L. O. DICKEY.

AUTOMATIC BLOCK SIGNAL SYSTEM FOR RAILROADS.

APPLICATION FILED SEPT. 20, 1906.

950,376. Patented Feb. 22, 1910.

2 SHEETS—SHEET 1.

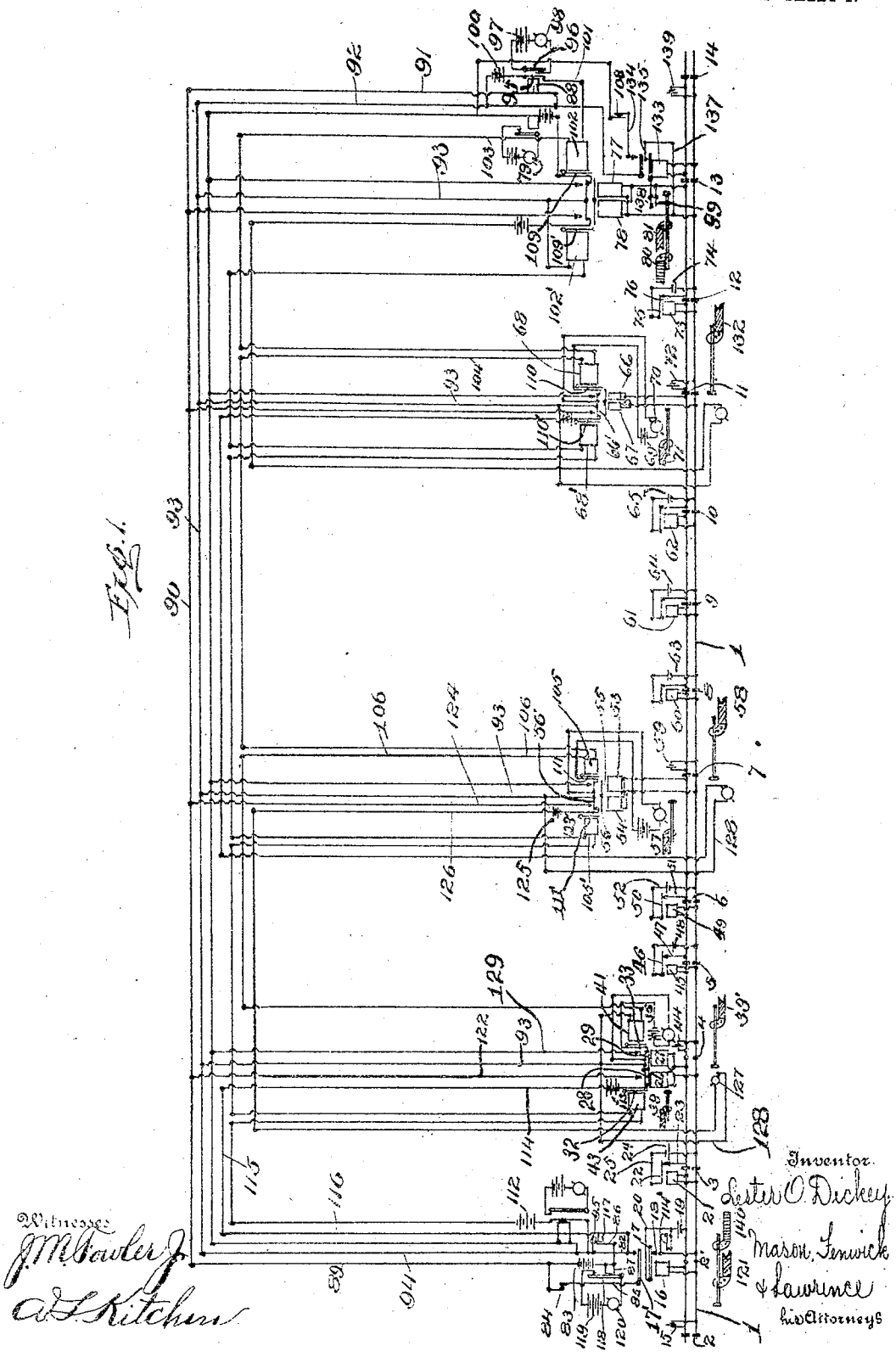

Fig. 1.

Witnesses:
J. M. Bowler
A. L. Ritchen

Inventor:
Lester O. Dickey
Mason, Fenwick & Lawrence
his Attorneys

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2 SHEETS—SHEET 2.

Fig. 2.

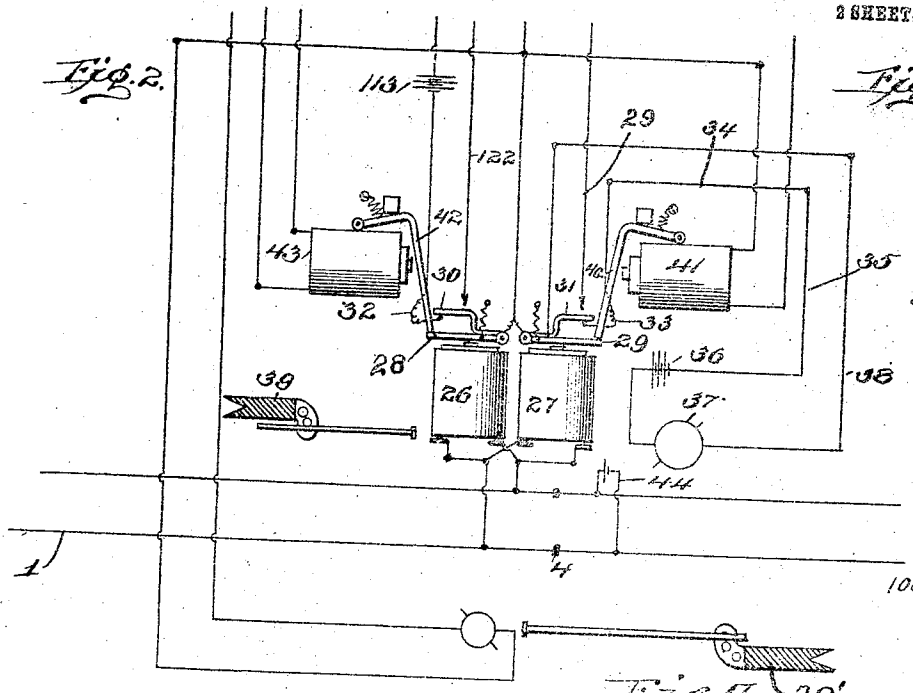


Fig. 5.

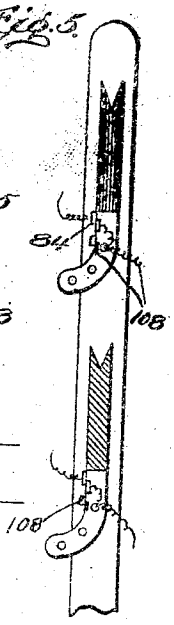


Fig. 4.

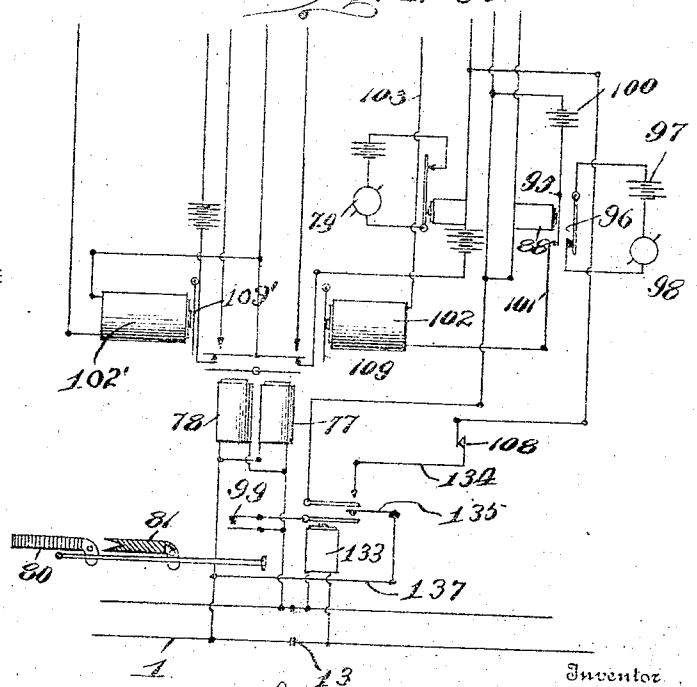
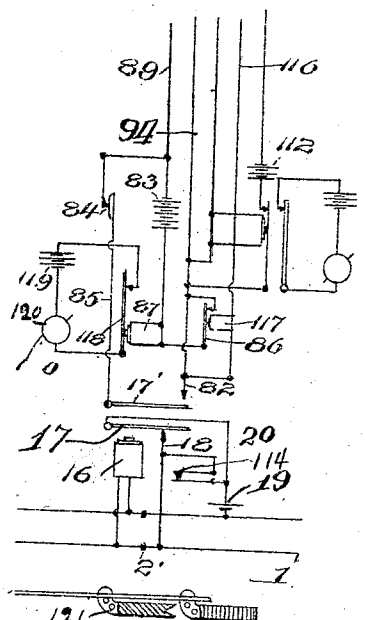


Fig. 3.



Witnesses

J. M. Fowler Jr.

A. S. Kitchin

Inventor

Lester O. Dickey

By Mason Fenwick & Lawrence

Their Attorneys

UNITED STATES PATENT OFFICE.

LESTER O. DICKEY, OF OMAHA, NEBRASKA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE STOTTS SIGNAL COMPANY, OF MARION, IOWA, A CORPORATION OF ARIZONA TERRITORY.

AUTOMATIC BLOCK-SIGNAL SYSTEM FOR RAILROADS.

950,376. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed September 20, 1906. Serial No. 335,461.

To all whom it may concern:

Be it known that I, LESTER O. DICKEY, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Automatic Block-Signal Systems for Railroads; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in automatic block signal systems for railroads.

The invention comprises the production of a system of blocks having a plurality of intermediate blocks located therein, and mechanism for operating signaling devices from either end of the main block and for operating signals in the intermediate sections of the main block as a train passes therethrough.

The invention further comprises the production of a plurality of intermediate blocks in the main block, electrically operated means for throwing signals to danger or to safety in said intermediate blocks as a train passes therethrough, and means for holding the signal at danger at each end of the main block while a train is in said block.

The object in view is the production of a block signaling system in which a signal is thrown to danger at each end of the block when a train enters the same and also throws to danger intermediate signals at predetermined intervals as the train passes through the said block.

A further object in view is the provision of a plurality of signals for a block signaling system that are adapted to be operated and thrown to danger by the entrance of a train into the block and held in that position while the train is in that block regardless of whether or not any other train runs past the signal at either end of the block and enters the same.

With these and other objects in view, the invention comprises certain novel constructions, combinations, and arrangements of parts as will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings: Figure 1 represents a diagrammatic view of a block with my invention applied thereto. Fig. 2 is an enlarged detail view of one of the intermediate signal throwing mechanisms. Fig. 3 is an enlarged detail view of one of the signal throwing mechanisms positioned at one end of the main block. Fig. 4 is an enlarged detail view of a signal throwing mechanism positioned at the end of the main block opposite the mechanism shown in Fig. 3. Fig. 5 is a detail view showing how certain contacts are mechanically broken when the signaling devices are thrown into operation.

The present invention may be used with any desired form of signaling devices or semaphore, but I have shown as a matter of illustration, simply a semaphore in which the blades of the signaling device are in a vertical position when not set for danger and are lowered by electrical devices to a horizontal position when it is desired to indicate a closed track.

Referring more particularly to the drawings, 1 represents a railway track of any usual construction.

2, 2′, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14, represent insulations used in dividing the main block into comparatively small subdivisions, which, in actual practice, are preferably about one-half mile in length.

15 is a battery of any desired construction, but preferably of the closed circuit type and is adapted to keep the track between the insulations 2 and 2′ continually charged and the mechanism connected therewith. In this way, the magnet 16, holds the armature 17 in contact with wire 18. When the armature 17 is thus contacting with the wire 18, a circuit is completed from battery 19 through wire 20, armature 17, wire 18, and that part of the track only which is located between 2′ and 3. By thus closing the circuit of the battery 19, the magnet 21 is kept energized, which, in turn will hold its armature 22 down and contact with a wire 23. By thus holding the armature 22 in contact with the wire 23, the circuit of the battery 24 is closed and permits a current therefrom to flow through wires 25, armature 22, wire 23, and that part of the track that is located between the insulations 3 and 4, and magnets 26 and 27, and then back to the battery 24. When the current thus flows through the magnets 26 and 27, the same will be energized and magnet 27 will operate armatures 29 and 31 so as to cause armature

31 to contact with wire 33. When contact is thus made with the armature 31, a circuit is completed through wires 34, 35, battery 36, a motor 37, and wire 38, for permitting motor 37 to be operated. When the current is completed through the motor 37, the signal 39 is thrown to safety and is held there as long as current flows through the motor or holding magnet. As soon as the magnet 27 releases the armature 31 and permits the same to break contact with the wire 33, the motor 37 will be deprived of its current and will consequently permit the signal 39 to assume a danger position. In order to permit the armature 31 to break contact with the wire 33, the armature 40 must be removed from contact with the end of the armature 29 of the magnet 27. In order to remove the end of the armature 40, from the armature 29, it will be necessary to energize the magnet 41 which will attract the armature 40 and consequently disengage the end of the same from the armature 29, as will be clearly seen in Fig. 2 of the drawings. Magnet 41 is energized by a battery through connecting means, which will be hereinafter fully described. The magnet 26, armatures 28 and 30, together with armatures 42, and magnet 43, all act in the same manner and by similar mechanism as the magnet 27, armatures 29, 31, and 40, and magnet 41, but only for a train running through the block toward the section lying between 2—2′.

At the right of insulation 4, will be seen a battery 44 which is adapted to normally keep charged the track between insulations 4 and 5, and consequently keep energized a magnet 45, which in turn normally holds an armature 46 in contact with wire 47. The contacting of the armature 46 with the wire 47 closes the circuit of battery 48 and therefore permits the same to keep charged that portion of the track lying between insulations 5 and 6, and also keep energized the magnet 49. The magnet 49 holds in contact the armature 50 with the wire 51, and consequently permits the battery 52 to keep charged the track lying between insulations 6 and 7. The current from the track will flow through magnets 53 and 54 and will operate the armatures 55 and 56 in a similar manner to the armatures 28 and 29, as clearly shown in Fig. 2. The operation of the magnets 53 and 54 and surrounding mechanism is identical with the operation of the magnets 26 and 27 and will therefore need no further description. They are, however, placed at any predetermined distance from magnets 26 and 27 so as to operate suitable signals 57 and 58. To the right of the insulation 7, is another battery, or a source of electrical current 59 which charges the track between insulations 7 and 8 and also energizes magnet 60. Magnet 60 being energized will close the circuit of battery 63 which in turn will keep charged the track between insulations 8 and 9. The magnet 61 also will be energized with current from batteries 63. This magnet will act in a similar manner to magnet 60 and close the circuit of battery 64 which in turn will keep charged the track between insulations 9 and 10. The magnet 62 is energized by current from battery 64 when the circuit of the same is kept closed by magnet 61. As will be clearly seen from the drawings magnet 62 keeps the circuit of battery 65 closed in the same manner that magnet 61 keeps closed the circuit of battery 64. The battery 65 will keep charged the track between insulations 10 and 11 and also furnish current for magnets 66 and 67. As the battery 65 forces current through the track located between insulations 10 and 11, it will also energize magnets 66 and 67, which in turn will operate the surrounding mechanism in a similar manner to magnets 26 and 27. The magnets 66 and 67, and surrounding mechanism are identical in structure with magnets 53 and 54 and surrounding mechanism, and also identical with magnets 26 and 27 and surrounding mechanism. When the armature 66′ of magnet 66 is operated it will close the circuit of battery 69 which is similar to that described in relation to battery 36, and will operate the motor 70 which is identical in structure with motor 37 and is adapted to throw and hold to safety signal 71. Armature 110 of magnet 68 is adapted to hold the circuit of battery 69 closed when magnet 68 is deënergized.

Between the insulations 11 and 12, is a battery 72 which normally keeps charged the rails lying between insulations 11 and 12 and also keeps energized the magnet 73 which in turn closes the circuit of battery 74 by means of holding armature 75 in contact with wires 76. In this way, the track between insulations 12 and 13, is normally kept charged which will cause magnets 77 and 78 to be energized and consequently close the circuit of motor 79 which in turn will throw the signals 80 and 81 to safety when said current is not shunted, as will be more clearly hereinafter described.

In order to more clearly set forth the construction and operation of the various devices for throwing the various signals to danger or to safety and also for more clearly presenting the various paths through which the current flows, I will describe the action of a train as the same passes through a block provided with my invention.

When the first pair of wheels passes over insulation 2 as the train enters the block, it will short circuit or shunt a major part of the current of battery 15 from the magnet 16 and consequently permit the magnet 16 to release the armatures 17 and 17′. When the armatures 17 and 17′ are thus released,

they will break contact with wire 18 and make contact with wire 82. When armature 17′ has made contact with wire 82 battery 83, which normally supplies current to magnet 88 at the opposite end of the block, will be short circuited. The current will, by reason of this short circuit, shunt magnet 88 and pass for a short distance along wire 89 through switch, or contact member 84, wire 85, armature 17′, wire 82, armature 86, and through magnet 87 back to the battery. By thus shunting the current from battery 83 the magnet 88 at the opposite end of the block will be deënergized. As the relay or magnet 88, is de-magnetized by short circuiting, or by opening the circuit, it releases the armatures 95, and 96, which in turn opens the circuit of battery 97, and thus deprives the motor 98 of electrical energy which will consequently permit the semaphore 80 to fall to danger and consequently close mechanically the contact 99, which is of a similar construction as that shown in Fig. 5 at 84. At the same time that the contact 99 is closed, the contact 108 of a similar construction to contact 99, is broken. In Fig. 5 of the drawing, will be seen one form of device that discloses a mechanical means for making contact at this point. At the same time that the circuit of battery 97 is opened, the battery 100 is opened by the armature 95 breaking contact with wire 101. Before the contact with wire 101 was broken, the current from battery 100 flowed through armature 95, wire 101, magnet 102, wire 103, magnet 68, wire 104, magnet 105, wire 106, magnet 41, and back through a common return 93, wire 92, back to the battery 100. When the circuit of the battery 100 is broken, the magnets 102, 68, 105, and 41 are de-magnetized and consequently allow the armatures 109, 110, 111, and 40, to swing into the path of movement of the armatures of magnets 77, 66, 53, and 27, and consequently prevent the same from operating. All these magnets and armatures are held out of operation until the train has proceeded entirely through the block and has allowed battery 83 to energize the magnet 88, and consequently close the circuit of the battery 100. As the train proceeds through the preliminary section between 2 and 2′, it is protected at the opposite end of the block by the danger signal 80 which has been thrown into the danger position, as heretofore described. As the first pair of wheels pass over the joint or insulation at 2′, the battery 19 will be short circuited or shunted from the magnet 21 and thus deënergize the same. When the magnet 21 is thus deënergized, it will, of course, release the armature 22, which in turn will open the circuit of battery 24, and consequently deënergize the magnets 26 and 27. The armatures on the relay 27 are locked so that they will not be allowed to break contact with the wire 33. The locking of the armature of magnet 27 is accomplished when the current of battery 83 is cut off from the magnet 88, which in consequence opens the circuit of the battery 100 which is used to energize the magnet 41 and consequently hold the armature 40 out of the path of movement of the armature of magnet 27. The armature of magnet 27 is thus not permitted to move but the armature of magnet 26 is allowed to move and break contact with the wire 32 (see Fig. 2) as the magnet 43 is still energized by current from battery 112. As the armature of magnet 26 opens, the contact is broken from wire 32, thus opening the circuit of battery 113 through the wire 114, wire 115, wire 116, magnet 117, and the common return 93. As the magnet 117 is thus deënergized, the circuit of battery 83 through magnet 87, is opened, and the armature 118 being thus released opens the circuit of battery 119 and consequently deprives motor 120 of current, which in turn will allow the green or caution signal arm 121 at the entrance of the block to fall to danger, and thus warn trains in the rear of the presence of a train in the block. As the armature of magnet 26, is moved or opened and breaks contact with wire 32, it will at the same time contact with wire 122 which is in electrical contact with wire 90 and thus continue to short circuit the current of battery 83 by means of wires 90 and 93 from the magnet 88 at the opposite end of the block. By thus keeping the current of battery 83 from the magnet 88, the danger signal is kept at danger at the end of the block through which the train is passing. As the last wheel of the train passes the insulated joints 2′, the battery 15 again energizes the magnet 16 and operates the armatures 17 and 17′. As the armature 17′ breaks contact with wire 82, it would permit current from the battery 83 to again energize the magnet 88 if the armature of magnet 26 had not broken the current that normally passes through magnet 117, which in turn opens the shunt circuit of battery 83 by means of releasing the armature 86.

As the front pair of wheels of the train passes the insulation at 4, the current from battery 44 is shunted from magnet 45 through the wheels of the train, thus opening or releasing armature 46. By thus releasing armature 46, the circuit of battery 48 is opened and magnet 49 is deënergized, which in turn releases its armature 50. When the armature 50 is thus released, the circuit of battery 52 is opened and consequently the magnets 53 and 54 will be deenergized. The armature of the relay 53 is locked by the armature of the magnet 105, which in turn is similar to magnet 41 and is operated identically with the magnet 41,

more particularly described heretofore. The armatures of magnet 54 however, are permitted to operate so as to break the contact with wire 123 and close contact with wire 124, as the armature 56′ opens the circuit of battery 125, through line wire 126, motor 127, wire 128, the common return 93, wire 124, armature 56′ and wire 123. When this circuit is open, as just described, the motor 127 is deprived of its current and consequently allows the intermediate green or caution arm 39′ to fall to danger and protects the rear end of the train from any train following through the next intermediate section and cannot be cleared or returned to safety until every wheel of the train is out of that section. The armature 30, of magnet 26 in opening after the magnet has become deënergized contacts with wire 122, which, by means of the common return 93, and line wire 90 continues to short circuit the current of battery 83 from the relay of magnet 88, and this continues to leave in position the danger signal at that end of the block. As the rear wheels of the train pass over the insulations 4, the battery 24 again energizes the magnets 26 and 27. As the magnet 26 is thus energized, the armatures 28 and 30 are operated so as to break contact with wire 122 which opens the shunt circuit of battery 83 at this point and closes the circuit of battery 113 through magnet 117. The relay 117 being thus energized, closes the circuit of battery 83 through magnet 87, which, in turn closes the circuit of battery 119 by means of the armature 118. When the circuit of battery 119 is thus closed, the motor 120 is operated to throw the green or caution signal 121 to safety and when so thrown to safety is held in such position by the motor 120 until the circuit of battery 119 is again broken. The train is thus protected in the rear by the green or caution signal 39′ and in front by the red or danger signal 80 at the opposite end of the block. As the train continues to move through the block and passes the insulated joints at relay or magnet 45, the same is again energized by the battery 44. The magnet 45 being energized closes the armature 46 to battery 48 but the current therefrom is shunted from magnet 49 by the train and therefore magnet 49 is not operative until the train passes over the insulation 6 positioned near the magnet 49. It will be evident therefore, that when the train passes the insulation 6, the magnet will be energized by battery 48, but the relay or magnets 53 and 54 are still held out of operation because the current of battery 52 is shunted away from the same through the train. As the train proceeds through the block and the front wheels thereof pass the insulation 7, similar operations of the circuit are had by means of relays or magnets 66 and 67 and the green or caution arm 58 is set for danger and battery 83 is again shunted from the relay or magnet 88 similarly to the way the same is shunted as the train passed magnets 26 and 27.

As the train passes the insulations 7, the green or caution signal arm 39′ is brought to safety but the train is protected in the rear by the caution or signal arm 58 which was thrown to danger as the train passed insulation 7. At the same time, the red or danger signal 80 is still held at danger by reason of the magnet 88 being inoperative and therefore preventing current from flowing to the motor for operating the said signal. Similar operations as those performed at magnets 26 and 27 and magnets 53 and 54 are performed as the train passes insulation 11 which is positioned opposite magnets 66 and 67. As the train passes the insulation 11, the green or caution signal arm 58 is thrown to safety in the same way that the green or caution signal arm 39′ is thrown to safety as the train passes insulation 7. At the same time that the green or caution arm is thrown to safety, the green or caution arm 132 is brought to danger and thus protects the rear of the train while the red or danger arm 80 is still held at danger by reason of current from battery 83, being short circuited, as already stated. As the train passes the last intermediate section over the insulation 13, the current from the magnet or relay 133 is shunted through the train and consequently the armatures of the relay are permitted to open and make contact with wires 134 and 135. The upper armature which contacts with the wire 134 makes no change in the signals or other devices because of the mechanical circuit breaker 108 interposed in the circuit and which is held open by the signal arm 80, when said arm is at danger. The lower armature of magnet 133, however, closes contact with the wire 135, which, by means of wire 137 and the mechanically operated circuit breaker 99, still maintains the shunt of the current of battery 74 from the magnets or relays 77 and 78. The magnets 77 and 78 thus deprived of current allow the green or caution arm 132, and the red or danger arm 80 to remain at danger until the last wheels of the train have passed the insulations 14 and the train has thus entirely cleared the block. When the train has thus cleared the block, the battery 139 will energize magnet 133 causing the armatures thereof to break contact with wire 135 and thus open the circuit that had been previously closed and the battery 74 is permitted to energize the magnets 77 and 78 and consequently permit the magnet 88 to become energized and bring the other devices accordingly into operation for throwing to safety the signal 80. It will be ob-

served that as the train enters the first preliminary section between 2 and 2′ all the magnets on relays 102, 68, 105 and 41 will be demagnetized by the breaking or opening of the circuit of battery 100, which will permit armatures 109, 110, 11 and 40 to swing in the path of the armatures of magnets 27, 53, 66 and 67, thus locking the armatures of the same against movements. The relays 26, 54, 67 and 78 are adapted to only operate the signal on the left of the track except the signal 80. Positioned opposite relays 43, 105, 68′ and 102′ are relays or magnets 41, 105, 68 and 102 which act in a similar manner to those just described, but are used to operate the signals on the right of the track as the train passes from signal 80 to 140.

As will be evident the red or danger signal is always operated at the preliminary section of the block and is held at danger as long as a train is passing through the block. In case a train enters the block from the right and passes from the preliminary section located between 13 and 14 toward the preliminary section 2 and 2′, the red signal 140 will be thrown to danger, and the green or caution signals on the right of the track, in the direction which the train is moving, are operated instead of the signals on the left side of the track. From this, it will be seen that trains moving in either direction will operate only the signals on the right side of the train. In this way any train passing through the block will be protected by a danger signal on the left side of the track in front and a caution signal in the rear on the right of the track. It will also be noted that it would be impossible for a second train which might enter the block in front of the first train and run past the red or danger signal, to operate any of the signals to the left of the first train because they were locked by the first train at the moment it entered the preliminary section. A train which enters the block at signal 80 and sets the danger or red signal 140 to protect itself from the front, will cause by the operation, the mechanical circuit breaker 114′ and 84 to be mechanically opened and held open during the passage of such train through the block, the same being made similar to circuit breaker 84, Fig. 5, and is attached to arm 140. The circuit breaker 84 being open prevents the operation of the green or caution signal 121 by any train which may deliberately run past the red or danger signal 140. Though a train running past the red or danger signal 140 will not be able to throw to danger the green signal 121, it will, however, be able to throw to danger green or caution signal 39, and thus protect itself from the coming train which may be passing between either insulations 10 and 11; 7 and 10, or 4 and 7. In case the first train has not passed the second section, that is, not passed insulation 7, the second train could run into the block and enter the second intermediate section from the signal 140 and operate the green or caution signal 59 in the face of the oncoming train and protect itself therefrom. Of course, the reverse of the above is true, that is, when the first train enters the block at the signal 80 and sets the red or danger signal 140 passing by the red or danger signal 80, which is at danger, it would set the caution signal against the oncoming train. Of course, these operations of signals and adaptability of the same for various purposes, present a structure that is adapted to prevent as far as possible accidents even when only an ordinary amount of care is exercised. In actual practice, of course, any engineer under ordinary circumstances would not run by a red or danger signal, but, as above indicated, in case an engineer did run by, he would be able to see at short intervals the condition of the track just ahead of him. When the block is entirely clear of all trains, the various batteries in contact with the track are permitted to energize the various magnets connected thereto, and in turn permit the remaining batteries of the system to operate the signal operating motors for bringing the same to a safety position and holding the same in that position.

If any of the intermediate sections should break, or for any reason, the electrical circuit should become interrupted, the caution signals at each end of the intermediate sections where the break is located and also the danger signals at each end of the block will be set to danger. This is brought about by the fact that the various batteries which keep constantly charged the rails of the track, will constantly energize the various magnets, which in turn hold various armatures out of contact with various circuits heretofore described, and when any rail is broken, or electrical connection broken, the various batteries cannot keep energized the particular magnet to which the same is normally connected. By the breaking of a rail, the magnet is deënergized, which in turn will permit the armature thereof to make circuit contacts, heretofore described, which in turn will close the circuits of the signal at each end of the block and each end of the intermediate block in which the break is located. In case a rail is broken in a preliminary section at either end of the block, only the danger signal at the opposite end would come to danger.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A block signaling system comprising a signal at each end of said block, a plurality

of signals positioned at regular intervals intermediate the ends in said block, means for operating the signals at each end of said block when a train enters same and for holding one of said signals at danger until the train clears the block and for throwing it to safety after the train has passed the block, and means for holding in the danger position each of said intermediate signals in the rear of said train until the same has cleared the corresponding section of the block and for throwing it to safety after the train has passed said section.

2. A block signaling system comprising a danger and a caution signal at each end of said block, a plurality of caution signals positioned within said block at pre-determined distances, means for operating the danger signal at one end and the caution signal at the other as the train enters said block, and means for successively throwing to danger and to safety the various caution signals within said block as the train passes therethrough.

3. A block signaling system comprising a primary block, intermediate sections positioned in said block, preliminary sections at each end of said block, signals positioned at each end of said primary block, a signal positioned at one end of each of said intermediate sections, means for throwing to danger the signal at one end of the primary block and holding the same at danger during the passage of a train through the block, means for throwing to safety said last mentioned signal, after the train has cleared the block, means for throwing the intermediate signals as the train approaches each of the signals, and means for throwing said intermediate signals to safety when the train has passed the same.

In testimony whereof I affix my signature in presence of two witnesses.

LESTER O. DICKEY.

Witnesses:
E. L. STATES,
R. A. SHULER.