No. 818,169. PATENTED APR. 17, 1906.

R. J. HEWETT.

ELECTRICAL CIRCUIT AND DEVICE.

APPLICATION FILED JUNE 2, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

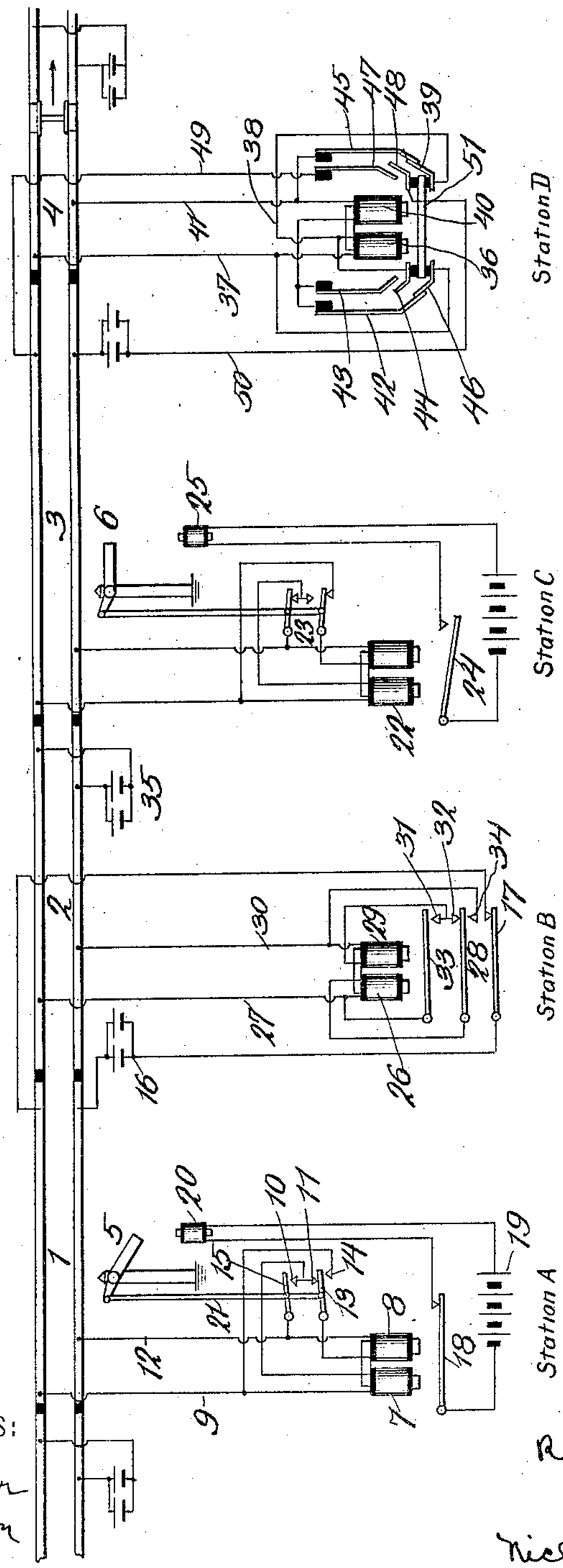

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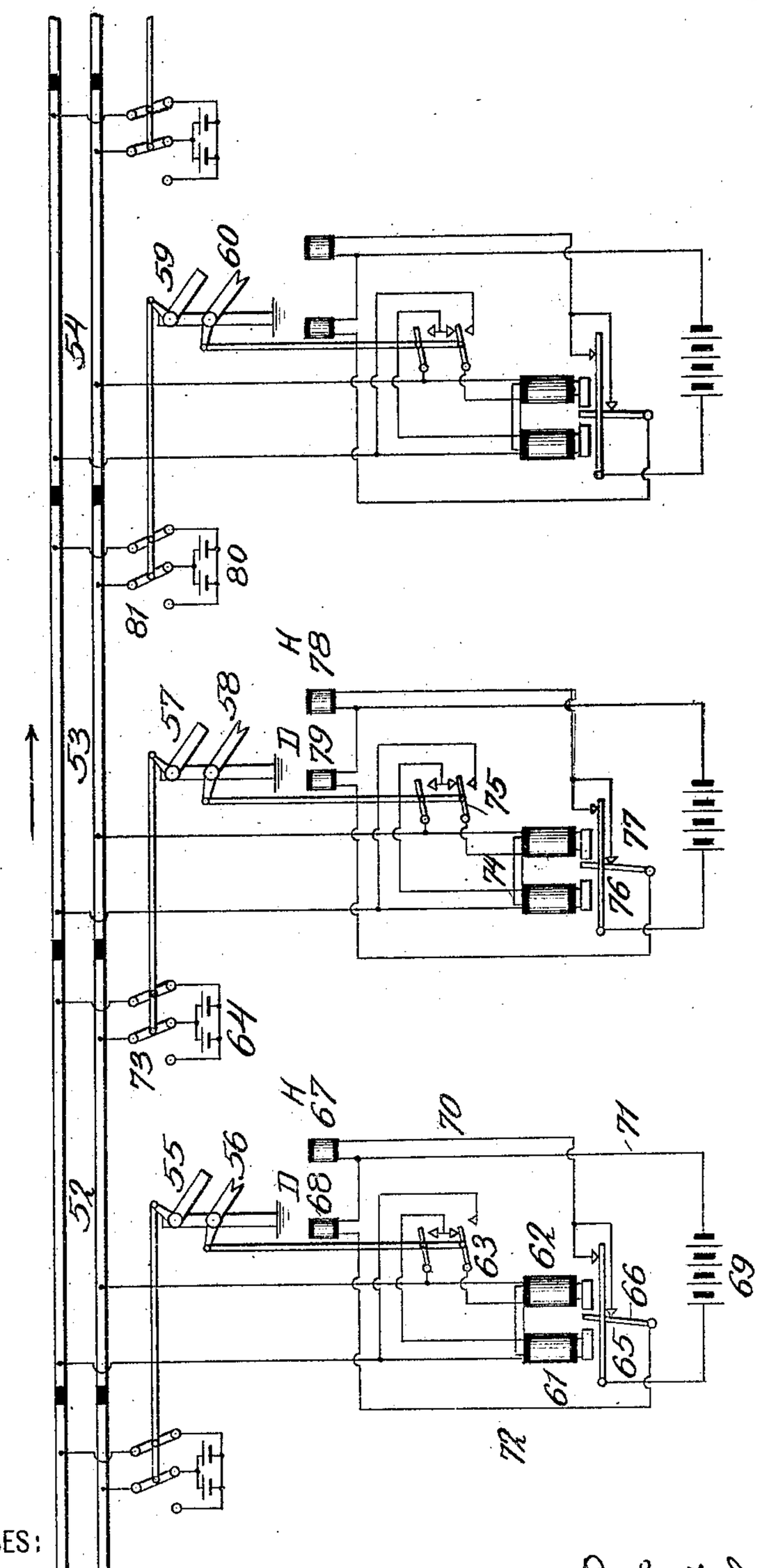
Fig. 2



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ELECTRICAL CIRCUIT AND DEVICE.

No. 818,169. Specification of Letters Patent. Patented April 17, 1906.

Application filed June 2, 1905. Serial No. 263,500.

To all whom it may concern:

Be it known that I, ROBERT J. HEWETT, a citizen of the United States, and a resident of Westfield, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Electrical Circuits and Devices, of which the following is a specification.

This invention relates to improvements in electrical circuits and devices, and especially such as are adapted for use in electric signaling systems.

The invention seeks to provide a magnetic device or relay which when connected in a track-circuit will effect an economy in the current consumption used to energize the said magnet device.

The invention also seeks to provide a signaling system in which said magnetic devices constitute a feature.

The magnetic device or relay may be employed as a "track-relay," in which case it would be generally located at the entering end of a track-section and associated with signals either working on the normal clear or normal danger principle. It may also be employed as a "clearing-relay," in which case it would generally be located at the exit end of the track-section and associated with signals working on the normal danger principle.

In the accompanying drawings, forming part of this specification, Figure 1 is a diagram of a railroad signaling system employing the invention. Fig. 2 is a diagram of another system employing the invention, this system using home and distant signals and track-relays with polarized armatures.

Referring now more particularly to the specific circuits and devices as shown in Fig. 1, 1, 2, 3, and 4 are insulated track-sections. Sections 1 and 2 constitute the block guarded by the signal 5, and sections 3 and 4 constitute the block guarded by signal 6. The signals work on the normal clear principle. The track-sections are provided with track-relays located, respectively, at stations A, B, C, and D. Each of these track-relays comprises two magnet-coils connected in the circuit of its track-section and associated with a circuit-changer, whereby the coils are changed from a connection of low resistance to a connection of high resistance and the reverse, this being preferably effected by shifting the coils from a series connection to a multiple connection and the reverse. These magnetic devices operate circuit-controllers, a circuit-controller moving from its pick-up position to its hold-up position when its magnet device is in the high-resistance connection and being kept in its hold-up position when this magnetic device is in low-resistance connection. Thus full current energy will be employed to move the circuit-controller from is pick-up to is hold-up position and a reduced current energy will be used to keep the circuit-controller in its hold-up position. 7 and 8 are the magnet-coils at station A. One side of coil 7 is connected with wire 9, leading from track-rail of section 1. The other side of coil 7 is connected to contacts 10 and 11. Coil 8 is connected on one side to wire 12, leading to the other track-rail of section 1, and the other side of this coil is connected to moving contact 13, which works between contact 11 and contact 14, which latter is connected to wire 9. Moving contact 15 is connected to wire 12 and works to and from contact 10. Moving contacts 13 and 15 constitute the circuit-changer associated with coils 7 and 8. The opposite ends of the rails of section 1 are connected through battery 16 and circuit-controller 17. Magnet-coils 7 and 8 operate circuit-controller 18, included in the circuit with battery 19 and magnet 20. Magnet 20 represents the motor or other operating or controlling device for signal 5. The circuit-changer is connected for operation with signal-rod 21; but it may be operated in any suitable manner.

In the normal condition of the circuits and devices as shown at station A the signal is held at "safety" by magnet 20, whose circuit is closed at circuit-controller 18. This circuit-controller 18 is therefore in its hold-up position. Magnet-coils 7 and 8 are connected in series with their track-circuit, so that the output of battery 16 is thereby reduced to an amount merely sufficient to safely hold circuit-controller 18 in its hold-up position. This circuit may be traced from wire 9 through coil 7, contacts 11 and 13, coil 8, and wire 12 through the rails and battery 16. When a train enters section 1, it shunts coils 7 and 8, permitting circuit-controller 18 to drop to its pick-up position. This opens the circuit of magnet 20 and puts the signal to "danger" behind the train. The circuit-changer shifts its position so as to

change the connection of coils 7 and 8 from a series connection to a mulitple connection. This change in the connections is shown at station C. The circuit for coils 7 and 8 will then flow from wire 9 through coil 7, contacts 10 and 15 to wire 12, and also from wire 9 through contacts 14 and 13, coil 8 to wire 12, and through the rails. When the train passes out of the block guarded by signal 5, coils 7 and 8 will be energized while in their multiple connection and will move circuit-controller 18 from its pick-up to its hold-up position. This will energize magnet 20 and return signal 5 to "safety." The circuit-changer will also be shifted back to its normal condition, in which the coils will be changed from multiple to series connection. The circuit-changer may be operated in any suitable manner.

At station C the track-relay 22, circuit-changer 23, circuit-controller 24, signal-magnet 25, &c., are duplicates of the corresponding parts shown at station A, the position of the parts being altered to correspond to the position of signal 6, which is at "danger" because of the presence of the train represented in section 4. At station C circuit-controller 24 is in its pick-up position and relay 22 is in its multiple connection.

At station B the relay automatically works with its own circuit-changer, there being no signal at this point. Coil 26 is connected on one side to wire 27, leading to one rail, and on its other side to moving contact 28. Coil 29 is connected on one side to wire 30, leading to the other rail, and on its other side to stationary contacts 31 and 32. Wire 27 is connected to moving contact 33, and wire 30 is connected to stationary contact 34. When the relay is in its normal condition, as shown, the coils are connected in series with their track-circuit, which includes battery 35, and the circuit-controller 17 is held in its hold-up position. At this time the circuit of the relay may be traced from wire 27 through coil 26, contacts 28 and 32, coil 29 to wire 30 and through the rails. When the relay is de-energized, circuit-controller 17 moves from its hold-up position to its pick-up position, contacts 33 and 28 change their position, so as to connect the coils in multiple. The circuit may then be traced from wire 27 through coil 26, contacts 28 and 34 to wire 30, also from wire 27 through contacts 33 and 31 and coil 29 to wire 30 and through the rails. When a train passes out of section 2, coils 26 and 29 will be energized while in their multiple or low resistance connection and move circuit-controller 17 from its pick-up to its hold-up position. At the same time they shift contacts 28 and 33 so as to change the connection of the coils from mulitple to series. It will be observed that contacts 28 and 33 have a pick-up and a hold-up position as well as circuit-controller 17 and that these contacts are operated by the coils under the same condition as is circuit-controller 17.

At station D the track-relay is shown in association with sliding contacts arranged so that the several contacts may be made and broken in a predetermined sequence. Coil 36 is connected on one side with track-wire 37 and on its other side by wire 38 with moving contact 39. Coil 40 is connected on one side with track-wire 41 and on its other side with stationary contacts 42 and 43. Wire 38 is connected with moving contact 44, wire 41 is connected with stationary contact 45, and wire 37 is connected with moving contact 46. Contacts 47 and 48 constitute the circuit-controller connected with wires 49 and 50 of track-circuit for relay 22. Moving contacts 44 and 46, 48 and 39 are carried by armature 51. When a train is in section 4, as indicated, magnet-coils 36 and 40 will be de-energized, and therefore connected in multiple or in their pick-up connection. At this time the connection of the coil may be traced from track-wire 37, coil 36, wire 38, contacts 39 and 45 to wire 41, also from wire 37, contacts 46 and 42, coil 40 to wire 41 and through the rails. Armature 51 and its moving contacts are thus in their pick-up position, and contacts 47 and 48 will be open, so that signal 6 will be held at "danger." When the train moves out of section 4 and coils 36 and 40 are energized in their multiple connection, armature 51 is moved from its pick-up to its hold-up position. This closes contacts 47 and 48, so that signal 6 is returned to "safety." It also shifts the contacts of the circuit-changer so that the coils are changed from multiple to series connection, the circuit at this time being traced from wire 37 through coil 36, contacts 44 and 43, coil 40, and wire 41 through the rails. Contacts 42, 43, 45, and 47 are made in the form of springs, contacts 42 and 47 having a bias inward or toward the coils. This arrangement makes the contacts slide upon each other, so as to insure good electrical connection, and contacts 46 and 39 may be made to remain in contact with their contacts 42 and 45 until contacts 44 and 48 have safely made, or substantially so, connection with their contacts 43 and 47. The momentum of the armature 51 in moving toward the coils can be relied upon to carry it up and close the front contacts even though the back contacts open somewhat in advance. Spring-contacts 42 and 45 may be adjusted so that there may be no interval of no current or that the interval of no current may be negligible. These springs may be adjusted so that the back contact 39 will open slightly in advance of back contact 46, and the closing of front contact 44 will follow the opening of back contact 46. In other words, the lifting of the armature causes contact 39 first to open, then contact 46 opens, and then contact 44 closes.

It will not be necessary to trace the complete operation of the circuit as a train passes over the sections 1, 2, 3, and 4 of the track. This will be readily understood from what has already been explained.

It will be observed that the movement of the circuit-changer from series to multiple connection of the coils is initiated when the coils are deënergized in series, and the movement of the circuit-changer from multiple to series connection is initiated when said coils are energized in multiple. It will also be observed that when said coils are energized in multiple they initiate the movement of the signal to clear position and when they are deënergized in series they initiate the movement of the signal to danger position.

In Fig. 2 the track is divided into sections or blocks 52, 53, and 54. 55 and 56 are home and distant signals located at the entering end of block 52. 57 and 58 are home and distant signals located at the entering end of block 53. 59 and 60 are home and distant signals located at the entering end of block 54. Associated with signals 55 and 56 are magnet-coils 61 and 62, provided with a circuit-changer 63. These coils and their circuit-changer are connected in their track-circuits with battery 64 in exactly the same way as the coils and circuit-changer at station A in Fig. 1 and need not be described in detail. These magnet-coils 61 and 62 have a neutral circuit-controller 65 and polarized circuit-controller 66. The former controls the home signal through magnet 67 and both together control the distant signal through magnet 68. The circuit of magnet 67 extends from battery 69 through armature 65, wire 70, magnet 67, and wire 71 to battery. The circuit of magnet 68 extends from battery 69 through armatures 65 and 66, wire 72, magnet 68, and wire 71 to battery. Battery 64 is provided with pole-changer 73, which, as shown, may be operated by the operating-rod of signal 57. Track-relay 74 is provided with circuit-changer 75, neutral and polarized circuit-controllers 76 and 77, signal-magnets 78 and 79, and with track-battery 80 and pole-changer 81, all being connected and operated in precisely the same way as the corresponding devices for block 52. Circuit-changer 63 is operated by rod of signal 56 and circuit-changer 75 is operated by rod of signal 58.

The operation of the device and circuits shown in Fig. 2 is as follows: A train entering block 52 shunts coils 61 and 62, thereby causing circuit-controllers 65 and 66 to move from their hold-up to their pick-up position and put signals 55 and 56 to "danger." Circuit-changer 63 shifts so as to change the connection of coils 61 and 62 from series to multiple. When a train enters block 53, signals 57 and 58 are put to "danger" in the same way and the circuits and devices operated in precisely the same way as with reference to block 52. The movement of signal 57 to "danger" shifts pole-changer 73 so as to energize coils 61 and 62 in their multiple but reversed connection. Neutral circuit-controller 65 is thereupon moved to its hold-up position. This closes the circuit through magnet 67 and puts the home signal 55 to "safety." When the train passes out of block 53 and into block 54, home and distant signals 59 and 60 go to "danger" behind the train in a manner already described, and the circuit and devices associated with these signals operate in the same way with reference to the preceding signals. Home signal 57 returns to "safety" in the same way as home signal 55 returned to "safety" and pole-changer 73 moves back to its former position, thereby causing polarized circuit-controller 66 to move from its pick-up to its hold-up position. This closes the circuit through magnet 68 and puts distant signal 56 to "safety," thereby shifting the circuit-changer 63 and changing the connection of coils 61 and 63 from multiple to series. As the train proceeds its operation upon the signals and their associated devices continues as already described.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a circuit, with magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection.

2. The combination of a circuit, with magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection, the position of said circuit-changer being dependent upon the energization and deënergization of said magnetic means.

3. The combination of a circuit, with magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance when said magnetic means are energized and to reverse the connection when said magnetic means are deenergized; and a circuit-controller controlled by said magnetic means and arranged to be

picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection

4. The combination of a track-circuit with a signal; magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller for the signal and controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection.

5. The combination of a track-circuit, with a signal; magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller for the signal and controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection, the position of said circuit-changer being dependent upon the energization and deënergization of said magnetic means.

6. The combination of a track-circuit, with a signal; magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance when said magnetic means are energized and to reverse the connection when said magnetic means are deënergized; and a circuit-controller for the signal and controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection.

7. The combination of a track-circuit, with a signal; magnetic means connected with said circuit; a circuit-changer connected with said circuit and operated by the movement of the signal and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection.

8. The combination of a track-circuit, with a signal; magnetic means connected with said circuit; a circuit-changer connected with said circuit and operated by the movement of the signal and acting to change the connection of said magnetic means from one of low resistance to one of high resistance when said magnetic means are energized and to reverse the connection when said magnetic means are deënergized; and a circuit-controller controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection.

9. The combination of a circuit, with two magnet-coils; a circuit-changer connected with said circuit and so arranged that when in one position it connects said coils in series and when in its other position it connects said coils in multiple; and a circuit-controller arranged to be picked up when said coils are in multiple and held up when said coils are in series.

10. The combination of a circuit, with two magnet-coils; a circuit-changer connected with said circuit and so arranged that when in one position it connects said coils in series and when in its other position it connects said coils in multiple; and a circuit-controller arranged to be picked up when said coils are in multiple and held up when said coils are in series, the movement of said circuit-changer to its last-mentioned position being initiated when said coils are deënergized in series, and the movement of said circuit-changer to its first-mentioned position being initiated when said coils are energized in multiple.

11. The combination of a track-circuit, with a signal; two magnet-coils; and a circuit-changer arranged to connect said coils in series and in multiple in the circuit, said coils when energized in multiple initiating the movement of the signal to clear position and when deënergized in series initiating the movement of the signal to danger position.

12. The combination of a track-circuit, with a signal; two magnet-coils; a circuit-changer arranged to connect said coils in series and in multiple in the circuit; a circuit-controller for controlling the position of the signal and arranged to be picked up when said coils are energized in multiple and to be held up when said coils are energized in series.

13. The combination of a circuit, with magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller controlled by said magnetic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection, said circuit changer being directly operated by said magnetic means.

14. The combination of a circuit, with magnetic means connected with said circuit; a circuit-changer connected with said circuit and acting to change the connection of said magnetic means from one of low resistance to one of high resistance and the reverse; and a circuit-controller controlled by said mag-

netic means and arranged to be picked up during the low-resistance connection of said magnetic means and to be held up during its high-resistance connection, said circuit-changer being directly operated by said magnetic means and moved to the low-resistance connection when said magnetic means are deenergized and to the high-resistance connection when said magnetic means are thereafter energized.

15. The combination of a circuit, with two magnetic coils; a circuit-changer connected with said circuit and so arranged that when in one position it connects said coils in series and when in its other position it connects said coils in multiple; and a circuit-controller arranged to be picked up when said coils are in multiple and held up when said coils are in series, said circuit-changer being operated directly by said magnet-coils and moved to multiple connection when said coils are deenergized and moved to series connection when said coils are thereafter energized.

16. The combination of a track-circuit, with a signal; two magnet-coils; and a circuit-changer arranged to connect said coils in series and in multiple in the circuit, said coils when energized in multiple initiating the movement of the signal to clear position and when deënergized in series initiating the movement of the signal to danger position, said circuit-changer being operated directly by said magnet-coils and moved to multiple connection when said coils are deënergized and moved to series connection when said coils are thereafter energized.

17. The combination of a track-circuit, with a signal; two magnet-coils; a circuit-changer arranged to connect said coils in series and in multiple in the circuit; a circuit-controller for controlling the position of the signal and arranged to be picked up when said coils are energized in multiple and to be held up when said coils are energized in series, said circuit-changer being operated directly by said magnet-coils and moved to multiple connection when said coils are deenergized and moved to series connection when said coils are thereafter energized.

18. The combination of a track-circuit, with home and distant signals; two magnet-coils; a circuit-changer arranged to connect said coils in multiple and in series in said track-circuit; a signal-circuit for the home signal having a circuit-controller with a neutral armature operated by said magnet-coils; a signal-circuit for the distant signal having a circuit-controller with a polarized armature operated by said magnet-coils; a pole-changer in said track-circuit.

19. The combination with a track-circuit having two magnet-coils; a signal; a signal-circuit for the signal having two circuit-controllers, operated by said coils, one of said circuit-controllers being moved from its pick-up to its hold-up position when said coils receive current of a given characteristic, and the other circuit-controller being moved from its pick-up to its hold-up position when said coils receive current of a different characteristic; means for varying the characteristic of the current for said coils; and a circuit-changer connected with said coils and acting to connect said coils in a low-resistance connection to pick up said circuit-controllers, and to connect said coils in a high-resistance connection to hold up said circuit-controllers.

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

ROBERT J. HEWETT.

Witnesses:
NICHOLAS M. GOODLETT, JR.,
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