

935,892.

A. C. CAREY.
ELECTRIC SIGNAL FOR RAILWAYS.
APPLICATION FILED NOV. 21, 1907.

Patented Oct. 5, 1909.
2 SHEETS—SHEET 1.

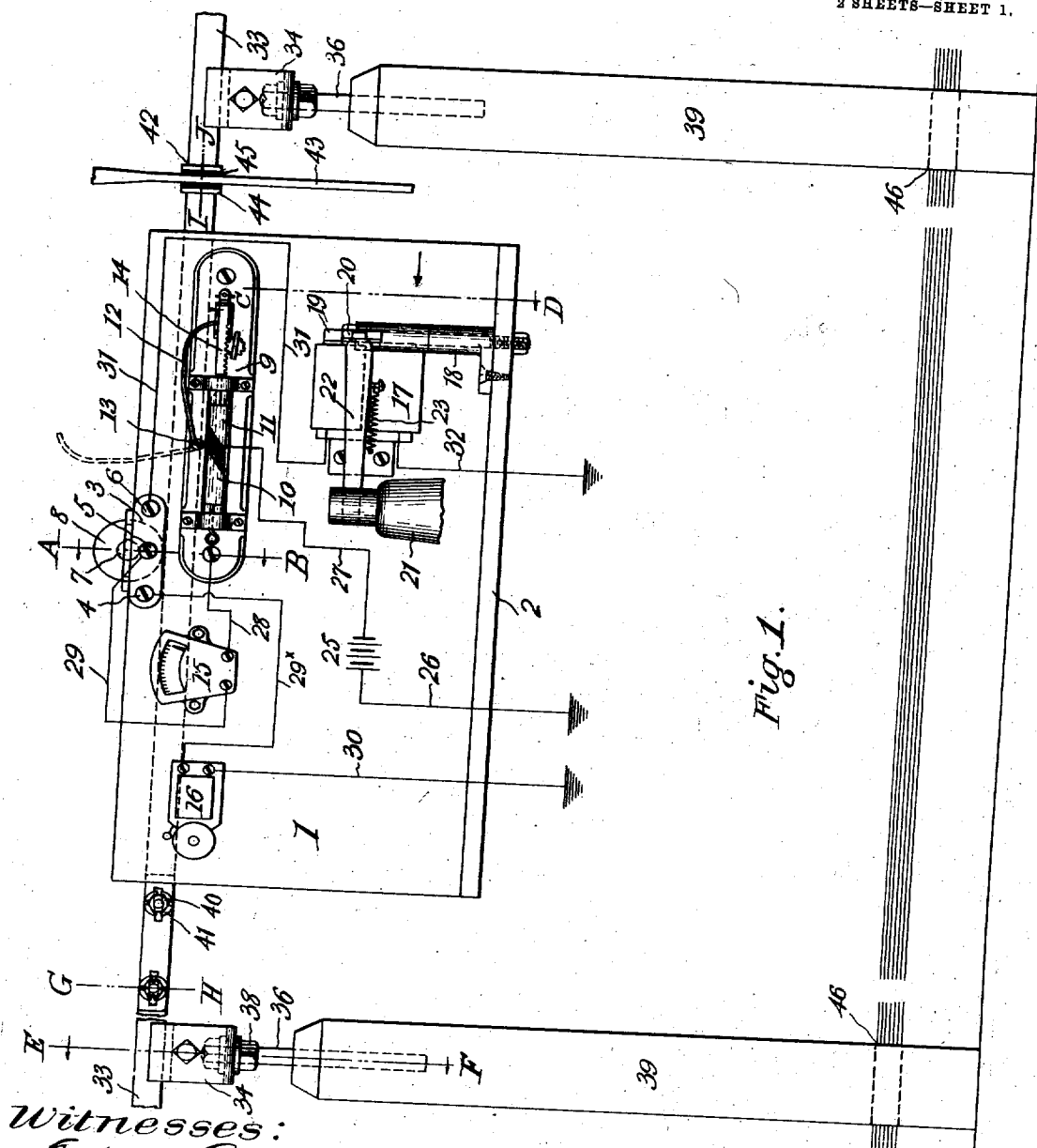


Fig. 1.

Witnesses:
Edmond.
Lillie M. Perry.

Inventor:
Augustus C. Carey
by W. H. Linnell Atty.

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2 SHEETS—SHEET 2.

Fig. 2.

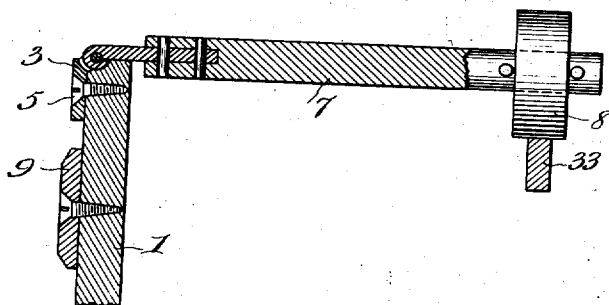


Fig. 5.

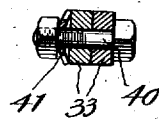


Fig. 3.

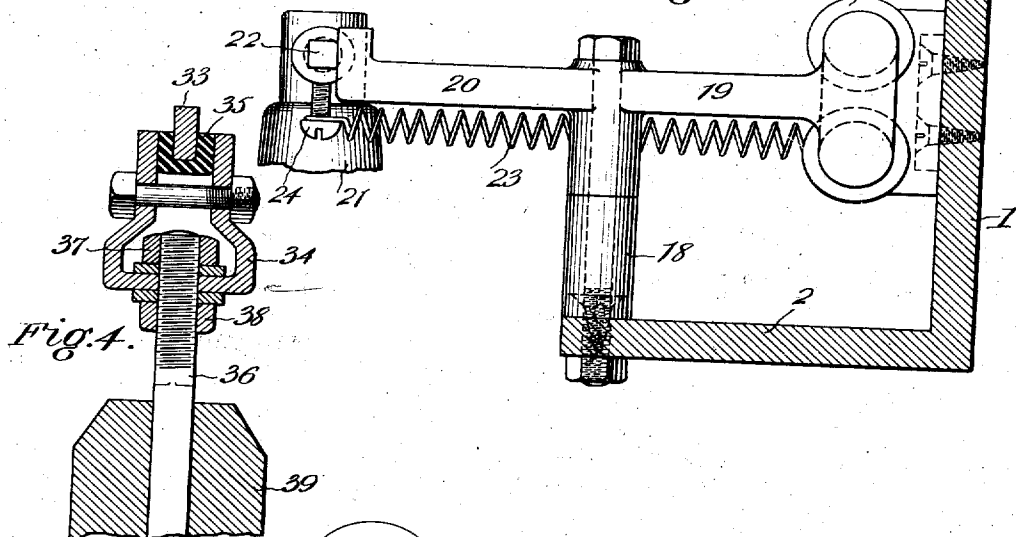


Fig. 4.

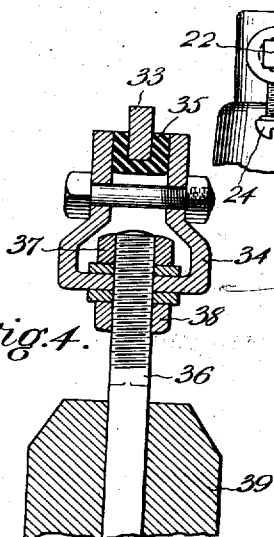
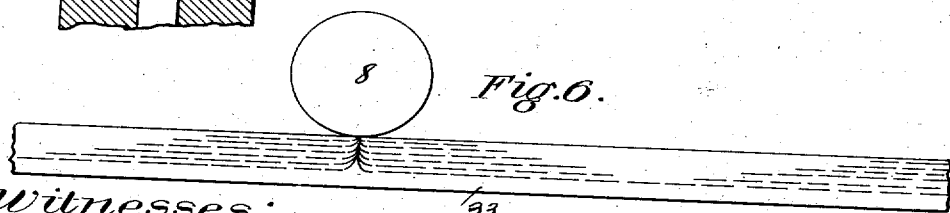


Fig. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

AUGUSTUS C. CAREY, OF BOSTON, MASSACHUSETTS.

ELECTRIC SIGNAL FOR RAILWAYS.

935,892.

Specification of Letters Patent.

Patented Oct. 5, 1909.

Application filed November 21, 1907. Serial No. 403,193.

To all whom it may concern:

Be it known that I, AUGUSTUS C. CAREY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Electric Signals for Railways, of which the following is a full, clear, and exact description.

The object of this invention is to prevent collisions of railway trains, and to attain this object automatically. For this purpose, this invention includes a conductor erected alongside of the track, with which conductor is a cooperating mechanism carried in the cabs of the locomotives and comprising an audible or other alarm, means for actuating the air-brake mechanism to set the brakes, a source of electric energy, and a regulator for the current, the whole arranged in such way that when trains enter a given stretch of track equipped with the conductor, the engineers of the several trains will be automatically apprised of the presence in that section of the other trains in time to shut off steam, and the air-brakes on the several trains will be automatically set, all as I will proceed now more particularly to set forth and finally claim.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a diagrammatic elevation showing the electrical installation and a portion of the roadway conductor. Fig. 2 is a sectional view, on a larger scale, taken on the line A B, Fig. 1, showing the contact roller and its supporting arm. Fig. 3 is a sectional view, on a larger scale, taken on the line C D, Fig. 1, and looking in the direction of the arrow, showing the engineer's air-brake valve and its releasing mechanism in elevation. Fig. 4 is a vertical section, on a larger scale, taken on the line E F, Fig. 1, showing one of the conductor supports. Fig. 5 is a cross-section, on a larger scale, taken on the line G H, Fig. 1, showing a lapped joint for the conductor sections. Fig. 6 is a diagrammatic view of the conductor and contact roller showing the direction of the current as it passes from the roller, and the incoming current from an approaching locomotive.

For purposes of illustration, I have herein shown the several electrical mechanisms employed as mounted upon a base 1, having a shelf 2 at its lower edge, but such base

may be dispensed with and the several devices may be otherwise arranged and supported in the cab of the locomotive or other vehicle to suit the purposes of the installation.

To the upper edge of the base 1, a conducting plate 3 is secured by means of screws 4, 5 and 6, and hinged to the upper edge of said plate 3, in any suitable manner, is an arm 7 of conducting material, carrying at its outer end a suitable contact, such as a roller 8. A current regulator 9 is also mounted upon the base 1, and preferably this regulator is of the "coherer" type, in which loose granular particles of conducting material are confined within a non-conducting tube between conducting plungers and adapted to be compacted, more or less, between the ends of the plungers to regulate or control the flow of electric current. The plungers 10 and 11 of the regulator are inclined or beveled at their inner ends to more effectively produce the loosening and compacting of the particles of granular material. Furthermore, the regulator is provided with a switch arm 12 for throwing the regulator in and out of circuit when desired. The switch arm 12 may be pivoted at 13 to the base of the regulator, and is adapted to be swung into and out of contact with the operating end 14 of the plunger 11. An electric meter 15, of any suitable or approved construction, is also arranged upon the base 1, for ascertaining the amount of current passing through the regulator. An alarm bell 16 is also arranged upon the base 1. Also mounted upon base 1 is an electro-magnet 17, and supported upon shelf 2 of the base is a suitable standard or support 18 upon which is pivotally supported the armature 19 for the electro-magnet 17, having an arm 20 projecting outwardly therefrom.

The electro-magnet 17 and its armature 19—20 will be arranged adjacent to the engineer's air-brake valve 21, Figs. 1 and 3, which may be provided with an arm 22 projecting therefrom and adapted to be engaged by the arm 20 of the armature 19 to hold said valve in a closed position. A spring 23 is connected at one end to the valve arm 22 by means of a screw 24, and at its other end is connected with the base of the electro-magnet 17, and serves to open the valve when released by the armature arm 20.

Any suitable source of electric supply may be employed in connection with the apparatus.

tus above described, as for example, a battery 25, having one of its terminals grounded by means of wire 26 in any suitable manner. The other terminal of battery 25 is connected by means of wire 27 with the pivot 13 of the switch 12, which as hereinbefore stated, is adapted to contact with the operating end 14 of the movable plunger 11 of the regulator 9. The opposite plunger 10 of the regulator is connected by means of wire 28 with one of the terminals of the meter 15, and a wire 29 connects the other terminal of the meter with the contact plate 3 by means of screw 5, and the conducting arm 7, carrying roller 8, is connected with the plate 3, and thus a metallic circuit is provided from the battery through the regulator and meter to the contact roller 8.

A wire 29* connects the contact plates 3, 20 by means of screw 4, with one terminal of the bell or other suitable alarm 16, and the other terminal of bell 16 is grounded in any suitable manner by means of wire 30, and thus a complete circuit is provided through battery, regulator, meter, contact plate 3, 25 and bell 16.

A wire 31 connects the contact plate 3, by means of screw 6, with one terminal of the electro-magnet 17, and the other terminal of the magnet is grounded in any suitable manner by wire 32, and thus a complete circuit is provided through battery, regulator, meter, contact plate 3, and electro-magnet 17.

The coils of the bell 16 and electro-magnet 35 17 are wound so that the coils of the bell 16 will be of less resistance than the coils of the electro-magnet 17, in order that upon supplying a predetermined amount of current in the circuits of the bell and electro-magnet, the bell will be the first to be operated, and upon a slight increase of current the electro-magnet will operate.

Each locomotive is to be supplied with the apparatus above described.

45 A conductor 33, preferably of soft iron, is arranged along the entire length of the road, and is supported in clamping brackets 34, suitably insulated from the conductor, as at 35, Fig. 4. These clamping brackets 50 34 are mounted upon screw posts 36, and are adjustable thereon by means of binding nuts 37 and 38. The screw posts 36 are secured in the upper ends of wooden or other suitable posts 39 arranged at suitable distances 55 apart along the road. The posts 39 may be bored transversely, as at 46, Fig. 1, and serve as supports for telegraph and telephone wires.

The conductor 33 is constructed of sections of flat rods or bars, of suitable length, 60 and the meeting ends are preferably lapped and bolted together, as by bolts 40 (Fig. 5) with an interposed spring washer 41, to insure a perfect contact between the lapped 65 surfaces of the ends of the conductor. The

holes for the bolts of the joints may be elongated to provide for the expansion and contraction of the bar due to changes of temperature.

The upper or contact surface of the conductor and the adjacent lapped surfaces of the joints are preferably polished and tinned or nickled to prevent corrosion, to thereby insure perfect contact surfaces, and the remaining surfaces of the conductor may be covered with any suitable non-conducting, non-corrodible, protecting material. 70 75

The conductor 33 is arranged along the track in a position to be engaged by the contact roller 8 of the signaling and brake apparatus carried by the locomotives, and thus maintains a normally closed branch circuit through the apparatus of the several locomotives upon the track. Said conductor is supported upon the posts in an insulated manner and without ground connection at any point. Any suitable provisions for carrying the conductor over or under crossings and at stations may be provided. 80 85

The operation of the apparatus is as follows:—As above stated, each locomotive or train is supplied with a set of signaling and brake apparatus and the current in the normally closed circuits on each locomotive is so regulated by means of the regulator 9, 95 and the armatures of the bell magnets and the brake releasing magnets so set with relation to the strength of the current on the respective locomotives, that when two locomotives are at a predetermined distance 100 apart, say about five hundred feet, the strength of the current in the circuits on the respective locomotives will be insufficient to energize the magnets sufficiently to attract the armatures of the signaling apparatus and brake mechanisms, and hence the signaling apparatus and brake mechanisms are maintained in closed circuits and remain inactive, due to the resistance offered by the branch circuit through the track conductor 105 and ground connections between adjacent locomotives. As soon as two locomotives approach one another and come closer together than the before mentioned predetermined distance apart, the branch circuit 110 between the adjacent or approaching locomotives is reduced and the resistance offered thereby decreased and the currents of the batteries or other sources of supply of the approaching locomotives are gradually 115 brought together and combine in the signaling apparatus and brake mechanism circuits of the respective locomotives, and as the locomotives still further approach the strength of the current increases, due to the reduction of the resistance offered by the branch circuit between the approaching locomotives, and when the locomotives reach, say, about three hundred feet apart, the strength of the current supplied by the com- 120 125 130

bined batteries will be sufficient to energize the magnets of the bells or other signaling apparatus on the approaching locomotives and thus notify the engineers of the approach of their trains, and to shut off steam. Upon further approach of the trains and consequent increase of current in the signaling apparatus and brake mechanism circuits, the magnets of the brake mechanism will be energized sufficiently to attract their armatures to release the brake valves on the approaching locomotives and set the brakes and to effectually stop the trains and thereby prevent collision. Should the engineers neglect to shut off steam, upon the sounding of the signals, the brake mechanisms will operate to effect the braking or stopping of the trains sufficiently to prevent accident. When the trains are stopped, the switch arm 12 of the regulator may be raised, as shown by dotted lines Fig. 1, and the circuits broken, until the trains are separated a sufficient distance to again lower the switch to set the apparatus for further protection against danger of collision.

I do not wish to be understood as limiting my invention to the exact details of construction and arrangement of parts herein shown and described, as the same may be changed in various particulars and still be within the scope of the invention.

I do not undertake to state definitely any theory involved in the operation of the apparatus, but have herein given the results of repeated experimental and service tests, in which I have employed dry cell batteries purchased in open market and without certain knowledge of their relative strength, and where the electrical equipment on each locomotive has been the same. It may be that these batteries on the different locomotives have or have developed in operation certain strength, but the tests have uniformly resulted in the setting of the brakes when the predetermined danger zone has been approached.

By the use of the term "locomotive" herein and in the claims, I do not wish to be understood as limiting the application of the invention to that one structure.

Instead of using one contact roller 8 for each locomotive, I may use two such rollers, and arrange them upon opposite sides of the locomotive cab for the purpose of running a train in opposite directions upon the same track equipped with a single conductor, and for this purpose, it would only require additional wiring to the several devices of the apparatus for the additional contact roller. Or, each locomotive may be provided with two sets of signaling and braking apparatus with a contact roller for each set arranged upon opposite sides of the locomotive cab and the road provided with two conductors, one upon each side of the track; or both

sets of apparatus may be arranged upon the same side of the locomotive with two contact rollers and two conductors upon the same side of the track. The contact roller is shown as a plain circular roller, but there may be used a contact device of other form, and the contact device may be provided with means for cleaning or scraping the conductor to free it of ice, snow, or dirt.

What I claim is:—

1. In an apparatus of the class described, the combination in a normally closed circuit, of a source of electricity, an electro-magnetically operated brake-controlling mechanism, and a movable contact device, applied to each of any number of locomotives and grounded through such locomotives, a continuous conductor arranged alongside of the railway track with which the movable contact devices come into electrical engagement to maintain a continuously closed circuit between the successive locomotives, the arrangement being such substantially as described that the electro-magnetically operated brake mechanism on each locomotive is adapted to be set to be inactive when the locomotives are a predetermined distance apart and is rendered active when the locomotives approach one another proximately, to set the brakes and thus prevent collision.

2. In an electric signal for railways, a normally closed circuit, including signaling apparatus, carried by each locomotive, combined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and their normally closed circuits on the respective locomotives are adapted to be maintained inactive until the locomotives approach one another.

3. In an electric signal for railways, a normally closed circuit, including signaling apparatus, carried by each locomotive, combined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and their normally closed circuits on the respective locomotives are adapted to be maintained inactive until the locomotives approach one another, and a switch for breaking the normally closed circuits on the respective locomotives.

4. In an electric signal for railways, a normally closed circuit, including signaling apparatus, carried by each locomotive, com-

lined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and their normally closed circuits on the respective locomotives may be set to be inactive when the locomotives are a predetermined distance apart and caused to be operated by an increase of current in said circuits upon the approach of two similarly equipped locomotives.

5. In an electric signal for railways, a normally closed circuit, including a signaling apparatus and a brake mechanism, carried by each locomotive, combined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and brake mechanisms and their normally closed circuits on the respective locomotives are adapted to be maintained inactive when the locomotives are a predetermined distance apart and the signaling apparatus and brake mechanisms caused to be operated by the approach of two similarly equipped locomotives.

6. In an electric signal for railways, a normally closed circuit, including a signaling apparatus and a brake mechanism, carried by each locomotive, and a regulator included in said circuit for controlling the amount of current to said signaling apparatus and brake mechanism, combined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said con-

ductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and brake mechanisms and their normally closed circuits on the respective locomotives are adapted to be maintained inactive when the locomotives are a predetermined distance apart and the signaling apparatus and brake mechanisms caused to be operated by the approach of two similarly equipped locomotives.

7. In an electric signal for railways, a normally closed circuit, including a signaling apparatus provided with an electromagnet having its coils of a predetermined resistance and a brake mechanism provided with an electro-magnet having its coils of a higher resistance than the coils of the signaling apparatus, carried by each locomotive, combined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive and adapted to engage the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and brake mechanisms and their normally closed circuits on the respective locomotives are adapted to be maintained inactive when the locomotives are a predetermined distance apart and the signaling apparatus and brake mechanisms caused to be operated one after the other, respectively, as two similarly equipped locomotives approach one another.

In testimony whereof I have hereunto set my hand this 18th day of November A. D. 1907.

AUGUSTUS C. CAREY

Witnesses:

THOMAS BAXTER,
EDWIN C. BAILEY.

Correction in Letters Patent No. 935,892.

It is hereby certified that in Letters Patent No. 935,892, granted October 5, 1909, upon the application of Augustus C. Carey, of Boston, Massachusetts, for an improvement in "Electric Signals for Railways," an error appears in the printed specification requiring correction, as follows: Page 3, line 32, the word "definitely" should read *definitively*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of October, A. D., 1909.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

lined with a conductor arranged along the track, a contact carried by and connected in branch with the circuits of each locomotive for engaging the conductor to include said conductor in a branch circuit between adjacent locomotives, and ground connections for the circuits of each locomotive to complete said branch circuit, whereby the signaling apparatus and their normally closed circuits on the respective locomotives may be set to be inactive when the locomotives are a predetermined distance apart and caused to be operated by an increase of current in said circuits upon the approach of two similarly equipped locomotives.

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