danger lights can be extinguished, provision is made for avoiding possible accident by leaving the switch open to the side track after the danger lights have been put out. It will be understood that while the track switch is thrown for the side track, all of the magnets B' are permanently energized, and the closing of the auxiliary circuit through the magnets A and A', whereby all of the said magnets are energized, would have no influence in extinguishing the danger lights, since the bars 21, would still be held in position to maintain the continuity of the red light circuits, by virtue of the energized magnets B'. Hence before the danger lights can be put out, the track switch must be set for the straight track, and possible collision with the train on the side track avoided.

In the construction illustrated in Fig. 9, it is assumed that the train going upon the side track is a slow train or a freight side-tracked to allow a fast train or passenger, traveling in the same direction, to go by; hence the necessity for throwing the track switch in position for the straight track for a train traveling in the same direction as the side-tracked train. However, my provision for maintaining the danger signals in the vicinity of the side track, will operate equally well for trains approaching from a direction opposite the travel of the side-tracked train.

From the foregoing description, the operation of my improved signaling apparatus will be readily understood. If we assume, referring to Fig. 1, that the train is traveling in the direction of arrow X, it will be understood that the circuit of the magnet B will be automatically broken one station in advance of the train, at a point above or beyond the corresponding track make and-

break device, whereby as the train reaches said station, the closing of the contacts of the make-and-break device on the left-hand side of the track, will fail to energize the magnet B, the entire signaling function being performed by the closing of the contacts of the make-and-break device 7, or that upon the right-hand side of the track. As the train continues on its way, every time it reaches a station, the closing of the contacts of the make-and-break device 7, serves to restore the continuity of the circuit of the magnet B above or beyond the track make-and-break device 7^a one station in the rear, thus leaving the magnets on the left-hand side of the track in condition to be acted upon by a train traveling in the opposite direction.

In addition to the special function just explained, a train traveling in the direction of the arrow X, every time it reaches a station, extinguishes a danger light two stations in the rear on the right-hand side of the track, displays a danger light at the station where the train is, on the right-hand side of the track, and also displays a danger light two stations ahead on the left-hand side of the track. It will be understood that the danger lights displayed by a train traveling over a track equipped with my improved system, leaves danger lights a predetermined distance in the rear on the right-hand side of the track and arranged to warn a train traveling in the same direction, since the reflectors of the said danger lights are open from the rear. Again the danger lights displayed forward of the train and on the left-hand side of the track, are arranged by virtue of the special reflectors with which they are equipped, to warn a train traveling in a direction opposite the arrow X. Finally assuming it is desired to side track a freight train traveling over a track equipped with my improved system, (see Fig. 9,) and also assuming that the said train is traveling toward the right, the switch points 55, will be thrown to the position shown in the last named figure, opening the side track to the said train. The throwing of the switch for the aforesaid purpose, closes an auxiliary circuit through all of the magnets B' B of the several stations in the vicinity of the side track; thus permanently energizing the said magnets as long as the switch remains open to the side track. After the freight train is safely upon the side track, it becomes desirable to extinguish the danger lights and display the safe or green lights, thereby indicating to a following train that the straight track is clear. But before the danger lights can be extinguished, the switch must be closed to the side track and opened to the main track, and when this is done, the magnets B' will be deenergized, then by closing a normally

open special circuit in the vicinity of the side track and in which all of the magnets A and A' are located, the bars 21 may be released, breaking the circuits of all the red lights and closing the circuits of the green or safe lights in the manner heretofore explained.

It must be understood that any suitable special signaling posts may be employed for the open switch signaling apparatus at a side track; also that I am not limited to the special arrangement, whereby danger and safe lights are displayed and extinguished at the special distances in the rear and advance of trains, disclosed in the drawing and described in the specification, since any other suitable predetermined arrangement in this record may be employed without departing from the spirit of the invention.

Having thus described my invention what I claim is:

1. A railway signaling apparatus, comprising signal stations arranged along the track, each station including an electric signal located on each side of the track, electro-magnetic means for closing the circuit of each signal at each station, means for automatically locking each signal circuit in the closed position, electro-magnetic means for releasing the locking means of each signal circuit, circuit make and break devices arranged along the track on each side thereof and adapted to be placed in the closed position by a passing train, and circuit connections between the track make and break devices and the electro-magnetic means of the signal stations, whereby when a track circuit make and break device on one side of the track is closed the electro-magnetic means for closing the circuit of the signal on one side of the track at the home station is energized, while the lock-release electro-magnetic means of the signal on the other side of the track at the same station is energized, and said circuit connections also releasing a signal that has been set in the rear of the train and setting a signal that has been released in front of the train, substantially as described.

2. A railway signaling apparatus comprising signal stations arranged along the track, each station including an electric signal on each side of the track, electro-magnetic means for closing the circuit of each signal at each station, means for automatically locking the signal circuits in the closed position, electro-magnetic means for releasing the locking means, circuit make-and-break devices arranged along the track adjacent each station, the contacts of each make-and-break device being arranged to be closed by a passing train, circuit connections between the track make-and-break devices and the electro-magnetic means of the signal stations whereby, when the circuit

track make-and-break device is closed, the electro-magnetic means for closing the circuit of the signal on one side of the track at the home station is energized, while the lock-releasing electro-magnetic means of the signal on the other side of the track at the same station is energized.

3. A railway signaling apparatus comprising signal stations arranged along the track, each station including an electric signal on each side of the track, electro-magnetic means for closing the circuit of each signal at each station, means for automatically locking the signal circuits in the closed position, electro-magnetic means for releasing the locking means, circuit make-and-break devices arranged along the track adjacent each station, the contacts of each make-and-break device being arranged to be closed by a passing train, circuit connections between the track make-and-break devices and the electro magnetic means of the signal stations, whereby, when a circuit track make-and-break device is closed, the electro-magnetic means for closing the circuit of the signal on one side of the track at a station in advance of the home station is energized, while the lock-releasing electro-magnetic means of the signal on the other side of the track at a station in the rear of the home station is energized.

4. In railway signaling apparatus, two signals at each station, at each station two sets of mechanism each including a circuit for one of said signals, electro-magnetic means for closing said circuit, means for locking said circuit in the closed position, a second electro-magnetic means for releasing said locking means, a second circuit in which the first named electro-magnetic means is located, a means for normally maintaining said second circuit closed at one point, a third electro-magnetic means for opening said second circuit, means for locking said second circuit in the open position, and a fourth electro-magnetic means for releasing said last named locking means.

5. In railway signaling apparatus, two signals at each station, at each station two sets of mechanism each including a circuit for one of said signals, electro-magnetic means for closing said circuit, means for locking said circuit in the closed position, a second electro-magnetic means for releasing said locking means, a second circuit in which said first named electro-magnetic means is located, means for normally maintaining said second circuit closed at one point, a third electro-magnetic means for opening said second circuit, means for locking said second circuit in the open position, a fourth electro-magnetic means for releasing said last named locking means, the circuit through the first named electro-magnetic means at the right of the home station

including the corresponding electro-magnetic means at the left of the second station in advance, and the second named electro-magnetic means at the left of the home station and the corresponding electromagnetic means at the right of the second station in the rear, and the third electro-magnetic means at the left of the first station in advance, and the fourth electro-magnetic means at the left of the first station in the rear and a make and break device at the home station adapted to be operated by the passing of a train for closing said last-named circuit.

6. In electric railway signaling apparatus, the combination of signaling stations arranged at suitable intervals along the track, the said signaling stations each including two electric signals, make-and-break devices arranged on each side of the track at each station and adapted to be operated by a passing train, circuit connections between the make-and-break devices and the respective signaling devices, electro-magnetic means for closing the signal circuits, means for locking the signal circuits in the closed position, electro-magnetic means for releasing the locking means, the circuit connections being arranged so that when a make-and-break device on one side of the track is closed, the electromagnetic means for closing the signal circuit on one side of the track at the home station is energized, while the lock-releasing electro-magnetic means of the signal on the other side of the track at the same station is energized, electro-magnetic means in advance of the home station and in connection with said make-and-break device for breaking a circuit in which is located the make-and-break device at the opposite side of the track at the station in advance, whereby the track make-and-break device on one side of the track is utilized for signaling purposes by a train traveling in one direction, while the make-and-break device on the other side of the track is disconnected.

7. In electric railway signaling apparatus, the combination of signaling stations arranged at suitable intervals along the track, said signaling stations each including two electric signals, make-and-break devices arranged on each side of the track at each station and adapted to be operated by a passing train, circuit connections between the make-and-break devices and the respective signaling devices, electro-magnetic means for closing the signal circuits, means for locking the signal circuits in the closed position, electro-magnetic means for releasing the locking means, the circuit connections being arranged so that, when a make-and-break device on one side of the track is closed, the electromagnetic means for closing the signal circuit on one side of the track

at the home station is energized, while the
lock-releasing electro-magnetic means of the
signal on the other side of the track at the
same station is energized, electro-magnetic
5 means in advance of the home station and in
connection with said make-and-break de-
vice for breaking a circuit in which is lo-
cated the make-and-break device at the op-
posite side of the track at a station in ad-
10 vance, means for locking said last named
circuit in the open position, and electro-
magnetic means in connection with a make-
and-break device farther in advance and

on the first-named side of the track for re-
leasing said locking means whereby the 15
track make-and-break devices on one side of
the track are utilized for signaling purposes
by a train traveling in one direction, while
the make-and-break devices on the other side
of the track are disconnected. 20

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

WILLIAM J. COOK.

Witnesses:

M. F. MAURY,
JESSIE HOBART.