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BLOCK SIGNALING SYSTEM FOR ELECTRIC RAILWAYS.

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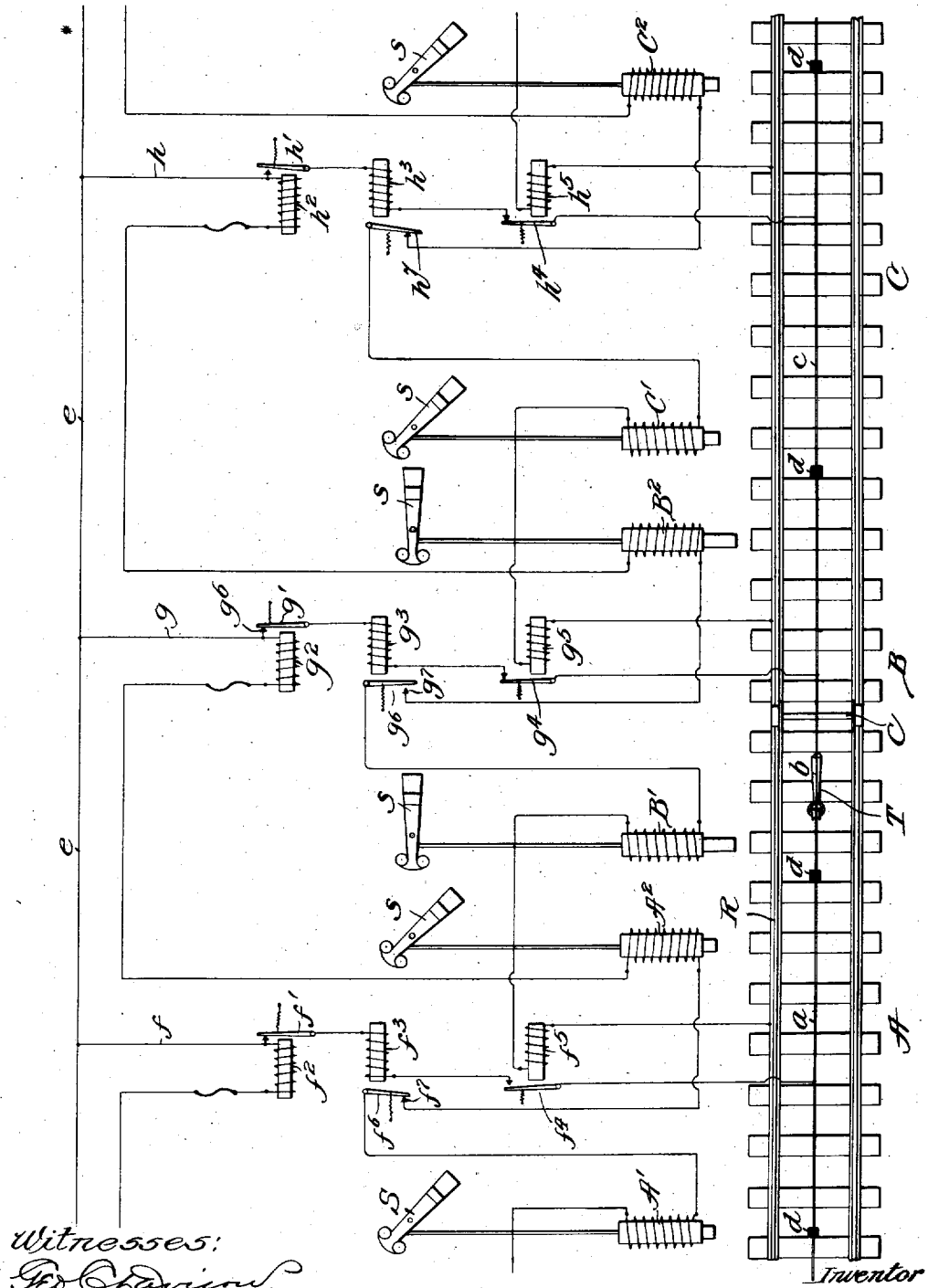
1,018,443. Patented Feb. 27, 1912.



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BLOCK-SIGNALING SYSTEM FOR ELECTRIC RAILWAYS.

1,018,443. Specification of Letters Patent. Patented Feb. 27, 1912.

Application filed February 4, 1910. Serial No. 541,988.

To all whom it may concern:

Be it known that I, KEENE RICHARDS, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Block-Signaling Systems for Electric Railways, of which the following is a full, clear, concise, and exact description.

My invention relates to a block signaling system for electric railways. Its object is to provide means, controlled by the presence of a car in a block, for setting a danger signal at some point in the rear of the car, and for shutting off the supply of current to the block immediately in the rar of the occupied block in the case of double track roads, and for effecting the same results with respect to the blocks both in advance and in the rear of such occupied block in the case of single track roads.

One feature of my invention consists of an electrically controlled signaling mechanism guarding the entrance to a block, said signaling mechanism having a circuit including an electrically actuated switch controlled by the presence of a car in a block.

Another feature of my invention, as applied more particularly to singe track roads, consists of electrically controlled signaling mechanism guarding the opposite ends of a certain portion of the road and having a common circuit which includes an electrically actuated switch controlled by the presence of a car in a block.

Another feature of my invention consists of an electrically actuated switch in the tap which feeds current to the trolley-wire or trolley-rail of a given block, the actuation of said switch being controlled by the presence or absence of a car in an adjoining block.

These and other features of my invention may be more readily understood by reference to the accompanying drawing which is a diagram of circuits and apparatus embodying the preferred form of my invention as applied to a single track road, said drawing showing the normal condition of the circuits and apparatus for a series of unoccupied blocks.

The railroad track may be laid off in the usual manner in a series of blocks A, B, C, etc., each of which is provided with sections *a*, *b*, *c*, etc. of the trolley-wire or trolley-rail. Each of said sections is electrically divided by the section insulators *d*, as is customary. Said sections *a*, *b*, *c* are fed from the main feed conductor *e* by branches or taps *f*, *g* and *h* leading from said conductors *e* to the sections *a*, *b*, *c* etc., respectively. The feed taps *f*, *g*, *h*, include in their circuits the switches f', g', h', respectively. Said switches are electrically actuated and, for example, may be armature switches normally maintained in closed position by relays f^2, g^2, h^2 respectively. Said feed taps also include in their circuits the coils of the relays f^3, g^3, h^3, respectively. Furthermore, in the application of the invention to single track roads, as is illustrated in the drawings, said feed taps also include the electrically actuated switches f^4, g^4, h^4, respectively.

In the single track system illustrated, the several blocks A, B, C are guarded at each end by suitable signaling mechanism, as, for example, by semaphores S. I have shown the semaphore signals actuated by the solenoids A′, A^2, B′, B^2, C′, C^2, respectively. The semaphores are so arranged that when their corresponding solenoids are energized the signals are set at safety, but upon the deenergization of said solenoids, the signals are set at danger. The solenoids for each block are included in a circuit which also includes relays controlling the continuity of the feed tap for each adjacent block. The circuit of the signaling mechanism for a single-track system is thus so arranged as to cover three adjacent blocks, and may be best understood by tracing one of the plurality of similar circuits, which controls the signals of one of the blocks, such circuit being multiplied throughout the system for each block.

The circuits controlling the signals of block B may be traced as follows: From ground, as for example, from the grounded rail R of the track, through a conductor which includes the relay f^5, of the adjacent block A, solenoid B′, armature g^6 and contact g^7 of relay g^3, solenoid B^2, relay h^2 of the adjacent block C, lead *h*, to the feed wire *e*. This circuit is closed when no car is in the block B, but is open at the switch g^6 when the car is in said block. In the former case the solenoids B′ and B^2 are thereby energized, and hence the corresponding signals S of the block B are set at safety, in the latter case the deënergized solenoids B′, B^2 set the corresponding signals at danger.

As hereinbefore stated, the circuit arrangement for each of the blocks is similar to that just described for block B.

The operation of my invention as applied to single track roads is as follows: When blocks A, B and C are unoccupied, the insulated sections a, b and c are not connected to ground, and hence there is no flow of current through the taps f, g and h. Normally, therefore, the relays f^3, g^3 and h^3 are deënergized and the back contacts f^7, g^7, h^7, respectively, controlled thereby are closed. If there is a car in block B, as indicated diagrammatically in the drawings by the car wheel C and the trolley T, the circuit through the feed tap g is thereupon closed from the feed wire e, through the tap g (which includes the switch g', relay g^3, and switch g^4) to the trolley wire b, and thence through the usual circuit provided on the car, that is, through the motor and circuit provided therefor, to the grounded rail R. This closure of the circuit of the tap g energizes the relay g^3, which thereupon attracts its armature g^6, thereby opening, at contact g^7, the circuit which includes the solenoids B′, B² and the ralays f^5 and h^2. Upon the consequent deënergization of coils B′, B², the semaphore signals S at each end of block B are set at danger. The opening of the contact g^7 also causes the deënergization of the relay h^2 of the block C, which relay thereupon releases its armature g' and consequently opens the circuit of tap h. The opening of contact g^7 also causes the deënergization of relay f^5, which thereupon releases its armature f^4 and consequently opens the circuit of tap f at the switch f^4. Hence a car attempting to enter either block A or block C would receive no current by reason of the feed-taps of such blocks being open at the switches f^4, and h' thereof, respectively, so long as the first mentioned car occupies the block B. I thus do not necessarily depend solely on the usual danger signal to prevent the entrance of the two cars in the same block, but I, as above described, preferably also provide means whereby even if the motorman should disregard the signals, he would still be prevented from running the car into danger.

Assume that block B and the next succeding block are clear, and that in its further progress the car leaves block B and enters block C. The car no longer connects feed-tap g to the ground. Thereupon the relay g^3 is deënergized and its armature g^6 is retracted into engagement with contact g^7, thereby again closing the circuit through the relay h^2, energizing the same, with the resultant closure of switch h' in the feed-tap to block C. The car upon entering block C is thus supplied with current since the trolley-wire c is connected to the feed-wire e through the now closed feed-tap h. It will also be noted that the closure of the current controlled by the switch g^6 also results through the energization of the relay f^5, in the closure of the switch f^4 in the feed-tap f, thus restoring the circuits of block A to normal condition.

From the foregoing description it will be obvious that the presence, under normal operation, of a car in a block, whatever direction the car may be traveling, will set a danger signal at each end of said block and will also cut off the supply of current to, or in other words make dead, the block at each end of the occupied block.

For convenience of illustration I have shown the current for the signaling circuits as obtained from the main feed conductor e, but I do not wish to be understood as limiting my invention to the use of such source of current for the signaling circuit.

I have preferably arranged the circuits and apparatus of my invention so that the semaphore signals are at safety when the solenoids controlling the same are energized for the reason that such signals will thus be set at danger under the conditions above described and will likewise go to danger in case the circuits are out of order by reason of an accidentally open circuit. I thus prevent a false safety signal being shown.

It is obvious that in case of double track roads it will be unnecessary to set a danger signal at the opposite end of the block from which the car enters and will likewise be unnecessary to make the next succeeding block dead. It follows, therefore, that the relays f^5, g^5, h^5 and the switches f^4, g^4, h^4, controlled thereby and the solenoids A′, B′, C′, and the semaphores S controlled thereby are not essential to a double-track road and may be dispensed with if desired.

I wish it also to be understood that the relays, solenoids and signaling apparatus set forth in the description and drawings are merely for the purpose of illustrating my invention and that any standard apparatus designed to perform the same or similar functions may be employed in lieu thereof, my invention not being limited in this respect.

What I claim is:

1. In a block-signal system, the combination with an electric railway having an electrically divided trolley-wire and a current supply feed-tap for each section of said trolley-wire, of a switch and an electrically actuated device included in each of said feed-taps, and an electrically actuated signal and its circuit for each block, said signal circuits each including an electrically controlled device for regulating the closure of said switch in an adjacent feed-tap, and also, said latter circuit including a switch controlled by said first mentioned electrically actuated device of another feed-tap.

2. In a block-signal system for electric railways, the combination with the trolley-wire and feed-tap of each block, of an electrically actuated signal and its circuit, a switch for opening or closing the signal circuit, electro-responsive mechanism included in the feed-tap of the block corresponding to said signal for controlling the operation of said switch, and electro-responsive mechanism, included in the signal circuit corresponding to each block, for controlling the continuity of the feed-tap of an adjacent block.

3. The combination with an electric railway having an electrically divided trolley-wire and a current supply feed-tap for each section of said trolley-wire, of electrically actuated mechanism included in each feed-tap, an electrically actuated signal and its circuit controlled by the said first mentioned mechanism of one feed-tap, an electrically actuated mechanism included in said signaling circuit for controlling the continuity of the circuit of the next succeeding feed-tap.

4. The combination with an electric railway having an electrically divided trolley-wire and a current supply feed-tap for each section of said trolley-wire, of two switches and an electrically actuated device included in each of said feed-taps, two electrically actuated signals and a circuit common to said signals, electrically controlled devices included in said signal circuit for regulating the closure of one of said switches in each of two non-adjacent feed-taps, and a switch in said signal circuit controlled by said first mentioned electrically actuated device of a feed-tap located between said two non-adjacent feed-taps.

5. In a block-signal system for electric railways, the combination with the trolley-wire and feed-tap of each block, of two switches and an electrically actuated device included in each of said feed-taps, and a signaling circuit for each block, each signaling circuit including two electrically actuated signals, one guarding each end of said block, and two electrically actuated devices, each controlling a said switch in two different feed-taps, said signaling circuit also including a switch controlled by said first mentioned electrically actuated device of the correspondng feed-tap.

6. In a block signal system for electric railways, the combination with the trolley-wire and feed-tap of each block, of switches controlling the continuity of said feed-taps, a normally closed signaling circuit, a switch for opening or closing said signaling circuit, an electrically actuated signal in said signaling circuit arranged to be set at safety and at danger when said circuit is closed and opened, respectively, an electrically actuated device included in the feed-tap of the block corresponding to said signal for controlling the continuity of the switch in said signaling circuit, and an electrically actuated device included in said signaling circuit and arranged when energized and de-energized to close and open, respectively, said switch included in the feed-tap of an adjacent block.

In witness whereof, I hereunto subscribe my name this 2nd day of February, A. D., 1910.

KEENE RICHARDS.

Witnesses:
GEORGE E. FOLK,
GEO. C. DAVISON.