

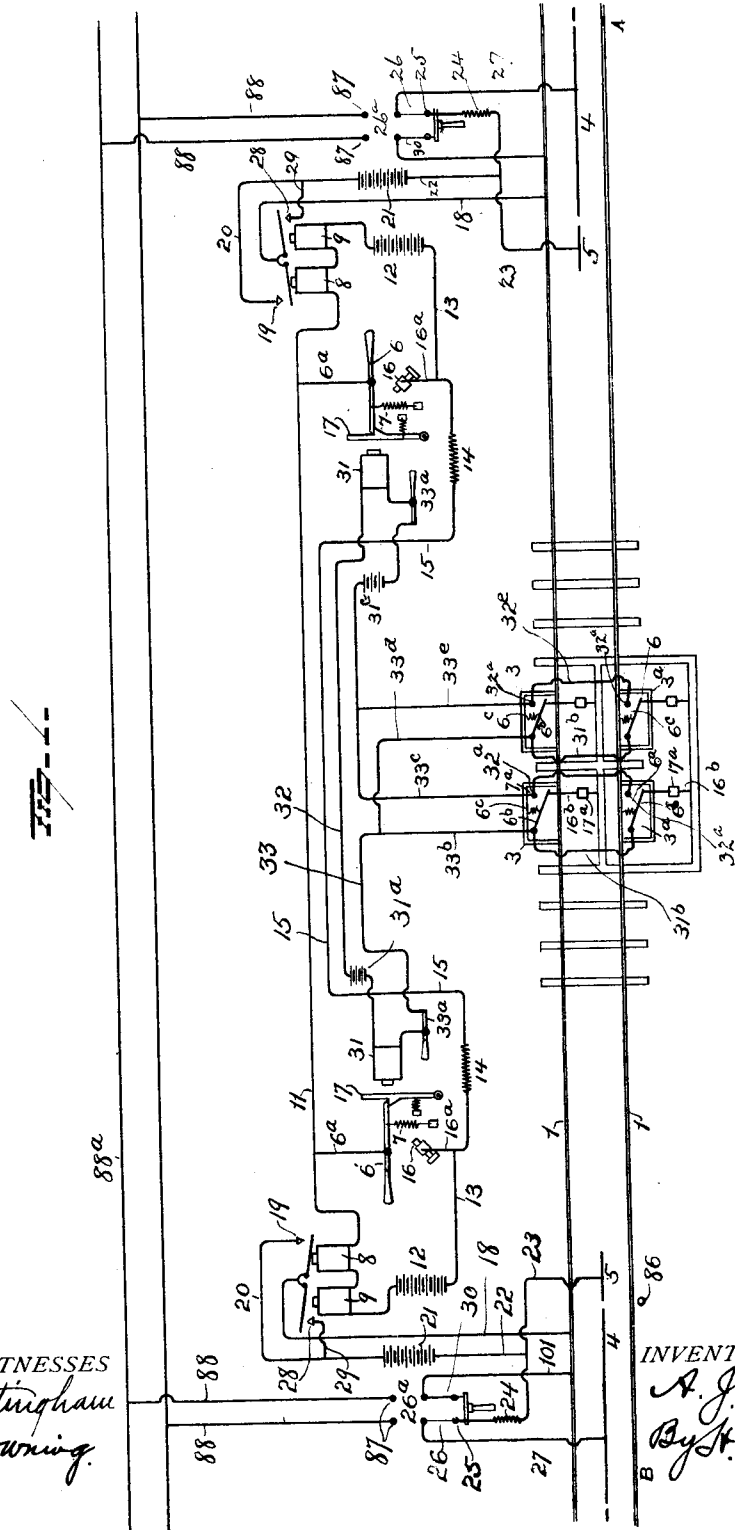
A. J. ALLARD.

ELECTRIC TRAIN SIGNALING AND CONTROLLING MEANS.
APPLICATION FILED OCT. 10, 1910. RENEWED JAN. 28, 1913.

1,060,402.

Patented Apr. 29, 1913.

2 SHEETS—SHEET 1.



WITNESSES
E. Nottingham
G. F. Downing

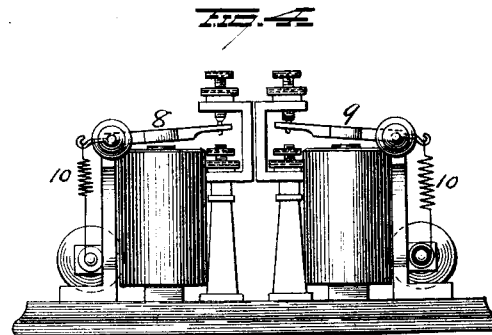
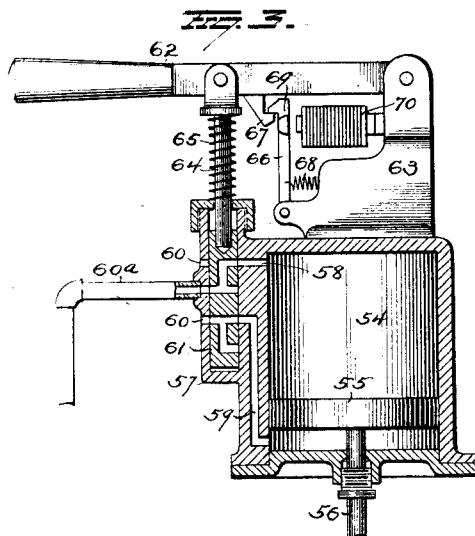
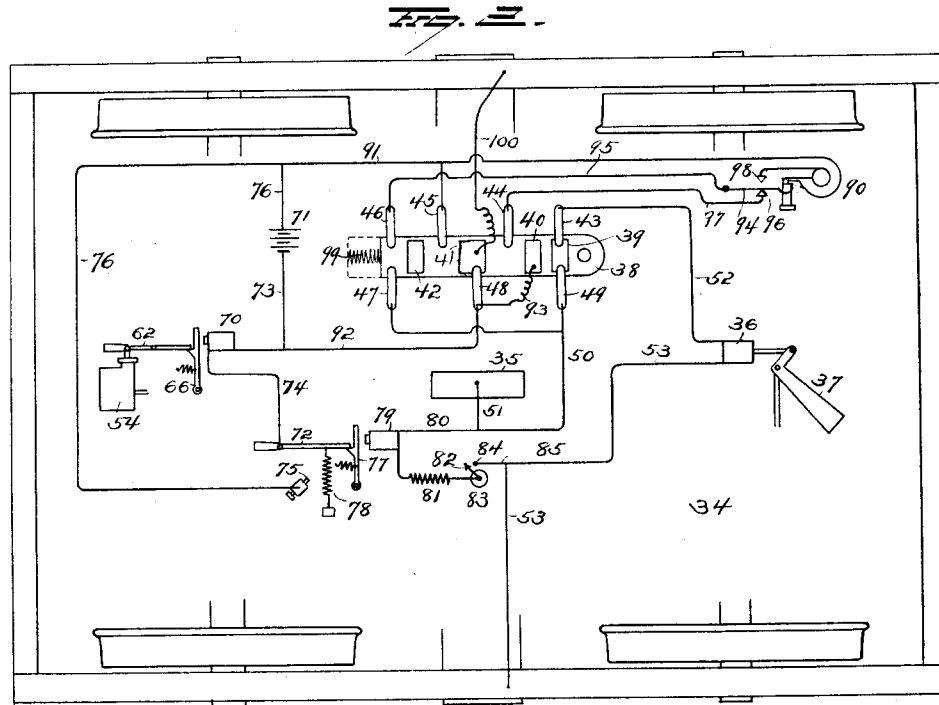
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UNITED STATES PATENT OFFICE.

ANDREW J. ALLARD, OF RICHMOND, VIRGINIA, ASSIGNOR OF ONE-THIRD TO T. F. GREEN AND ONE-THIRD TO DAVID R. CREECY, JR., OF RICHMOND, VIRGINIA.

ELECTRIC TRAIN SIGNALING AND CONTROLLING MEANS.

1,060,402.

Specification of Letters Patent.

Patented Apr. 29, 1913.

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To all whom it may concern:

Be it known that I, ANDREW J. ALLARD, of Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Electric Train Signaling and Controlling Means; 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 electrical train-signaling and controlling means, the object of the invention being to provide means for effectually protecting trains from accident on account of damaged or burned bridges and to so construct a system of circuits and devices that in the event of damage to a bridge, the engineer will be warned, and his train automatically stopped if such warning be disregarded.

With this object in view, the invention consists in certain novel features of construction and combinations of parts as hereinafter set forth and pointed out in the claims.

In the accompanying drawings, Figure 1 is a diagrammatical view illustrating the circuits and devices associated with a bridge. Fig. 2 is a diagrammatical view showing the circuits and devices on a locomotive. Fig. 3 is a detail view of the brake controlling devices, and Fig. 4 is a view of one pair of relays.

1, 1, represent the rails of a track and 2 a bridge.

In Fig. 1 a block of railway is shown extending from A to B, such points being located suitable distances from respective ends of the bridge 2. A plurality of pairs of circuit closers 3, 3^a are secured to the track rails on the bridge, and each of these circuit closers comprises a pivoted arm 6^b and a contact 7^a mounted in a suitable box or casing secured to a track rail. A spring 6^a is provided for the arm 6^b of each circuit closer and tends to move the latter toward the contact 7^a but is normally prevented from thus moving the contact arm by means of a flexible device 10^b. The flexible devices 10^b for the several circuit closers are provided with fusible sections 17^a, and said flexible devices are connected with base timbers of the bridge in such manner that the contact arms of the circuit closers will be

normally held away from the stationary contacts 7^a. The contact arms 6^b of the circuit closers 3, 3^a of each pair are connected by electrical conductors 31^b and the stationary contacts of said circuit closers are connected by electrical conductors 32^a.

At each end of the block, contact rails 4 (each preferably about one-thousand feet in length) are located between the track rails, and near the inner end of each contact rail 4, a shorter contact rail 5 is located, said contact rails being adapted to cooperate with a contact shoe on each locomotive, as hereinafter explained.

Near each end of the block, pairs of relays 8—9 are located, and in order that the armatures of said relays shall respond to currents of different voltages under different conditions, the springs 10 connected with said armatures will be so adjusted that the armature of each relay 8 will be actuated upon the passage of a low voltage current through its coils, and so that the armature of each relay 9 will be actuated only when a current of higher voltage passes through its coils. For convenience the relays 8 will be hereinafter referred to as low voltage relays and the relays 9 will be referred to as high voltage relays. The coils of the relays are included in series with each other and a line wire 11 connects one terminal of the relay magnets at one end of the danger zone or block with the relay magnets at the other end thereof. The other terminal of each pair of relay magnets is connected with a battery 12 and the latter is connected, by a conductor 13 with one end of a resistance 14. The resistance 14 at respective ends of the block are connected by a line wire 15. It will thus be seen that the relay magnets at both ends of the block are included in series in a constantly closed circuit comprising the line wires 11 and 15, batteries 12 and resistance 14, and that, by reason of the resistances 14, the voltage of the current in this circuit is such that the low voltage relay magnets only will be sufficiently energized to actuate their armatures, and hence the local circuits (hereinafter described) controlled by the relays 8 will be open as shown in Fig. 1 of the drawing.

At each end of the block, a switch lever 6 is located and electrically connected with the line wire 11 by means of a conductor 6^a. The switch lever 6 is adapted to be moved

by means of a spring 7, into engagement with a contact 16 electrically connected with the conductor 13 by means of a conductor 16^a, but the switch lever is held normally out of engagement with the contact 16 by means of a latch 17 controlled by an electro-magnet 31. One terminal of the coil of this magnet at one end of the block is connected with one terminal of a battery 31^a, and with the other terminal of this battery, a line wire 32 is connected. The wire 32 extends to the other end of the block and is connected with one terminal of the switch magnet 31 there located. The other terminals of the switch magnets at respective ends of the block are connected, through a line 33, manually-operated switches 33^a and another battery 31^a. The line 33 also includes the circuit closers 3, 3^a at the bridge. That is to say,—the line conductor 33 is divided and connected by conductors 33^b, 33^c with the contact arms 6^b and contacts 7^a of the first pair of circuit closers. A conductor 33^d connects the conductor 33^b with the contact arms of the second pair of circuit closers, and the contacts 32^a of the latter are connected by a conductor 33^e with the line conductor 33.

It will be apparent that the relays at both ends of the block are included in a closed circuit with the batteries 12 and resistances 14, and by reason of said resistance, the voltage of the current in this circuit is sufficient to cause the low voltage relays only to actuate their armatures. Should the base timbers of the bridge give way on account of a wash-out or from other cause, so as to break one or more of the flexible devices 16^b, or should one of the fusible sections 17^a be severed in the event of fire, one or more of the circuit closers 3, 3^a would promptly close the circuit including the batteries 31^a and magnets 31, thus energizing the latter and causing them to withdraw the latches 17. The switch levers 6 will thus be released and their springs will cause them to swing into engagement with the contacts 16. In this manner, a short circuit is established (at each end of the block) between the conductors 11 and 13, and the resistances 14 and the line 15 connecting them, will be short-circuited. The resistance offered by the resistances 14, line 15 and the major portion of line 11, having now been removed from the circuit of batteries 12, said batteries will supply currents of sufficient voltage to energize the high voltage relays and cause the latter to actuate their armatures and close the local circuits of batteries 21, at 28, but as this local circuit includes a track rail and contact rails, it will remain open until a train approaches the block and the contact shoe on the locomotive engages one of said contact rails.

At each end of the block, the armature

of the relays are connected, by means of a conductor 18, with a track rail. The contact 19 of relay 8 is connected by a conductor 20 with one terminal of a battery 21 and the other terminal of this battery is connected by a conductor 22 with a conductor 23. One end of the conductor 23 is connected with a short contact rail 5 and the other end is connected with one terminal of a resistance 24, the other terminal of said resistance being connected with a switch contact 25 with which the arm 26 of a switch 26^a coöperates. This switch is connected, by means of a conductor 27, with a long contact rail 4. The contact 28 for the armature lever of relay 9 is connected, by a conductor 29, with the conductor 20. The switch 26^a comprises two mechanically connected arms 26 and 30 and suitable contacts for said arms.

With the arrangement of circuits above described, it will be seen that when the circuits of batteries 21 are closed by reason of "trouble" at the bridge as above described, said battery will be connected with the long contact rail 4 through the resistance 24 and with the short contact rail 5 with said resistance excluded from the circuit.

Each locomotive is provided with a contact shoe 35 to engage the contact rails 4 and 5, and in the cab of the locomotive, a solenoid 36 is located, the core of this solenoid being connected with a semaphore 37 also located in the cab. A switch 38 is also located in the cab and comprises a longitudinally movable bar provided with a plurality of contact plates 39, 40, 41 and 42, and a plurality of contact arms 43, 44, 45, 46, 47, 48 and 49. The switch arms 43, 49 are normally connected by the contact plate 39, and the arm 49 is connected by conductors 50—51 with the contact shoe 35. The switch arm 43 is connected by a conductor 52 with one terminal of the coil of solenoid 36, the other terminal of said coil being connected, by means of a conductor 53 with the truck frame.

Assume now, that one of the flexible devices 16^b at the bridge has been severed, either by a defect in the bridge structure or by fire, so as to permit the closing of one or more of the circuit closers 3, 3^a; that the high voltage relays have operated to close the local circuits of batteries 21, at 28,—and that a train approaches the block, with its shoe 35 in engagement with the long contact rail 4. Under such conditions, a circuit will be established including battery 21, resistance 24, contact shoe and truck frame of the locomotive, and the circuits on the latter will include the semaphore solenoid. The semaphore in the cab will thus be operated and moved to "danger" or "stop" position,—indicating to the engineer that the bridge is unsafe. Should the engineer dis-

regard such warning, his train will be automatically stopped, by means of appliances and in the manner which will now be explained.

5 A cylinder 54 (shown in detail in Fig. 3) is located on the locomotive and provided with a piston 55, the rod 56 of which is connected with the air-brake valve mechanism (not shown) for operating the same. The
10 cylinder 54 is provided with a valve chamber 57 which communicates with the respective ends of the cylinder by means of ducts 58—59, and said valve casing is also provided with exhaust ports 60. An air supply pipe communicates with the valve chamber between the exhaust ports. A reciprocating valve 61 is located within the valve chamber 57 and provided with suitable ducts for connecting respective ends of the
15 cylinder with the air supply pipe and an exhaust port, alternately so as to cause reciprocation of the piston 55 for operating the valve controlling mechanism of the air brakes. A hand lever 62 is pivoted at one
20 end to a suitable support 63 and this lever is connected, by means of a rod 64 with the valve 61,—said lever being movable in one direction by a spring 65. The valve 61 is maintained normally in the position shown
25 in Fig. 3, by means of a latch 66 pivoted at one end to a fixed support and adapted at its other end to engage a lug or hook 67 on the lever 62, such engagement being normally maintained by means of a spring
30 68. The latch lever 66 is provided with an armature 69 for an electro-magnet 70, and this magnet is controlled by devices presently explained, to actuate the latch lever and release the hand lever 62. When the
35 hand lever shall have been thus released, the spring 65 will be free to shift the valves 61 and thus admit air behind the piston 55 to operate the valve mechanism of the brakes.

45 The brake controlling devices above described will be located in such position under the locomotive that it will be necessary for the engineer to leave his cab before he can reach them for resetting, such resetting
50 being accomplished by operating the hand lever 62 until its latch devices 66—67 become engaged.

The coil of the magnet 70 is included in a normally open local circuit with a battery
55 71 and a switch 72,—this circuit being traced on Fig. 2 as follows: The battery 71 is connected by a conductor 73 with one terminal of the coil of magnet 70 and the other terminal of said coil is connected, by a conductor 74, with the switch lever 72. This
60 switch lever is intended to cooperate with a fixed contact 75 and the latter is connected, by a conductor 76, with the battery 71. This circuit is maintained normally open by the
65 engagement of a pivoted latch 77 with the

switch lever 72 as shown in Fig. 2, and when said switch lever has been released by the operation of the latch lever, it will be thrown, by the action of a spring 78, and be permitted to cooperate with the contact 75
70 to close said local circuit.

The switch devices above described for controlling the local circuit of magnet 70, will also be located under the locomotive, so as to necessitate the engineer leaving the
75 cab to reset them. It is apparent that the engineer cannot reset the brake controlling devices shown in Fig. 3, until he has first reset the switch 72 to open the local circuit including the magnet 70 because the latter
80 would not permit the operation of the latch lever 66 as long as the magnet 70 remains energized. The latch 77 is maintained normally in engagement with the switch lever 72 by means of a suitable spring and the
85 operation of said latch is controlled by an electro-magnet 79. One terminal of the coil of this magnet is connected, by a conductor 80, with the conductor 51, the latter being connected with the contact shoe 35 as before
90 explained. The other terminal of the coil of magnet 79 is connected with one end of a stationary resistance 81, the other end of said resistance being connected with the
95 movable arm 82 of a speedometer 83 of any preferred construction and suitably connected with the car axles or wheels. The arm 82 of the speedometer also forms a switch arm adapted to cooperate with a contact 84, the
100 latter being connected, by means of a conductor 85, with the conductor 53. The speedometer will be so set that the circuit including the magnet 79 will be closed at
105 82—84 when the train is running beyond a predetermined rate of speed,—preferably, five miles per hour or more. The speed of the train when it reaches the long contact rail and while it is passing over such rail would (in most instances) be such that the
110 circuit controlled by the speedometer would be closed, but the voltage of the current supplied by the batteries 21 would be so cut down by the resistances 24 and 81, that the magnet 79 would not be sufficiently energized to operate the trip 77, and hence the circuit
115 of the magnet 70 which controls the brake mechanism, would be kept open.

As before explained, the semaphore 37 in the cab will be moved to "danger" or "stop" position, when the shoe 35 is in engagement with the long contact rail 4. At
120 the forward end of this long contact rail, a post 86 will be located alongside the railroad to indicate to the engineer, the end of the long contact rail, and therefore, the necessity for slackening the speed of the train or stopping it if the semaphore 37 still remains at "danger." Should the engineer
125 disregard the warning of his semaphore and permit the train to continue at a rate of
130

five miles per hour (more or less) according to the setting of the speedometer) and the shoe 35 should reach the short contact rail 5, the air brakes on the train would be at once applied, by reason of the automatic manipulation and operation of circuits and devices, as follows: When the shoe 35 leaves the long contact rail 4 and engages the short contact rail 5, those portions of the circuit which include the resistance 24 will be opened and the circuits of the battery 21 will be closed through the conductor 23, short contact rail 5 and the cab circuits, thus placing the full voltage supplied by the battery 21 in the short contact rail and cab circuits. The circuit of the magnet 79 being now closed at the speedometer, and the resistance 24 having been cut out, sufficient current will be supplied by the battery 21 to so energize the magnet 79 as to cause it to actuate the trip 77 and release the switch lever 72. This switch lever will then be promptly moved by the spring 78, into engagement with the contact 75 and close the local circuit including the magnet 70 and battery 71. The magnet 70 will then move the trip 66 and release the lever 62 whereupon the action of the spring 65 will shift the valve 61 and permit a movement of the piston 55 to operate the valve mechanism of the air brakes and the consequent application of the latter, thus automatically stopping the train. Before the train can proceed, the engineer must alight from his cab and manually reset, first the switch lever 72 and then the lever 62 as previously explained.

Should the constantly closed circuit embracing the line conductors 11—13—15, batteries 12, relays 8—9 and resistances 14, become impaired, as by breaking or grounding, the low resistance relays would at once become deenergized, so that their armatures would be released and permitted to engage the contacts 19 of the local circuits. Under such conditions, a train approaching the block from either end would (upon reaching the long contact rail 4) receive a "danger" or "stop" signal, because said local circuit would be closed through the semaphore circuit on the train.

In order that the engineer may be enabled to report such conditions as above described, or to report the existence of trouble at the bridge, to a despatcher's office and receive orders, means for establishing telephonic communication are provided. A telephone 90 is provided in the cab of the locomotive and the arms 28—30 of the switch 26^a are adapted (when thrown from the position shown in Fig. 1) to engage contacts 87, with which conductors 88 leading to telephone lines 88^a are connected. In the cab, one terminal of the battery 71 is connected with a telephone terminal by means of conductors 76—91, and the other terminal of said bat-

tery is connected with switch arm 48, by means of conductors 73—92, and the switch arm 48 is electrically connected with switch contact 40 by a conductor 93. The switch arm 94 of the telephone is connected by conductor 95 with arm 46 of the switch 38, and the contact point 96 for the telephone switch arm 94, is connected, by a conductor 97 with the arm 44 of switch 38. The contact point 98 is connected in the talking circuit of the telephone and the conductor 91 is connected with the arm 45 of switch 38. The contact 41 of the switch 38 is connected by a conductor 100, with the truck frame. The switch 38 is maintained in its normal position by means of a spring 99.

When the engineer desires to communicate with the despatcher's office, he will first throw the switch 26^a to connect the telephone line wires (through the medium of conductors 24 and 101) with a track rail 3 and a conductor rail 4 and he will then move the switch bar 38 longitudinally. The result of this will be to include the battery 71 in circuit with the telephone line and in circuit with a rheotome bell (not shown) at the despatcher's office. As soon as the engineer removes the telephone receiver from its hook, the calling battery 71 will be cut out and the talking circuit of the telephone will be closed. The engineer can now receive orders from the despatcher and if such orders be for him to proceed, the engineer will first restore the switches 26^a and 38 and then proceed with his train at a rate less than five miles an hour (more or less according to the setting of the speedometer 82) until he has passed the short conductor rail 5.

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

1. The combination with a block of railway, a bridge between the ends of the block, rolling equipment, signal means on the rolling equipment and circuit connections for the signal means, of high and low voltage relays at the ends of the block, a closed electric circuit including the relays at both ends of the block, a resistance included in said circuit, a circuit shunting said resistance, circuit closers on the bridge, electrical means controlled by said circuit closers for closing said shunt circuit, breakable connections between said circuit closers and timbers of the bridge for normally holding the circuit closers open, partial local circuits at the ends of the block controlled by the relays, and means for connecting said partial local circuits in circuit with the circuit connections of the signal means on the rolling equipment.

2. The combination with a railway block, a bridge between the ends of the block, rolling equipment, a visual signal and brake

controlling means on the rolling equipment, electrical means for controlling the signal and brake controlling means, partial circuits of different resistances for the respective electrical controlling means on the rolling equipment, a shoe connected with said partial circuits, and long and short contact rails at the ends of the block to cooperate with said shoe, of high and low voltage relays at respective ends of the block, a closed circuit including the relays at both ends of the block, a resistance in said circuit, a plurality of circuit closers on the bridge a normally open circuit shunting the resistances, electrical means controlled by said circuit closers to close said shunt circuit, breakable

devices connected with timbers of the bridge and with said circuit closers to hold the latter normally open, local circuits at the ends of the block, each local circuit having branches connected with the long and short contact rails respectively, and resistances in the circuit branches connected with the long contact rails.

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

ANDREW J. ALLARD.

Witnesses:

ARTHUR L. PLEASANTS,
W. B. CLAIBORNE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
