(No Model.) 2 Sheets—Sheet 1.

A. GARING.

ELECTRIC SIGNALING APPARATUS.

No. 568,606. Patented Sept. 29, 1896.

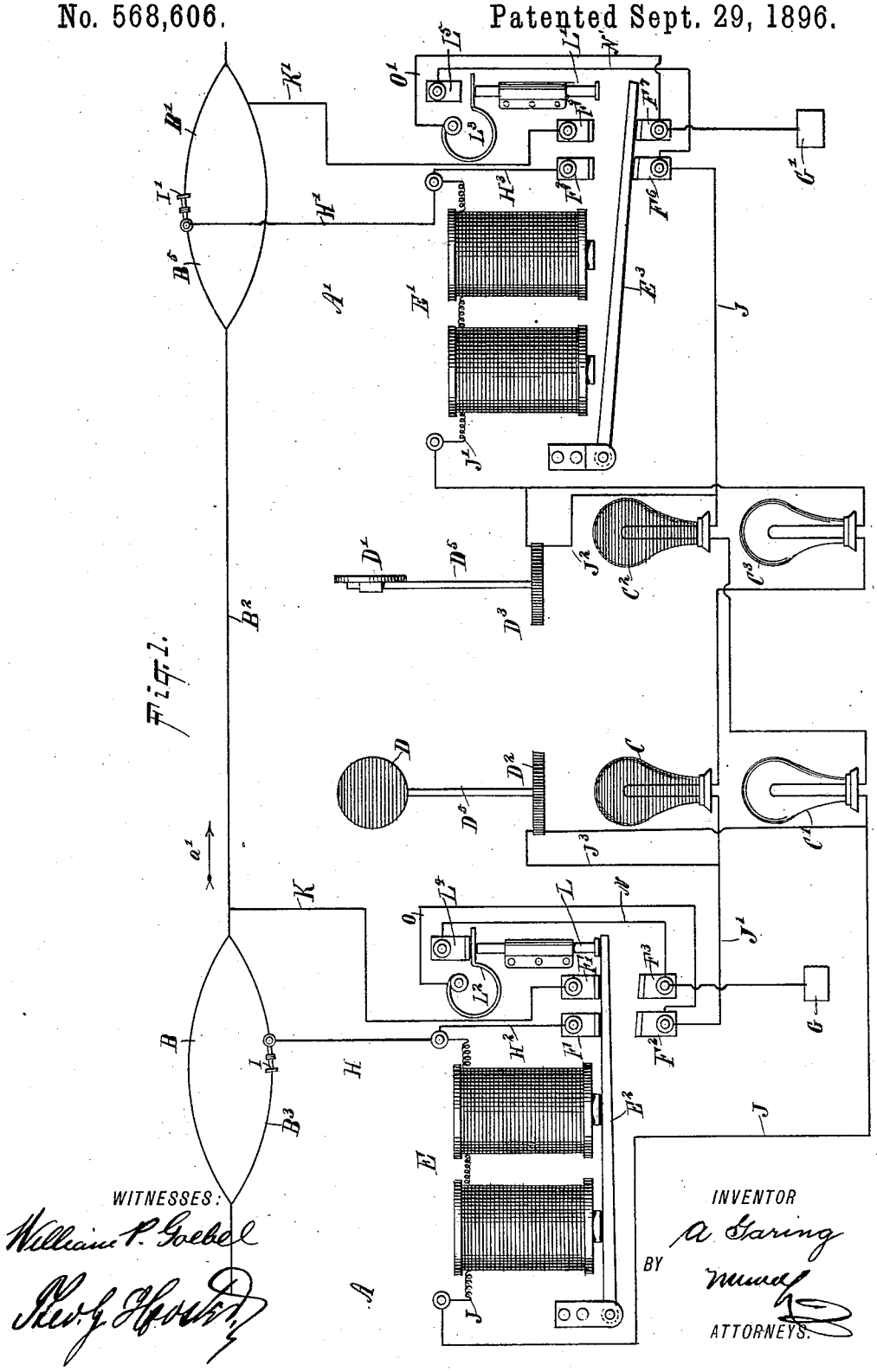

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

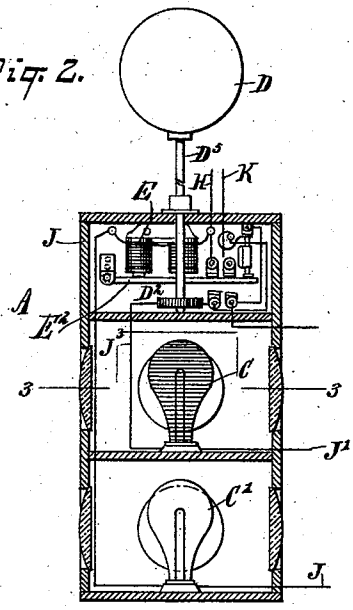


Fig. 3.

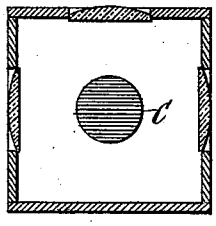


Fig. 4.

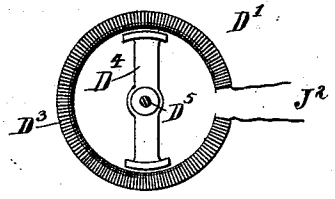


Fig. 5.

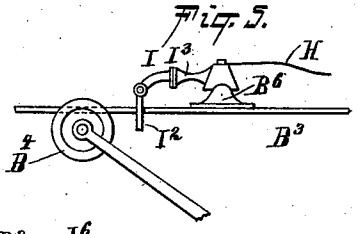


Fig. 6.

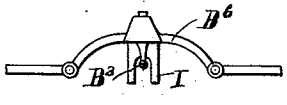
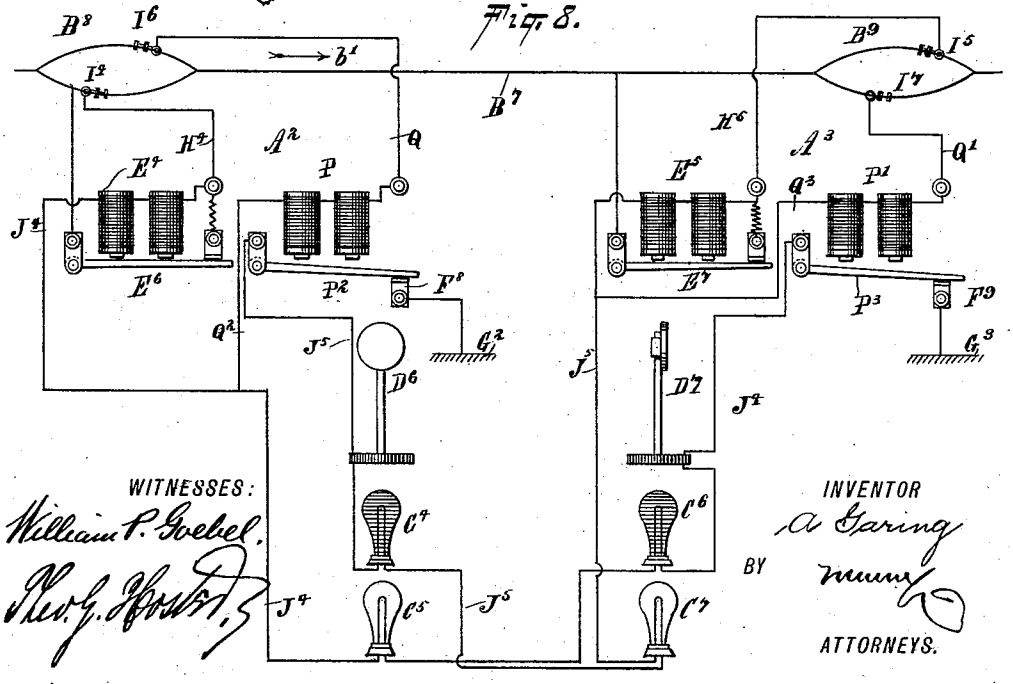


Fig. 7.

Fig. 8.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ADOLPH GARING, OF CARLSTADT, NEW JERSEY, ASSIGNOR OF ONE-HALF TO JOHN OEHLER, OF SAME PLACE.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 568,606, dated September 29, 1896.

Application filed April 21, 1896. Serial No. 588,462. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH GARING, of Carlstadt, in the county of Bergen and State of New Jersey, have invented a new and Improved Electric Signaling Apparatus, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved electric signaling apparatus more especially designed for use on trolley and other railroads and arranged to prevent head collisions of the cars on single tracks, curves, switches, and the like.

The invention consists principally of an electromagnet at each end of the section and a signal-carrying circuit-wire leading from each magnet to the other end of the section to connect with a ground contact-point adapted to be closed by the armature of the electromagnet at this end of the section, the current passing through said circuit-wires containing the signals being controlled by a part carried by the car.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a diagrammatic view of the improvement. Fig. 2 is a sectional side elevation of one of the signal-boxes. Fig. 3 is a sectional plan view of the same on the line 3 3 of Fig. 2. Fig. 4 is an enlarged sectional plan view of the motor for actuating the day target-signal. Fig. 5 is an enlarged side elevation of the trolley-wheel, trolley-wire, and hanger. Fig. 6 is a cross-section of the same. Fig. 7 is a cross-section of the trolley-wire and part of the hanger, and Fig. 8 is a diagrammatic view of the improvement as arranged for turning out the electric lamps at both ends of the sections when the cars leave the latter.

The signal-boxes A A′, both alike in construction, are set up at the ends of the section, for instance, as illustrated in Fig. 1, at the turnouts B B′, located at the ends of the section B^2, which latter forms part of a trolley-railroad. Each of the signal-boxes A A′ contains a night-signal in the shape of a red electric lamp C C^2, respectively, for indicating "danger" and a white electric lamp C′ C^3, respectively, for indicating "safety." The boxes also contain day-signals in the shape of targets D D′, respectively, adapted to be given quarter-turns for indicating "safety" and "danger" positions, as hereinafter more fully described, the said targets being actuated by electric motors in the form of field-magnets D^2 D^3, respectively, made circular and containing an armature D^4, secured on a shaft D^5, mounted to turn in suitable bearings and supporting at its upper end the targets.

In the box A are formed two compartments, one of which contains the red electric lamp C and the other contains the white electric lamp C′, the rays of the lamps when lighted passing through suitable lenses to the outside to be visible by the motorman on the approaching car. The other signal-box A′ is similarly arranged with compartments, one of which contains the red electric lamp C^2 and the other the white electric lamp C^3.

In the upper ends of the signal-boxes A A′ (see Figs. 1 and 2) are arranged electromagnets E E′, respectively, having armatures E^2 E^3, respectively, in the shape of levers mounted to swing up when attracted by the magnets, and adapted to drop when the electromagnet is rendered inactive. The armature E^2, when attracted by its electromagnet E, makes contact with two contact-points F F′, and when said armature drops it makes contact with two contact-points F^2 F^3, of which the latter is connected with the ground G. The other armature E^3 when attracted makes contact with contact-points F^4 F^5, and when the electromagnet E′ is inactive and the armature drops then it makes contact with the contact-points F^6 F^7, of which the latter is connected with the ground G′.

The electromagnet E is connected by a wire H with a hanger I, straddling the trolley-wire B^3 at the turnout B, said hanger being insulated from the said trolley-wire and adapted

to be engaged by a trolley-wheel B^4 when the car travels through the turnout in the direction of the arrow a'. When this takes place, the trolley-wheel B^4 sends a momentary current through the hanger I and wire H to the electromagnet E, so as to energize the same and cause the magnet to attract its armature E^2, as indicated in Fig. 1. The other magnet E′ is connected by a wire H′ with a similar hanger I′, straddling the trolley-wire B^5 at the turnout B′, said hanger I′ being adapted to be engaged by the trolley-wheel of a car traveling through the turnout B′ in the inverse direction of the arrow a'. The wire H is connected by a wire H^2 with the contact-point F, and a similar wire H^3 connects the wire H′ with the contact-point F^4. The electromagnet E is also connected with a circuit-wire J, containing the white electric lamp C′ in the signal-box A, said wire then extending to the other end of the section to the signal-box A′, and there contains the red electric lamp C^2, and then connects with the contact-point F^6. A circuit-wire J′ connects with the electromagnet E′ and contains the white electric lamp C^3 in the signal-box A′, and extends from this lamp C^3 to the other signal-box A and there contains the red electric lamp C, and then makes connection with the contact-point F^2.

A branch wire J^2 leads from the wire J in the signal-box A′ to one end of the field-magnet D^3, connected at its other end with the circuit-wire J′, as plainly indicated in Fig. 1. A similar branch wire J^3 leads from the wire J′ in the signal-box A to one end of the field-magnet D^2, the other end of which is connected to the circuit-wire J.

Now when the device is arranged on a trolley-railroad, as shown in the drawings, then the electricity necessary for lighting the lamps C C′ C^2 C^3 and that required for working the motors and giving quarter-turns to the target-signals is directly supplied from the trolley-wire B^2, and for this purpose the same is connected by a live wire K with the contact-point F′ in the signal-box A and by a live wire K′ with the contact-point F^5 in the signal-box A′. The free ends of the armatures E^2 and E^3 engage vertically-disposed insulated rods L L′, respectively, fitted to slide in suitable bearings in the signal-boxes A A′ and pressed on at their upper ends by springs L^2 L^3, respectively, for holding the said insulated rods normally in a lowermost position—that is, when the armatures E^2 and E^3 are disengaged from their electromagnets. When the armatures, however, are attracted, then the rods L L′ are pushed upward to make contact between the springs L^2 and L^3 and the contact-points L^4 L^5, respectively, connected by wires N N′, respectively, with the contact-points F^3 and F^6, respectively. The springs L^2 and L^3 are connected by wires O O′ with the contact-points F^2 and F^7, respectively, as indicated in Fig. 1. This arrangement serves for grounding the electric lamps after the current is cut off.

Each hanger I I′ is provided with a fork I^2, straddling the corresponding wire, as plainly shown in Figs. 5, 6, and 7, said fork being fulcrumed on an arm I^3, secured to a support B^6, carrying the trolley-wire, the latter being insulated from said support in the usual manner, and consequently insulated from the hanger I or I′.

The operation is as follows: When a car passes the turnout B on the wire B^3 in the direction of the arrow a', then the trolley-wheel of this car makes contact for an instant with the fork I^2 of the hanger I, so that a current of short duration is sent through the hanger I and wire H to the electromagnet E to energize the latter and cause the magnet to attract the armature E^2, as illustrated in Fig. 1. When this takes place, the armature E^2 in moving in contact with the contact-point F′ causes a current to pass from the trolley-wire B^2 by the wire K to the contact-point F′, the armature E^2, the electromagnet E, and the wire J to light the white lamp C′ in the box A and the red lamp C^2 in the box A′, the current passing by way of the contact-point F^6, armature E^3, and contact-point F^7 to the ground G′. Now it will be seen that at the turnout B the white lamp C′ is burning, thus indicating "safety" for a following car, but at the same time "danger" is signaled by the red lamp C^2 in the box A′ to a car approaching this section in the inverse direction of the arrow a'. When the car traveling in the direction of the arrow a' has finally arrived at the turnout B′, then the car going in the inverse direction can start into the section, and in doing so the trolley-wheel B^4 in passing over the wire B^5 makes a momentary contact with the fork I^2 of the hanger I′, and thereby sends a current of short duration through the wire H′ to the electromagnet E′, so that the armature E^3 is attracted. When this takes place, the burning white lamp C′ and the burning red lamp C^2 are instantly extinguished, as the circuit for those lamps is broken by the armature E^3 leaving the contact-point F^7, connected with the ground G′. The moment that the circuit of the wire J is broken the electromagnet E is rendered inactive, and consequently the armature E^2 drops and makes contact with the points F^2 and F^3 and disconnects the points F F′. The armature E^3 in making contact with the points F^4 F^5 causes a live current to pass from the trolley-wire by the wire K′ through the contact-point F^5 and armature E^3 to the electromagnets E′, which thus keep the armature E^3 attracted, and the current passes through the wire J′ to the white lamp C^3 in the box A′, and to the red lamp C in the box A, so that the two lamps C^3 and C are lighted to display "safety" at the end B of the section B^2 for cars following in the inverse direction of the arrow a' and to display "danger" for cars traveling to the end B′ of the section B^2 in the direction

of the arrow a'. Thus the car can travel over the section B^2 in the inverse direction of the arrow a' until it finally reaches the turnout to pass into the next following section and permit another car to pass over the turnout B to the section B^2 in the direction of said arrow a'. When this takes place, the above-described operation is repeated; that is, the trolley-wheel of this car makes momentary contact with the hanger I to cause the electromagnet E to again attract its armature E^2 and to break the current at the contact-point F^3 for the circuit previously passed through the wire J'. The armature E^3 then drops back to its normal position (shown in Fig. 1) to make a ground contact for the live current passing through the wire J, as previously explained.

During the day the lamps C C' C^2 C^3 are cut out in the wires J J' by a suitable switch, and the wires are connected by a similar switch with the branch wires J^2 J^3, so as to actuate the motors controlling the day target-signals D' and D. As the targets make quarter-turns they all stand alternately in "danger" and "safety" positions to give signals the same as the red and white lamps burning during the night. It is understood that when a current passes through the circuit-wire J or J' then the electric motor for the corresponding day-signal is energized to set the target accordingly, and when the current is cut off then a light spring or equivalent device returns the armature and target to the normal previous position.

When it is desired to cut off or turn out the lights when the car leaves the section in either direction, then I prefer the arrangement illustrated in Fig. 8. In this case the two signal-boxes A^2 and A^3 at the end of the section B^7 at the turnouts B^8 B^9 are provided with electromagnets E^4 E^5, and with an additional set of electromagnets P P', located in said boxes A^2 A^3, respectively.

The electromagnets E^4 E^5 are connected by the wires H^4 H^5, respectively, with the hangers I^4 I^5, respectively, and the said electromagnets are also connected with the circuit-wires J^4 J^5, respectively, of which the wire J^4 contains the white lamp C^5 in the signal-box A^2 and the red lamp C^6 and the day-signal D^7 in the signal-box A^3. The other circuit-wire J^5 contains the white lamp C^7 in the box A^3 and the red lamp C^4 and day-signal D^6 in the box A^2. The wire J^4 connects in the signal-box A^3 with the end of the armature-lever P^3 for the electromagnet P', said armature being adapted to make contact with the point F^9, connected with the ground G^3. The wire J^5 connects in the signal-box A^2 with the pivot of the armature P^2 for the electromagnet P, and this armature, when in a lowermost position, makes contact with the point F^8, connected with the ground G^2.

The electromagnets P P' are connected by wires Q Q' with hangers I^6 I^7, respectively, arranged in the trolley-wires at the turnouts B^8 B^9 for the cars leaving the section B^7. The electromagnet P is also connected by a branch wire Q^2 with the circuit-wire J^4, and a similar branch Q^3 connects the electromagnet P' with the circuit-wire J^5.

Now it will be seen that when a car travels in the direction of the arrow b' its trolley-wheel, by contacting with the hanger I^4, causes the white lamp C^5 to be displayed in the box A^2 and the red or danger lamp C^6 to be displayed in the box A^3. When this car leaves the section at the turnout B^9, its trolley-wheel comes in contact with the hanger I^7 and a momentary current is sent through the wire Q' to the electromagnet P', so that the armature P^3 is attracted and the ground connection for the circuit-wire J^4 is broken, so that the lamps C^6 C^5 are extinguished. The same operation takes place when a car travels in the inverse direction of the arrow b', as this causes the white lamp C^7 and the red lamp C^4 to be lighted by the trolley-wheel actuating the hanger I^4. When this car leaves the section at the turnout B^8, the trolley-wheel comes in contact with the hanger I^6, and consequently a current passes to the electromagnet P, which then attracts the armature P^2, to break the ground connection for the circuit-wire J^5, containing the lamps C^4 and C^7.

It is further understood that the electricity for the lamps and motors for the day-signals may be supplied from some local source instead of from the trolley-wires, as previously explained in reference to Fig. 1.

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

1. An electric signaling apparatus, comprising an electromagnet and its armature at each end of the section, and an independent signal-carrying circuit-wire leading from each electromagnet to the other end of the section, and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, the current passing through the said circuit-wire containing the signals, being controlled by a part carried by the car, substantially as shown and described.

2. An electric signaling apparatus, comprising an electromagnet and its armature at each end of the section, an independent circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, substantially as shown and described.

3. An electric signaling apparatus, comprising an electromagnet and its armature at

each end of the section, an independent circuit-wire leading from each electromagnet to the other end of the section, and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, and means, substantially as described, for sending a momentary current to the electromagnet by a part carried by the car, as set forth.

4. An electric signaling apparatus, comprising an electromagnet and its armature at each end of the section, an independent circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, means, substantially as described, for sending a momentary current to the electromagnet by a part carried by the car, and means, substantially as described, controlled by the armature of the said electromagnet for sending a live current through the said electromagnet and the respective circuit-wire whenever the corresponding armature is attracted, as set forth.

5. An electric signaling apparatus, comprising an electromagnet and its armature at each end of the section, an independent circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, and live wires connected with contact-points adapted to be engaged by the armatures of the electromagnets when said armatures are attracted to send a live current of electricity through the respective circuit-wire, to set a safety-signal at one end of the section and a danger-signal at the other end of the section, substantially as shown and described.

6. An electric signaling apparatus, comprising hangers at the ends of the section and adapted to be momentarily engaged by the trolley-wheel of the car entering the section, an electromagnet and its armature at each end of the section and connected with said hanger so that a momentary current can pass from the hanger to the electromagnet at the time the trolley-wheel is in engagement with the said hanger, a circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, substantially as shown and described.

7. An electric signaling apparatus, comprising hangers at the ends of the section and adapted to be momentarily engaged by the trolley-wheel of the car entering the section, an electromagnet and its armature at each end of the section and connected with said hanger so that a momentary current can pass from the hanger to the electromagnet at the time the trolley-wheel is in engagement with said hanger, a circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, and live wires connected with contact-points adapted to be engaged by the armatures of the electromagnets when the said armatures are attracted, to send a live current of electricity to the respective current-wire to set a safety-signal at one end of the section and a danger-signal at the other end of the section, substantially as shown and described.

8. An electric signaling apparatus, comprising hangers at the ends of the section and adapted to be momentarily engaged by the trolley-wheel of the car entering the section, an electromagnet and its armature at each end of the section and connected with said hanger so that a momentary current can pass from the hanger to the electromagnet at the time the trolley-wheel is in engagement with said hanger, a circuit-wire leading from each electromagnet to the other end of the section and connected with a ground contact-point adapted to be closed by the armature of the electromagnet at this other end of the section, a danger-signal and a safety-signal in each circuit-wire, the one signal being located at one end of the section and the other signal being located at the other end of the section, and a grounding connection for each circuit-wire and controlled from the armature of the other electromagnet, to ground the circuit-wire when this armature is retracted, substantially as shown and described.

9. An electric signaling apparatus, comprising two hangers at the end of each section, one hanger being adapted to be engaged by the trolley-wheel of the car entering the section, and the other by the trolley-wheel of the car leaving this end of the section, two electromagnets and their armatures at each end of the section and connected by wires with said hangers at this end of the section, so that a momentary current can pass from the re-

spective hanger to the corresponding electromagnet to energize the same, a circuit-wire leading from the electromagnets at one end of the section to a ground-contact controlled by the armature of one of the electromagnets at the other end of the section, a safety-signal and a danger-signal in each circuit-wire, the one being at one end of the section and the second signal being located at the other end of the section, substantially as shown and described.

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