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E. WOLTMANN.

TRAIN STOP FOR ELECTRIC RAILWAYS.

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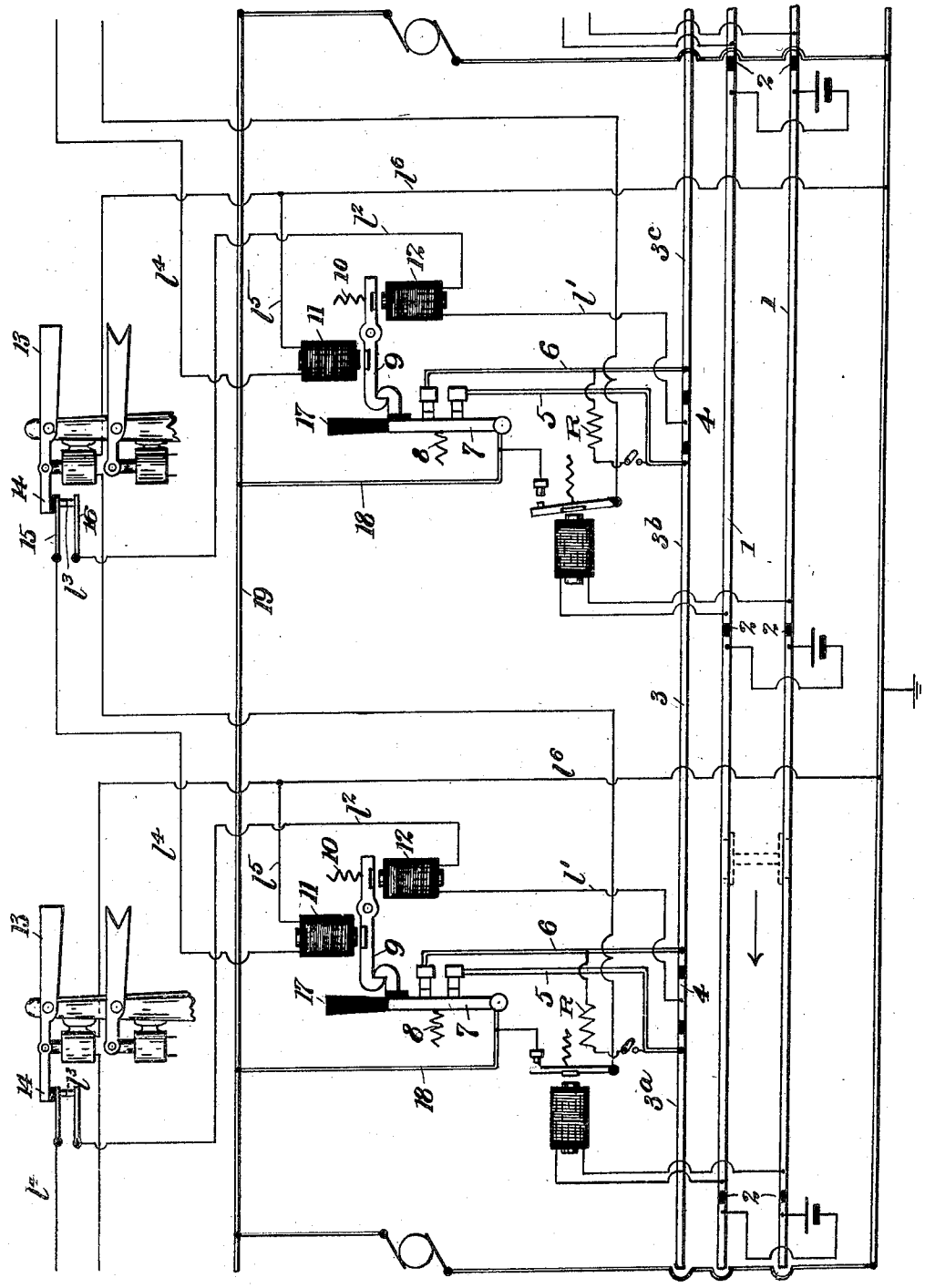

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## TRAIN-STOP FOR ELECTRIC RAILWAYS.

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*To all whom it may concern:*

Be it known that I, ERNST WOLTMANN, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Train-Stops for Electric Railways, of which the following is a full, clear, and exact description.

My invention relates to electric railway installations in which the power is supplied through a third rail or trolley, the usual track rails being made use of for a ground return. In installations of this sort it is quite a common practice to have the third rail or trolley made sectional with insulating joints at certain intervals so that the different sections may be separately charged or electrified from the power mains. By this construction it is possible to exert a certain control over the train, for example, to stop any train in any section by cutting off the electric power therefrom. In some cases this is done automatically by a connection with the semaphore signal system, and in other cases it is done by switches at stations of the road. But in all cases, so far as I am aware where the third rail or trolley is sectionally electrified, it has been at the sacrifice of its function as a current carrying means for the electric system. It is evident that an electric road is a power transmission system in which the electric energy is carried through long distances in a conductor, and as the third rail has great current carrying capacity, it is extremely advantageous to make use of it for actually transmitting the current of the system from the distant point, as well as its obvious function of furnishing a contacting member for a train at any particular point.

In carrying out the present invention I aim to secure all the features of a sectionally electrified third rail or trolley, and at the same time utilize all the possibilities of the third rail as a line conductor for transmitting the power.

The drawing shows diagrammatically an arrangement of circuits and parts embodying the principles of my invention.

I have shown the invention applied to a railway having a third rail or conductor for supplying the electrical energy to the trains. This third rail is constructed in sections insulated from one another, and the electrification of the sections is under the control of the signal apparatus. It is to be understood that this is merely an illustrative application of the real invention. The invention, however, has particular advantages when used with a signal system in this way, in that it constitutes a very effective train stop to enforce the observance of the semaphore signals at danger. It will be seen from the later description that notwithstanding this sectional construction, and train stop function, that the third rail is normally in a condition to carry all or nearly all of the line current, so that its great capacity for this purpose is fully utilized, and additional conductors or feeders are rendered unnecessary.

Referring to the drawings, 1 indicates the running rails of a railroad, which may be sectionally insulated from one another at 2, in the usual way for the operation of the block signals and semaphore apparatus.

3 denotes the third rail which is also divided into sections insulated from one another. Three sections are shown, denominated $3^a$, $3^b$ and $3^c$. These different sections are not only insulated from one another, but have between them a small and separately insulated section 4.

At every point where the third rail is interrupted by the insulated section 4, there are leads 5 and 6, which are normally connected together by a suitable switch 7. These switches may be of any ordinary or approved construction, and in themselves constitute no part of the present invention. Their function is to normally connect the leads 5 and 6 together, so that the third rail is electrically continuous throughout its length under normal conditions.

The switches 7 are capable of being opened by a magnet operated release or detent. The essential characteristic of this release or detent is that it is operated by either of two separate circuits. I have shown the switches 7 impelled into circuit opening relation by springs 8, and normally restrained from such movement by detents 9, tensioned by the springs 10. 11 and 12 denote electromagnets, either of which when energized attracts the detent 9 so as to allow the switch 7 to open its circuit. The magnets 11 and 12 are interconnected in such a way that two switches at the terminals of any third rail section are simultaneously operated so as to disconnect the third rail section from the power circuit. A convenient circuit for this purpose is formed as follows: from each of the insulated sections 4 of the third rail,

through wire $1^1$, magnet 12, wire $1^2$, contact devices $1^3$, wire $1^4$, magnet 11, wires $1^5$ and $1^6$, to ground. Since this circuit includes magnet 12 of one switch 7, and the magnet 11 of the next adjacent switch 7, both switches are simultaneously opened in case current passed therethrough. The current is obtained from the collector shoe of a passing train which is in such a circuit on the train as to be electrified to the line voltage, even although it is temporarily out of contact with an electrified section of the third rail. Thus when the first collector shoe of the train passes on to an insulated section 4, such insulated section is raised to the line voltage, and current flows, provided the circuit is not broken at the point $1^3$. The switches 7 at both ends of any third rail section are, therefore, simultaneously actuated to open the circuit of said third rail section the instant a train passes thereon, unless this action is prevented by any desired means interrupting the controlling circuit, as above indicated. The means which I have illustrated for controlling the actuation of these switches is merely diagrammatic, being given for the purpose of illustration. Each semaphore arm 13, has an extension 14, to impel contact springs 15 and 16, into engagement whenever the semaphore arms are at danger, so as to close the switch controlling circuit at the points $1^3$. Thus when any train passes a semaphore at danger, the section of the third rail in advance of the train is merely deënergized in the manner already described, and the train is automatically stopped. After the switches 7 have been opened, they may be re-closed in any desired way, for example, by handles 17 thereon, which constitute a form of manual means for this purpose. The particular circuits and connections by which the semaphore signals are operated may, of course, be of the usual or any desired description. In the drawing the circuits by which the danger semaphores are set are shown in detail, but as these features in themselves constitute no part of the present invention, a detailed description of them may be omitted.

An additional feature of the invention lies in having leads or connections 18, which extend from the switches 7, to a common feeder or main 19, extending throughout the length of the railway. When the switches 7 are closed, this feeder 19 is merely in a multiple circuit with the third rail, and the electric power is divided between the two in proportion to their resistances. When, however, a pair of switches 7 are open to cut out any given section of the third rail, the conductor 19 remains to carry the line current for the other sections of the railway. This may overload the conductor temporarily, but an occasional overload in short sections is not serious. Moreover in two, three or four-track installations, a conductor 19 may be made common to all the tracks, so that a proportionate saving is effected.

It is to be understood that the separate conductor or main 19 is not absolutely necessary, because it is not expected that the trains run by danger signals set against them, and the actuation of a train stop to enforce a danger signal is an event so unusual and so serious that the stoppage of all the trains of the line thereby is not of such great relative importance. By using the additional main or conductor 19, however, the capacity of the switches 7 is not required to be nearly as great as would otherwise be necessary.

While I have referred in this description to rendering the sections of the third rail wholly deënergized, or non-electrified, I do not desire to limit myself in this way, because in some cases it is desirable to have the third rail feebly electrified at all times, it being merely reduced in voltage enough to secure the stoppage of the train. This can be readily accomplished by the use of resistances R, as clearly shown in the figure.

What I claim, is:—

1. In an electric railway system, a sectional power rail or trolley wire normally constituting a line conductor for the power current transmission and at every point of its length forming part of the main current carrying circuit for all the trains of the entire system, danger signals corresponding to the terminations of the sections, and means actuated conjointly by a signal at danger and a train passing on to the section protected by such signal, for lowering the potential of said section without interfering with the current carrying function of the remainder of the rail or trolley wire.

2. In an electric railway system, a sectional power rail or trolley wire normally electrically continuous throughout its length and constituting a line conductor for the power current transmission, and at every point of its length forming part of the main current carrying circuit for all the trains of the entire system, means for rendering any selected section temporarily non-electrified, and a separate conductor for carrying the line current temporarily past any such non-electrified section.

3. In an electric railway system, a sectional power rail or trolley wire normally electrically continuous throughout its length and constituting a line conductor for the power current transmission, and at every point of its length forming part of the main current carrying circuit for all the trains of the entire system, short insulated sections located between the main sections of said rail or trolley wire, and circuit connections from said insulated sections for cutting out

an adjacent main section from the power circuit.

4. In an electric railway system, a sectional power rail or trolley wire normally electrically continuous throughout its length and constituting a line conductor for the power current transmission, and at every point of its length forming part of the main current carrying circuit for all the trains of the entire system, short insulated sections between the main sections, and electric circuits from said short sections operated to cut out the adjacent main section of the power rail or trolley wire when said circuits are completed.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

ERNST WOLTMANN.

Witnesses:
WALDO M. CHAPIN,
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