

1,182,100.

Patented May 9, 1916.

2 SHEETS—SHEET 1.

FIG. 1.

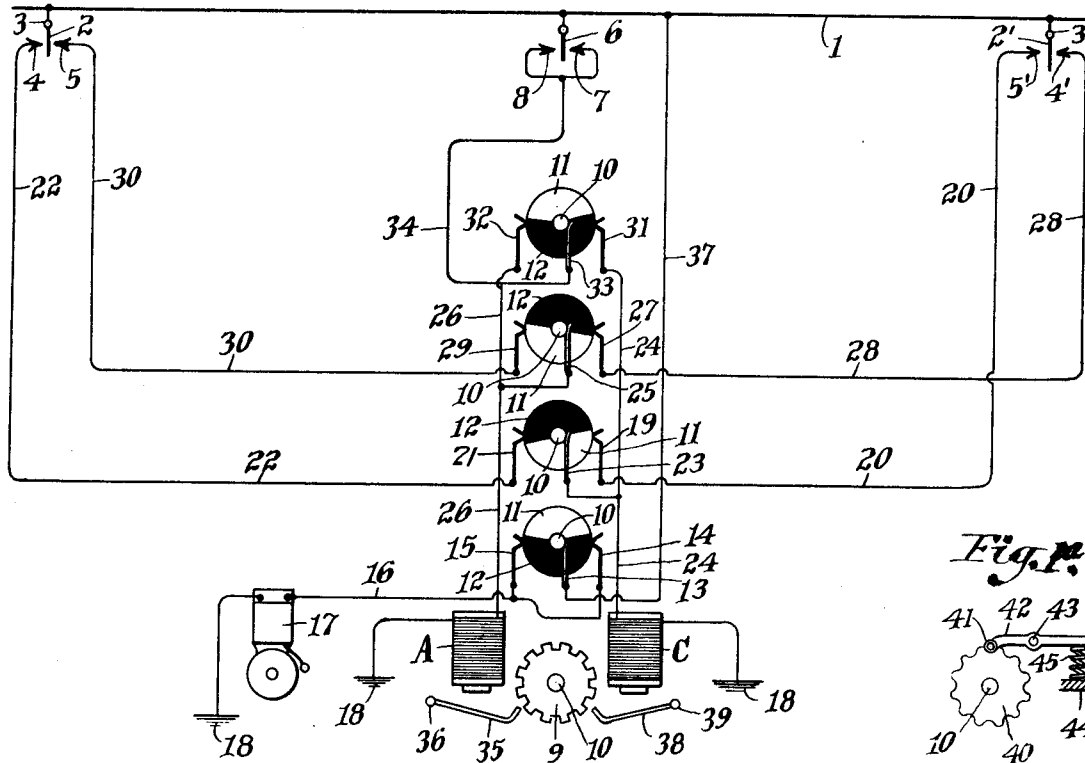


Fig. 2.

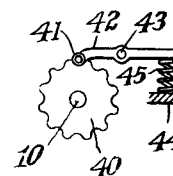
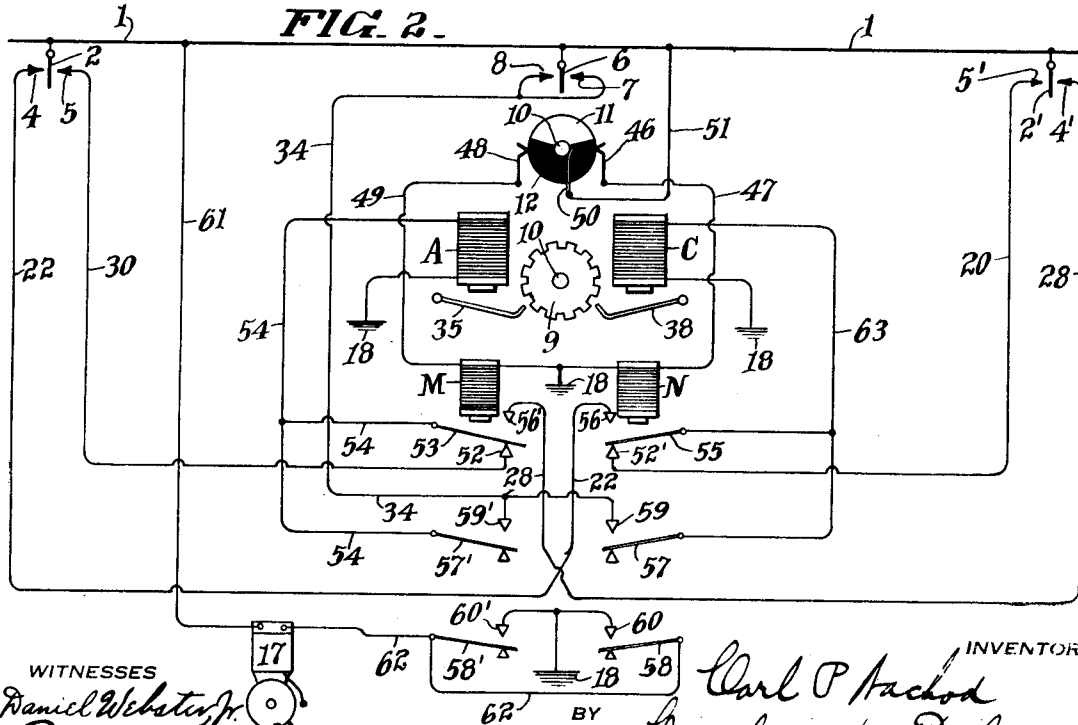


FIG. 2.



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2 SHEETS—SHEET 2.

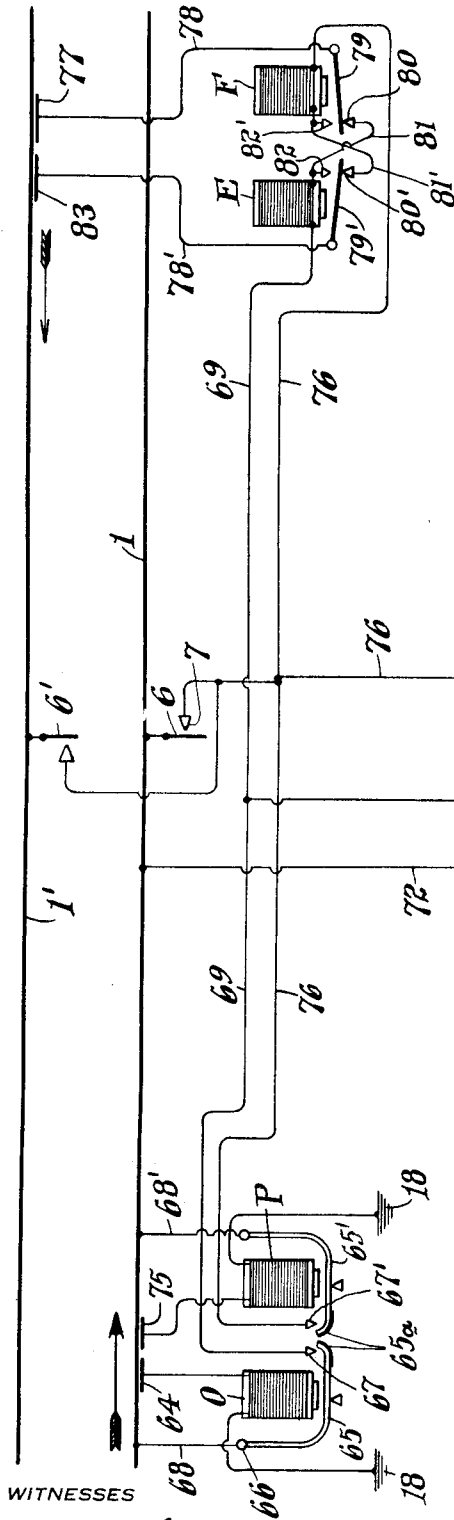


FIG. 3.

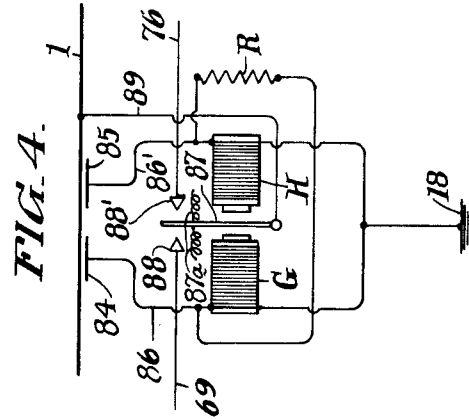


FIG. 4.

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CARL P. NACHOD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO NACHOD SIGNAL COMPANY, INC., A CORPORATION OF NEW YORK.

CROSSING-SIGNAL.

1,182,100.

Specification of Letters Patent.

Patented May 9, 1916.

Application filed August 3, 1912. Serial No. 713,042.

To all whom it may concern:

Be it known that I, CARL P. NACHOD, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Crossing-Signal, of which the following is a specification.

My invention relates to a crossing signal that is, to means for giving visual, audible or other signals at the crossing of a highway with a railway, particularly an electric railway.

My invention resides in the signaling system of the character above referred to in which a train or car approaching the crossing with the highway controls, from a point reached by the train or car in advance of the crossing, a circuit which controls the giving of the alarm signal at the highway, and after the train or vehicle has advanced a suitable distance, for example, having passed the highway, discontinues the alarm. And it is a further feature of my invention that if a car or train should pass the advance control point, and then return past that control point it will discontinue the alarm signal. And it is a further feature of my invention, particularly as to a single track railway over which train or car movements occur in both directions, that if two or more trains or cars pass the advance control point toward the highway crossing, and one or more of them remains or remain between such advance control point and the crossing and the other or others pass on beyond the crossing and beyond the advance control point for traffic in opposite direction, the alarm signal will not be discontinued. And as to a single track railway, my invention resides in means for giving an alarm at the highway for traffic in both directions for the single track railway.

My invention resides also in further features of alarm control, and my invention resides in the apparatus and system herein after described and claimed.

For an illustration of some of the forms my invention may take reference is to be had to the accompanying drawings, in which:

Figure 1 illustrates an application of my invention to a single track railway. Fig. 1^a is a detail illustrating means for insuring completion of such movement after deenergization of the switching actuating magnet.

Fig. 2 is an illustration of the application of my invention to a single track railway, with modified signal apparatus. Fig. 3 illustrates an application of my invention to a double track railway, alternative forms of vehicle controlled contact mechanism being shown. Fig. 4 is a fragmentary diagram illustrating a further form of vehicle controlled contact mechanism.

Referring to Fig. 1, a contact conductor 1, or a signal conductor of a single track steam or other railway, indicates the direction of the railway which crosses a highway, presumably at a point substantially midway between the contactors 2 and 2', here illustrated, by way of example, as of conductors hanging upon the pivots 3 and 3' and electrically connected with the conductor 1, which, of course, is connected with one terminal of a source of energy not shown. The contactors 2, 2' are disposed between the stationary contacts 4 and 5, and 4', 5'. Near or at the highway crossing, is disposed a third contactor 6 adapted to engage either of the contacts 7 or 8. The signal mechanism comprises the notched wheel 9 secured upon the shaft 10 upon which are secured also the movable members of four switches, all simultaneously driven by the shaft 10 but insulated from each other. Each switch comprises a conducting portion and an insulation portion, the conducting portions being represented at 11 and the insulating portions at 12. From the conductor 1 extends a conductor 37 in electrical communication with the brush 13 which maintains electrical communication with the conducting portion 11 of the lowermost switch. Normally bearing upon the insulation 12 of the lowermost switch are the two brushes 14 and 15 electrically connected to each other and by conductor 16 with one terminal of the alarm signal 17 whose other terminal connects with the earth or return conductor 18 to which also is connected one terminal of the source of energy, not shown. In this switch the insulating material 12 occupies somewhat more than half a circumference. In the next switch the insulation portion and the conducting portion occupy substantially half of a circumference. There is normally in engagement with the conducting portion 11 of this switch a brush 19 connected by conductor 20 to the contact 5'. And nor-

mally in contact with the insulation 12 of this switch is a brush 21 connected through conductor 22 with contact 4. The brush 23 maintains electrical communication with the conducting portion 11 of this switch and is in electrical communication with one terminal of the winding of the electro-magnet C whose other terminal connects to the return conductor or earth 18; and the brush 23 is also in electrical communication through conductor 24 with the brush 31 of another switch. In the next switch the insulation portion and the conducting portion are substantially a half circumference in extent and with the conducting portion 11 there is constantly in contact a brush 25 in electrical communication through conductor 26 with one terminal of the electro-magnet A, whose other terminal connects with the earth or return conductor 18, and with the brush 32 of another switch. Normally bearing on the insulation 12 of this switch is the brush 27 in electrical communication through conductor 28 with the contact 4'. And normally in contact with the conducting portion 11 is the brush 29 in electrical communication through the conductor 30 with the contact 5. In the last switch the brush 31 is normally in engagement with the insulation material 12 as is also the brush 32. Maintaining electrical communication with the conducting portion 11 is the brush 33 connected through conductor 34 with both contacts 7 and 8.

The operation is as follows: Assuming a car or train moving from the left toward the crossing, at a desired distance in advance of the crossing it actuates the contactor 2 to bring the same into engagement with the contact 5 whereupon current will flow from conductor 1, through contact 5, conductor 30, brush 29, brush 25, conductor 26, through magnet A to earth or return conductor 18 thereby energizing the magnet A which thereupon attracts its armature 35, pivoted at 36, stepping the notched wheel 9 around one notch, in a clockwise direction as viewed in Fig. 1. The result is that brush 14 is brought into contact with the conducting member 11 of the lower switch whereupon current will flow from conductor 1, through conductor 37, brush 13, brush 14, conductor 16, alarm signal 17 to earth or return conductor 18, thereby causing the alarm 17 to operate and advise anyone on the highway of the approach of a train or car. The contact between 2 and 5 is of short duration and the magnet A is consequently soon deenergized, but the shaft 10 which has been revolved one notch remains in its revolved position, with the result that the alarm 17 continues in operation until some further control is exercised upon the apparatus. The car or train in proceeding later causes the contactor 6 to engage contact 7 whereby current

flows from the conductor 1 through contactor 6, contact 7, conductor 34, brush 33 to the conducting portion 11 of the fourth switch which is now in electrical communication with the brush 31 due to the stepping around of the shaft 10 previously referred to. Current therefore flows through brush 31, conductor 24, through the winding of magnet C to the earth or return conductor 18. The magnet C being thus energized attracts its armature 38, pivoted at 39, to step the notched wheel 9, and therefore the shaft 10 and the attached switches, in counter clockwise direction one notch. This restores the apparatus to the position shown in Fig. 1 which interrupts the circuit and the alarm 17 because brush 14 is again in engagement with the insulation 12, thus discontinuing the alarm. In so actuating the notched wheel 9 the magnet C in reality breaks its own circuit because the brush 31 comes again into engagement with the insulation 12 of the fourth switch. In consequence the remainder of the stroke of the armature 38 and the angular movement of the switches must be completed due to their inertia. However a second notched wheel 40, Fig. 1^A, may be secured upon the shaft 10. Coöperating with the wheel 40 is a roller 41 pivoted on the end of the lever 42 pivoted at 43. Between a fixed abutment 44 and the end of the lever 43 is disposed a spring 45 supposed to be under compression thus urging the roller 41 into the deepest portion of each notch. By this arrangement a rotation of the shaft 10 initiated by the magnet C is completed by the spring 45. In fact the function of wheel 40 may be performed by wheel 9 by associating therewith similar coöperating parts. After passing the contactor 6 the train or car in proceeding toward the right finally brings contactor 2' into engagement with contact 4' but there is no resulting operation, since the brush 27 is on insulating material in the third switch. If more than one car or train enters the territory between contactors 2 and 6, the alarm will be set into operation by the first car or train passing the contactor 2, as previously described. A second and subsequent car or train will however produce no effect upon the now operating alarm 17 but will simply step the wheel 9 around one notch for each additional car or train so entering. This makes no change in the electrical circuits, the brush 14, for example, continuing in contact with the conductor 11 of the first switch, the conductor 11 having angular extent sufficient to allow rotation of the wheel 9 several notches and still maintain electrical communication with the brush 14. The first car or train reaching the contactor 6 causes the magnet C to step the notched wheel 9 backward one notch. The alarm however continues in operation

until all the cars or trains which have passed the contactor 2 have passed the contactor 6 to energize the magnet C a sufficient number of times to return the notched wheel 9 to normal position indicated in Fig. 1 whereupon the alarm will be discontinued. As the successive cars or trains pass the contactor 2' nothing occurs, for the reason above given. If a car should pass the contactor 2 toward the right toward the crossing the alarm would be set in operation as hereinbefore described. If the car or train should then back out past the conductor 2, without having first passed the contactor 6, the alarm would be discontinued because in this return movement the contactor 2 will engage contact 4 allowing current to flow from conductor 1 through contactor 2, contact 4, conductor 22, brush 21, which is in electrical communication with the conductor 11 of the second switch due to the previous energization of the magnet A, and thence through brush 23, conductor 24, magnet C to earth or return conductor 18 stepping the notched wheel 9 and the switches back one notch, that is, to normal and discontinuing the alarm. Or if two cars or trains should enter from the left toward the right past the contactor 2, one of them immediately backing out, the alarm would be set in operation by the first car or train entering, the notched wheel and switches would be stepped around one further notch with the second car or train without affecting the alarm which continues in operation, and then in backing out the notched wheel 9 is stepped back one notch, leaving the alarm in operation until the first train passes the contactor 6. Or if two cars or trains should enter from the left toward the right past the contactor 2, the alarm would be set into operation by the first car entering and the second car entering would not discontinue the alarm but would simply step the notched wheel 9 around one further notch as previously explained. If now one of the cars should remain at some point between the contactors 2 and 6, while the other passed on through past contactor 6 and contactor 2', the operation of contactor 6 would simply step the notched wheel 9 back one notch, leaving the alarm in operation, and in passing the contactor 2' no circuits would be changed. Of course the operation is the same for trains moving from right toward the left in which case, as will appear from Fig. 1, the operation will be similar in all cases to that described for train movements from the left toward the right, except that in this case the magnet C becomes the setting magnet and the magnet A the clearing magnet. And it will appear from the employment of the notched wheel 9 of the associated switches that the crossing signal system described in effect involves a car

counting function inasmuch as the signal is not stopped until all the cars or trains which have entered past a controlling point have passed beyond the highway, or have otherwise passed from the alarm zone or territory.

The switches involving the contactors 2, 6, and 2', with the associated stationary contacts may be styled directionally sensitive switches, that is, switches, which close one circuit or another depending upon the direction of movement of the train or car. In the case of Figs. 1 and 2 these directionally sensitive switches are mechanical, that is, the contactors are mechanically actuated by a passing car or vehicle.

Referring now to Fig. 2, a highway crossing is assumed as in connection with Fig. 1 and here again I employ directionally sensitive mechanically operated switches. In this case the arrangement is such that the clearing magnet does not break its own circuit, as described in connection with Fig. 1; furthermore the number of switches actuated by the notched wheel 9 is less than in Fig. 1. The notched wheel 9, operating the shaft 10, operates only one switch whose conducting portion 11 is somewhat less than a half circumference. Normally bearing upon the insulating material is the brush 46 connected by conductor 47 with one terminal of the electro-magnet N whose other terminal connects to the earth or return conductor 18. The opposed brush 48 connects through conductor 49 with one terminal of the electro-magnet M whose other terminal connects with the earth or return conductor 18. The brush 50 maintains permanent electrical communication with the conductor 11 of the switch, and connects by conductor 51 with the signal conductor or trolley wire 1.

The operation is as follows: A vehicle moving from left to right, for example, first actuates the directionally sensitive switch 2, causing current to flow from conductor 1 through conductor 30, to contact 52, through armature 53, of electro-magnet M, through conductor 54, to one terminal of the electro-magnet A whose other terminal connects to the earth or return conductor 18. This causes the energization of electro-magnet A which attracts its armature 35 which steps the notched wheel 9 around one notch thereby bringing conductor 11 of the switch into contact with brush 46 whereupon current flows from the conductor 1 through conductor 51, brush 50, conductor 11, brush 46, conductor 47, through the winding of electro-magnet N to earth or return conductor 18. Electro-magnet N being now energized attracts its armature 55 into engagement with contact 56. Movable with the armature 55 are the contact levers 57 and 58 which are attracted against their respective contacts 59 and 60 when the magnet N is

energized. The circuit including 55, 56 is open at contact 4 as is also the circuit including contacts 57 and 59 at contacts 7 and 8. But the engagement of contact 60 by contact 58 closes a circuit from conductor 1, through conductor 61, alarm signal device 17, conductor 62, contact 58, contact 60 to earth or return conductor 18 thus energizing the alarm 17. This alarm continues in operation until the train or car has moved contactor 6 into engagement with contact 7 whereupon current flows from the conductor 1 through the contactor 6, contact 7, conductor 34, through contacts 59 and 57, which are in engagement with each other due to the continued energization of electro-magnet N, thence through conductor 63, electro-magnet C to earth or return conductor 18. This momentarily energizes the electro-magnet C which returns the notched wheel 9 and shaft 10 and the rotary switch to normal position indicated. This deenergizes electro-magnet N whereupon the movable contacts 55, 57 and 58, drop, the last two against insulated stops and the first against the contact 52' in connection through conductor 20 with the contact 5'. In consequence of the deenergization of magnet N the circuit of magnet C is open and the circuit of the alarm 17 is open at contact 60, wherefore the alarm stops. As the car or train passes on to the right contactor 2' is brought into engagement with contact 4' but nothing occurs since the circuit of the including conductor 28 is open at 56'. If a car enters past the contactor 2 from the left it starts the alarm and the magnet N continues energized as previously described. If a car or train should back out again in reverse direction, it will bring contactor 2 into engagement with contact 4 whereupon current will flow from conductor 1, through contactor 2, contact 4, conductor 22, to contact 56, through contact 55, it being remembered that the electro-magnet N is energized, through conductor 63 and magnet C to earth or return conductor 18, thus returning the notched wheel and the rotary switch to normal, stopping the alarm and breaking the circuit of the magnet C, due to the deenergization of the magnet N, because brush 46 is now resting on insulating material 12. The arrangement is symmetrical for trains moving in opposite direction in which case the electro-magnet M exercises controls similar to those exercised by electro-magnet N.

In Fig. 3 a double track railway is indicated, the one signal conductor or contact conductor being illustrated at 1 and the other at 1'. Traffic is assumed from left to right in connection with conductor 1 and from right to left in connection with conductor 1', as indicated by the arrows. As-

suming the train moving from left to right in connection with conductor 1, a traveling contact carried by the train or car bridges the conductor 1 and the contact 64 energizing the relay magnet O whose one terminal is connected with the contact 64 and whose other terminal is connected to earth or return conductor 18. When the magnet O is energized it attracts its armature 65, pivoted at 66, bringing the same into engagement with contact 67, whereupon current will flow from conductor 1 through conductor 68, armature 65, contact 67, conductor 69, through the winding of the magnet A to the earth or return conductor 18 energizing the magnet A which attracts its armature 35 stepping the notched wheel 9 around one notch thereby revolving the switch carried on its shaft 10 to withdraw the insulating material 12 from beneath the brush 70. It then contacts with the conducting portion 11 which is continuously in electrical communication with the brush 71. The brush 70 is connected by conductor 72 with the conductor 1 and the brush 71 connects by conductor 73 to the signaling instrument or alarm 17 whose other terminal connects preferably through resistance 74 with the earth or return conductor 18. This sets the alarm 17 into operation. This may be a trembler bell. Connected in shunt thereto are shown two incandescent lamps L, L which, due to the make and break of the circuit of the bell will be alternately extinguished and lighted, causing a flashing or flickering signal in addition to the audible signal furnished by the bell 17. As the traveling contact on the vehicle leaves the contact 64 and bridges conductor 1 and contact 75 the electro-magnet P is energized and attracts its armature 65'. But the armature 65 has been previously attracted and is therefore in the path of movement of the armature 65' and the armature 65 therefore prevents the armature 65' from engaging contact 67'. The result is that current continues to flow from conductor 1 through conductor 69 as initiated by magnet O. While the magnet O is deenergized when the traveling contact is on contact 75, nevertheless the attraction of armature 65' holds armature 65 in engagement with contact 67 until the traveling contact, as a trolley wheel, has left contact 75. The armatures 65 and 65' are tipped with insulation as indicated at 65^a, so that their mechanical engagement with each other does not electrically connect them. The alarm signal or signals continue to give an alarm at the crossing until the contactor 6 at or near the highway is brought, by the vehicle, into engagement with contact 7 whereupon an impulse of current will flow through conductor 1 through contactor 6, contact 7, conductor 76, winding of magnet C to earth or return

conductor 18. This momentarily energizes the magnet C which attracts its armature 38 and steps the notched wheel back to normal breaking the circuit of the signal or signals at the rotary switch. In passing farther on to the right no contacts or circuits are controlled by the car or train. As in Figs. 1 and 2, so in Fig. 3 successive cars or trains closely following the first do not disturb the signal circuit but merely step around the notched wheel 9 a further notch for each car or train entering; and as each passes the contactor 6 the wheel 9 is stepped back a notch for each car or train and as the last departs the signal circuit is broken by the return of the notched wheel 9 and rotary switch to normal. If a car or train having passed the contacts 64 and 75 returns or backs out past these contacts, magnet P will first be energized attracting its armature 65 into engagement with contact 67' whereupon current will flow from conductor 1 through conductor 68', armature 65', contact 67', and conductor 76 through magnet C to momentarily energize the same to return the notched wheel 9 one notch toward normal to stop the signal, or if other cars or trains have entered ahead of the car or train in question it will leave the signals still operating but will simply cancel the effect of its own entry. Assuming a train moving on the other track from right to left the operations are the same as described with respect to a train or car moving from left to right. By way of example, however, a different directionally sensitive contacting mechanism is shown. The contact 77 is first brought into communication with the conductor 1' whereupon current will flow through conductor 78, armature 79 of relay magnet F, contact 80, conductor 81, through the winding of the relay magnet E thence by conductor 69 through the magnet A starting the signals or alarms as previously described. Upon energization of the magnet E it attracts its armature 79' into engagement with contact 82, in electrical communication through conductor 81 with contact 80, and as the traveling contact leaves contact 77 and engages contact 83 the magnet E continues energized by current flowing through it from conductor 1', conductor 78', armature 79' and contact 82, conductor 69 and magnet A. In case a car or train backs out past contacts 83 and 77, contact 83 is first brought into circuit energizing magnet F which attracts its armature 79 against contact 82' in electrical communication through conductor 81' with contact 80'. When the armature 79 is attracted against contact 82', the traveling contact in engaging contact 77 maintains the circuit through conductor 76 as initiated through contact 83.

In Fig. 4 is shown a further modified arrangement. Here the contact 84 is assumed

to be first engaged by a traveling contact moving from left to right causing current to flow from conductor 1 through contact 84, conductor 86, relay magnet G to earth or return conductor H. The magnet G accordingly attracts the armature 87, biased to the mid-position indicated, bringing it into engagement with contact 88 so that current flows through conductor 1 through conductor 89, armature 87, contact 88 and conductor as 69 for energizing the magnet A for example. Simultaneously with the energization of magnet G current flows through the magnet H, but the current through the magnet H is much reduced by the resistance R. This pull upon the armature 87 is less than the pull thereon by magnet G and in consequence the armature 87 engages contact 88 as described. When the traveling contact engages contact 85 current will flow from conductor 1, through contact 85, conductor 86', magnet H, to earth or return 18 and simultaneously through resistance R and the magnet G to earth or return 18. But since the armature 87 is now so close to the pole of magnet G due to the operation previously described, the magnet G, notwithstanding the resistance R in this circuit, holds the armature 87 in engagement with contact 88. With vehicle movement in opposite direction contact 85 is first brought into circuit and with the result that armature 87 is brought into engagement with contact 88', magnet H overcoming magnet G due to the fact that the resistance R is now in the circuit of the magnet G. With the armature 87 in engagement with contact 86' current flows from conductor 1 through conductor 89, armature 87, contact 86', and conductor 76 to energize magnet C, for example, of Fig. 3.

While I have shown in Figs. 3 and 4 different types of directionally sensitive contact mechanisms it is to be understood that in place of any of them may be used the mechanical directionally sensitive switch such as illustrated in Figs. 1 and 2. And it is to be further understood that in place of any of the mechanical directionally sensitive switches of Figs. 1 and 2 may be substituted any of the forms of directionally sensitive switches illustrated in Figs. 3 and 4. And it is to be understood that any of the directionally sensitive switches of Figs. 3 and 4 may be used in place of either of the directionally sensitive switches shown in Fig. 3. And in general my invention is not limited to the break types of directionally sensitive switches illustrated for any other suitable type of directionally sensitive switch may be used for any of those described. And while I have indicated the alarm 17 as in the form of an electric bell, it is to be understood that such alarm device may be either audible or visual or of

any suitable nature whatsoever. And while I have shown the energy for operating the alarm as derived from conductor 1, it is to be understood that the alarm may be energized by local energy, as from a battery or any other source of power, disposed in a circuit with the alarm and controlled by the same mechanism.

What I claim is:

1. In a crossing signal system, the combination with a vehicle controlled switch in advance of the crossing, of a signal, a signal setting magnet, a signal restoring magnet, said vehicle controlled switch in advance of the crossing controlling said signal setting magnet, a vehicle controlled switch controlling both said magnets to restore said signal, and switches actuated by said magnets through which said vehicle controlled switches control said magnets.

2. In a crossing signal system, the combination with a signal, of signal setting and signal restoring magnets, a vehicle controlled switch in advance of the crossing controlling said setting magnet, a second vehicle controlled switch near the crossing controlling said restoring magnet, and a vehicle controlled switch on the opposite side of said second vehicle controlled switch from said first named vehicle controlled switch controlling said signal restoring magnet to set said signal.

3. In a crossing signal system, the combination with a signal, of magnets controlling said signal, a vehicle controlled switch in advance of the crossing controlling one of said magnets to set said signal, a vehicle controlled switch in advance of the crossing on the other side thereof controlling another of said magnets for setting said signal, and a vehicle controlled switch near the crossing controlling said magnets to restore said signal.

4. In a crossing signal system, a vehicle controlled switch in advance of the crossing, an alarm, a circuit therefor, a switch controlling said circuit, step by step mechanism for actuating said alarm circuit switch, means controlled by said vehicle controlled switch for actuating said step by step mechanism, means for actuating said step by step mechanism in reverse direction, a switch actuated by said step by step mechanism controlling said last named means, and a second vehicle controlled switch near the crossing controlling said first and second named means through said last named switch.

5. In a crossing signal system, the combination with a directionally sensitive vehicle controlled switch in advance of the crossing, an alarm, a circuit therefor, a switch controlling said alarm circuit, step by step mechanism controlling said alarm circuit switch, means controlled by said vehicle controlled switch for actuating said step

by step mechanism a step for each vehicle passing said vehicle controlled switch, means for actuating said step by step mechanism in reverse direction, said vehicle controlled switch controlling said last named means to actuate said step by step mechanism a step for each vehicle passing said vehicle controlled switch in reverse direction, a switch controlled by said step-by-step mechanism, and a second vehicle controlled switch near the crossing cooperating therewith in controlling said first and second named means.

6. In a crossing signal system, the combination with a directionally sensitive vehicle controlled switch in advance of the crossing, an alarm, a circuit therefor, a switch controlling said alarm circuit, step by step mechanism controlling said alarm circuit switch, means controlled by said vehicle controlled switch for actuating said step by step mechanism a step for each vehicle passing said vehicle controlled switch, means for actuating said step by step mechanism in reverse direction, said vehicle controlled switch controlling said last named means to actuate said step by step mechanism a step for each vehicle passing said vehicle controlled switch in reverse direction, a switch controlled by said step by step mechanism, and a second vehicle controlled switch near the crossing controlling said last named means through said last named switch to actuate said step by step mechanism in reverse direction for each vehicle passing said second vehicle controlled switch.

7. In a crossing signal system, a vehicle controlled switch in advance of the crossing, an alarm, a circuit therefor, a switch controlling said alarm circuit, means for actuating said switch controlled by said vehicle controlled switch, means for actuating said switch in reverse direction, a second vehicle controlled switch near the crossing, and a switch controlling either of said alarm circuit switch actuating means through said second vehicle controlled switch.

8. In a crossing signal system, a directionally sensitive vehicle controlled switch in advance of the crossing, an alarm, a circuit therefor, a switch controlling said circuit, an electro-magnet for actuating said switch controlled by said vehicle controlled switch by vehicle movement toward said crossing, an electro-magnet for actuating said alarm circuit switch in reverse direction, a switch actuated simultaneously with said alarm circuit switch cooperating with said directionally sensitive vehicle controlled switch upon vehicle movement in reverse direction to control said second electro-magnet, a second vehicle controlled switch near said crossing, and a third switch in circuit with said second vehicle controlled switch and actuated with said alarm circuit switch control-

ling either of said electro-magnets to return said alarm circuit switch toward normal position.

9. In a crossing signal system, the combination with a signal, of magnets controlling said signal, a vehicle controlled switch in advance of the crossing controlling one of said magnets to set said signal, a vehicle controlled switch in advance of the crossing on the other side thereof controlling another of said magnets for setting said signal, a vehicle controlled switch near the crossing, and a two position switch in circuit with said last named vehicle controlled switch controlling either of said magnets to restore said signal.

10. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, the magnet operating to set said signal under the control of one of said vehicle controlled switches operating to restore said signal under the control of the other of said vehicle controlled switches, and an intermediate vehicle controlled switch near the crossing controlling said magnets to restore said signal.

11. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, the magnet operating to restore said signal under the control of one of said vehicle controlled switches operating to set said signal under the control of the other of said vehicle controlled switches.

12. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, and switching mechanism operated by one of said magnets when setting said signal under the control of one of said vehicle controlled switches preventing control of another of said magnets by the other of said vehicle controlled switches.

13. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, and switching mechanism

operated by one of said magnets when setting said signal under the control of one of said vehicle controlled switches bringing another of said magnets under the control of one of said vehicle controlled switches for restoring said signal, and an intermediate vehicle controlled switch near the crossing controlling said magnets to restore said signal.

14. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, and switching mechanism operated by one of said magnets when setting said signal under the control of one of said vehicle controlled switches bringing another of said magnets under the control of said one of said vehicle controlled switches for restoring said signal and preventing control of said last named magnet by the other of said vehicle controlled switches.

15. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, the magnet operating to set said signal under the control of one of said vehicle controlled switches operating to restore said signal under the control of the other of said vehicle controlled switches, and a third vehicle controlled switch between said vehicle controlled switches controlling said magnets to restore said signal.

16. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal under the control of one of said vehicle controlled switches operating to set said signal under the control of the other of said vehicle controlled switches, and a third vehicle controlled switch between said vehicle controlled switches controlling said magnets to restore said signal.

17. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, switching mechanism operated by one of said magnets when setting said signal under the control of one of said

vehicle controlled switches preventing control of another of said magnets by the other of said vehicle controlled switches, and a third vehicle controlled switch between said vehicle controlled switches controlling said magnets to restore said signal.

18. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, switching mechanism operated by one of said magnets when setting said signal under the control of one of said vehicle controlled switches bringing another of said magnets under the control of said vehicle controlled switch for restoring said signal, and a third vehicle controlled switch between said vehicle controlled switches controlling said magnets to restore said signal.

19. In a crossing signal system, the combination with a signal, directionally sensitive vehicle controlled switches on opposite sides of a crossing, signal controlling magnets, each of said vehicle controlled switches controlling one of said magnets to set said signal and another of said magnets to restore said signal, switching mechanism operated by one of said magnets when setting said signal under the control of one of said vehicle controlled switches bringing another of said magnets under the control of said one of said vehicle controlled switches for restoring said signal and preventing control of said last named magnet by the other of said vehicle controlled switches, and a third vehicle controlled switch between said vehicle controlled switches controlling said magnets to restore said signal.

20. In a crossing signal system, the combination with a vehicle controlled switch in advance of the crossing, a signal, means for setting said signal controlled by said vehicle controlled switch, means for restoring said signal, a switch actuated by said signal setting means controlling said signal restoring means, a second vehicle controlled switch controlling said signal restoring means

through said last named switch, and a third vehicle switch beyond the crossing for controlling said signal setting and restoring means.

21. In a crossing signal system, the combination with a signal, of a signal controlling switch, a pair of magnets for actuating said signal switch, means responsive to vehicle movement located in advance of the crossing controlling one of said magnets to actuate said signal switch, means responsive to vehicle movement located on the opposite side of the crossing controlling the other of said magnets to actuate said signal switch, a switch movable in unison with said signal switch preventing control of said second magnet by said second named means upon actuation of said signal switch by said first named magnet, and means responsive to vehicle movement located intermediate said first and second named means controlling both said magnets to restore said signal switch.

22. In a crossing signal system, the combination with a signal, of a step-by-step signal controlling switch, a pair of magnets for actuating said signal switch, means responsive to vehicle movement located in advance of the crossing controlling one of said magnets to actuate said signal switch a step for each vehicle, means responsive to vehicle movement located on the opposite side of the crossing controlling the other of said magnets to actuate said signal switch a step for each vehicle, a switch movable in unison with said signal switch preventing control of said second magnet by said second named means upon actuation of said signal switch by said first named magnet, and means responsive to vehicle movement located intermediate said first and second named means controlling both said magnets to restore said signal switch a step for each vehicle.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

CARL P. NACHOD.

Witnesses:

BEATRICE WHITNEY,
ELEANORE T. McCALL.

It is hereby certified that in Letters Patent No. 1,182,100, granted May 9, 1916, upon the application of Carl P. Nachod, of Philadelphia, Pennsylvania, for an improvement in "Crossing-Signals," an error appears in the printed specification requiring correction as follows: Page 7, line 114, claim 16, after the word "signal" insert a comma and the words, *the magnet operating to restore said signal*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of May, A. D., 1916.

[SEAL.]

J. T. NEWTON,
Acting Commissioner of Patents.