(No Model.)

J. B. STRUBLE.

SIGNALING.

No. 590,600. Patented Sept. 28, 1897.

FIG. 1.

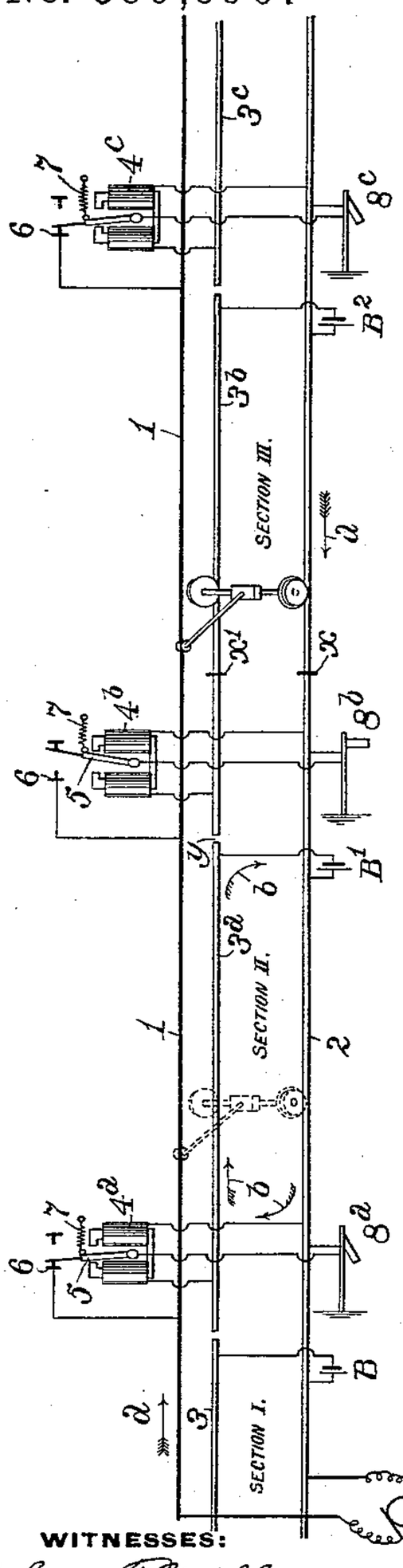


FIG. 2.

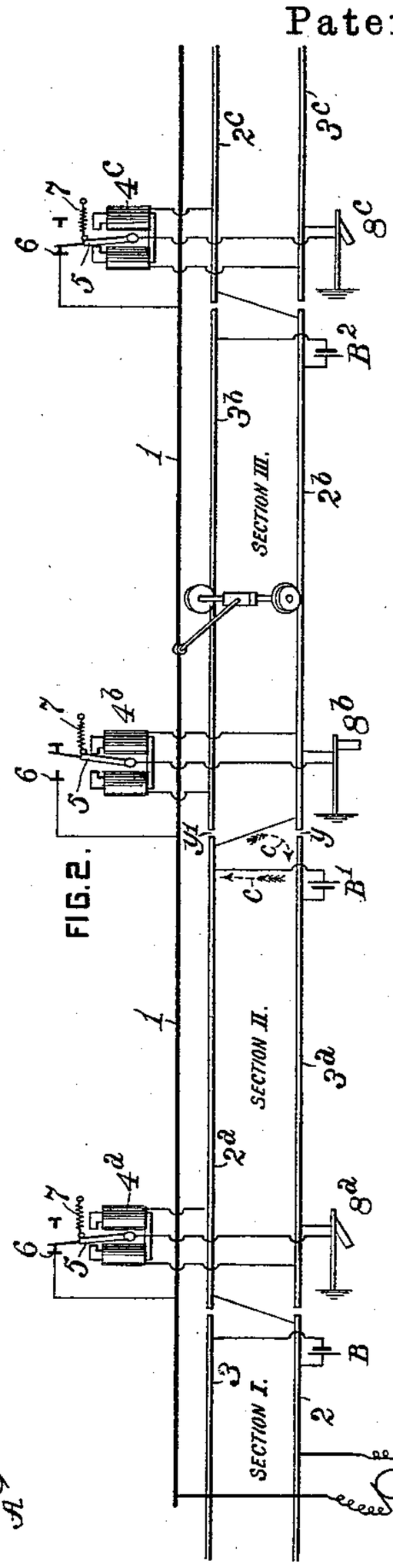
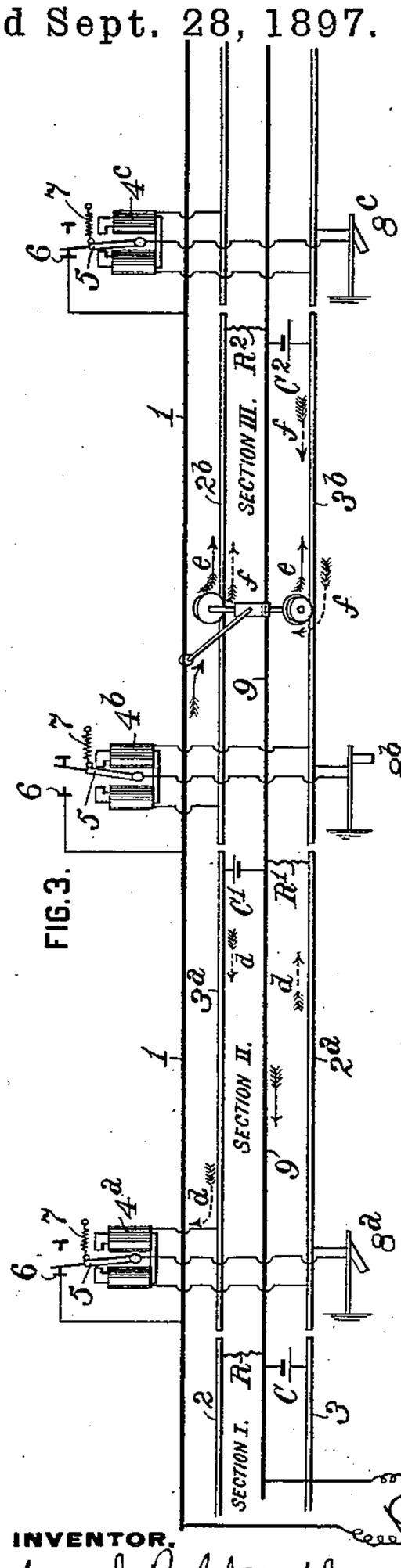


FIG. 3.



UNITED STATES PATENT OFFICE.

JACOB B. STRUBLE, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH AND SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA.

SIGNALING.

SPECIFICATION forming part of Letters Patent No. 590,600, dated September 28, 1897.

Application filed May 20, 1897. Serial No. 637,328. (No model.)

To all whom it may concern:

Be it known that I, JACOB B. STRUBLE, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Signaling, of which improvements the following is a specification.

The invention described herein relates to certain improvements in signaling for electric railways, and has for its object the employment of signal-controlling circuits and relays so constructed and arranged as to prevent the currents used for operating the motors from interfering with the proper operation of the signals.

In signaling for steam-railways the track is divided into a series of blocks or sections, one or both rails of each block or section being insulated from the rail or rails of the adjacent sections. The rails of each section are connected at one end to the poles of a suitable battery and at the opposite end to the poles of any ordinary relay whose armature forms part of a signal-controlling circuit. As the direction of flow of current through the relays heretofore employed is immaterial as regards the energizing of the latter, it is apparent that when such system is applied to electric railways a leakage of dynamo-current might set the signal to clear position when a car is on the section controlled by such signal.

The present invention consists in the employment of a polarized relay so connected to the rail-sections that when energized by any current than that from the track-battery its armature will be so shifted as to cause the setting of the signal to "danger."

The invention also consists in certain details, all as hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a diagrammatic view illustrative of one form or embodiment of my invention. Figs. 2 and 3 are similar views illustrating other forms or modifications of the invention.

In the practice of my invention the generator A has one pole, as the positive, connected to the trolley main feed-wire or third rail 1 in accordance with the system employed, and the negative pole connected to the return-rail 2, which in the form or arrangement shown in Fig. 1 is continuous or unbroken. The other rail is divided into a series of insulated sections 3 3^a 3^b, &c. Each rail-section 3 3^a, &c., is connected at or near its end to one pole of a battery B B′ &c., while the opposite pole of the latter is connected to the rail 2. The batteries are so connected to the rails of each section that the currents will flow through the track-relays in the opposite direction to that of the generator A. At the opposite ends of each track-section the poles of polarized relays 4^a 4^b 4^c, &c., are so connected to the rails that when excited by the batteries the armatures 5 will be shifted in one direction against stops 6, but if excited by a current from the generator the armature will be shifted in the opposite direction or away from the stops. The armatures 5 are adapted to be shifted away from the stops 6 by gravity or a spring 7 when the polarized relay becomes deënergized.

The circuits operating the signals 8^a 8^b 8^c, &c., include as parts thereof the armature 5 and the stops 6 of the polarized relays 4^a 4^b. Any suitable form of battery or generator may be used in the signal-circuits, but it is preferred to connect one branch of the signal-circuits to the main feed or trolley wire or third rail and the other branch to the return-rail, so as to employ a portion of the current from the generator A for operating the signals.

For purposes of illustration the direction of the current from the generator A is indicated by full arrows *a* and that from the batteries B B′ B^2 by the half-arrows *b*. With the currents flowing in reverse directions it will be readily understood that when a car enters upon a section, as III, its battery B^2 will be short-circuited, and the armature 5 of the relay 4^b will be moved by gravity or a spring from the stop 6, thereby breaking the signal-circuit and sending the signal to "danger."

In case the return-rail should be broken, as at *x*, or any other resistance be present

the current from the car-motor in seeking a path back to the generator might pass through the relay 4^b; but as its direction of flow through the relay is the reverse of that of the track-battery the only effect produced on the energizing of the relay 4^b will be to shift its armature farther from the stop 6.

In case of defective insulation at *y* and a break in one or both of the rails 2 and 3, as at *x x'*, the battery B' would charge the relay 4^b in such manner as to clear the signal of section III, although the car had previously short-circuited the battery B^2 and sent the signal to "danger." While such a condition might possibly occur when using the arrangement shown in Fig. 1, it is rendered impossible by the arrangement shown in Fig. 2. In the arrangement illustrated in Fig. 2 both rails of each section are insulated at the ends of the sections from the rails of the adjacent sections, and one rail 2^a of one section is electrically connected to the opposite rails 2 and 2^b of the adjoining sections to form the return-conductor for the motor-operating current. In case the insulation, as at *y*, should become defective track-battery B' would become short-circuited, as indicated by dotted arrows, and would not affect relay 4^b. If insulation *y* should become defective and the current from battery B' found a return-circuit, the relay 4^b would be excited in such manner as to cause its armature to move away from the contact-point 6, thereby shifting the signal to "danger."

In Fig. 3 is shown an arrangement whereby storage batteries C C' C^2, adapted to be charged during the passage of cars over the sections, may be used as track-batteries. As in the arrangement shown in Fig. 2, the return-rails 2 2^a, &c., are arranged alternately on opposite sides of the track in adjoining sections. The return-rails 2 2^a 2^b of each section are connected to a common return-wire 9 through suitable resistances R, and the common return-wire is connected to the insulated rails 3 3^a, &c., through storage batteries C C' C^2, the negative poles being connected to the common return-wire and the positive pole to the rails 3 3^a 3^b. The path of the current is indicated by dotted arrows *d*, flowing in section II from the battery along insulated rail 3^a, through relay 4^a, and thence along return-rails 2^a and through resistance R' to battery. The relay 4^a is so connected to the rails that the current from the battery will so excite the relay as to shift its armature against contact point or stop 6 and thereby close the signal-circuit. In section III the path of the current from the feed-wire is represented by full arrows *e*, flowing from the trolley-wire through the motor and thence through the car-wheels and the rails to the common return-wire. The resistance connecting the rail 2^b to the common return-wire is made sufficiently high to insure the passage of the greater part of the return-current through the storage battery, so as to charge the latter. The resistance R' has the further function of preventing an excessive discharge from the storage battery, the path of the current from the latter being shown by dotted arrows *f*, through the axles of a train when occupying a section, but not under the influence of the motor-current.

I claim herein as my invention—

1. In a signaling system for electric railways, the combination of a trolley-wire, a series of two or more track-sections, one line of rails of each section being adapted to serve as a return-conductor for the motor-current, polarized relays having their poles connected to the rails of each section, batteries having their poles so connected to the rails of the sections that the currents therefrom will produce in the relays an opposite polarity to that produced by the motor-current, and signal-circuits having make-and-break mechanisms controlled by the polarized relays, substantially as set forth.

2. In a signaling system for electric railways, the combination of a trolley-wire, a series of two or more track-sections, one line of rails of one section being connected to the opposite line of rails of the adjoining sections, such connected line of rails serving as a return-conductor for the motor-current, polarized relays having their poles connected to the rails of each section, batteries having their poles so connected to the rails of each section that the currents therefrom will produce, in the relays, a polarity opposite to that produced by the motor-current, and signal-circuits having make-and-break mechanisms controlled by the relays, substantially as set forth.

3. In a signaling system for electric railways, the combination of a trolley-wire, a series of track-sections, a return-conductor, resistances connecting one line of rails of each section to the return-conductor, storage batteries connecting the other line of rails of each section to the return-conductor, polarized relays having their poles connected to the rails of the several sections and signal-circuits having make-and-break mechanisms controlled by the relays, substantially as set forth.

4. In a signaling system for electric railways, the combination of a trolley-wire, a series of track-sections, a return-conductor electrically connected to one line of rails of one section and to the opposite lines of rails of adjoining sections, resistances arranged in the connections between the return-conductor and said lines of rails, storage batteries having their poles connected to the return-conductor and the other line of rails of each section, polarized relays connected to the rails of each section and signal-circuits having make-and-break mechanisms controlled by said relays, substantially as set forth.

5. In a signaling system for electric railways, the combination of a track-section, one line of rails of the section being connected to one pole of the generator, a trolley-wire con-

nected to the opposite pole of the generator, a branch from a generator-circuit forming a signal-circuit, a make-and-break mechanism included in the signal-circuit, a polarized relay connected to the rails of the section and adapted to control the make-and-break mechanism in the signal-circuit, and a battery so connected with the rails of the section that the current therefrom will produce in the relay a polarity the reverse of that produced by the current from the generator, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JACOB B. STRUBLE.

Witnesses:
DARWIN S. WOLCOTT,
M. S. MURPHY.