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A. J. WILSON.

ELECTRIC BLOCK AND BLOCK SECTION SIGNALING SYSTEM.

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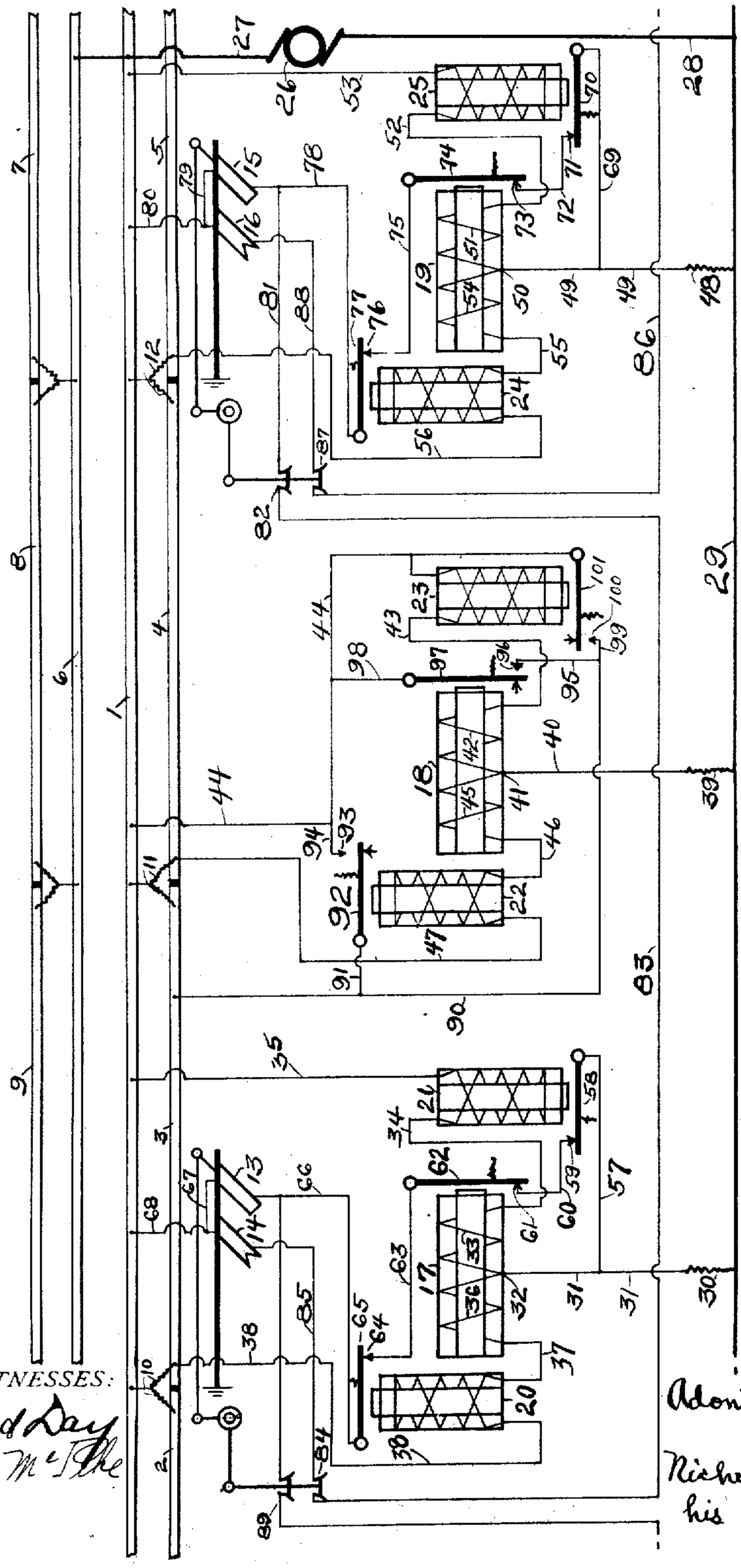

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ELECTRIC BLOCK AND BLOCK-SECTION SIGNALING SYSTEM.

No. 842,367. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed August 21, 1906. Serial No. 331,425.

To all whom it may concern:

Be it known that I, ADONIRAM J. WILSON, a citizen of the United States, and a resident of Westfield, in the county of Union, State of New Jersey, have invented certain new and useful Improvements in Electric Block and Block-Section Signaling Systems, of which the following is a specification.

This invention relates generally to block-signaling systems, but more particularly to block-signaling systems for electric railways.

The invention seeks to provide a system which is reliable under all conditions, highly efficient in operation, and which reduces the maintenance factor to a minimum.

A feature of the present invention is its capability of employing the same source of electric energy as that employed for the propulsion of trains, also for the energization of its various signal and track circuits, in which case a continuous return-rail extending throughout all the blocks and the trolley-wire or "third rail" are jointly employed as power-mains for the signal-circuits as well as for the trains.

In carrying out the invention one or more track-controlled electromagnetic devices are employed for each protected block, and it is preferred that one of these devices be differentially wound and be controlled jointly by the opposite rails of the associated block. The system contemplates the protection of a plurality of blocks by means of home and distant signals and by various interdependent and local signal-circuits.

A further object is to provide efficient and reliable means for relaying from one block-section to another when it is desired to protect a long block and this block is divided into subsections.

An embodiment of the invention is shown in the single drawing forming part of this specification, and in which two blocks are illustrated with their associated signals, circuits, and controlling devices.

Referring now more particularly to the drawing, 1 designates a continuous return-rail, a portion of which is included in each block, and 2, 3, 4, and 5, respectively, the insulated rail-sections of an east-bound track. For the purposes of this invention rails 1, 3, and 4 are regarded as constituting the first block and rails 1 and 5 the second block, the first block obviously being divided into two sections 3 1 and 4 1. The east-bound track alone is shown as provided with applicant's system, while numerals 6, 7, 8, and 9 merely designate a west-bound track, which may, if desired, be provided with the system.

Numerals 10, 11, and 12 designate track resistances respectively bridging the rails 2 3 1, 3 4 1, and 4 5 1.

Numerals 13 and 14 respectively designate the home and the distant signal for the first block, and numerals 15 and 16 respectively designate the home and the distant signal for the second block. Signals 13 and 14 are shown associated with section 3 1 of the first block. Each track-section is provided with a differential electromagnetic device 17, 18, and 19, respectively, each having two equal coils or windings oppositely wound, while 20 and 21 are supplementary electromagnetic devices for track-section 3 1, and 22 23 supplementary devices for track-section 4 1, and 24 25 supplementary devices for section or block 5 1.

26 designates a source of electric energy which is connected to the return-rails 1 and 6 by wire 27 and by wire 28 is connected to the through-wire 29. This source of electric energy 26 is preferably the same as that employed for the propulsion of electric trains, and in that case 29 would designate the third rail or trolley-wire. Each of the electromagnetic devices 17 to 25, inclusive, is provided with a separate armature which is normally held attracted by the associated electromagnetic device, but is retracted, as indicated, upon the deënergization of said device. In tracing circuits the third rail 29 and return-rail 1 will be regarded, respectively, as the starting and ending points, since for all practical purposes they are the same as the source of electric energy 26. Each set of electromagnetic devices comprises a branched circuit between the third rail 29 and the opposite rails of the associated track-section. This circuit for the first set of electromagnetic devices may be traced as follows: third rail 29, potential-reducing resistance 30, wire 31 to point 32, then branching, one branch through coil 33, wire 34, relay 21, wire 35 to return-rail 1; the other branch from point 32 through coil 36, wire 37, relay 20, wire 38, insulated rail-section 3, thence through track-resistances 10 and 11 in parallel to re-

turn-rail 1. A similar circuit 39 40 41, 42 43 23 44, 45 46 22 47, insulated rail-section 4, resistances 11 and 12 is provided for the second set of devices. The similar branched circuit for the third section is as follows: 48 49 50, 51 52 25 53, 54 55 24 56, insulated rail-section 5, resistance 12, and a similar resistance at the other end of the block, but not shown.

The circuit for home signal 13 may be traced as follows: third rail 29, resistance 30, wires 31 and 57, armature 58, contact 59, wire 60, contact 61, armature 62, wire 63, contact 64, armature 65, wire 66, home signal 13, wire 67, wire 68 to return-rail 1.

The circuit for home signal 15 may be traced as follows: third rail 29, resistance 48, wires 49 and 69, armature 70, contact 71, wire 72, contact 73, armature 74, wire 75, contact 76, armature 77, wire 78, home signal 15, wires 79 and 80 to return-rail 1.

The circuit for distant signal 14 may be traced as follows: third rail 29, resistance 48, wires 49 and 69, armature 70, contact 71, wire 72, contact 73, armature 74, wire 75, contact 76, armature 77, wire 78, wire 81, circuit-closer 82, through-wire 83, circuit-closer 84, wire 85, distant signal 14, wire 68 to return-rail 1.

The circuit for distant signal 16 may be traced as follows: through-wire 86, circuit-closer 87, wire 88, distant signal 16, wire 80 to return-rail 1. This circuit to be completed should be connected with a circuit-closer similar to circuit-closer 89 or to circuit-closer 82, above described. It is not illustrated complete, as it is merely a repetition of a similar circuit for distant signal 14, already traced. The relay-circuit bridging rails 3 and 1 and controlled by the electromagnetic devices associated with block-section 4 1 may be traced as follows: insulated rail-section 3, wire 90, then branching through three parallel paths—first, wire 91, armature 92, contact 93, wires 94 and 44 to return-rail 1; second, wire 95, contact 96, armature 97, wires 98 and 44 to rail 1, and, third, wire 99, contact 100, armature 101, wire 44 to rail 1.

All circuits and apparatus are shown in their normal condition and, as shown, all signal-circuits are normally closed, all electromagnetic devices are operatively energized, and all signals are normally held at "safety."

The operation of the branched circuits through the differential electromagnetic devices is controlled by a train in the associated track-section as follows: The current strength in the branches through coils 36, 45, and 54 is normally less than that through coils 33, 42, and 52 on account of the resistances 10, 11, and 12, included solely in the first-named branches. The magnetizing effect of coils 36, 45, and 54 is therefore overbalanced by that of the opposing coils 33, 42, and 52, respectively, so that each pair of coils 36 33 45 42, and 54 51 has normally a joint magnetizing or operative effect and holds each of the circuit-closing armatures 62, 97, and 74, respectively, attracted, as shown. If, however, a train is in a track-section, its wheels and axles bridge the opposite rails and shunt out the associated track resistances. This equalizes the current strength through the opposing equal coils of the associated differential electromagnetic device, such as 17. The joint magnetizing effect of the coils is therefore destroyed and the armature released, breaking a signal-circuit in the case of the differential devices 17 and 19 and closing a relay-circuit in the case of differential device 18. The relays 20, 21, 22, 23, 24, and 25 are each connected in a separate branch of the branched circuits described and are energized unless one of the said branches is accidentally broken. Then the corresponding electromagnetic device is deënergized to release its armature and in the case of the electromagnetic devices 20, 21, 24, and 25 breaks a signal-circuit, while in the case of electromagnetic devices 22 and 23 the released armature closes a relay-circuit. These circuits have all been traced above.

The operation of the system as affected by an advancing train is as follows: If an advancing train enters section 3 1, rail 3 is bridged by the wheels across to rail 1, as previously described, and the track resistances 10 and 11 are shunted out. This destroys the normal operative effect of the differential device 17, which releases its armature 62, opening the circuit through home signal at 61 62. This signal, which has previously been held at "safety" by the closed signal-circuit, now goes to "danger" by gravity. The movement of signal 13 to "danger" opens circuit-closers 84 and 89. The opening of circuit-closer 84 breaks the normally closed circuit through distant signal 14, which is normally held by its circuit at "safety." Distant signal 14 then goes to "danger." Thus as the train proceeds into block-section 3 1 both the home and the distant signal are at "danger" behind the train to block the advance of a second train. As the train progresses into block-section 4 1 track resistances 11 and 12 are shunted out by the wheels, as previously described, destroying the normal operative effect of differential device 18, which releases its armature 97 to make contact with 96 and close the relay-circuit 95, 96, 97, 98, and 44 to bridge rail 3 across to rail 1. It is thus evident that as the train entirely leaves block-section 3 1 the condition of differential device 17 remains unchanged, since the relay-circuit described serves to shunt out track resistances 10 and 11, the same as previously did the wheels and axles of the train. This relaying function is useful in connection with long blocks, which may thereby be divided up into subsections,

as illustrated, and operate much more effectively than if a long stretch of rails is relied upon for track-circuits, in which case difficulty sometimes arises from leakage across from one rail to another. As the train progresses into track-section 5 1 track resistance 12 is shunted out and also a succeeding track resistance, if one should be provided, so that the normal operative effect of differential device 19 is destroyed. Armature 74 is released, breaking the circuit through home signal 15 at 73 74. Home signal 15 then goes to "danger," the same as previously did home signal 13. The movement of home signal 15 to "danger" opens circuit-closers 87 and 82 to break circuit through distant signal 16 and distant signal 14, respectively. Distant signal 16 then goes to "danger" from its normal safety position, the same as did distant signal 14, as previously described. Distant signal 14 is at "danger" any way, its circuit being broken at 84, so this second break in its circuit causes no change in the signal's condition. When the train is entirely out of block-section 4 1, differential device 18 regains its normal operative effect, attracting its armature 97 to break the relay-circuit at 96 97. This last action then restores the normal operative effect of differential device 17, which closes the circuit through home signal 13 at 61 62. Home signal 13 then goes to "safety," closing circuit-closers 84 and 89. The closing of closing-circuit 84, however, has no effect upon distant signal 14, since said signal-circuit is broken at 82, as described. As the train leaves block 5 1 differential device 19 regains its normal operative effect, closing the circuit through home signal 15, which is then caused to go to "safety." The movement of home signal to "safety" closes circuit-closer 82, completing the signal-circuit for distant signal 14, which then also goes to "safety." A complete series of operations as affected by an advancing train has now been described, and it is to be understood that these operations may be repeated indefinitely. Furthermore, although there is illustrated a block divided into separate subsections, as shown by 3 1 and 4 1, it is to be understood that in some instances it may be preferred to employ merely undivided or continuous blocks or a combination of such blocks and blocks divided into sections. In other instances the mutual control and operation of two adjacent sets of signals, such as 13 14 and 15 16, is the same. In the system illustrated the devices 18, 22, and 23 serve merely to relay from section 4 1 to section 3 1. However, if rail-section 4 were merely a continuation of rail-section 3, so that instead of two sections, as illustrated, there was one continuous block, then these devices 18, 22, and 23 would not be necessary, and the train would have the same effect on leaving this block as the effect described on leaving the second block 5 1.

Although there has been illustrated what is considered to be a preferred embodiment of this invention, it is to be understood that various changes are contemplated. Although it is preferable to employ the additional magnetic devices 20, 21, 22, 23, 24, and 25 illustrated, one in each branch of a track-circuit, these devices are not essential for the operation of the differential devices 17, 18, and 19. For some purposes also it may be preferable to omit the track resistances 10, 11, and 12, in which case only the coils of the differential devices 17, 18, and 19, which coils are connected to the continuous return-rail 1, will normally be energized to give the differential devices their normal operative effect, which will be destroyed the same as if track resistances were employed when the train bridges the opposite rails to which the two coils of a differential device are connected. If the track resistances are omitted, it is necessary also to omit the electromagnetic devices 20, 22, and 24, as otherwise they would not normally be deënergized.

One form of mechanical connection between the home signals and the circuit-closers 89 84 and 82 87 has been diagrammatically illustrated, but this connection may be variously modified.

Although the various signal-circuits are illustrated as leading directly to the signals, it is to be understood that the signal-circuit does not necessarily lead directly through a single motor. Any of the well-known signal-actuating devices may be employed in each case and motive power for the signal may be supplied by fluid-pressure, electricity, or any suitable agent.

What is claimed, and desired to be secured by Letters Patent, is—

1. In a block-signaling system, a plurality of block-sections; each comprising a portion of a continuous return-rail and an insulated rail-section; means for relaying from one section to a distant section, comprising a differential electromagnetic device having two windings, one winding connected to the continuous return-rail and one winding connected to the insulated rail-section, so that their joint magnetizing effect is controllable by a train bridging the rails of said sections, and a relay-circuit connected to the rails of said distant section and controlled by said differential device.

2. In a block-signaling system, a plurality of block-sections; each comprising a portion of a continuous return-rail, an insulated rail-section and a bridging resistance therefor; means for relaying from one section to a distant section, comprising a differential electromagnetic device having two windings, one winding connected to the continuous return-

rail and one winding connected to the insulated rail-section, so that their joint magnetizing effect is controllable by a train bridging the rails of said section; and a relay-circuit connected to the rails of said distant section and controlled by said differential device; a separate electromagnetic device connected between each of said two windings and the opposite rails of the block-section respectively; and a separate relay-circuit controlled by each of said latter electromagnetic devices and connected with the opposite rails of said distant block-section so as to be closed on a break in either of the said rail connections from said two coils of the differential electromagnetic device

3. In a block-signaling system; a block comprising a portion of a continuous return-rail and a plurality of insulated rail-sections; a source of electric energy; a differential electromagnetic device comprising two windings, one connected between the source of electric energy and the return-rail and the other connected between the source of electric energy and one of the insulated sections, said windings having a joint magnetizing effect when said insulated section is normal and clear and having no joint magnetizing effect when said insulated section is bridged or connected to the continuous return-rail; a signal inductively controlled by said differential electromagnetic device; and means controlled by a train on a distant insulated rail-section for electrically connecting said first-mentioned rail-section to said continuous return-rail so as to control said signal.

4. In a block-signaling system; a block comprising a portion of a continuous return-rail and a plurality of insulated rail-sections; a source of electric energy; a differential electromagnetic device comprising two windings, one connected between the source of electric energy and the return-rail and the other connected between the source of electric energy and one of the insulated sections, said windings having a joint magnetizing effect when said insulated section is normal and clear and having no joint magnetizing effect when said insulated section is bridged or connected to the continuous return-rail; a signal inductively controlled by said differential electromagnetic device; and means controlled by a train on a distant insulated rail-section for electrically connecting said first-mentioned rail-section to said continuous return-rail so as to control said signal; said means comprising a differential electromagnetic device connected between the source of electric energy and the return-rail and the insulated rail-section of the distant block-section.

5. In a block-signaling system; a block comprising a portion of a continuous return-rail and a plurality of insulated rail-sections; a source of electric energy; a differential electromagnetic device comprising two windings, one connected between the source of electric energy and the return-rail and the other connected between the source of electric energy and one of the insulated sections, said windings having a joint magnetizing effect when said insulated section is normal and clear and having no joint magnetizing effect when said insulated section is bridged or connected to the continuous return-rail; a signal inductively controlled by said differential electromagnetic device; and means controlled by a train on a distant insulated rail-section for electrically connecting said first-mentioned rail-section to said continuous return-rail so as to control said signal; said means comprising a branched circuit connected respectively to the return-rail and the insulated rail-section, a differential relay controlled jointly thereby and a relay controlled by each branch, said relays controlling several multiple-relay circuits.

6. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal of said succeeding block.

7. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal and the train-controlled means of said succeeding block.

8. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks; said

means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal and the train-controlled means of said succeeding block and also by the home signal at the first block.

9. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit in multiple with said home signal of the succeeding block.

10. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit in multiple with said home signal of the succeeding block and controlled by the home signal of said succeeding block.

11. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit in multiple with said home signal of the succeeding block and controlled by the home signal and the train-controlled means of said succeeding block.

12. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit in multiple with said home signal of the succeeding block and controlled by said home signal of the succeeding block and controlled by the home signal and the train-controlled means of said succeeding block and also by the home signal at the first block.

13. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block and normally closed, thereby holding said signal at "clear;" and a distant-signal circuit also normally closed, maintaining the distant signal at "clear" and controlled by the home signal of said succeeding block.

14. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block and normally

closed thereby holding said signals at "clear;" and a distant-signal circuit also normally closed, maintaining the distant signal at "clear" and controlled by the home signal and the train-controlled means of said succeeding block.

15. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block and normally closed thereby holding said signals at "clear;" and a distant-signal circuit also normally closed, maintaining the distant signal at "clear" and controlled by the home signal and the train-controlled means of said succeeding block and also by the home signal at the first block.

16. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block and normally closed thereby holding said signals at "clear;" and a distant-signal circuit also normally closed, maintaining the distant signal at "clear" and in multiple with said home signal of the succeeding block.

17. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block and a home signal at a succeeding block; a source of electric energy; two local track-circuits respectively connecting the opposite rails of each of said blocks to the source of electric energy; each of said track-circuits including a relay and one of the two opposing coils of a differential relay; a home-signal circuit controlled jointly by said relays and said differential relay; a distant-signal circuit in multiple with the said home signal of the succeeding block.

18. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block and a home signal at a succeeding block; a source of electric energy; two local track-circuits respectively connecting the opposite rails of each of said blocks to the source of electric energy; each of said track-circuits including a relay and one of the two opposing coils of a differential relay; a home-signal circuit controlled jointly by said relays and said differential relay; a distant-signal circuit in multiple with the said home signal of the succeeding block and controlled by said home signal.

19. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section; a home and a distant signal at one block and a home signal at a succeeding block; a source of electric energy; two local track-circuits respectively connecting the opposite rails of each of said blocks to the source of electric energy; each of said track-circuits including a relay and one of the two opposing coils of a differential relay; a home-signal circuit controlled jointly by said relays and said differential relay; a distant signal circuit in multiple with the said home signal of the succeeding block and controlled by the home signal and each of the relays of said succeeding block.

20. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section and a resistance permanently cross-connecting said continuous return-rail and said insulated rail-section and interconnecting said insulated rail-sections; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal of said succeeding block.

21. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section and a resistance permanently cross-connecting said continuous return-rail and said insulated rail-section and interconnecting said insulated rail-sections; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; train-controlled means at each of

said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal and the train-controlled means of said succeeding block.

22. In a block-signaling system; a plurality of blocks, each block comprising a portion of a continuous return-rail and an insulated rail-section and a resistance permanently cross-connecting said continuous return-rail and said insulated rail-section and interconnecting said insulated rail-sections; a home and a distant signal at one block; a home signal at a succeeding block; a source of electric energy; a train-controlled means at each of said blocks, said means comprising an electromagnetic device with two opposing windings, said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear; a local operating-circuit for each of said home signals controlled by the train-controlled means of the associated block; and a distant-signal circuit controlled by the home signal and the train-controlled means of said succeeding block and also by the home signal at the first block.

23. In an electric block-signaling system in which a differential relay controls the signal-circuits; interlocked home and distant signal-circuits, each being controlled by a separate block; and means for utilizing the same source of power as is used for the propulsion of trains to control and to energize said interlocked signal-circuits.

24. In a block-signaling system; a plurality of blocks, each comprising a portion of a continuous return-rail and an insulated rail-section; a source of electric energy; train-controlled means for each of said blocks, comprising an electromagnetic device with two opposing windings said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear, which effect is changed when said block is occupied by a train; a normal clear signal for one block; a normally energized circuit for said signal controlled by the electromagnetic device of the associated block; a normal clear signal for a preceding block; a normally energized circuit for said latter signal, controlled by the electromagnetic device of the associated block and by the said first-mentioned signal.

25. In a block-signaling system; a plurality of blocks, each comprising a portion of a continuous return-rail and an insulated rail-section; a source of electric energy; train-controlled means for each of said blocks, comprising an electromagnetic device with two opposing windings; said windings connected respectively between the source of electric energy and the opposite rails of the associated block so as to have a normal operative effect when the associated block is clear, which effect is changed when said block is occupied by a train; a normal clear signal for one block; a normally energized circuit for said signal controlled by the electromagnetic device of the associated block; a normal clear signal for a preceding block; a normally energized circuit for said latter signal controlled by the electromagnetic device of the associated block, by the said first-mentioned electromagnetic device and by the said first-mentioned signal.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ADONIRAM J. WILSON.

Witnesses:
MAY V. MCPIKE,
LEONARD DAY.