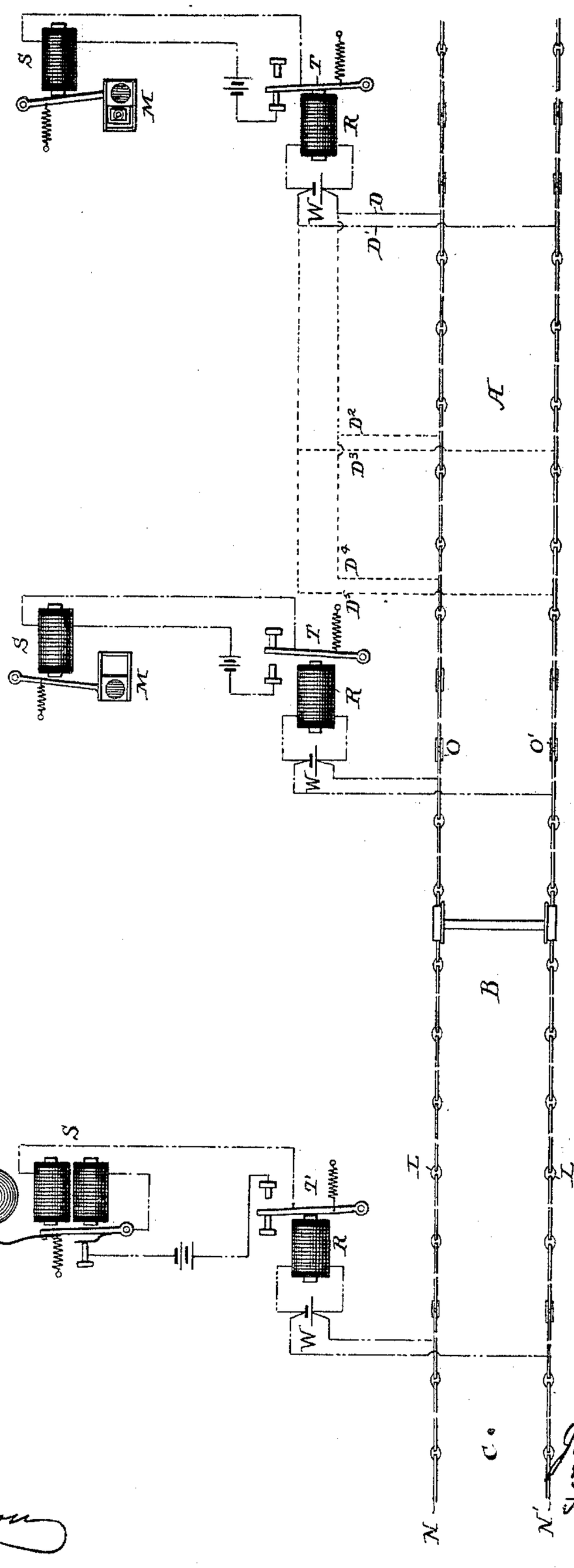
(No Model.)

J. B. STEWART.

TRACK CIRCUIT.

No. 491,609. Patented Feb. 14, 1893.



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UNITED STATES PATENT OFFICE.

JOSEPH B. STEWART, OF HAVERSTRAW, NEW YORK.

TRACK-CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 491,609, dated February 14, 1893.

Application filed November 5, 1892. Serial No. 451,065. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH B. STEWART, a citizen of the United States, and a resident of Haverstraw, Rockland county, New York, have invented certain new and useful Improvements in Track-Circuits, of which the following is a specification.

My invention relates to track circuits for electrically operated railway signals, highway crossing bells and the like, and it has for its object to improve and simplify said circuits whereby the signals or bells can be operated with great certainty, with the least amount of battery power, and an exceedingly simple arrangement of circuits, whereby the well known disadvantages of the ordinary track circuits may be avoided.

To these ends my invention consists in the various features of construction, arrangement and mode of operation, substantially as hereinafter more particularly set forth.

Referring to the accompanying drawing, I have shown a diagrammatic representation of one embodiment of my invention, sufficient to enable those skilled in the art to understand and construct the same.

With the growing and extending use of electric railway signals, crossing bells &c., it becomes important to provide as simple, cheap and effective apparatus as is possible, whereby the disadvantages inherent to the ordinary systems in use are avoided, and it is with the object of overcoming many of these disadvantages that my present invention is made. Without attempting to point out all these disadvantages, it may be stated that in the ordinary systems now generally in use, a comparatively large battery or other power is necessary to operate the signals and insure the proper arrangement of the circuits, and it has been common to connect an independent battery of a certain number of cells to the end of each section of track, the track being divided into sections of a given length, depending upon various reasons, as for instance the amount of traffic on the line. The rails composing these sections are connected by what are termed bridge or connecting wires, and the current is thus carried along the lines of rails from beginning to end of the section, and usually at the beginning of the section the circuit is connected by wires to a relay in the local of which the signal, bell or other device is arranged. In this construction each section must be insulated from the other, and this is usually accomplished by the insertion of insulating blocks or fish plates between the ends of the rails of the adjacent section, and it has been found that this is an element of weakness to the track, not only from the fact that the ends of the rails do not receive a proper support, but the insulation is apt to be destroyed or forced out of position by wear due to passing trains, or to the expansion or "running" of the rails in hot weather. These and other reasons, especially when the system is what is called the closed circuit system, cut off the current from the relay, causing it to open, and the signal to go to danger, which is a constant source of annoyance and failure. Furthermore a circuit thus arranged is liable to be deranged by lightening, which may destroy the instrument or otherwise affect the closed circuit. By my arrangement I avoid these and other difficulties, which need not be recited, and at the same time retain the well known advantages of a closed circuit system, and am able to utilize a minimum amount of battery power, and avoid the insulation of the track sections.

In carrying out my invention, I bridge each rail joint in the usual way, but preferably provide two connections to each joint, and this is done throughout the section, but at the ends of the section the connections are omitted, and the ends of the rails are united in the usual way by the fish plates or other devices, and I preferably leave two or three joints so united without the additional connectors, and I have found that the resistance of these rail joints is so high that the current used will not overcome the resistance. I make use of a very small amount of battery power, one cell of battery being found usually sufficient, and this battery is connected in a short circuit with a relay, the relay being of a certain specific resistance, depending upon the length of the track section, and the resistance thereof. For instance in the ordinary sections I have found that a relay having a resistance of about twenty ohms is sufficient, and it will be understood that under normal conditions, the current from the battery flows through this relay, maintaining it

in its excited condition, and the armature of the relay controls the local circuit, which operates the signal, the bell or other device, and this local circuit may be closed or opened under these conditions as may be desired.

Connected to the battery and extending from each side of the cell, are what may be termed tap wires, which are connected respectively to each line of rails, and as in the normal condition there is no connection between the two lines of rails, this tap or loop circuit is normally opened, and the resistance of the rail joints is sufficient to prevent the current flowing beyond the section in a manner to affect the relay of the next section, or to produce any other disturbance. If, now, a train enters the section thus connected, the two lines of rails are short circuited through the axles and wheels by a circuit which is of relatively very low resistance and lower than the circuit of the relay, and this completes the circuit through the taps, and the battery power is shunted from the relay, and the armature thereof falls back, and makes or breaks the contacts of the local circuit. When, however, the train passes out of the section beyond the rail joints not provided with connectors, the resistance of the loop circuit is increased, and the current is shunted therefrom into the relay, and this acts to restore the armature to its normal condition and operates the signal or bell correspondingly, and the relay remains thus excited until the passage of another train.

Referring to the drawing, I have illustrated as well as may be, a track having a series of sections or divisions lettered respectively A, B, C, and each section is made up of a number of rails N, N', N representing the rails on one side of the track, and N' the rails on the other side of the track. The rails of each section are shown as provided with two connectors L, uniting the adjacent ends of the rails, and these connectors may be in any of the well known forms, and as is well known offer little or no resistance to the passage of the current from one rail to the next, they extending around the ordinary fish plates or other rail joint attachment. At the end of the section, however, one or more of the joints are left unprovided with the connectors as indicated at O, O', the adjacent rails being simply connected by the fish plates, and these as is well known offer a considerable resistance to the passage of the current, especially when it is of low voltage. While in some instances a single joint offers sufficient resistance, I can leave two, three or more joints without the connectors, so as to insure a sufficient amount of resistance for all emergencies, without affecting the efficiency of the system.

Each section is provided with a battery W, which need not consist of more than one cell, as this I have found sufficient for the purposes in most instances, and this battery is connected directly to the coils of the relay R, having a certain definite resistance, as for instance twenty ohms, and the armature T, thereof is held in its closed position against the stress of the spring. Leading from the battery are the taps D, D', connected to the rails at each side of the track, and as before stated, the resistance of this tap or loop circuit is normally greater than the resistance of the relay, and under the well known laws of the flow of currents, the relay is excited. When, however, the train reaches the section, being shown on the section B, the wheels and axles close the loop circuit through a low resistance of about two ohms, more or less, so that the relay is shunted, and only a slight amount of current flows through the coils thereof, insufficient to maintain its armature in its closed position, and it falls back under the stress of the spring, but when the train passes out of the section, the resistance of the loop or tap circuit is increased, and the current again flows to a great extent through the the relay, energizing the same, and attracting the armature. This armature can be arranged to control a local circuit, either to open it or close it as the case may be. Thus in connection with section A, I have shown the armature T, as closing the local circuit of the magnet S, and maintaining the signal or semaphore M, in a position of safety. When, however, the train reaches the section, the armature T, of the relay is retracted, opening the local circuit, and the signal may fall by gravity, weight, spring or otherwise to a position of danger, and so remain as long as the train is on this particular section, it being shown in section B as at danger.

In connection with section C, I have shown a railway crossing bell arranged in the local circuit, and in this instance of course the local circuit is normally opened, while the passage of the train releasing the armature of the relay of that section, closes the local circuit, and causes the bell to ring continuously as long as the train is on that section. It will be understood of course that these signals and alarms may be arranged in any of the well known relations, and I have shown them in the diagram arranged adjacent to each section, as being the most convenient position in explaining my invention.

In carrying out my invention in order to prevent any possible accidents, it is essential that the same poles of the battery of each section should be connected to the same line of rails; that is, for instance the positive pole of each battery should be connected in each instance to the line of rail N, and the negative pole of the batteries should be connected to the line of rails N'.

In some instances it may be an advantage in order to avoid any chances of a rail circuit being broken in a section behind the train, to employ two or more loops or tap circuits connected to the rails of the section at different points, substantially as is set forth in my prior patent No. 480,147, and I have indicated by

the dotted lines D^2, D^3, D^4, D^5, such a connection, but this is not essential, as the chances of derangement of the circuit, especially where two connecting wires are used to bridge each rail joint, are very remote, and in ordinary use I prefer to omit these connections. It will thus be seen that I provide an exceedingly simple track circuit, and retain all the advantages of a closed circuit system of signals, and I am enabled to make use of the smallest possible battery power, and operate the signals positively. Moreover, I dispense with the usual insulation, dividing the different sections of the track, and this is an essential feature of my invention, as I therefore avoid all the objection to the usual arrangement of the track rails, which have heretofore been pointed out, and which are well known to those skilled in the art.

Without limiting myself to the precise construction and arrangement of parts herein set forth, which can be readily varied without departing from the spirit of my invention, what I claim is:

1. A system of electric railway signals having the rails of the adjacent signal sections connected with the ordinary mechanical connections only and the rails comprising each signal section connected by low resistance connectors, substantially as described.

2. A system of electric railway signals, having the rails of the adjacent sections connected by the usual mechanical connections only and the rails of each signal section connected by low resistance conductors, in combination with a battery of low power, a relay included in the circuit of said battery, and taps leading from said battery to the lines of rails, substantially as described.

3. A system of electric railway signals, having the rails of the adjacent sections connected by the ordinary mechanical connections only and the rails of the section connected by low resistance conductors, in combination with a battery of low power, a relay connected in circuit with the battery, taps leading from the battery to the lines of rails, the resistance of the relay being so proportioned to the resistance of the section of rails to be protected that the relay will be normally energized, but will be de-energized on the passage of a train over the rails of the section, substantially as described.

4. A system of electric railway signals having the rails of the adjacent sections connected by the usual mechanical connections only and the rails of each signal section connected by low resistance conductors, in combination with a battery of low power, a relay included in the circuit of said battery, taps leading from said battery to the lines of rails, and a local circuit controlling a signal device and controlled by the relay, substantially as described.

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

JOSEPH B. STEWART.

Witnesses:
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N. E. CLARK.