July 13, 1926. 1,592,469

P. J. SIMMEN

AUTOMATIC TRAIN CONTROL

Original Filed Dec. 28, 1922 2 Sheets-Sheet 1

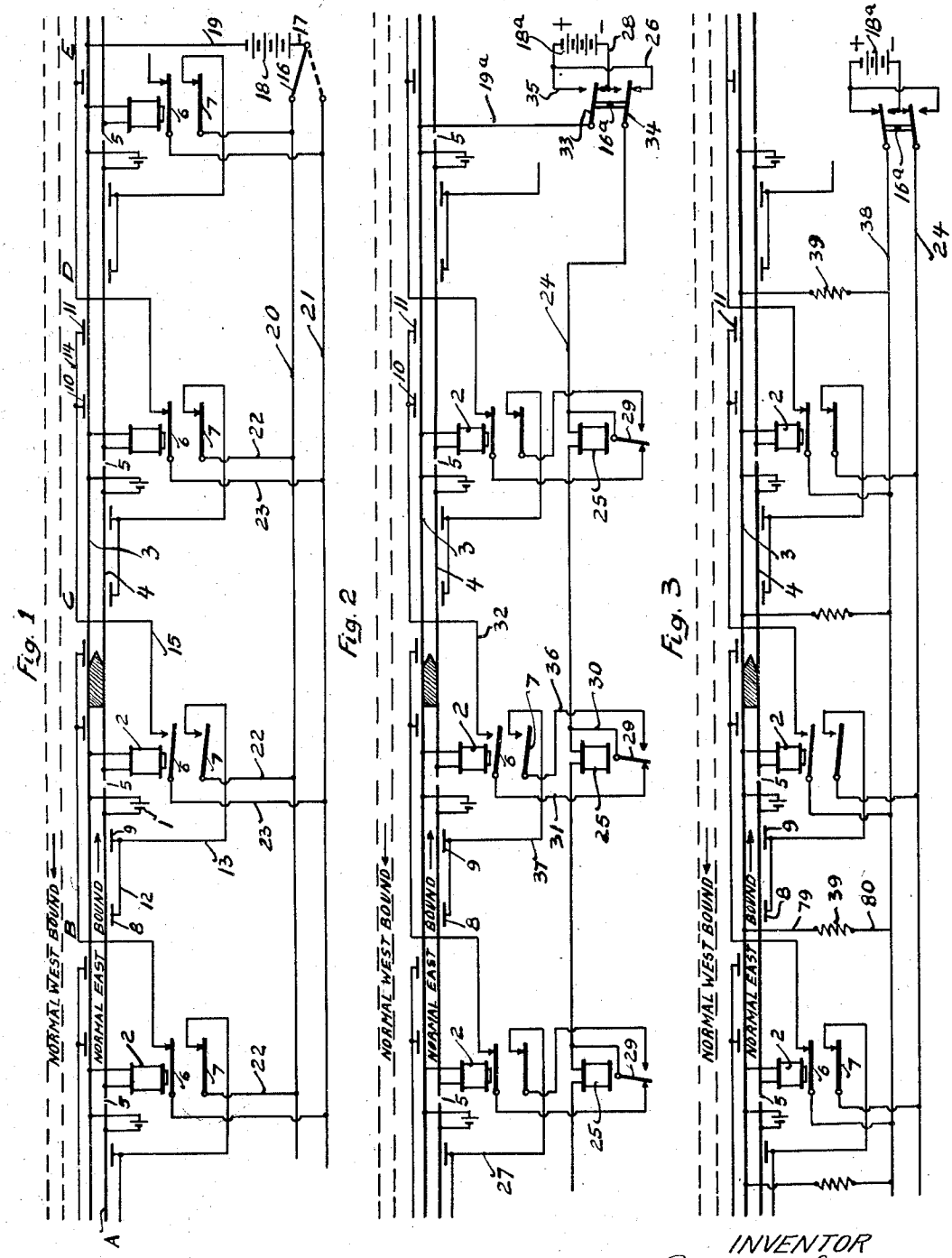

Fig. 1

Fig. 2

Fig. 3

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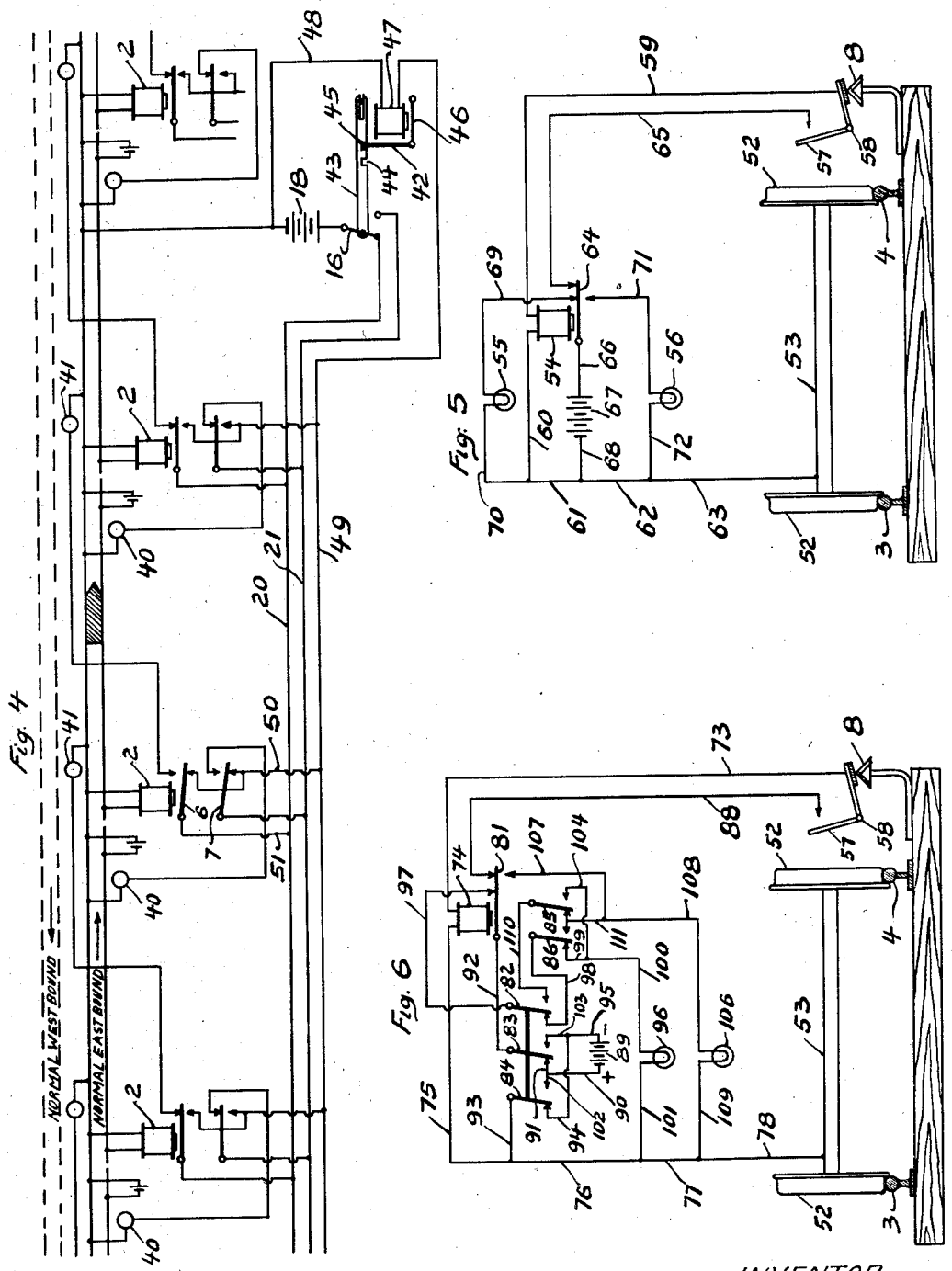

Fig. 4

Fig. 5

Fig. 6

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Patented July 13, 1926. 1,592,469

UNITED STATES PATENT OFFICE.

PAUL J. SIMMEN, OF EDEN, NEW YORK.

AUTOMATIC TRAIN CONTROL.

REISSUED

Continuation of application Serial No. 609,388, filed December 28, 1922. This application filed March 12, 1923. Serial No. 624,351.

This application is a continuation of my application Serial No. 609,388, filed December 28, 1922.

This invention relates to a system of controlling trains on railway tracks, particularly to a system suitable for a single track railway, wherein trains are operated in both directions, or the substantial equivalent thereof, such as a railway having a track normally for trains running in one direction and another track normally for trains running in the other direction, but which tracks it is desirable to use at certain times for trains running in a direction opposite to the normal running.

Traffic conditions on railways have reached the point where it is often desirable to operate trains in a direction opposite to the normal direction of traffic, for instance, where a railway has two tracks, one normally for east-bound traffic and one normally for west-bound traffic and there is an excess of east-bound traffic at certain times of the day, as for instance commuters' trains into a big city in the morning, it is highly desirable to operate east-bound trains over the normally west-bound track, but as under present conditions the automatic train protection provided on east-bound tracks is only operative and responsive to east-bound traffic and automatic train protection provided on west-bound tracks is only operative and responsive to west-bound traffic, this is impossible to do safely.

A principal object of this invention is to provide means to operate trains safely to both directions over a trackway or east-bound trains over a normally west-bound track or vice versa and at the same time provide complete automatic block train protection.

A further object of the invention is to provide means so that when the train protection is operative for allowing and protecting an east-bound movement for a certain length of track all west-bound train protection is inoperative or operative to indicate danger to west-bound trains and vice versa.

A further object of the invention is to provide means by which an electrical switch, the position of which determines direction of traffic to be allowed for a particular track, is locked in the position in which it has been placed until all trains on the section governed by such switch have left the section, that is, when one or more blocks are set up through the medium of the switch to allow east-bound train movements, the particular section of track can not be changed to permit west-bound train movements until the block or blocks governed by the switch are unoccupied by a train.

Other objects and advantages will appear as the description of the particular physical embodiment of the invention and desirable modifications thereof selected to illustrate the invention progresses and the novel features will be particularly pointed out in the appending claims.

In describing the invention in detail, reference will be had to the accompanying drawings, wherein I have illustrated a preferred physical embodiment of my invention, and wherein like characters of reference designate corresponding parts throughout the several views and in which:

Figure 1 is a diagrammatic representation of apparatus and circuits along a track embodying my invention. Figures 2 and 3 are modifications of the system shown in Figure 1; Figure 4 shows a modification of Fig. 1 and also shows locking means to prevent an improper manipulation of the controlling switch; Fig. 5 shows apparatus and circuits on the vehicle carrying the train control means; Fig. 6, is a modification of Fig. 5.

Fig. 1, illustrates in full lines, a single trackway railway, although for the purposes of my invention it may well be, say, the normally east-bound track of a two track railway, therefore a normally west-bound track is shown in dotted lines, which is not shown as being equipped with a train control system as it is only necessary to duplicate parts that are shown for the protection of the track considered the normally east-bound track.

The trackway shown in full lines in Fig. 1, is divided into sections or blocks A, B, C, D and E. Each block is provided with a track battery 1 and a track relay 2 and with the track rails forms a normally closed track circuit well known to those skilled in the art. Rail 3 of the track is electrically continuous, while rail 4 of the track is divided into block sections by means of the insulat-

ing joints 5. Each track relay 2 controls two armatures 6 and 7. Alongside of the track are shown pairs of train control rails for each block, train control rails 8 and 9 governing east-bound movements into block C, and train control rails 10 and 11 governing west-bound movements into block C. Train control rails 8 and 11 are distant train control rails placed the proper braking distance in the rear of the entrance of block C; signal rails 9 and 10 are home train control rails placed along the track just previous to the entrance to block C. Similar train control rails are placed to govern east and west-bound movements of each block. Wire 12 electrically connects distant rail 8 and home rail 9 and wire 13 connects these rails to a front contact of armature 7 of track relay 2. Wire 14 electrically connects distant rail 11 and home rail 10 and wire 15 connects these rails with a front contact of armature 6 of track relay 2.

At a proper or desirable place, as a despatcher's office, interlocking tower or wayside station is located a manually operable switch 16. One side of this switch is connected through wire 17, battery 18, wire 19 to track rail 3. In one position of switch 16, it is electrically connected to line wire 20; while in the other position of switch 16 shown in dotted lines, it is connected to line wire 21. Line wire 20 is connected at each block section through wire 22 to armature 17 of track relay 2, and line wire 21 is connected at each block section through wire 23 to armature 6 of track relay 2.

Normally switch 16 governs a section of track consisting of one or more blocks between passing sidings or cross-overs where a train can cross over from one track to the other.

The system so far described provides for energizing or deenergizing train control rails 8 and 9 when switch 16 is connected to line wire 20; and to energize or deenergize train control rails 10 and 11 when switch 16 is in contact with line wire 21. The means by which train control may be effectuated on the locomotive by reason of the energization or deenergization of train control rails will be described hereinafter. The train control on the locomotive is so arranged that proceed is given when the train control rail is energized, and a stop when the train control is deenergized.

The system of Fig. 1 operates as follows: When the track is intended to be used for east-bound train movements, switch 16 is in contact with line wire 20. Assuming that there is no train in any of the blocks governed by the switch, all the track relays 2 are energized and armatures 6 and 7 make contact with the wires leading to the train control rails. Train control rails 8 and 9 are energized and therefore conditioned to give a proceed to a train through the following circuit; track rail 3, wire 19, battery 18, wire 17, switch 16, wires 20 and 22, armature 7 and wires 13, and 12. In this position of switch 16, only the east-bound rails 8 and 9 can be energized, while the west-bound rails 10 and 11 remain deenergized, since these receive their energy through line wires 21 which is disconnected from battery 18 by switch 16.

When the section of track composing blocks A, B, C, D, and E is conditioned for east-bound train movements, automatic train protection is also provided, when, for instance, an east-bound train is in block C the track battery of block C is short circuited through the wheels and axles of the east-bound train. Track relay 2 of block C is not sufficiently energized to retain the armatures 6 and 7 so as to make contact with the front contacts of the track relay and these contacts are broken by the dropping of armatures 6 and 7. Armatures 7 being disconnected from front contact and wire 13, disconnects train control rails 8 and 9 from line wire 20 and battery 18 so that a second train moving eastward in block B will get a danger signal at train control rails 8 and 9. When the first train has moved from block C into block D, armatures 6 and 7 will be drawn upwardly and again close the front contacts thus again energizing train control rails 8 and 9 conditioning them to give a proceed for a following train.

When the last east-bound train has left the section governed by switch 16 and it is desired to condition the section of track for west-bound movements, switch 16 is disconnected from line wire 20 and connected to line wire 21. This results in disconnecting all train control rails governing east-bound movements from battery 18, thus deenergizing all east-bound train control rails and conditioning them to give a danger or stop to all east-bound trains. At the same time all west-bound train control rails are conditioned to give a proceed but automatic train protection is provided for west-bound following movements, for instance, assume a west-bound train in block C, track relay 2 of block C will be deenergized and armature 6 will be disconnected from front contact and wire 15, thus disconnected rails 10 and 11 from line wire 21, and battery 18 and so a following train will receive a stop before entering block C.

Figure 2 is a modification of Fig. 1, the track and train control rail layout being identical. The modification consists in introducing a polarized relay 25 at each block section. These polarized relays are controlled by a switch 16[a] through line wire 24 and wire 27. Switch 16[a] is a pole changing switch that is in one position positively energizing line wire 24 and in the other

position negatively energizing line wire 24. When switch 16[a] is in the position as shown in Figure 2, current flows in a circuit as follows: from the positive side of battery 18[a] line wire 26, switch member 34, line wire 24, polarized relays 25, wire 27 to track rail 3, wire 19[a] to the other switch member 33 and thence through wire 28 to the negative pole of battery 18[a]. With the switch 16[a] in this position polarized relays 25 are positively energized and their polarized armatures as 29, assume the positions shown in Figure 2. With the polarized armatures in these positions all west-bound train control rails are conditioned to receive energy from battery 18[a] through the following circuit; positive side of battery 18[a] wire 26, switch member 34, line wire 24, wire 30, polarized armature 29, wire 31, track relay armature 6, wire 32 to train control rails 10 and 11 and from these rails through a circuit on the locomotive to track rail 3, thence through track wire 19[a], switch member 33 and wire 28 to the negative side of the battery.

When switch 16[a] is placed in the position opposite to that shown in Fig. 2 polarized relays 25 are negatively energized through the following circuit; from the negative side of battery 18[a], wire 28, switch member 34, line wire 24, polarized relays 25, wire 27 to track rail 3 and thence through wire 19[a], switch member 33, and wire 35 to positive side of battery 18[a]. When polarized relays 25 are thus negatively energized the polarized armatures of the relays will assume the position opposite to that shown in Fig. 2, whereby the west-bound train control rails are disconnected from battery 18[a] and the east-bound train control rails 8 and 9 conditioned to receive energy from battery 18[a] through the following circuit; from negative side of battery 18[a], wire 28, switch member 34, line wire 24, wire 30, polarized armature 29, wire 36, armature of track relay 7, wire 37, train control rails 8 and 9, and thence through a circuit on the locomotive to track rail 3, and wire 19[a], switch member 33, and wire 35, to positive side of battery 18[a].

When switch 16[a] is positioned as last described all west-bound train control rails are deenergized, and therefore condition to give a stop, but all east-bound train control rails are conditioned to be energized and given proceed as described in reference to Fig. 1. Automatic rear end protection from block to block is similarly provided by the arrangement of Fig. 2.

Fig. 3, is a further modification of Fig. 1. In Figs. 1 and 2, a single rail track circuit is shown, track rail 3 being electrically continuous, track rail 4 being divided into blocks through insulating joints 5. In Fig. 3 a double rail track circuit is provided, track rails 3 and 4 being divided into blocks by inserting insulating joints in both track rails 3 and 4. In order to provide a return circuit to battery 18[a] which in Figs. 1 and 2 is through track rail 3, a return wire 38 is provided which in turn is connected through resistance 39 to track rail 4 of each block section. The purpose of the resistance coil 39 is to prevent current from the track batteries of one block flowing into another block.

In the circuit as shown in Fig. 3, both east-bound train control rails 8 and 9 and west-bound train control rails 10 and 11 are conditioned to be electrically energized, with this difference however, that the east-bound rails are positively energized and the west-bound rails negatively energized. It is intended to use a cab circuit similar to the one shown in the Patent No. 1,239,048 granted to Paul J. Simmen, September the 4th, 1917, and it is further intended that this circuit be so conditioned that when there is positive energy in the train control rails, a proceed is always given no matter whether the train is running east-bound or west-bound; and when the train control rail is negatively energized, the circuit is so conditioned, that a danger or stop is always given, no matter whether the train is running east-bound or west-bound. In other words hand switch 50 of Patent No. 1,239,048 is permanently fixed in one position so that positive energy in the train control rails will always give a proceed and negative energy a danger or stop.

Fig. 4 is a further modification of Fig. 1. In this modification fixed signals 40 are substituted for east-bound train control rails 8 and 9 and fixed signals 41 are substituted for west-bound train control rails 10 and 11. Signals 40 and 41 may be the signals themselves indicating clear when energized and danger when deenergized; or they may represent relays which condition fixed signals either to the clear or danger condition in the usual manner depending upon whether relays 40 and 41 are energized or deenergized. In addition to the track layout similar to Fig. 1, Fig. 4 shows a locking arrangement 42. This locking arrangement is intended to prevent the throwing of switch 16 from one position to another as long as there is either an east-bound or a west-bound train in the section controlled by switch 16. This is accomplished in the following manner; attached to switch 16 is a slidable bar 43, this bar is notched as at 44 and 45, so that when the switch is in the position shown, notch 45 is in alignment with dog 42, and dog 42 is connected with armature 46 of magnet 47, so that when switch 16 is in the opposite position to the one shown in Fig. 4, notch 44 of bar 43 is aligned with dog 42.

Whenever a train enters the section of track governed by switch 16, magnet 46 be-

comes energized thus locking bar 43 in the position it is in through the following circuit; battery 18, wire 48, magnet 47, line wire 49, wire 50, back contact of armature 6, wire 51, line wire 20, switch 16, to opposite side of battery 18. Similarly when any other track relay of the blocks governed by switch 16 is deenergizing, switch 16 is locked in the position it is then in. It is thus evident that a section of track governed by switch 16 cannot be changed from an east-bound condition into a west-bound condition until all the trains have left the section so governed.

It is evident that this locking arrangement of switch 16 is applicable to all the layout shown in Figs. 2, 3 and 4, and it is to be considered a part thereof without the addition of further figures.

In Figs. 5 and 6, I have shown suitable train carrying apparatus to co-operate with my trackway circuits and apparatus. The arrangement as shown by Fig. 5, can be used with the arrangements as shown by Figs. 1 and 2, and the arrangement of Fig. 6 is especially designed for co-operation with a trackway as shown in Fig. 3.

In Fig. 5, the rails are designated by the numerals 3 and 4 and a car, represented solely by a pair of wheels and an axle, the wheels being designated 52 and the axle 53, is shown resting upon the rails 3 and 4. The car carries thereon an electro-magnetic device 54; a train control device 55; another train control device 56; and a shoe 57 pivoted at 58.

As the car travels along the rails, the shoe 57 contacts with the several ramps as 8, and in so contacting is turned on its pivot as shown in Fig. 5. The ramps 8, are as their name implies, bodies having an inclined portion, and correspond substantially with the ramp; such as those designated by 1 in the patent to P. J. Simmen, No. 1,140,623, granted May 25, 1915. If the ramp 8 were energized when the shoe 57 contacts therewith, having reference both to Fig. 1, and Fig. 5, current will flow through the wire 59, electro-magnetic device 54, wires 60, 61, 62 and 63 to the axle 53, then through the wheels 52 and rail 3 to the wire 19, and so back to the other terminal of the battery. The current flowing in the above traced path, will energize the electro-magnetic device 54, and raise its armature 64 into the position as shown in Fig. 5. As the train proceeds and the shoe 57 rides over the ramp 8, it will gradually turn on its pivot 58, following the incline of the ramp, and before the shoe actually gets out of contact with the ramp, one arm of the shoe will contact with the wire 65, whereupon a circuit will be formed in which current will flow as follows: one terminal of battery 65, wire 66, armature 64, wire 65, shoe 57, wire 59, electro-magnetic device 54, and wires 60, 61 and 68 to the other terminal of the battery 67. The current flowing in the above traced path will maintain the energization of the electro-magnetic device 54, and so cause its armature 64, to be maintained in its upper position as shown in Fig. 5, after the shoe 57 leaves the ramp as 8, and until the next ramp is encountered.

When armature 64 is in the upper position as shown, a circuit is formed in which current flows as follows: one terminal of battery 67, wire 66, armature 64, wire 69, train control device 55, here illustrated as a lamp, and wires 70, 71 and 68 to the other terminal of the battery 67. Current flowing in the above traced path will energize the train control device 55 indicating to the motorman or engine driver that it is proper for him to proceed.

If a train equipped with the devices as shown in Fig. 5, in passing along the trackway, encounters a ramp as 8, which is not energized, then upon the movement of the shoe 57, by contact with the ramp, the circuit hereinbefore traced to the wire 65 will be broken, and as there is no energization of the ramp as 8, the circuit hereinbefore traced through the wire 59 will not be made, consequently the electro-magnetic device 54 will be deenergized and will remain deenergized even after the shoe 57 leaves the ramp 8, because, although in passing down the incline of the ramp, one arm of the shoe will contact with wire 65, before the shoe actually leaves contact with the ramp, nevertheless the circuit through wire 65 will not be completed because at that time, the armature 64 will be in the lower position out of contact with wire 65, consequently the train, will have to proceed if it proceeds at all, with armature 64, in its lower position. When armature 64 is in its lower position, a circuit is formed in which current flows as follows: one terminal of the battery 67, wire 66, armature 64, wire 71 train control device 56, here shown as a ramp, and wires 72, 62 and 68 to the other terminal of the battery 67. Current flowing in the above traced path, will energize the train control device 56, and indicate to a motorman or engine driver, that the train should not proceed. It should also be observed that under the conditions as just outlined the circuit through train control device 55 is broken, with a consequent deenergization of train control device 55, so that the train control device 55, which is here illustrated as a lamp, will go out, and the going out of this lamp, will also be a notification or an action necessitating the stopping of the train.

Applicant has called the devices 55 and 56, train control devices, because these devices are merely illustrative of one of the many and various means which may be con-

trolled by the electro-magnetic device 54, and applicant by illustrating the devices 55 and 56, as lamps, does not desire to be understood as excluding such devices as electro-pneumatic air valves connected with the ordinary and well known air-brake system of a train, and operating when energized or deenergized to automatically control the setting or releasing of the air-brakes.

Applicant further wishes to have it observed, that contact with a train control ramp, or rail, such as 8, is merely to cause such action or notification upon the vehicle as will cause that vehicle to stop or be brought to a stop at the time of or prior to the passage of the train, pass the next following train control rail or ramp, such as 9.

In Fig. 6, applicant has illustrated a construction particularly applicable to the trackway arrangement as shown in Fig. 3.

In Fig. 6, 3 and 4 designates track-rails. 52 designates wheels, 53 designates an axle, and 57 a shoe, adapted to a contact with a ramp, or train rail as 8.

By reference to the description hereinbefore given of the construction as shown by Fig. 3, it will be learned that a ramp as 8, used in such system, may be positively energized, negatively energized or deenergized. If ramp 8, is positively energized, then current will flow in a circuit as follows: ramp 8, shoe 57, wire 73, electro-magnetic device 74, wires 75, 76, 77 and 78, axle 53, wheel 52, rail 4, wire 79, resistance 39, wire 80, and wire 38 to the pole changing switch 16^a, when thrown so that its upper switch arm contacts with the negative terminal of the battery 18^a, and the positive terminal of the battery is connected by the lower switch arm to the wire 24, and thus to the ramp or train control 8. Current flowing in the above traced path, so energizes electro-magnetic device 74, that neutral armature 81 is moved to the upper position as shown in Fig. 6, and its polarized armatures 85 and 86 are thrown to the left as shown in Fig. 6.

As the train advances and shoe 57 rides down the incline of the train control rail or ramp, one arm of the shoe contacts with wire 88, so that while armature 81 is in the upper position as shown, and before the shoe 57 leaves the ramp 8, a circuit is formed in which current flows as follows:

Positive terminal of the battery 88, wires 90 and 91, switch arm 83, wire 92, armature 81, wire 88, shoe 57, wire 73, electro-magnetic device 74, wires 75 and 93, switch arm 84, and wires 94 and 95 to the negative terminal of the battery 89.

Current flowing in the above traced path maintains the energization of electro-magnetic device 74, after the shoe 57 has left the rail 8, and until the shoe 57 contacts the succeeding train control rail or ramp such as 9. The current flowing in the last traced circuit, flows in such direction as to maintain the energization of electro-magnetic device 74, and to maintain that energization such, that the polarized armatures 85 and 86 are held in the position as shown in Fig. 6, so that the train control device 96, is energized by current flowing in a circuit as follows; positive terminal of battery 89, wires 90 and 91, switch arm 83, wire 92, armature 81, wire 97, switch arm 82, wire 98, polarized armature 86, wires 99 and 100, train control device 96, wires 101, 76 and 93, switch arm 84, and wires 94 and 95 to the negative terminal of the battery 89. Current flowing in the above traced path energizes the train control device 96, illustrated as a lamp, and maintains the energization of the lamp 96 until the shoe 57 contacts with another train ramp or rail 8, so that the motorman or engine driver, is notified that he may proceed.

If the switch 16^a of Fig. 3, is in the position as shown in Fig. 3, so that the lower switch arm thereof, is connected with the negative terminal of the battery 18^a, and so wire 24 is connected to that terminal, and thus train control ramp or rail 8, is connected to the negative terminal of battery 18^a, then the train control ramp or rail 8 is negatively energized, and a circuit is formed when the shoe 57 contacts with the ramp 8 in which current flows as follows: from the ramp 8, through shoe 57, wire 73, electro-magnetic device 74, wires 75, 76, 77 and 78, axle 53, wheel 52, rail 4, wire 79, resistance 39, wires 80 and 38, upper switch arm of pole changing switch 16^a, and to the position positive terminal of the battery 18^a, the circuit being traced against the flow of current. The current will flow in the last traced path, that is, when ramp 8 is negatively energized, in an opposite direction to its flow, when ramp 8 is positively energized, consequently electro-magnetic device 74 will be so energized that although neutral armature 81 will be held in the upper position as shown in Fig. 6, the polarized armatures 85 and 86 will be thrown to the right, that is to a position opposite to that as shown in Fig. 6.

As the armatures 85 and 86 are thrown to the right as viewed in Fig. 6, the circuit energizing train control device 96 will be broken, as armature 86 will break contact with wire 99, and although armature 85 contacts with 104, wire 110 does not contact switch arm 82, consequently the train control device 96 will no longer be proceed energized. At the same time stop train control device 106 will be energized by a circuit in which current flows as follows; positive terminal of battery 89, wires 90 and 91, switch arm 83, wire 92, armature 81, wire 97, switch arm 82, wire 98, armature 86 in the right hand position, wires 11 and 108,

train control device 106, wires 109, 77, 76 and 93, switch arm 84 and wires 94 and 95 to the negative terminal of battery 89.

As shoe 57 leaves ramp 8, the circuit for electro-magnetic device 74 will not be maintained, because as shoe 57 rides down the slope of the ramp, it will arrive at a point where, while still in contact with the ramp, one arm will also be in contact with wire 88. Under such condition with ramp 8 negatively energized as assumed, the battery on the trackway as 18^a, will be connected in opposition to the battery 89 on the train, that is, the positive terminal of the battery on the trackway will be connected to a rail as 4, and so by wheel 52 axle 53, wires 78, 77, 76 and 93, switch arm 84, and wires 94 and 95 to the negative terminal of battery 89, and the negative terminal of the trackway will be connected to ramp 8 and then by shoe 57, wire 88, armature 81, wire 92, switch arm 83 and wires 91 and 90 to the positive terminal of battery 89. These two batteries acting in opposition will result in such a combined action upon the electro-magnetic device 74, that it will be de-energized, and armature 81 dropped to its lower position.

When armature 81 drops to its lower position, train control 96 becomes deenergized, because its circuit includes armature 81 as hereinbefore traced, and at the same time, train control device 106 becomes energized through a circuit in which current flows as follows: positive terminal of battery 89, wires 90 and 91, switch arm 83, wire 92, armature 81 in the lower position, wires 107 and 108, train control device 106, wires 109, 77, 76 and 93, switch arm 84, and wires 94, and 95 to the negative terminal of battery 89. The energization of train control device 106 results in a stop for the vehicle and this is reenforced by the absence of the proceed given by train control device 96.

The deenergization of electro-magnetic device 74 caused by the vehicle encountering a negatively energized ramp will continue until the next ramp along the trackway is encountered, whereupon electro-magnetic device 74 will be affected in accordance with the energization of that ramp.

Regardless of whether a train equipped as shown in Fig. 6, is moving east-bound or west-bound, upon the lower trackway as shown in Fig. 3, if its shoe 57 encounters a deenergized ramp or train control rail, as 8 or 11, the maintaining circuit to electro-magnetic device 74, will be broken, and neutral armature 81 will fall to its lower position, and under such conditions train control device 96 will be deenergized regardless of the positions of polarized armatures 85 and 86, because by reference to the description hereinbefore set forth, of the two circuits for energizing train control device 96, it will be found that both of them include armature 81 in its upper position, consequently the armature 81 is in its lower position, both of these circuits will be broken, and train control device 96 will be deenergized.

When armature 81 is in its lower position, train control device 106 will be energized by a circuit as follows: positive terminal of battery 89, wires 90 and 91, switch arm 83, wire 92, armature 81, wires 107 and 108, train control device 106, wires 109, 77, 76 and 93, switch arm 84, and wires 94 and 95 to the negative terminal of the battery 89. Current flowing in the above traced path will energize train control device 106, and so indicate to the motorman or engine driver, the necessity of stopping which necessity is further confirmed by the extinguishment of train control device 96, as hereinbefore described.

From the above description of Fig. 6 in connection with Fig. 3, it will be understood that, if a ramp rail as 8 or 11, is positively energized, the proceed train control device 96 on the vehicle will be given no matter whether the train is running east-bound or west-bound, and when the train control rails as 8 or 11 are negatively energized, a train will be given a danger or stop, no matter whether the train is running east-bound or west-bound, and when the train control rails as 8 or 11 are deenergized, a vehicle will be given a danger or stop, regardless of whether it is running east-bound or west-bound.

Although train control devices 96 and 106 are described as lamps, applicant desires to have it understood that he does not wish to exclude such other devices as may be usable in this connection, such as were described in connection with the description of train control devices 55 and 56 shown in Fig. 5.

Applicant further desires to have it understood that the stop and proceed given on the vehicle are not necessarily limited to a visual indication, and he does not desire to exclude devices for given stop and proceed, which act directly upon any part of the vehicle or its equipment, as for instance the air-brakes or the propulsion means, and he desires to further have it understood that the deenergizatin of 96 is as much a danger or stop as the energization of 106 is a danger or stop.

By reference to my Patents No. 941,541 granted Nov. 30, 1909 and No. 1,239,048 granted September 4, 1917, it will be found that the principles of Figs. 5 and 6 are fully disclosed therein.

Although applicant has described the principle and mode of operation of his invention, and illustrated and described a preferred physical embodiment thereof, and desirable modifications thereof, nevertheless he

desires to have it understood that the forms selected are merely illustrated, and do not exhaust the possible physical embodiment of means underlying his invention.

What I claim as new and desire to secure by Letters Patent of the United States:

1. In a railway train control system, in combination: a trackway; train control means arranged on each side of the trackway, that upon one side for governing trains moving in one direction, and that upon the other side for governing trains moving in the opposite direction; a source of electrical energy for the operation of said train control means; and manually operated means located at a fixed remote point and in circuit with said source and the control means supplied by said source for selecting the direction of train movement in which proceed shall be given and for transmitting proceed to trains moving in such direction and for simultaneously conditioning the train control means on the other side of the trackway to transmit stop.

2. In a railway train control system, in combination: a trackway; means for train control arranged on one side of the trackway; means for train control arranged on the other side of the trackway; a source of current; means located at a fixed remote point and in circuit with said source for connecting one terminal of the source to either the one or the other train control means; means including a track circuit and a track relay in permanent relation to one another and controlled by the presence of a train upon the trackway for controlling the last mentioned means, and means for connecting the train control means to the other terminal of the source of current.

3. In a railway train control system, in combination: a trackway; a train control arranged on one side of the trackway; a source of current; manually operable means located at a fixed remote point and in circuit with said source for connecting one terminal of the source to the train control rail; means having its elements in permanent relation to one another and controlled by the presence of a train upon the trackway for controlling the last mentioned means, and means controlled by a train upon the trackway and having an operating circuit supplied from said source and which includes said manually operable means for locking the manually operable means in its operated position.

4. In a railway train control system, in combination: a trackway, including two rails; means for dividing the trackway into electrically isolated sections; a source of a difference of potential connected across the rails at one point in each section; a translating device connected across the rails of each section at a point remote from the connection of the source of a difference of potential, said source and said translating device being in permanent relation to one another; a train control rail positioned on one side of the trackway; a train control rail positioned on the other side of the trackway; a source of current; manually operable means located at a fixed remote point and in circuit with said source for connecting one terminal of the source to either of the train control rails; means controlled by said translating device for controlling the last mentioned means, and means for connecting the train control rail to the other terminal of the source of current.

5. In a railway train control system, in combination: a trackway; train control means arranged on each side of the trackway, that upon one side for governing trains moving in one direction, and that upon the other side for governing trains moving in the opposite direction; a source of electrical energy for the operation of said train control means; manually operable means located at a fixed remote point and in circuit with said source and said train control means for conditioning the train control means on one side of the trackway for transmitting to trains going in one direction proceed and simultaneously conditioning the train control means on the other side of the trackway to transmit stop; a train, and means on the train co-operating with the train control means on the trackway for receiving proceed or stop.

6. In a railway train control system, in combination: a trackway; train control means arranged on each side of the trackway, that upon one side for governing trains moving in one direction, and that upon the other side for governing trains moving in the opposite direction; a source of electrical energy for the operation of said train control means; manually operable means located at a fixed remote point and in circuit with said source for conditioning the train control means on one side of the trackway for transmitting to trains going in one direction, proceed and simultaneously conditioning the train control means on the other side of the trackway to transmit stop; and means having its elements in permanent relation and controlled by a train upon the trackway for governing the manually operable means in such a manner that, the first train control means positioned back of a train on the trackway will transmit stop to a following train.

7. In a railway train control system, in combination: a trackway; a train control rail arranged on one side of the trackway; a train control rail arranged on the other side of the trackway arranged in slightly staggered relation to the first mentioned train control rail; a source of current; means for

connecting one terminal of the source to either the one or the other train control rail; means controlled by the presence of a train upon the trackway for controlling the last mentioned means, and means including a train having an electrical circuit thereon for connecting the train control rails to the other terminal of the source of current.

8. In a railway train control system, in combination: a trackway including two rails; means for dividing the trackway into electrically isolated sections; a source of a difference of potential connected across the rails at one point in each section; a translating device connected across the rails of each section at a point remote from the connection of the source of a difference of potential; a train control rail on one side of the trackway; a train control rail on the other side of the track rail, each rail being arranged adjacent the means for dividing the trackway into electrically isolated sections, and one rail being on the opposite side thereof from the other rail; a source of current; two line wires; means for connecting either the one or the other of the line wires to one terminal of the source of current; means controlled by the translating devices for connecting or disconnecting the train control rail on one side of the trackway to one line wire, and for connecting or disconnecting the train rail on the other side of the track rails to the other line wire, and means including a car movable upon the trackway rails and carrying a train control circuit and devices for electrically connecting each of the train control rails to the other terminal of the source of current.

9. In a railway train control system, in combination: a trackway including two rails; means for dividing the trackway into electrically isolated sections; a source of a difference of potential connected across the rails at one end of each section; a translating device connected across the rails of each section at the opposite end thereof; train control rails, two arranged in tandem on one side of the track rails, and two arranged in tandem on the other side of the track rails adjacent each means for separating the rails into electrically isolated sections; an electrical conductor connecting the two train control rails on one side of the track rails, and an electrical conductor connecting the two train control rails on the other side of the trackway; a source of current; a conductor connecting one side of the source with one of the track rails; a manually operable switch arm connected to the other side of the source; two line wires, each having a terminal co-operating with the switch arm; an electrical conductor connecting the train control rails on one side of the track rails with one of the line wires; an electrical conductor connecting the other line with the train control rails on the other side of the track rails, and means interposed in the last mentioned conductors, for rendering them continuous or discontinuous and controlled by the translating device.

10. In a railway train control system, in combination: a trackway including two rails; means for dividing the trackway into electrically isolated sections; a source of a difference of potential connected across the rails, at one end of each section; a translating device connected across the rail of each section at the opposite end thereof; train control rails, two arranged in tandem on one side of the track rails, and two arranged in tandem on the other side of the track rails adjacent each means for separating the rails into electrically isolated sections; an electrical conductor connecting the two train control rails on one side of the track rails; an electrical conductor connecting the two train control rails on the other side of the trackway; a source of current; a conductor connecting one side of the source with one of the track rails; a manually operable switch arm connected to the other side of the source; two line wires, each having a terminal co-operating with the switch arm; an electrical conductor connecting the train control rails on one side of the trackway with one of the line wires; an electrical conductor connecting the other line with the train control rails on the other side of the track rails; an electro-magnetic device; a connection from one terminal of the electro-magnetic device to the terminal of the battery connected to the track rail; a line wire connected to the other terminal of the electrical magnetic device; a reciprocable bar formed with two notches therein connected to the switch arm; a dog formed to fit into either the one or the other of the notches and so positioned that when the switch arm is in one position the dog may be fitted in one notch, and when the switch arm is in its other position, the dog may fit in its other notch; means controlled by the electro-magnetic device when energized for causing the dog to move into one or the other of the notches, according to the position of the switch arm, and to thus prevent movement of the switch arm manually until deenergization of the electro-magnetic device; a conductor connected to the line wire last mentioned, and means controlled by the translating device to connect said conductor with either the one or the other of the two first mentioned line wires, whereby irrespective of the position of the manually operative switch, the electro-magnetic device will be energized upon the entrance of a train to the track section to which the translating device is connected.

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