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E. L. ORCUTT & R. SHELDON.

ELECTRIC SIGNALING SYSTEM.

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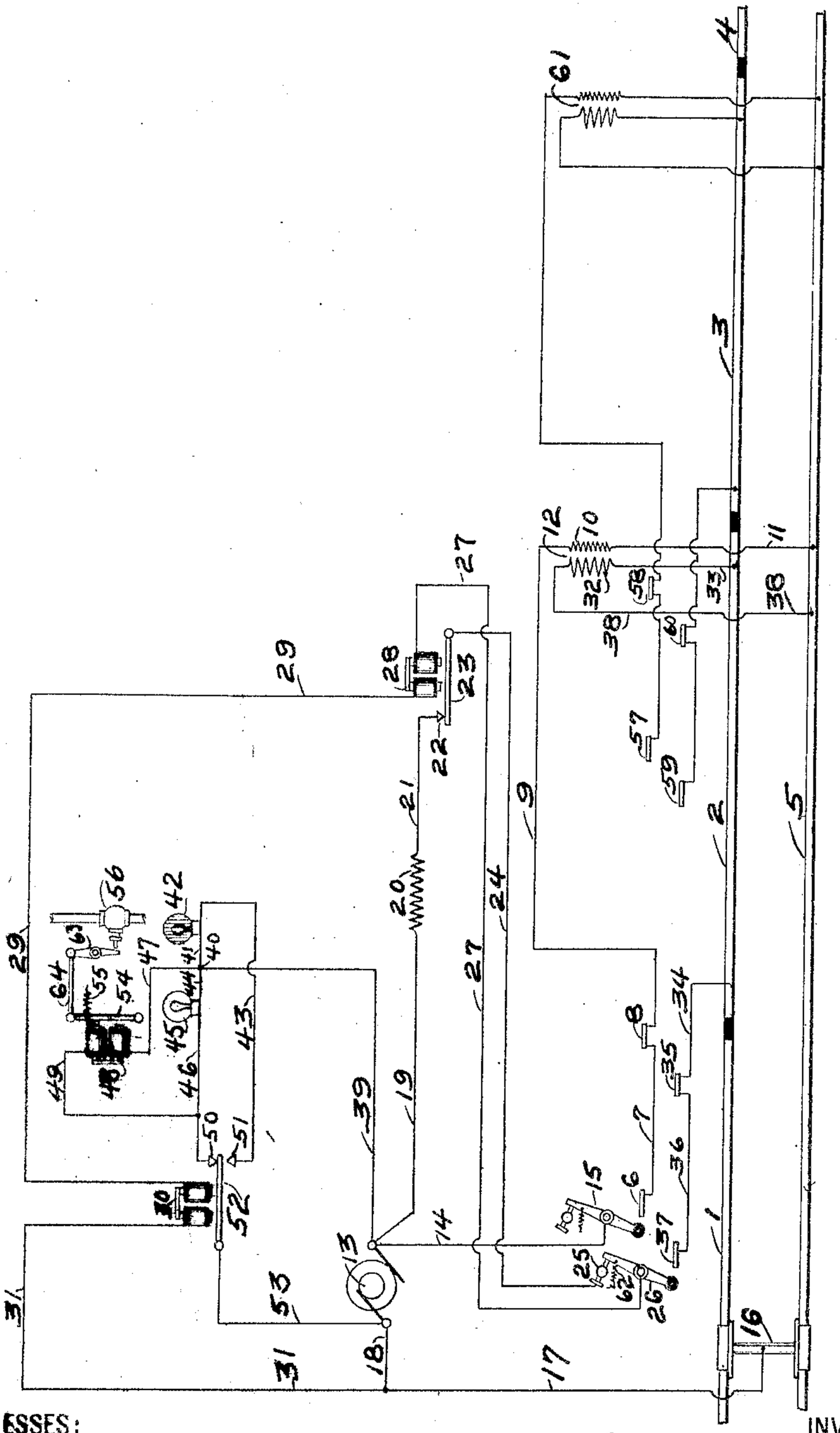

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ELECTRIC SIGNALING SYSTEM.

No. 855,727. Specification of Letters Patent. Patented June 4, 1907.

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To all whom it may concern:

Be it known that we, EDWARD L. ORCUTT and RICHARD SHELDON, both citizens of the United States, and residents of the borough of Manhattan, county, city, and State of New York, have invented certain new and useful Improvements in Electric Signaling Systems for Railroads, of which the following is a specification.

This invention relates to electric signaling systems for railways. It seeks to provide a system economical in installation, maintenance and operation, coupled with general efficiency and reliability.

The invention is particularly characterized by the local operating and controlling circuits carried on the train.

The invention also seeks to provide an efficient, reliable and economical arrangement whereby a train may be automatically stopped before entering a dangerous block.

In the accompanying drawings forming part of this specification:—the figure is a diagram illustrating the circuits and devices applied to two protected blocks.

Referring now more particularly to the drawings, the track is divided into four blocks, in which rails 1 and 5 constitute the first block; rails 2 and 5 the second block; rails 3 and 5 the third block; and rails 4 and 5 the fourth block. Rails 1, 2, 3 and 4 are insulated from each other while rail 5 is electrically continuous.

6 and 8, and 37 and 35 are pairs of track contacts associated with the block to which rails 2 and 5 belong. 57 and 58, and 59 and 60 are similar contacts but are associated with the succeeding block. These track contacts consist preferably of short rails spaced apart and fixed to the road bed in advance of the protected block. The contacts of each pair are electrically connected, as by an insulated wire.

12 is a transformer located at the end of the block and connected as will be disclosed. Contact 8 is connected by wire 9 to the primary coil 10 of the transformer 12. The coil 10 is then connected through wire 11 with rail 5. This constitutes a circuit which will be termed the track supply circuit, as it supplies the energy for the transformer 12. The power for this circuit is supplied by a generator 13 which is continuously active and which is preferably located on the train. Generator 13 is connected by wire 14 to a train contact 15 arranged to move with the train and make contact with track contacts 6 or 8, etc. The return from the track supply circuit is from rail 5 to truck 16, wires 17, 18, back to generator 13. Generator 13 also normally energizes the local controlling circuit on the train which is traced as follows:—13, 19, compensating resistance 20, wire 21, contact 22, circuit closer 23, wire 24, back contact 25, circuit breaking contact 26, wire 27, controlling circuit controller 28, wire 29, safety-danger device controller 30, wires 31, 18 and back to generator 13. This circuit, however, is broken by the circuit breaking train contact 26 when this contact engages one of the track contacts 37 or 35. These track contacts 37 and 35 are connected together by the conductor 36 and then to the rail 2 by wire 34. Rail 2 then connects with one terminal of the secondary 32 of transformer 12 through wire 33. The other terminal of the secondary 32 is then connected by wire 38 with return rail 5. This completes a second track circuit which will be termed the controlling track circuit.

Lamps 42 and 45 and magnet 48 with its coöperating mechanism are safety-danger devices located on the train and operated by the generator 13 as follows:—The controller 30, normally energized as described above, normally holds its armature 52 in contact with the contact 50 thus there is a normally closed operating circuit from generator 13, wire 39, to point 40, branching there through one branch; 44, safety lamp 45, wire 46, contact 50; and in a second branch; wire 47, magnet 48, wire 49, contact 50, thence through armature 52, wire 53, back to generator 13. However, if controlling magnet 30, is deënergized, this armature 52 leaves contact 50 and connects with contact 51 completing the danger operating circuit from generator 13, wire 39 to point 40, wire 41, lamp 42, wire 43, contact 51, armature 52, wire 53, back to generator 13.

The train contacts 15 and 26 are so arranged on the train that they will engage the track contacts 6 and 37 or 8 and 35 respectively in the order named. Thus the transformer 12 will be energized before the local

controlling circuit through the circuit breaking train contact 26 is broken. Then the controlling track circuit will be connected with the controlling train circuit as follows:—Track contact 37, circuit breaking train contact 26, wire 27, controlling circuit controller magnet 28, wire 29, controller 30, wire 31, wire 17, truck 16, rail 5, wire 38, secondary 32, wire 33, rail 2, wire 34, contact 35, wire 36 back to track contact 37.

28 is a magnetic controller connected in the train controlling circuit and operating the circuit closer 22, 23 and is designed so as to be operated by alternating current as are also the other magnetic devices illustrated.

The circuit closer 22, 23, when closed, which is its normal condition, completes a local train or signal controlling circuit as follows:—Generator 13, wire 19, resistance 20, wire 21, contact 22, circuit closer 22, 23, wire 24, back stop 25, circuit breaking train contact 26, wire 27, controller magnet 28, wire 29, controller 30, wires 31, 18 and back to generator 13.

20 is a resistance properly to proportion the flow of energy in the normal local controlling circuit direct from the generator 13 and closed at 25, 26 to the flow of energy through the controller portion of that circuit when said controlling circuit is supplied from the secondary of the transformer by cutting in the track controlling circuit at 26, 37 and cutting out the generator 13 and resistance 20 on the opening of 25, 26.

If desired the controller 30 may operate not only its own circuit changer 52, 50, 51 but may be designed to operate the circuit closer 23, in which case a single armature would suffice.

56 is a valve which is designed to control the air brakes or the steam supply on the train and is operated when the controller 48 is deënergized. The spring 55 retracts the armature 54 and releases the valve by means of the link 64 and lever 63.

The signal 42, 45, may be of any approved type to give a safety and danger indication. It is shown as two lamps 42 and 45 each giving a distinctive color.

61 indicates a transformer identical with transformer 12 but associated with the succeeding block. Each succeeding block to be protected is likewise provided with a transformer.

The operation of the system and apparatus is as follows:—As described above the local controlling circuit on the train is normally closed and normally maintains the local operating circuit on the train closed through the safety portion of the safety danger devices so as normally to indicate safety. As previously described, the local controlling circuit includes a circuit breaking train contact 25, 26, and also the circuit closer 22, 23, which together with the magnet 28 constitute a controller for this controlling circuit and form an important feature of this invention. Obviously a break in this controlling circuit may occur either at 22, 23 or at 25, 26 or at both localities. As the train advances the train contacts 15 and 26 first engage the first pair of track contacts 6 and 37, respectively in the order named and make the first test of block 2, 5. The contact 26 opens the local controlling circuit as it leaves the contact 25. If this local controlling circuit was now dependent solely upon itself for energy, this circuit would be broken at a second point by the deënergization of the magnet 28 the generator circuit through which has been broken at 25, 26 and which would release the circuit closer 23 from its contact 22. However, before the train contact 26 breaks contact at 25 by engaging track contact 37, the train contact 15 has previously engaged track contact 6 and energized the supply track circuit. The supply track circuit is completed by train contact 15 engaging track contact 6 and the truck 16 engaging rail 5. If the block is clear and the rails are intact, the controlling track circuit is energized by the transformer and is connected through a portion of the train controlling circuit by means of train contact 26, etc. as previously described. In this manner the local controlling circuit controller 28 is energized by the track controlling circuit as is also the magnet 30. 28 holds 22, 23 closed and 30 maintains the safety indication on the train. As the train contact 26 leaves the track contact 37, 26 closes against contact 25 restoring the local controlling circuit to its normal condition. A second test of the block in advance of the train is made when train contacts 15 and 26, respectively, engage the second pair of track contacts 8 and 35. The operation of this second test is precisely similar to that of the first test described. In fact, similar tests may be repeated wherever desired merely by providing additional pairs of track contacts similar to 6, 37 and 8, 35.

The operation of the circuits just described has been for a clear block. However, if when the train contacts 15 and 26 engage the track contacts 6 and 37, the block 2, 5 is dangerous, the local controlling circuit controller 28 will not be energized by the track controlling circuit, since a train in block 2, 5 would shunt this controlling current through its wheels and axles or a break in the rails would form a break in the track controlling circuit. Thus in case of danger when train contact 26 breaks the local controlling circuit at 25 this local controlling circuit is also broken by circuit closer 22, 23 which operates to lock the circuit at danger even after the contact 26 reëngages contact 25. If this

local controlling circuit controller 22, 23, 28 were not provided the engineer would receive a safety indication even when the block 2, 5 was dangerous as soon as contact 26 reengages contact 25. This safety indication would be false and obviously highly dangerous although a second test of the block would be obtained upon reaching the track contacts 8 and 35.

If a safety indication were obtained at a first test at track contacts 6 and 37, and after passing these contacts the block 2, 5 had become dangerous, this dangerous condition would be communicated to the engineer upon reaching the second set of track contacts 8, 35. Upon leaving these track contacts 8, 35 the controller 22, 23 and 28 would operate to lock the controlling circuit and the signals controlled thereby at danger.

It is preferable to locate the first set of test contacts 6 and 37 considerably in advance of the block protected while the second set of contacts 8 and 35 may preferably be located at the entrance to the block, thus two tests, one considerably in advance of the block and one made upon entering the block are insured.

Control of the operating circuits for the safety danger devices is obtained through the magnet 30 in the local controlling circuit which operates the armature 52. When this magnet is energized the local operating circuit includes the contact 50 and the safety portion of the safety danger devices. When the magnet 30 is deënergized, its armature 52 is in contact with front contact 51 and the local operating circuit is through the danger portion of the safety danger devices.

Obviously it would be possible to combine the magnets 30 and 28 so that a single magnet, such as 30, would control not only the circuits 52, 50 etc. and 52, 51 etc.. but also the circuit through 22, 23 etc.

Although generator 13 is designated or being of the alternating type as are likewise the transformer at the blocks, never the less, under some conditions, it might be desirable to employ a D. C. generator and rotary converters in place of the transformer. Also the generator for the supply circuit may be located as desired within the scope of the claims.

It will be understood that the details of this invention may be variously modified without departing from the scope thereof and it will further be understood that the apparatus and some of the circuits may successfully be operated in conjunction with various arrangements of cooperating circuits, although what has been illustrated and described are considered to be preferable.

What we claim and desire to secure by Letters Patent is:—

1. In an electric signaling system for railways, the combination of a train signal; a signal operating circuit on a train; a signal controlling circuit on a train; a track circuit; and a controller on a train for the signal controlling circuit operated and controlled by the track circuit.

2. In an electric signaling system for railways, the combination of a signal; a train controller; a combined signal and train-controller operating circuit; a controlling circuit; a track circuit; and a controller for the controlling circuit operated and controlled by the track circuit.

3. In an electric signaling system for railways, the combination of a signal on a train; a train-controller on a train; a combined signal and train-controller operating circuit on a train; a controlling circuit on a train; a track circuit; and a controller operated and controlled by the track circuit.

4. In an electric signaling system for railways, the combination of a signal on a train; a train controller on a train; a combined signal and train controller operating circuit on a train; a controlling circuit on a train; a track circuit; and a controller on a train operated and controlled by the track circuit.

5. In an electric signaling system for railways, the combination of a supply circuit; a generator therefor located on the train; a controlling track circuit; a signal; an operating circuit, therefor; a signal controlling circuit; and a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

6. In an electric signaling system for railways, the combination of a supply track circuit; a generator therefor located on the train; a controlling track circuit; a signal; an operating circuit therefor; a signal controlling circuit; and a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

7. In an electric signaling system for railways, the combination of a supply track circuit including a transformer; a generator therefor; a controlling track circuit; a signal; an operating circuit therefor; a signal controlling circuit; and a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

8. In an electric signaling system for railways, the combination of a supply track circuit including a transformer; a generator therefor; a controlling track circuit including a transformer; a signal; an operating circuit therefor; a signal controlling circuit; and a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

9. In an electric signaling system for railways, the combination of a supply track circuit including a transformer; a generator therefor on a train; a controlling track circuit including a transformer; a signal; an op-

erating circuit therefor; a signal controlling circuit; and a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

10. In an electric signaling system for railways, the combination of a signal; an operating circuit therefor; a controlling circuit therefor including a controller for the operating circuit; a controller for the controlling circuit; a circuit breaking train contact and a controller circuit closer in the controlling circuit.

11. In an electric signaling system for railways, the combination of a signal; a signal operating circuit; a normally closed signal controlling circuit; a controller for the signal operating circuit; a controller for the signal controlling circuit; a circuit breaking train contact operating to break the normal controlling circuit when the train reaches a predetermined point.

12. In an electric signaling system for railways, the combination of a signaling circuit; a controlling circuit therefor normally including a generator; a controller for the controlling circuit; and a circuit breaking train contact and a circuit closer operated by the controller in the normal controlling circuit.

13. In an electric block signaling system for railways, the combination of a supply track circuit; a generator therefor; a controlling track circuit comprising a track contact at the entrance to the preceding block, a second track contact at the end of the preceding block, one rail of the block, a transformer and a return rail; a signal operating circuit on a train; a signal controlling circuit on a train; a controller for the signal controlling circuit operated and controlled by the controlling track circuit.

14. In an electric signaling system for railways, the combination of a local signal controlling circuit including a controller for said controlling circuit; a circuit closer operated by said controller; an equalizing shunt resistance associated with said circuit closer; and a circuit breaking train contact for said controlling circuit.

15. In an electric signaling system for railways, the combination of a signal controlling circuit on a train normally including a local generator; a track circuit; a circuit breaking train contact operating to cut out the local generator from the controlling circuit and to cut in the track circuit when the train reaches a predetermined point.

16. In an electric block signaling system for railways, the combination of a supply track circuit including a track contact, one coil of a transformer and one rail of the block; a generator therefor on a train; a controlling track circuit including a track contact, the other coil of the transformer and both rails of the block; a signal on the train; a signal operating circuit on the train; a signal controlling circuit on the train normally including and closed through the generator, a signal controller, a controller for the controlling circuit, a circuit breaking train contact, and a circuit closer operated by the said controlling circuit controller; and said circuit breaking train contact, when the train reaches a predetermined point, operating to cut out the generator from the controlling circuit and cut into the controlling circuit the controlling track circuit.

17. In an electric signaling system for railways, the combination of a generator on a train; a transformer in the block arranged to be energized by said train generator; a controlling track circuit including said transformer and a track contact; a signal and a signal operating circuit on the train; a signal controlling circuit on the train normally closed through a signal controller, a magnetic controller for the controlling circuit, a circuit breaking train contact, a circuit closer operated by said magnetic controller, and the generator; said circuit breaking train contact operating, when the train reaches a predetermined point, to cut the controlling track circuit into the said controlling circuit on the train and to break the normal controlling circuit on the train at two points in case of "danger."

18. In an electric signaling system for railways, the combination of a generator on a train; a controlling track circuit operated by said generator, including two separated track contacts; a signal controlling circuit on the train normally including the train generator, a controller for the said controlling circuit on the train, a circuit closer operated by said controller and a circuit breaking train contact; said train contact operatively engaging each of the track contacts when the train reaches predetermined points, then breaking the normal signal controlling circuit on the train and cutting the controlling track circuit into said signal controlling circuit on the train and in case of danger breaking said controlling circuit on the train at two points.

19. In an electric block signaling system for railways, the combination of a controlling track circuit for each block; a normally closed controlling circuit on a train; means in advance of each protected block to break the normal signal controlling circuit on the train at two points and to cut the controlling track circuit into said signal controlling circuit on the train.

20. In an electric block signaling system for railways, the combination of a controlling track circuit for each block; a normally closed controlling circuit on a train; a plurality of separated means in advance of each protected block each to break the normal signal con-

trolling circuit on the train at two points and to cut the controlling track circuit into said signal controlling circuit on the train.

21. In an electric block signaling system for railways, the combination of a normally closed signal controlling circuit on a train; means on the train to break the normal signal controlling circuit at two points when the train reaches a predetermined position in advance of a protected block; a controlling track circuit at the protected block independently to operate the signal controlling circuit on the train and then cause it to assume its normal condition when and only when the block is safe.

22. In an electric signaling system for railways, the combination of a supply circuit; an alternating generator therefor; a controlling track circuit; a signal; an operating circuit therefor; a signal controlling circuit; and a magnetic controller for the signal controlling circuit operable and controllable by alternating current from the controlling track circuit.

23. In an electric signaling system for railways, the combination of a supply track circuit; an alternating generator therefor on a train; a controlling track circuit; a signal; an operating circuit therefor; a signal controlling circuit; and a magnetic controller for the signal controlling circuit operable and controllable by alternating current from the controlling track circuit.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

EDWARD L. ORCUTT.
RICHARD SHELDON.

Witnesses:
IDA G. GILMORE,
LEONARD DAY.