No. 741,312. PATENTED OCT. 13, 1903.

A. G. DAHMKE.

RAILWAY SIGNALING SYSTEM.

APPLICATION FILED FEB. 3, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

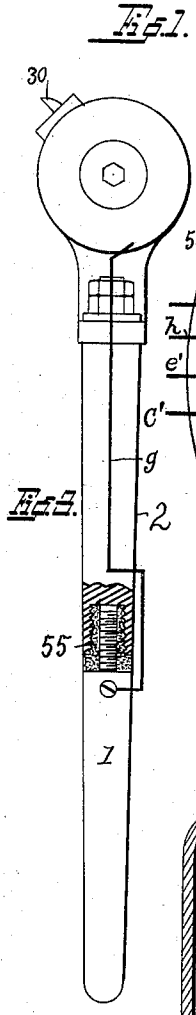


Fig. 3.

Fig. 4.

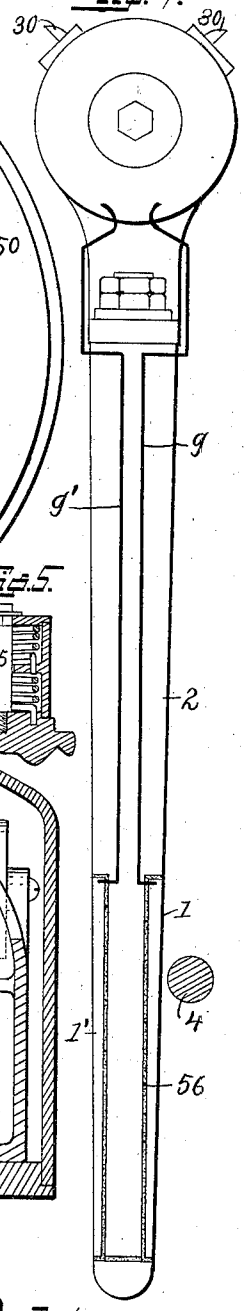


Fig. 5.

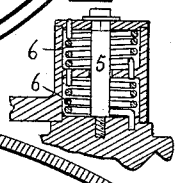


Fig. 2.

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NO MODEL

2 SHEETS—SHEET 2.

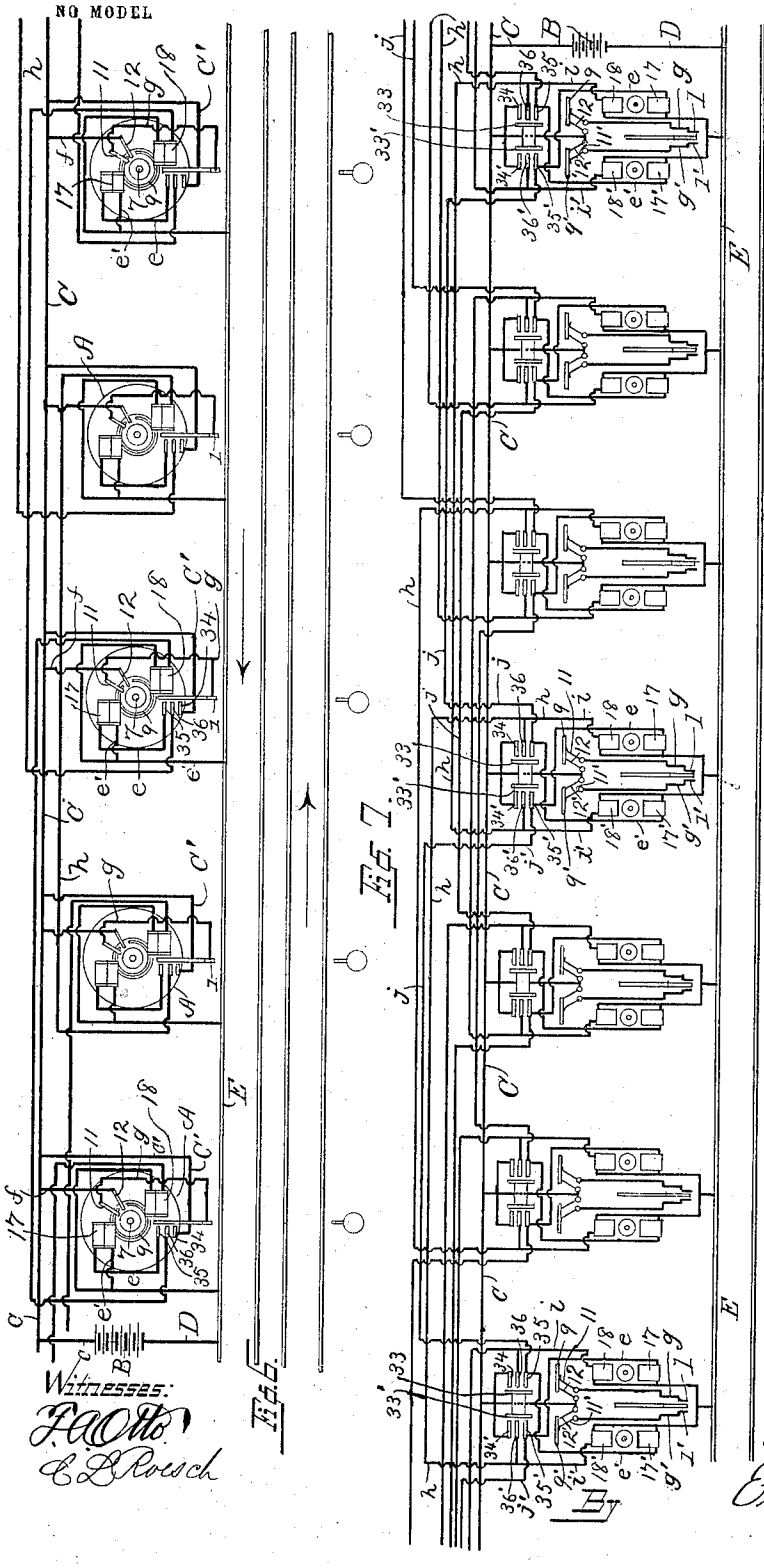


Fig. 1.

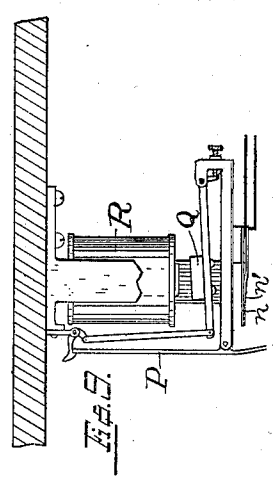


Fig. 2.

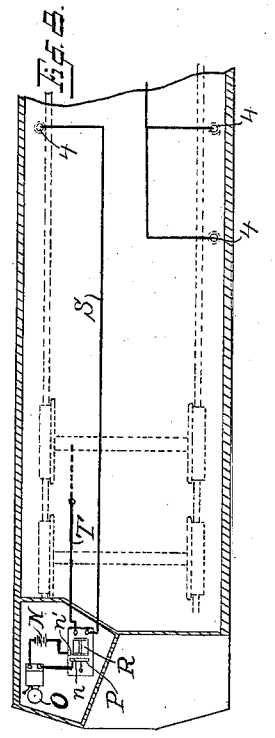


Fig. 3.

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No. 741,312. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

ADOLPH G. DAHMKE, OF CHICAGO, ILLINOIS.

RAILWAY SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 741,312, dated October 13, 1903.

Application filed February 3, 1902. Serial No. 92,232. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH G. DAHMKE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented new and useful Improvements in Railway Signaling Systems, of which the following is a specification.

My invention relates to improvements in railway signaling systems, with especial reference to that class of signals known as "block-signal" systems, although my invention may also be applied to bridge and switch signals, &c.

The object of my invention is to provide improved mechanism whereby signals, either visual or audible, may be produced within a moving body, such as an engine or car, to indicate the presence of another body, car, or other obstruction within a given distance from the signaling apparatus, the apparatus being automatically rendered operative or inoperative by the presence or removal of the obstruction itself.

My invention also contemplates the provision of means whereby each member of a series of moving objects will record its presence in the signaling apparatus, which will then not become inoperative until the last of such objects shall have passed beyond the section controlled by such signaling apparatus.

In the following description reference is had to the accompanying drawings, in which—

Figure 1 is a plan view of one of the members of my improved system with the casing removed. Fig. 2 is a vertical section view of the same, drawn on line $x\ x$ of Fig. 1. Fig. 3 is a detail top view of one of the operating-levers of a two-track system. Fig. 4 is a similar view showing the form of lever preferred for one-track systems. Fig. 5 is a detail of the springs and pivot of the lever shown in Fig. 4. Figs. 6 and 7 are diagrammatic views of two and one track systems, respectively. Fig. 8 is a diagram of the connections and signaling apparatus of the car or moving body. Fig. 9 is a detail of the relay and shutter carried by the vehicle.

Like parts are identified by the same reference characters throughout the several views.

My invention as applied to railways contemplates the provision of a series of signaling-stations along the track or tracks of the railway interconnected electrically to form so-called "blocks" consisting of a plurality of coöperative signaling apparatus.

In the drawings, Fig. 6, A represents the casing of the signaling apparatus; B, a common source of electrical energy hereinafter termed for convenience a "battery;" C, a common conducting-wire extending from one pole of battery B throughout the series of signaling apparatus, and D is an electrical conductor extending from battery B to the rails E of the track or to the ground, the rails forming one terminal of a circuit of battery B, hereinafter termed the "track-circuit," and an insulated conducting-bar 1, Figs. 3 and 4, carried by a lever 2 of each signaling apparatus being constituted another terminal or pole of the battery whenever its respective apparatus is in signaling adjustment. At all other times the bar 1 is cut out and inoperative except for the purpose of adjusting the apparatus. The levers 2 are arranged to project from the working portions of their respective apparatus through slots 3 in the casing A and support the bars 1 in position to be struck by a contact device 4, carried by a car upon the track, the terms "car" and "vehicle" being used in their generic sense as indicating any moving body. A single contact device 4 may be employed or a series on each car, if desired. Each car to be signaled is provided with a local battery N, (or other source of electrical energy,) in the circuit of which suitable signals are included, as indicated at O in Fig. 8. The circuit of battery N is normally open with terminals at $n\ n'$, but may be closed by a shutter P, supported from an armature Q of a relay R. The latter is in electrical connection with the contact 4 through the medium of conductor S and with the car axle and wheels through conductor T. It is therefore obvious that when the contact 4 engages the bar 1 of any signaling-lever in circuit with battery B of the track-circuit a current will pass through the relay R from bar 1 to the railway-track and the relay will be energized to actuate the armature Q, releasing the shutter. The lat-

ter then drops into a position connecting terminals *n n'* of the battery N, closing the circuit thereof and operating the signal.

Referring now to the construction of the apparatus connected with each lever 2, each such lever is provided with a pivot-shaft 5, and a spring 6 is used to hold it in normal position for contact with the car-arms 4. The apparatus is organized for the purpose of switching in and cutting out the contact-bar 1 of the lever from the circuit of battery B. A central shaft 7 is provided with a disk 8, carrying an insulated annular conducting-shoe 9, notched or recessed at 10, as shown in Fig. 1. Brushes 11 and 12, forming terminals of an electrical circuit of battery B, are positioned for contact with the shoe; but normally one of the brushes is in registry with the recess 10 and out of shoe contact. The shaft 7 is provided with a disk-advancing ratchet-wheel 15 and a retracting ratchet-wheel 16, operated through the medium of the electromagnets 17 and 18, respectively, each of which acts upon an armature-lever 19, pivotally connected with a ratchet-engaging pawl 20, the pawl actuated by the armature of magnet 17 operating upon the advancing ratchet 15 and that actuated through the medium of magnet 18 operating upon the retracting-ratchet 16. Each pawl has an arm 21, engaged by a retractable spring 22, the pawl being held normally out of contact with the ratchet-wheel to which it pertains. When the armature 19 is attracted by its magnet, its movement brings the pawl-arm 21 into engagement with a pin 23, whereby the pawl is pushed into engagement with the ratchet in opposition to the tension of spring 22. The pins 23 are cushioned upon spiral springs 24, so as to permit the continued movement of the armature-levers after their respective pawls have been forced into engagement with the corresponding ratchets.

The operation of the magnets and the respective pawl-and-ratchet mechanisms are controlled through the medium of the lever 2, which is provided with a catch 30, adapted to engage a latch 31, pivotally mounted on a circuit-closing lever 32, as best shown in Fig. 1. This lever 32 carries an insulated contact-plate 33, which serves as a circuit-closer for the magnet-circuits of the battery B. The circuit-closer 33 is moved by the lever 32 into and out of contact with the terminals 34, 35, and 36, the terminal 34 having electrical connection through wire C' with the conductor C of battery B, the terminal 35 having electrical connection through the magnet 17 with the track by means of suitable conductors *e e'*, and the terminal 36 having electrical connection with the magnet 18 of another station through conductor *h*. When the lever 5 is moved to the position indicated by dotted lines in Fig. 1, the catch 30 passes the latch 31, the latter having a retractile spring 40, which holds it normally in the path of the catch, but which permits the latch to yield to permit the catch to pass to the position in which it is shown in dotted lines. The latch is not free, however, to swing in the opposite direction, and during the return movement of lever 2, caused by the reaction of spring 6, the engagement of catch 30 with latch 31 moves the lever 2 to bring the circuit-closer 33 into contact with terminals 34, 35, and 36, the circuit-closer remaining in such contact and moving with increasing pressure against the terminals (which are formed of resilient material) until the catch 30 and latch 31, moving in different arcs, become separated, whereupon the lever 32 is restored to its normal position by retractile spring 41. When the circuit-closer is in contact with the terminals, the circuit of battery B is closed through conductors C C', terminal 34, plate 33, terminal 35, conductor *e*, magnet 17, conductor *e'*, rails E, and conductor D, the magnet 17 being thus energized and actuating its corresponding armature 19, and the pin 23 (acting upon the arm 21 of pawl 20, carried by said lever) forces the pawl into engagement with the ratchet-wheel 15, the continued movement of the armature-lever advancing the ratchet-wheel one notch and bringing the conducting-shoe 9 into simultaneous engagement with the brushes 11 and 12. As the brush 11 is connected with bar 1 of the station-lever 2, the effect of closing the circuit from brush to brush through the shoe is to constitute bar 1 a terminal of the circuit of the local battery B, the other terminal being, as before stated, the track-rail. If then a vehicle provided with a contact-arm 4 passes along the track E, the arm 4 will be brought into contact with the bar 1 and the circuit of battery B will be closed through the conductors C and *f*, brush 12, shoe 9, brush 11, conductor *g*, bar 1, vehicle-arm 4 and the electrical connections of the relay R in the vehicle, the vehicle-wheels and track, and conductor D. The relay will thus be energized to actuate the circuit-closing shutter P and close the circuit of local battery carried by the vehicle, when a current from said battery will pass through the signal O and operate the latter continuously until the shutter is replaced by the person in charge of the vehicle.

To accomplish the restoration of the contact-shoe 9 to its normal or inoperative position through the medium of electromagnet 18, an electric circuit of battery B is formed, which includes the terminal 36 and the conductor *h*, leading therefrom to the preceding apparatus, the magnet 18 thereof, conductor *h'*, and the rail connection of that apparatus through the medium of conductor *e'*. With this arrangement whenever the circuit is closed between the terminals 34 and 36 a current from battery B passes from terminal 34 through terminal 36 and through the conductor *h* to energize the magnet 18 of the preceding connected apparatus, and thereby re-

tract the shoe 9 of that apparatus through the medium of the magnet-armature and its pawl-and-ratchet connections.

Referring now to Fig. 6 and briefly reviewing the operation of the system as therein illustrated, it is assumed that all of the parts are in normal position. The first vehicle provided with contact-arms 4 which passes over the track E will actuate all the levers of the several apparatus in succession. In passing each apparatus the lever 2 thereof will be actuated to the position in which it is indicated by dotted lines in Fig. 1 and will during its return stroke bring the circuit-closer 33 into contact with the terminals 34, 35, and 36; but as the shoes 9 are all in normal position at the time the car passes and the contact-bar 1 therefor cut out from the circuit of battery B at the time the vehicle-arm 4 contacts therewith no current will be received by the first vehicle, the circuit-closer 33 not coming into engagement with the terminals 34, 35, and 36 until the vehicle-arm 4 passes out of engagement with the lever 2, which then on its return movement actuates the circuit-closing lever 32. The lever 32 will, however, in each case close the circuit of battery B on the return-stroke of lever 2 through the magnet 17 to advance the shoe 9 and electrically connect the brushes 11 and 12, thus switching contact-bar 1 of the lever into circuit with battery B, constituting the same a terminal of that circuit, which circuit may then be closed by a succeeding vehicle equipped with a contact-arm 4. When the first vehicle reaches the end of the block, (represented by any two apparatus connected by a conductor *h*,) the closing of the circuit between terminals 34 and 36 of the last apparatus causes a current to pass through and energize the magnet 18 of the preceding apparatus, whereby the shoe 9 of the preceding apparatus is retracted to normal position through the medium of the armature-lever of that magnet and its corresponding pawl-and-ratchet mechanism. In this manner the vehicle may travel the entire length of the system, the bar 1 being switched into a circuit of battery B as the vehicle passes and being again cut out from such circuit as the vehicle reaches the end of the block. In the construction shown in Fig. 6 each lever would be cut out when the vehicle reached the second apparatus in advance of the one to which such lever pertains. If a second vehicle passes along the track E in such proximity to the first vehicle as to pass any apparatus before its lever 2 is cut out by the action of the first vehicle, as above described, a circuit of battery B is closed through the relay of the second vehicle at the instant of contact between vehicle-arm 4 and lever-bar 1, and the signal in such vehicle is operated, thus notifying the person in charge of such vehicle of the fact that the first vehicle has not yet passed out of the block. As the second vehicle in actuating lever 2 advances the shoe 9, it is obvious that both vehicles must pass out of the block and successively actuate the lever 2 of the last apparatus of the block before the contact-shoe of the first apparatus will be restored to its normal position. With this construction it is obvious that if two or any greater number of vehicles are introduced into the block they must all pass out again before the initial apparatus of the block will return to normal position.

In Fig. 7 I have illustrated diagrammatically my invention as applied to a single-track system. In such cases the vehicles run in both directions upon the same track, and it is therefore necessary to provide the lever 2 with contact-bars on each side, (which, although alike in all respects, are for clearness indicated respectively at *l* and *l'* in the drawings,) all the other parts of which apparatus are duplicated. The pivot-shaft of the lever 2 is provided with oppositely-acting springs 6, as indicated in Fig. 5; but as all the other added parts of the apparatus used in Fig. 7 are exact duplicates of those shown in Fig. 1, with the exception that they are arranged to act in the opposite direction, further illustration thereof is deemed unnecessary. The electrical connections of the several apparatus of the single-track system are, however, different in this respect—viz., that the terminal 36 is not only connected by conductors *h* with the shoe-retracting magnet 18 of the apparatus at a preceding station, but it is also connected by a conductor *i* with a retracting-magnet 18 of the same station, the latter being operative to cut out the bar 1' on the opposite side of the lever from that in vehicle contact. A conductor *j* extends from terminal 35, controlling the bar 1, to the station in advance of the one containing such terminal and is electrically connected with the opposite terminal 35 in such other station—*i. e.*, with the terminal 35 through which is switched in the bar 1' of that station. The object of this arrangement is to provide for not only signaling vehicles approaching from the rear, but also for signaling vehicles approaching from the front and restoring each signaling mechanism to its normal inoperative position as soon as the necessity for such signal ceases.

Certain details of construction are illustrated in the drawings for the purpose of facilitating the operation of my invention. For example, springs 50 for retracting the armatures 19, the adjusting-nuts 51 for regulating the tension of such springs, stops 52 for regulating the stroke of the armature-levers 19, and stops 53 for regulating the stroke of the circuit-closing lever 32, &c., are details which will readily suggest themselves to the manufacturer.

For the double-track system the entire end of the lever 2 may form a single bar 1, as

shown in Fig. 3, the part 1 being insulated from the body of the lever 2, as indicated at 55 in said figure. For the single-track system I preferably use the lever 2, with bars 1 and 1′ secured at opposite sides thereof and insulated therefrom, as indicated at 56 in Fig. 4. Where trains are equipped with my device, contact-arms 4 may be provided at both ends of the train, the lever 2 being thus actuated twice while the train is passing. In such case the rear contact-arm is preferably unconnected to any signaling apparatus on the train and is merely used for the purpose of advancing the shoe 9 an additional notch, so that in case the train becomes separated before passing out of the block the lever of the initial apparatus will not be switched out of circuit until the rear section of the train is removed from the block.

It will be observed that the bar 4 is in contact with the lever 2 during an interval equal to the time required for the bar 4 to swing the lever to a point where it will clear the end thereof. By arranging the lever so that it will swing when struck by the bar, I am enabled to secure a pressure contact for a sufficient interval to accomplish the desired purpose of energizing the relay and setting the train-signaling apparatus in operation.

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

1. In a system of the described class, the combination with a source of electrical power-supply, having one pole in the path of moving vehicles; electrically-controlled mechanisms located at intervals along said path, and each provided with a movable element controlling the action of two or more of such mechanisms; connections for transmitting the motion of the movable element of one mechanism to connect that element with the source of electrical supply and cut out the movable element of another such mechanism; and means, carried by a moving vehicle, for mechanically contacting with and actuating said movable elements, and receiving electrical impulses from such of them as are in circuit at the time of vehicle contact.

2. In a system of the described class, the combination with a source of electrical power-supply, having one pole in the path of moving vehicles; electrically-controlled mechanisms located at intervals along said path, and each provided with a movable element controlling the action of two or more of such mechanisms; connections for transmitting the motion of the movable element of one mechanism to connect that element with a source of electrical supply and cut out the movable element of another such mechanism; and means, carried by a moving vehicle, for mechanically contacting with and actuating said movable elements, and receiving electrical impulses from such of them as are in circuit at the time of vehicle contact; together with a local signaling-circuit on each such vehicle, normally open and adapted to be closed through the medium of the electrical impulses received through said movable elements.

3. In a system of the described class, the combination with a series of signaling-stations, arranged in blocks and having common current-transmitting connection with a source of electrical energy; a movable arm or lever, projecting at each station in the path of a contact device, carried by a vehicle traversing the line of said series of stations, said arm being adapted to serve as a terminal of an electrical circuit; a shoe adapted to be adjusted to electrically connect said arm with the source of electrical energy; electromagnetic mechanism, controlling the movement of said shoe; and connections whereby the movement of an arm at one station will make and break some of the electromagnetic circuits of two or more stations.

4. In a system of the described class, the combination with a series of signaling-stations, arranged in blocks and having common current-transmitting connection with a source of electrical energy; a movable arm or lever, projecting at each station in the path of a contact device, carried by a vehicle traversing the line of said series of stations, said arm being adapted to serve as a terminal of an electrical circuit; a shoe adapted to be adjusted to electrically connect said arm with the source of electrical energy; electromagnetic mechanism, controlling the movement of said shoe; and connections whereby the movement of an arm at one station will make and break some of the electromagnetic circuits of two or more stations; together with electrical signaling mechanism carried by a vehicle and adapted to be operated through the medium of an electrical impulse received from said arm or lever.

5. The combination of a moving vehicle, equipped with signaling apparatus and electrical signal-controlling mechanism; a contact device carried by the vehicle and electrically connected with the signal-controlling mechanism; signaling-stations located at intervals along the path of the vehicle; a normally insulated movable element at each station, adapted to be actuated by the contact device of the vehicle; an automatic readjusting-spring for each such movable element; and circuit-closing mechanism adapted to be operated by said element during its readjusting movement to connect said element electrically with one pole of an electrical circuit.

6. The combination of a moving vehicle equipped with signaling apparatus and electrical signal-controlling mechanism; a contact device carried by said vehicle and electrically connected with the vehicle-wheels through said signal-controlling mechanism; signaling-stations located at intervals along the path of said vehicle; a movable element at each station adapted for both electrical and mechanical contact with the contact de-

vice of the vehicle; circuit-closing mechanism operated by said element, for electrically connecting it with a source of electrical energy having one pole normally in the path of the vehicle; and means, controlled by a similar movable element of another station, for restoring the circuit-closing mechanism to circuit-breaking position together with mechanism for automatically restoring the movable element to normal contacting position when released by the vehicle contact device.

7. The combination of a moving vehicle, equipped with signaling apparatus; and electrical signal-controlling mechanism; a contact device carried by the vehicle and electrically connected with the signal-controlling mechanism; signaling-stations located at intervals along the path of the vehicle; circuit-closing mechanism at each station connected with a source of electrical energy, having one pole normally in the path of the vehicle; a movable element at each station, projecting in the path of vehicle contact devices, and adapted to be actuated thereby and adapted to form electrical contact therewith; mechanical adjusting mechanism for each such movable element; and a catch connected with the circuit-closing mechanism, and located in the path of the movable element, said catch being adapted to be actuated by the movable element, and arranged when actuated in one direction, to operate the circuit-closing mechanism, to connect said movable element as a terminal for a normally open circuit originating in said source of electrical energy.

8. In a system of the described class, the combination with the track-rails of a railway-track; of a series of stations, each connected with a source of electrical energy, of which the track forms one polar terminal; a movable element at each station, adapted for both electrical and mechanical contact with a vehicle on the track; automatic mechanism for restoring said element to normal position after being mechanically actuated; and means, operative during the automatic movement of said element, for connecting the same to an electrical terminal of opposite polarity to that of the rails.

9. In a system of the described class, the combination with the track-rails of a railway-track; of a series of stations, each connected with a source of electrical energy, of which the track forms one polar terminal; a movable element at each station, adapted for both electrical and mechanical contact with a vehicle on the track; automatic mechanism for restoring said element to normal position after being mechanically actuated; and means, operative during the automatic movement of said element, for connecting the same to an electrical terminal of opposite polarity to that of the rails; together with electromagnetic mechanism controlled by said element for cutting out a similar element at another station.

10. In a system of the described class, the combination of a series of signaling-stations; a movable element arranged for both mechanical and electrical contact with moving vehicles; a circuit-closer, adapted to constitute said element a terminal for a source of electrical energy; mechanism, controlled by said element, for actuating said circuit-closer in one direction; and mechanism controlled by similar elements at other stations for reversing the movement of the circuit-closer, said actuating mechanism of the circuit-closer being provided with a one-way latch, adapted to yield under pressure of said element when actuated by a moving vehicle, and arranged to engage said element during its return movement, to communicate motion therefrom to the adjusting devices of the circuit-closer.

11. In a system of the described class, the combination with an electrical signaling-station; of a circuit-closing shoe normally in circuit-breaking position, but adapted for continuous circuit-closing contact during several successive adjustments; a movable element; automatic devices for restoring said element to normal position when moved therefrom; latch mechanism adapted to engage said element during its automatic movement; and electromagnetic devices, controlled by said latch mechanism, for adjusting the shoe, said shoe being arranged to connect said movable element with a source of electrical energy when adjusted to circuit-closing position.

12. In a system of the described class, the combination with a railway-track; of a series of stations adjacent thereto; a movable element at each station, normally disconnected both mechanically and electrically from the other mechanism at that station; devices carried by moving vehicles adapted for both mechanical and electrical contact with said movable elements at the respective stations; a source of electrical energy, having one polar terminal in the track-rails, and another in the station; means for automatically restoring the movable element to normal position when adjusted out of such position; a latch arranged to engage said element during such automatic movements; and mechanism, connected with the latch, and adapted to be actuated thereby to connect up the movable element as a terminal of said electrical circuit.

13. In a system of the described class, the combination with the rails of a railway-track; a source of electrical energy, of which the rails constitute terminals; a series of stations along the track, each having a terminal of opposite polarity to the rail-terminals; movable elements at the stations, normally disconnected electrically, and arranged for mechanical contact with moving vehicles; vehicles on said track provided with contact devices adapted to actuate the movable elements; and mechanism, controlled by said movable elements, and oper-

ative after the passage of a contacting vehicle to provide electrical terminals in position for contact with a succeeding vehicle.

14. In a system of the described class, the combination with the rails of a railway-track; a source of electrical energy, of which the rails constitute terminals; a series of stations along the track, each having a terminal of opposite polarity to the rail-terminal; movable elements at the stations, normally disconnected electrically, and arranged for mechanical contact with moving vehicles; vehicles on said track provided with contact devices, adapted to actuate the movable elements; and mechanism, controlled by said movable elements, for providing electrical terminals in position for vehicle contact; together with other mechanism, also controlled by said movable elements, for cutting out the electrical contact-terminals of other stations; and signaling devices on the vehicles, electrically connected with the vehicle contact devices and the track-rails.

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

ADOLPH G. DAHMKE.

Witnesses:
CHESTER ARTHUR BROWN,
J. K. FILESS.