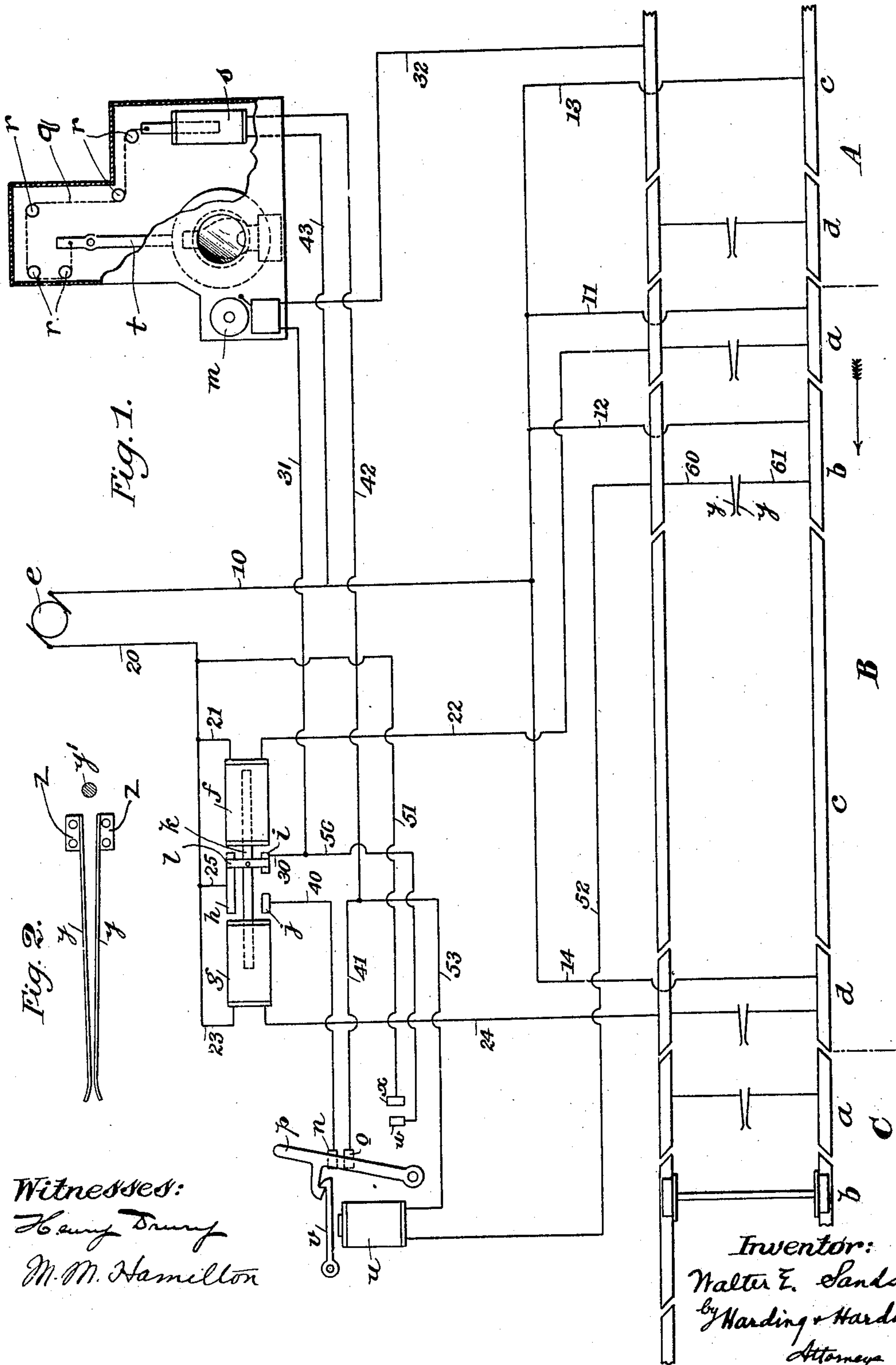


No. 836,895.

PATENTED NOV. 27, 1906.

W. E. SANDS.  
ELECTRIC BLOCK SIGNAL.  
APPLICATION FILED DEC. 29, 1905.



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# UNITED STATES PATENT OFFICE.

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## ELECTRIC BLOCK-SIGNAL.

No. 836,895.

Specification of Letters Patent.

Patented Nov. 27, 1906.

Application filed December 29, 1905. Serial No. 293,720.

*To all whom it may concern:*

Be it known that I, WALTER E. SANDS, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Electric Block-Signals, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object certain improvements in electric block-signals in which a road is divided into sections and a train or car in a given block arranges an electric circuit in such a manner that a danger-signal is set for a second train or car entering the block behind and an alarm started at the side of the track and in which when the first train or car emerges from the block the signal is set to "safety" and the alarm stopped.

The invention is in some respects an improvement on the invention set forth in my application filed March 8, 1905, Serial No. 250,702.

The more specific object of the present invention is to improve the signaling mechanism set forth in said application by rendering its operation certain even when the normal danger-signal and alarm-setting mechanism is rendered inoperative. This is accomplished by the addition of a safety-set section to the block-section of my prior application and by a modification of and addition to the mechanism and electrical connections set forth in my prior application.

In the drawings, Figure 1 is a diagrammatic view of the entire system. Fig. 2 is a detail plan view of supplemental contact-strips for the several block-sections.

The track is divided into a series of blocks separated or insulated from each other, each block consisting of a "setting-section" *a*, a "safety-set section" *b*, a main section *c*, and a "releasing-section" *d*. In the drawings there are shown one complete block B and parts of two other blocks A and C.

The designed operation is as follows: A train or car traveling in the direction of the arrow and entering block B first enters setting-section *a* and establishes an open circuit to the signaling mechanism, including the main section *c* of block A, which is closed by

another train entering the main section *c* of block A, thus setting the signaling mechanism to "danger." The first train then enters the safety-set section *b*, which is normally inoperative; but if the setting-section fails to work then the safety-set mechanism becomes operative and performs the function normally performed by the setting-section *a*. The first train after traversing the main section *c* of block B enters the releasing-section *d* and establishes a circuit to the signaling mechanism including the main section *c* of block A, which is closed by the second train on main section *c* of block A, thus setting the signaling mechanism to "safety." The means whereby these results are secured are comprised in the mechanism and electrical connections that will now be described.

*e* is the source of electric supply, from one pole of which extends the wire 10, which is connected by means of wire 11 with one rail of the setting-section of block B, by wire 12 with one rail of the safety-set section of block B, by wire 14 with one rail of the releasing-section of block B, and by wire 13 with one rail of the main section of block A.

From the other pole of the source of supply extends the wire 20. Wire 20 is connected by wire 21 with one pole of the solenoid *f*, whose other pole is connected by wire 22 with the other rail of the setting-section *a* of block B. Wire 20 is also connected by wire 23 with one pole of the solenoid *g*, whose other pole is connected by wire 24 with the other rail of the releasing-section *d* of block B.

*h* is a contact-strip between the two solenoids *f* and *g* and connected by wire 25 with wire 20. *i* and *j* are contact-pieces respectively opposite the opposite ends of contact-strip *h*. The solenoids *f* and *g* have a common core *k*, to which is secured a cross-piece *l*, the core and cross-piece constituting, in effect, an armature or switch common to both solenoids. When the solenoid *g* is excited, the core *k* is drawn to the left, causing the cross-piece *l* to electrically connect *h* and *j*. When the solenoid *f* is excited, the core *k* is drawn to the right, causing the cross-piece *l* to electrically connect *h* and *i*.

30 is a wire connected to contact-piece *i*. 31 and 50 are branch wires extending from



wires 30. Wire 31 extends to an alarm *m*, which is connected by wire 32 with the other rail of main section *c* of block A.

40 is a wire connecting contact-piece *j* with a contact-piece *n*. *o* is a contact-piece normally electrically connected with contact *n* by means of the pivoted switch-lever *p*. 41 42 are wires connecting contact-piece *o* and one pole of the solenoid *s*. The other pole of the solenoid is connected by wire 43 with the wire 10.

The core of the solenoid *s* is connected by a cord *q*, passing over a series of pulleys *r*, with the semaphore *t*. It will be understood that when the solenoid *s* is not energized, gravity moves the semaphore *t* to the illustrated position signifying "danger." When the solenoid *s* is energized, the semaphore *t* is moved to "safety."

While the source of current-supply *e* is diagrammatically illustrated and shown as connected with but a single block, it will be understood that the most convenient arrangement will ordinarily be to provide a single source of supply at the end of a long transmission-line extending throughout the length of the line of way with which each block is connected in shunt-circuit.

When the track is vacant, the core of solenoids *f* and *g* is in its left-hand position, thus establishing the following circuit: from source of supply through wires 20 and 25, contact-strip *h*, cross-piece *l*, contact-piece *j*, wire 40, contact *n*, lever *p*, contact *o*, wires 41 and 42, solenoid *s*, and wires 43 and 10, thus exciting the solenoids *s* and setting the signal *t* to "safety." When a train or car reaches the setting-section *a*, the following circuit is established: from the source of supply through wires 10 and 11, car-axles, wire 22, solenoid *f*, and wires 21 and 20 to the source of supply. This energizes solenoid *f* and pulls core *k* to the right, opening the circuit to the solenoid *s* and setting the signal to "danger." When a second train or car reaches the main section *c* of block A, the following circuit is established: from the source of supply through wires 10 and 13, car-axles, wire 32, alarm *m*, wires 31 and 30, contact *i*, cross-piece *l*, contact-strip *h*, and wires 25 and 20 to the source of supply. Thus the car or train on block A is notified, both by the danger-signal and the alarm, that a car or train is on the block ahead.

When the first-mentioned train or car on block B reaches the releasing-section *d*, the following circuit is established: from the source of supply through wires 10 and 14, car-axles, wire 24, solenoid *g*, and wires 23 and 20 to the source of supply. This energizes solenoid *g*, drawing the core to the left, closing the circuit through the solenoid *s*, thereby setting the signal to "safety" and opening the circuit through the alarm. The train or car on block A is thus notified that block B is clear.

The foregoing operation is the normal one; but experience has shown that there is always a possibility that the setting mechanism will fail to work, due to sand on the rails, for instance, or to other causes. A perfect signaling system must be one that can be relied upon to always work, at least so far as concerns the setting of the signaling mechanism to "danger." The possibility of a failure in this respect is obviated by the interposition of the safety-set section *b* between the setting-section *a* and the main section *c* and the mechanism and connections that will now be described.

*u* is a magnet connected to the other rail of the safety-set section *b* by means of the wire 52 and to the junction of wires 41 and 42 by means of wire 53. The armature *v* of the magnet in its normal position engages the lever *p* and holds it in the illustrated position. *w x* are two contact-pieces normally separated and connected, respectively, to wire 50 and wire 51, the latter connecting with wire 20.

It will be understood that if the setting mechanism works properly when a train or car reaches the setting-section *a* the solenoid *f* will move the cross-piece *l* to the position illustrated, breaking the connection between contacts *h* and *j*. Therefore when the train or car reaches the safety-set section *b* the circuit through the magnet *u*, while closed between the rails of section *b*, will be open between contacts *h* and *j*, and the magnet will not be energized. If, however, the setting mechanism has failed to work, the solenoid-core *k* and cross-piece *l* will remain in the left-hand position, and when the train or car reaches the safety-set section *b* the following circuit will be established: from the source of supply through wires 10 and 12, car-axles, wire 52, magnet *u*, wire 53, wire 41, contact *o*, switch-lever *p*, contact *n*, wire 40, contact *j*, cross-piece *l*, contact *h*, and wires 25 and 20 to the source of supply. The magnet *u* thus energized attracts the armature *v*, which releases the switch-lever *p*, and the latter falls into position to span the contacts *w* and *x*. When the second train reaches the main section *c* of block *a*, the following circuit is established: from the source of supply through wires 10 and 13, car-axles, wire 32, alarm *m*, wires 31 and 50, contact *w*, switch-lever *p*, contact *x*, wires 51 and 20 to the source of supply. This operates the alarm. The circuit to solenoid *s* remains open, owing to the breaking of connection between contacts *n* and *o*, and hence the signal remains at "danger." This condition continues until the switch-lever *p* is reset to its normal position, when the circuit to the alarm is broken and the circuit to the solenoid *s* closed, thus setting the signal to "safety." The switch-lever *p* is of course not set until the first train or car passes out of block B onto block C.



It will be understood that there is a separate set of mechanism corresponding to that described, connected with the setting, safety-set, and releasing sections of each block and the main section of the preceding block.

While both rails of the track are shown insulated or separated from each other at the junction of the sections, it is not necessary to so insulate or separate the sections of rail connected with wire 10, as the rail-sections connected with wire 10 may be a continuous rail.

It will be understood that the releasing-section may be considered to be either a part of the block behind it or a part of the block ahead of it or as constituting merely a means for separating the two blocks, although I have for convenience preferred to assume it to be a part of the block behind it.

Instead of depending upon the rails and car-axles to close the circuits I may provide the contact-strips shown in detail in Fig. 2 and in diagram in Fig. 1. These contacts each consist of strips *y y*, one or both of which are flexible and secured, respectively, preferably at their ends, to the supports *z z*. These contacts are located, preferably, between the tracks and are connected by wires 60 and 61 with the opposite rails of the section, or wire 60 may be connected directly with wire 10 and wire 61 directly with the wire 22, 52, 32, or 24, leading to the corresponding section. The circuit is closed by means of an arm *y'* on the car, which enters the space between the contact-strips *y y* at their supported ends and during its travel spreads the strips apart, maintaining contact with both and emerging from between the strips at their opposite free ends. The contact-strips, if desired, may be exclusively relied upon to control the various circuits and may thus themselves constitute the several sections embodied in my system, although it is preferred to use them, when used at all, conjointly with the rail-sections, so as to insure the establishment of the various circuits with absolute certainty.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The combination, with a track having blocks; and a setting-section, a safety-set section, and a releasing-section in each block; of a source of current-supply, electric connections from the source of current-supply including said sections, signal mechanism, a circuit including the signal mechanism, means on the car adapted to close the circuits through the several sections, and means actuated by the closing of the circuits through the several sections, to control the signal-circuit.

2. The combination with a track having blocks; and a setting-section, a releasing-section, a safety-set section and a main section

in each block; of a source of current-supply, circuits including said sections, an alarm in the main-section circuit, means on the car adapted to close the circuits through the several sections, and means, actuated by the closing of the circuits through the several sections, to control the alarm-circuit.

3. The combination with a track having blocks; and a setting-section, a releasing-section, a safety-set section and a main section in each block; of a source of current-supply, circuits including said sections, an alarm in the main-section circuit, signal mechanism, a circuit including the signal mechanism, means on the car adapted to close the circuits through the several sections, and means, actuated by the closing of the circuits through the several sections, to control the alarm and signal circuits.

4. The combination with a track having blocks, and a setting-section and a safety-set section in each block of a source of current-supply, signal mechanism, a circuit including the signal mechanism, a circuit including the setting-section, a circuit including the safety-set section, means actuated by the closing of the setting-section circuit, to open the circuit to the signal mechanism and the safety-set-section circuit, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to open the circuit to the signal mechanism.

5. The combination with a track having blocks, and a setting-section, a safety-set section and a releasing-section in each block, of a source of supply, a signal mechanism, a circuit including the signal mechanism, circuits including respectively the setting-section, the releasing-section and the safety-set section, means, actuated by the closing of the setting-section circuit, to open the circuit to the signal mechanism and the safety-set-section circuit, means, actuated by the closing of the releasing-section circuit, to close the circuit to the signal mechanism, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to open the circuit to the signal mechanism.

6. The combination with a track having blocks, and a setting-section, a safety-set section and a main section in each block, of a source of supply, circuits including respectively the setting-section and the safety-set section, an alarm, two circuits including the alarm, and the main section, means, actuated by the closing of the setting-section circuit, to open the safety-set-section circuit and also, when the main-section circuit is closed, to close one of the circuits to the alarm; and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to close the other circuit to the alarm when the main-section circuit is closed.



7. The combination with a track having blocks; and a setting-section, a releasing-section, a safety-set section and a main section in each block; of a source of current-supply, an alarm, two circuits each including the main circuit and the alarm, circuits including respectively the setting-section, the releasing-section and the safety-set section, means, actuated by the closing of the setting-section circuit, to open the safety-set-section circuit and also, when the main-section circuit is closed, to close one of the circuits to the alarm, means, actuated by the closing of the releasing-section circuit, to open both circuits to the alarm, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to close the other circuit to the alarm when the main-section circuit is closed.

8. The combination with a track having blocks; and a setting-section, a releasing-section, a safety-set section and a main section in each block; signal mechanism, a circuit including the signal mechanism, circuits including respectively the setting-section and the safety-set section, an alarm, two circuits including the alarm and the main section, means, actuated by the closing of the setting-section circuit, to open the circuit to the signal mechanism and the safety-set-section circuit, and also, when the main-section circuit is closed, to close one of the circuits to the alarm, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to open the circuit to the signal mechanism and also, when the main-section circuit is closed, to close the other circuit to the alarm.

9. The combination with a track having blocks; and a setting-section, a releasing-section, a safety-set section and a main section in each block; of a source of current-supply, signal mechanism, a circuit including the signal mechanism, an alarm, two circuits each including the main section and the alarm, circuits including respectively the setting-section, the releasing-section and the safety-set section, means, actuated by the closing of the setting-section circuit, to open the circuit to the signal mechanism and the safety-set-section circuit and also, when the main-section circuit is closed, to close one of the circuits to the alarm, means, actuated by the closing of the releasing-section circuit, to close the circuit to the signal mechanism and open both circuits to the alarm, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to work, to open the circuit to the signal mechanism and also, when the main-section circuit is closed, to close the other circuit to the alarm.

10. The combination with a track having blocks, and a setting-section and a safety-set section in each block, of a source of current-

supply, signal mechanism, a circuit including the signal mechanism, a circuit including the setting-section, a circuit including the safety-set section, two switches interposed in the signal-circuit, means, actuated by the closing of the setting-section circuit to open one of said switches and means, actuated by the closing of the safety-set section when the first-named means fails to operate, to open the other switch.

11. The combination with a track having blocks, and a setting-section and a safety-set section in each block, of a source of current-supply, signal mechanism, a circuit including the signal mechanism, a circuit including the setting-section, a circuit including the safety-set section, two switches, each interposed in both the signal-circuit and the safety-set-section circuit, means, actuated by the closing of the setting-section circuit, to open one of said switches, and means, actuated by the closing of the safety-set section when the first-named means fails to operate, to open the other switch.

12. The combination with a track having blocks, and a setting-section, a safety-set section and a main section in each block, of a source of supply, circuits including respectively the setting-section and the safety-set section, an alarm, two circuits including the alarm and the main section, two switches, one adapted to be interposed in each alarm-circuit, means, actuated by the closing of the setting-section circuit, to close one of said switches, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to close the other of said switches.

13. The combination with a track having blocks, and a setting-section, a safety-set section and a main section in each block, of a source of supply, circuits including respectively the setting-section and the safety-set section, an alarm, two circuits including the alarm and the main section, two switches, one adapted to be interposed in one alarm-circuit and the other adapted to be interposed in the other alarm-circuit and both of them normally interposed in the safety-set-section circuit, means, actuated by the closing of the setting-section circuit, to operate one switch to open the safety-set-section circuit and close one alarm-circuit, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to operate the other switch to open the safety-set-section circuit and close the other alarm-circuit.

14. The combination with a track having blocks, and a setting-section, a safety-set section and a main section in each block, of a source of supply, an alarm, signal mechanism, two circuits each including the alarm and main section, circuits respectively including the setting-section and the safety-set section,



two switches, one adapted to be interposed in the signal-circuit and one alarm-circuit and the other adapted to be interposed in the signal-circuit and the other alarm-circuit, means, 5 actuated by the closing of the setting-section circuit, to move one of said switches to open the signal-circuit and close one alarm-circuit, and means, actuated by the closing of the safety-set section when the first-named 10 means fails to operate, to move the other switch to open the signal-circuit and close the other alarm-circuit.

15 15. The combination, with a track having blocks, and a setting-section, a safety-set section and a main section in each block, of a source of supply, an alarm, signal mechanism, two circuits each including the alarm and main section, circuits respectively including the setting-section and the safety-set section, two switches, each adapted to be interposed in the signal-circuit and the safety-set-section circuit, one switch adapted to be interposed in one alarm-circuit and the other switch in the other alarm-circuit, means actuated by the closing of the setting-section circuit, to move one of said switches to open the signal-circuit and the safety-set-section circuit and close one alarm-circuit, and means, actuated by the closing of the safety-set-section circuit when the first-named means fails to operate, to move the other of said switches to open the signal-circuit and the safety-set-section circuit and close the other alarm-circuit. 30

35 16. The combination with a track having blocks; and a setting-section, a safety-set section, a main section and a releasing-section comprising each block; of a source of current-supply, a signal-control solenoid, electric connections from one pole of the current-supply to the main section of one block and the other sections of the adjacent block and 40

to the signal-control solenoid, a setting-solenoid and a releasing-solenoid, said solenoids being oppositely acting, an armature common to both solenoids, a contact in connection with the armature in either position of the armature, a second contact with which the armature connects when in one position, a third contact with which the armature connects in its other position, electric connections respectively from the setting-section to the setting-solenoid and from the releasing-section to the releasing-solenoid, a normally disconnected pair of contacts, a normally 45 connected pair of contacts, a switch-lever normally connecting the latter-named pair of contacts, a magnet, the armature whereof normally holds the switch-lever in its normal position, the switch-lever adapted to connect 50 the normally disconnected contacts when released by said armature, an alarm, electrical connections from the other pole of the current-supply respectively to the setting-solenoid, the releasing-solenoid, the first contact 55 and one of the contacts of the normally disconnected pair, electrical connections from the second contact to the alarm and to the other contact of the normally disconnected pair, an electrical connection from the third 60 contact to one contact of the normally connected pair, electrical connections from the other contact of the normally connected pair to the signal-control solenoid and to the magnet, and electric connections respectively 65 from the safety-set section to the magnet and from the main section to the alarm. 70 75

In testimony of which invention I have hereunto set my hand, at New York, on this 22d day of December, 1905.

WALTER E. SANDS.

Witnesses:

L. A. SQUIER,

THORNLEY B. WOOD.