No. 775,736. PATENTED NOV. 22, 1904.

E. SERA & F. STOLFI.

ELECTRIC SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED JULY 18, 1904.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.

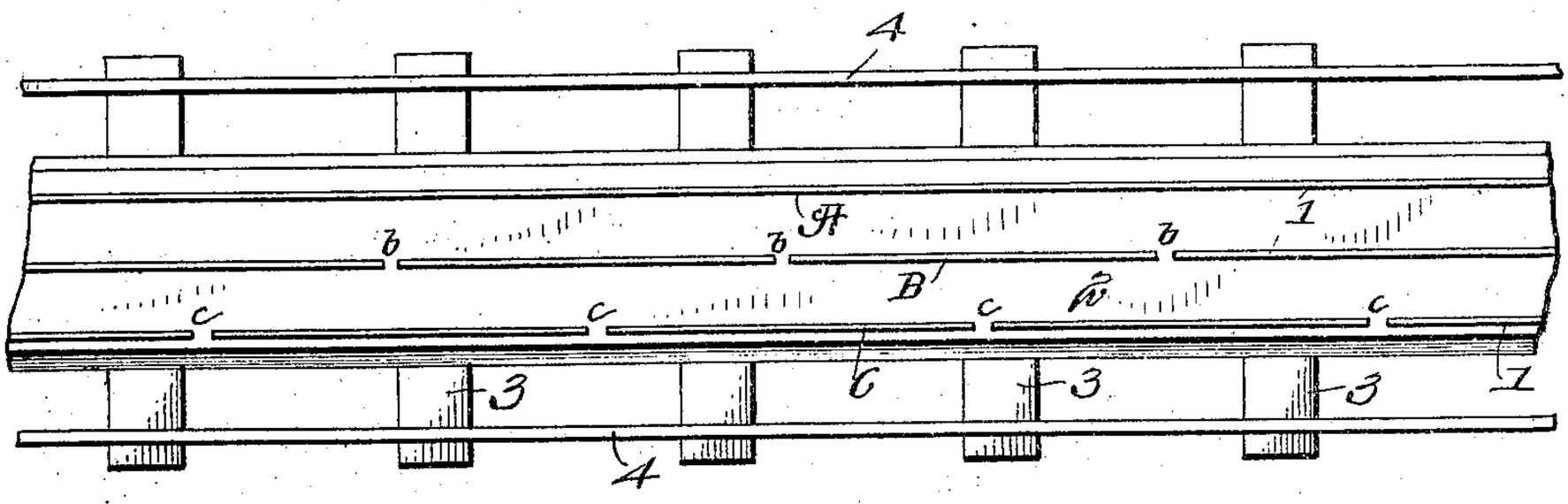

Fig. 2.

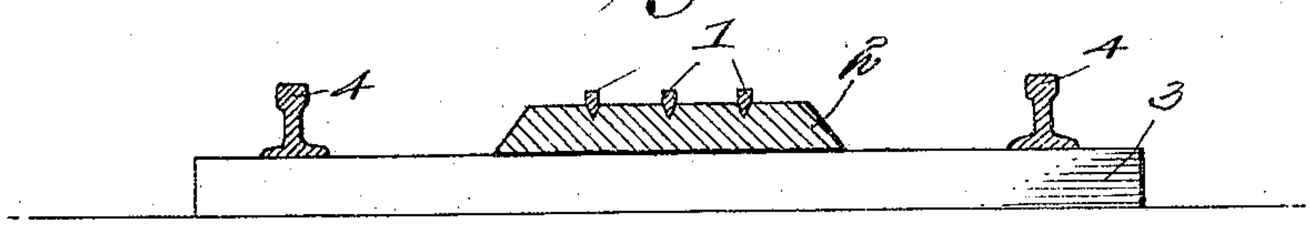

Fig. 3.

Fig. 4.

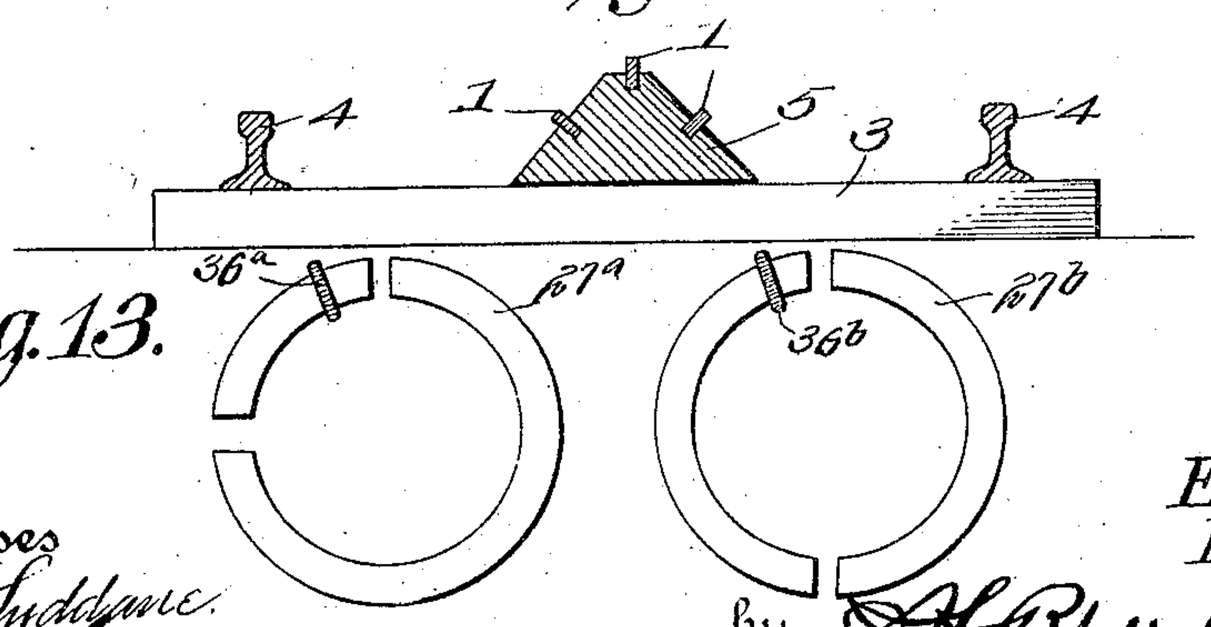

Fig. 13.

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 5.

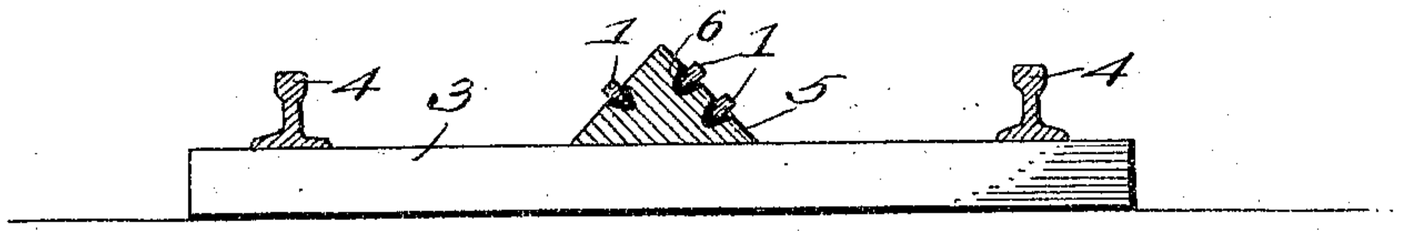


Fig. 6.

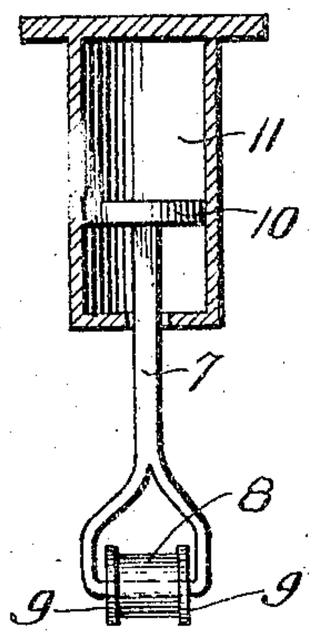
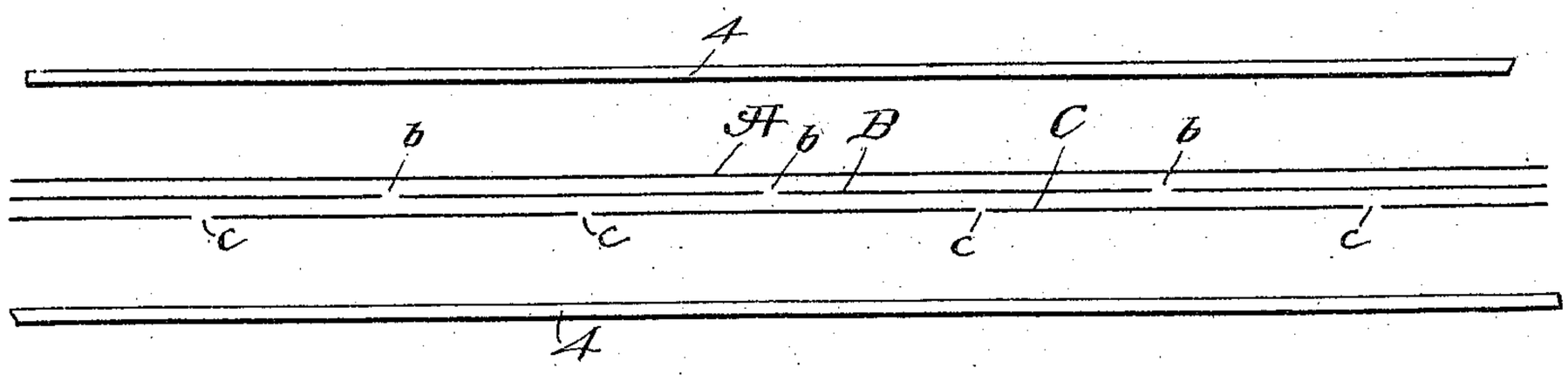


Fig. 7.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 8.

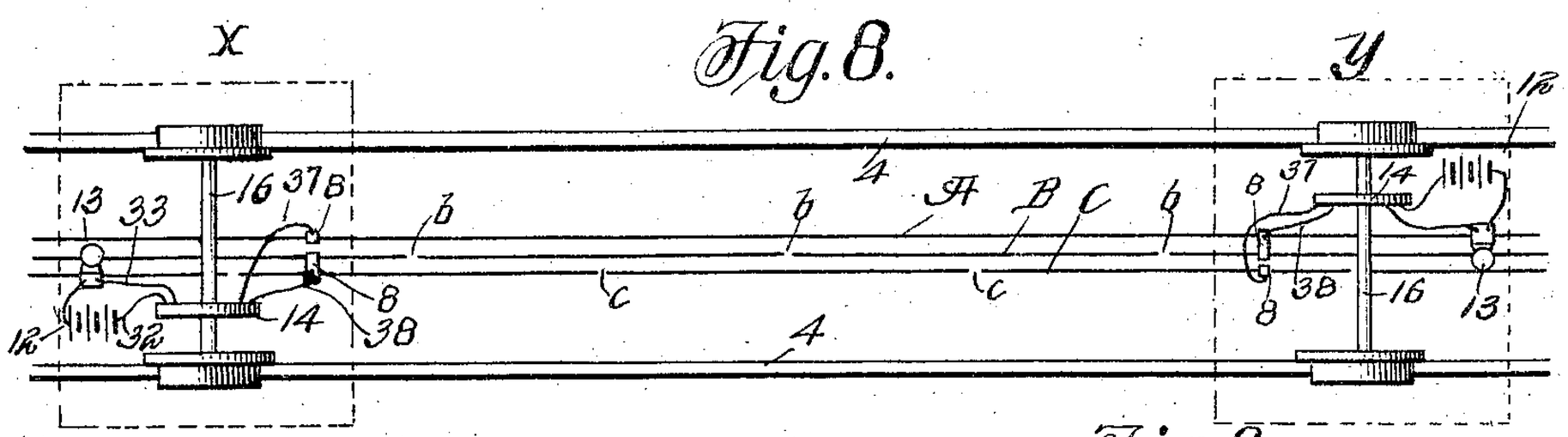


Fig. 9.

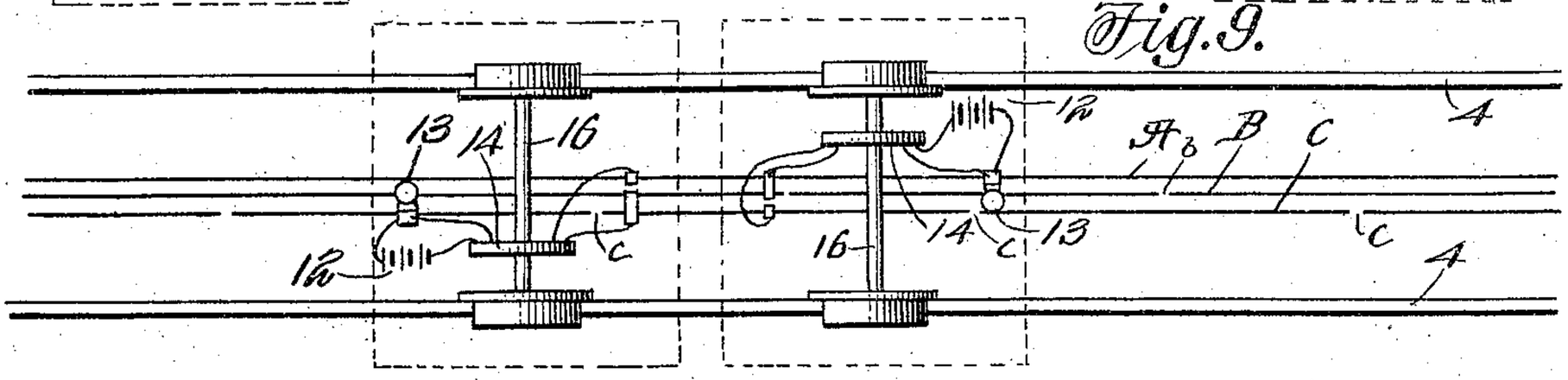


Fig. 10.

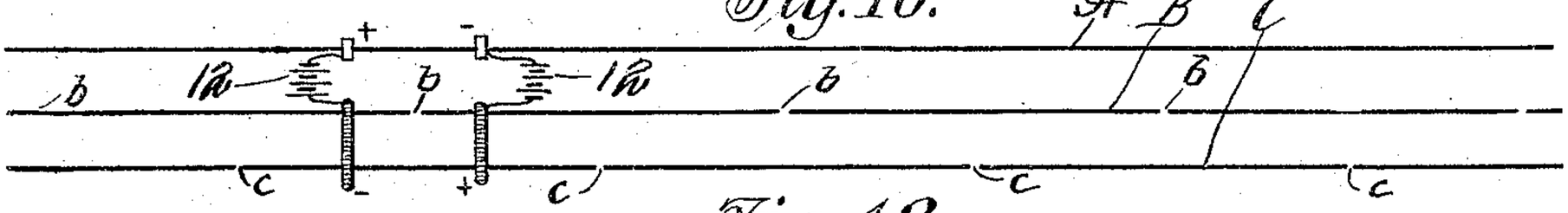


Fig. 12.

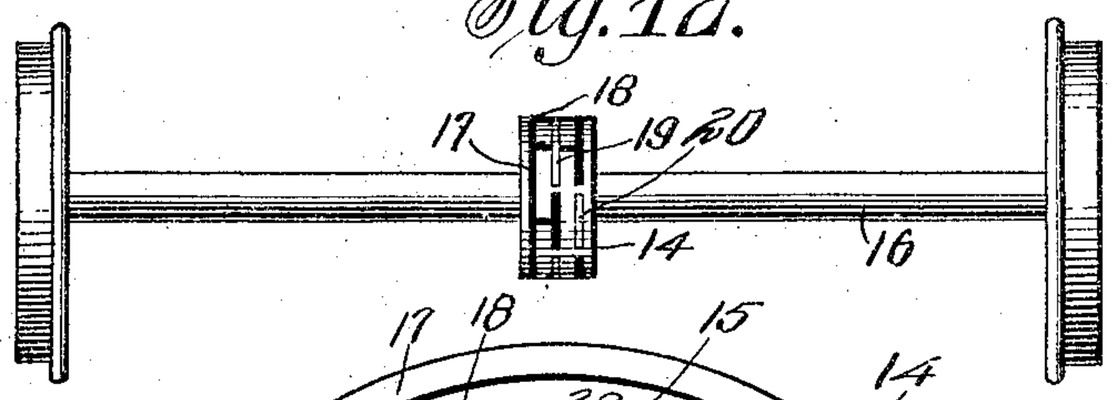
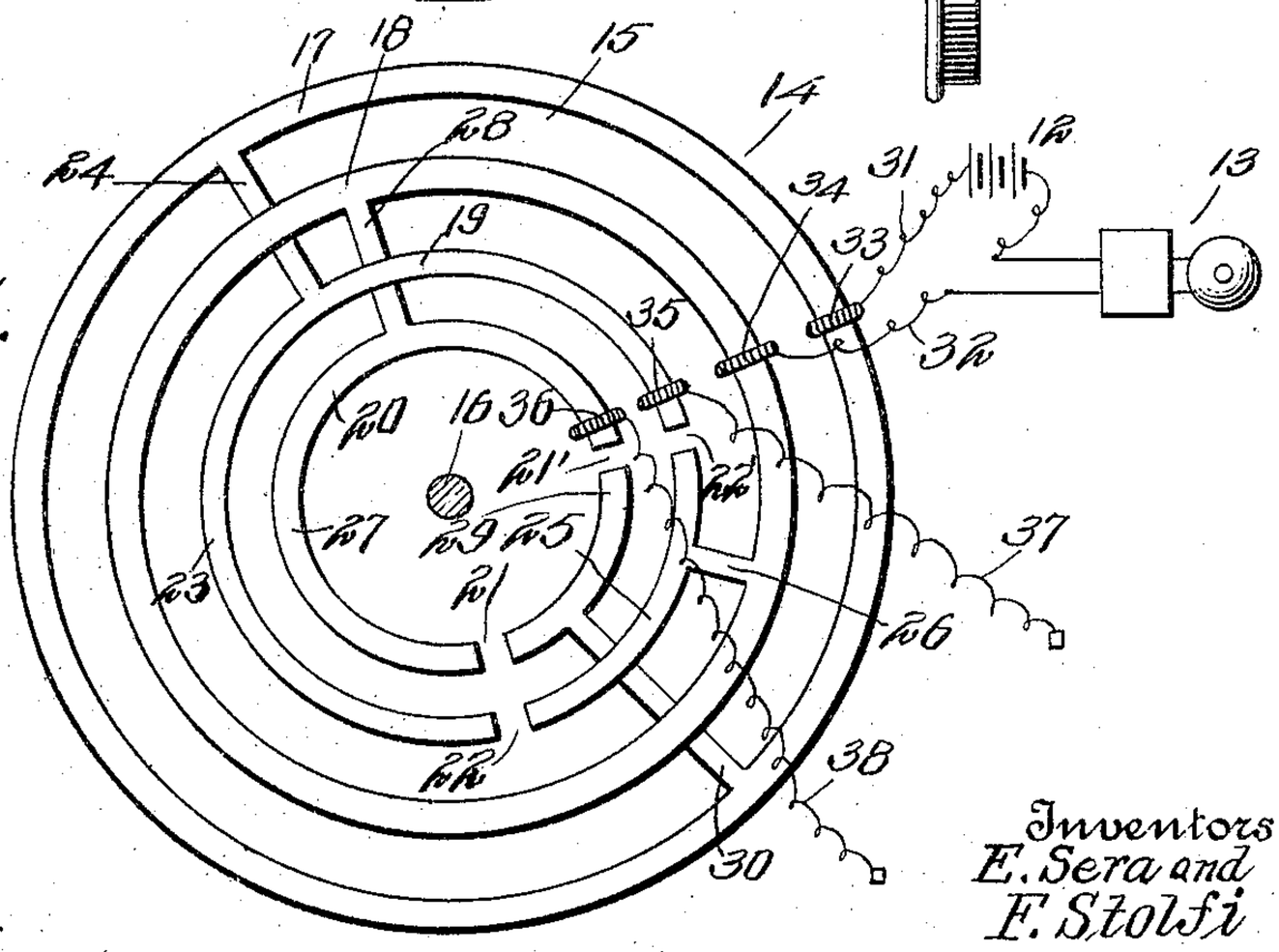


Fig. 11.



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ELECTRIC SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED JULY 18, 1904.

NO MODEL. 4 SHEETS—SHEET 4.

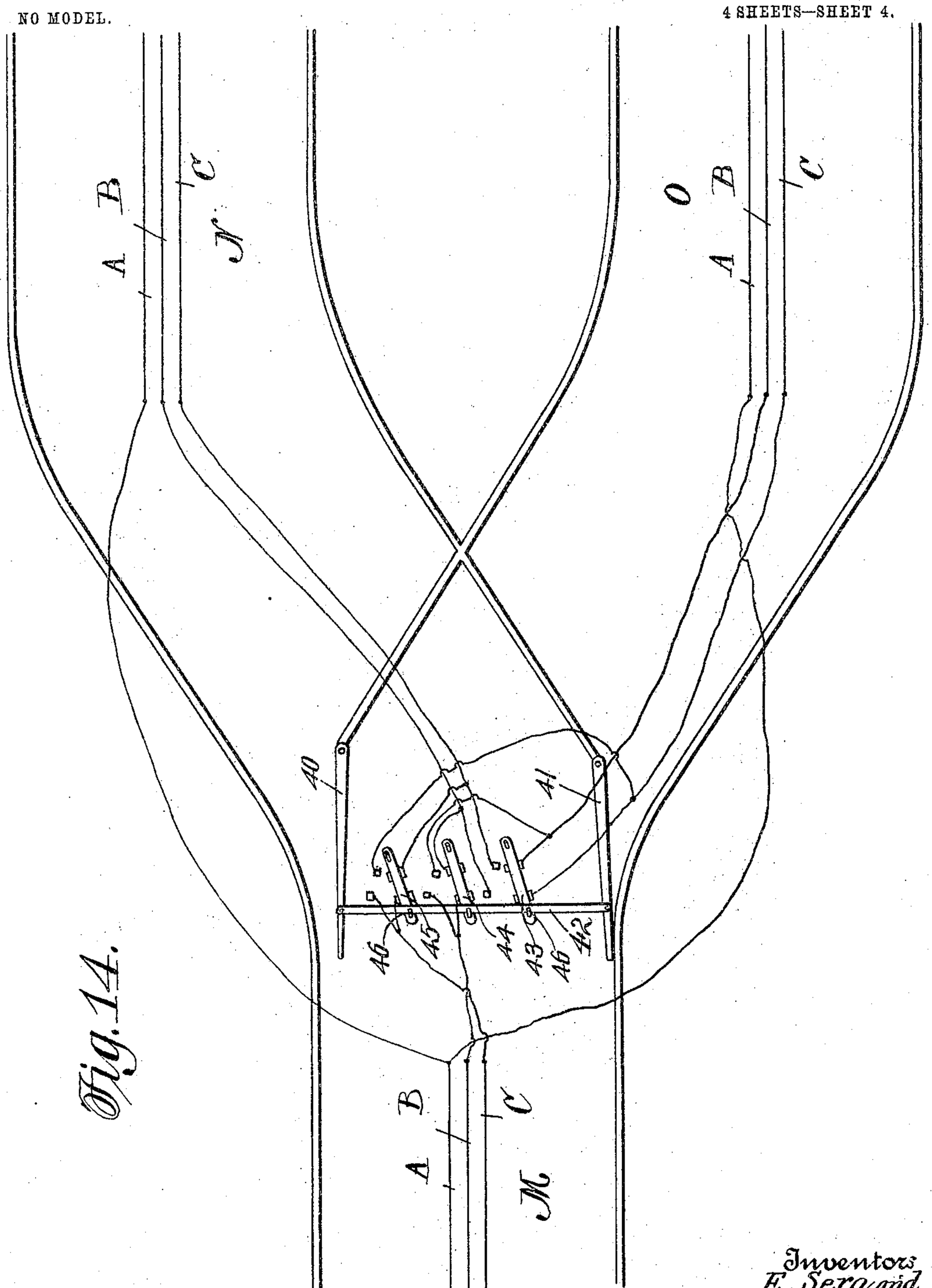

Fig. 14.

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No. 775,736. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

EMILIO SERA AND FLORIANO STOLFI, OF NEW YORK, N. Y.

ELECTRIC SIGNALING SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 775,736, dated November 22, 1904.

Application filed July 18, 1904. Serial No. 217,004. (No model.)

To all whom it may concern:

Be it known that we, EMILIO SERA and FLORIANO STOLFI, citizens of Italy, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Signal Systems for Railways; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in electric signal systems for railways of that class in which the signals in cabs of locomotives or motor-cars are operated when two or more approaching trains or cars on the same line come within a predetermined distance of each other.

The object of our invention is to provide simple, inexpensive, efficient, and automatic systems of this character which will effectively prevent both head-on and rear-end collisions and also wrecks due to improperly-set switches.

With these and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view of a portion of a railway-track constructed in accordance with our invention. Fig. 2 is a transverse section through the same. Fig. 3 is a view similar to Fig. 1, showing a modified form of track. Fig. 4 is a transverse section through the track shown in Fig. 3. Fig. 5 is a transverse sectional view through a modified form of the track shown in Figs. 3 and 4. Fig. 6 is a detail sectional view through a device carried by the engine or motor-car for taking up the electric current from the conductor along the track. Fig. 7 is a diagrammatic view of a portion of the railway-track, showing the arrangement of the electrical conductor-rails between the track-rails. Fig. 8 is a similar view showing diagrammatically two trains, cars, or the like and their electrical connections. Fig. 9 is a view similar to Fig. 8, showing the two trains or cars in the same block or section, so that the electric circuit through the signal apparatus upon the trains or cars will be completed to warn the engineer or motorman of danger. Fig. 10 is a diagrammatic view of the electrical connections on two trains or cars. Fig. 11 is a side elevation of the pole-changing device shown in Figs. 8 and 9, the electrical connections being illustrated diagrammatically. Fig. 12 is an elevation of an axle and two supporting-wheels, showing another form of pole-changing device mounted upon said axle. Fig. 13 shows two diagrammatic views of two of the contact-rings upon the pole-changing devices, their interruptions being arranged at different angles; and Fig. 14 is a diagrammatic view of a railway-switch, showing the electrical connections therefor.

In the practice of our invention we secure along the railway-track a series of electrical conductors, one or more of which is interrupted, so that the track will be divided into sections or blocks and provide upon each of the locomotives, motor-cars, or the like running upon said track suitable signaling apparatus having electrical connections with said track-conductors, so that when two trains or cars approach within a predetermined distance of each other said signals will be sounded or operated to warn the operators of the trains or cars. In the drawings we have shown three of such track-conductors, which are designated by the letters A, B, and C. The conductor A is continuous, extending from end to end of the track, and the conductors B and C are interrupted or divided into sections, as shown at *b* and *c*, the said interruptions or breaks being arranged alternately—that is, the break *c* in the conductor C occurs opposite the centers of the sections formed by the break *b* in the conductor B. These breaks or interruptions may be arranged any suitable distance apart; but we preferably provide the breaks in each conductor two miles apart, so that the breaks *b* and *c* occur at every mile along the track. Said track-conductors may be of any suitable form and mounted in any desired manner; but we preferably employ iron or other metal bars 1, as shown in Figs. 1 to 5 of the drawings. As shown in Figs. 1 and 2, said bars 1 are arranged in parallel relation upon brack-

ets or blocks 2, secured upon cross-ties 3, upon which the track-rails 4 are mounted. The blocks or brackets 2 are preferably constructed of wood, so that the bars or rails 1 will be insulated from each other; but it will be understood that they may be insulated in any other desired manner. Instead of mounting the bars or rails 1 as just described we may mount them as shown in Figs. 3, 4, and 5. As here illustrated, a continuous beam 5, of wood or other similar material, is provided upon the ties between the rails, and the bars 4 are secured upon the top and sides of said continuous beam 5, which may be triangular or of any other shape in cross-section. As shown in Fig. 5, the rails or bars 1 are mounted in suitable insulating material, which is embedded in said beam 5.

Any suitable means may be provided upon the trains for taking up the electrical current from the conductors A, B, and C. In Fig. 6 we have shown one device which may be used and which is in the form of a depending arm 7, having a roller or wheel 8 journaled in its lower forked end. Said wheel 8 is adapted to engage and run upon one or more of the track-conductors and has upon each of its sides flanges 9, which hold it upon said conductor-rails. Upon the upper end of said arm 7 is a piston 10, which is mounted to slide in a cylinder 11, which may be secured upon a locomotive or motor-car at any suitable point. Said cylinder and piston form an air-cushion, which holds the wheel 8 upon the conductor-rails; but in place of this air-cushion, springs, weights, or any other suitable devices may be employed for forcing the wheel into contact with the conductor-rail. It will be also seen that in place of the wheel 8 we may use brushes, contact-shoes, or any other suitable contact devices.

Each train which runs upon the track is provided with an electric battery or generator 12, a signaling device 13, and a pole-changing device 14. The battery 12 may be either a generating or a storage battery, and the signaling device 13 may be an electric bell, lamp, or any other device adapted to attract the attention of the engineer or motorman, the battery, signaling, and pole-changing devices being preferably mounted upon the locomotive or motor-car of the train, although they may be mounted on any of the other cars.

The pole-changing device may be of any suitable form; but, as illustrated in the drawings, it comprises a disk or wheel 15, of wood or other insulating material, which is mounted upon one of the axles 16 of the locomotive and which is provided upon either its periphery, as shown in Fig. 12, or upon one of its side faces, as shown in Fig. 11, with a series of concentric metallic rings 17, 18, 19, and 20, preferably of copper. The two outer rings 17 and 18 are continuous, while the two inner rings 19 and 20 are interrupted at two points 21 21′ 22 22′, the points 21 and 22 and 21′ and 22′ being in radial alinement with each other. The larger segment 23 of the ring 19 is connected to the outer ring 17 by a strip of copper or other electrical conductor 24, and the smaller segment 25 of said ring 19 is connected to the ring 18 by a similar conductor 26. The larger segment 27 of the inner ring 20 is connected to the ring 18 by a conductor 28, and the smaller segment 29 of said ring 20 is connected to the ring 17 by a conductor 30. The outer ring 17 is preferably connected to the positive pole of the battery 12 by a conductor 31, and the negative pole of said battery is connected by a conductor 32 to the ring 18, the signaling device 13 being preferably included in said conductor 32, although it may be located at any suitable point. The connections between the conductors 31 and 32 and the rings 17 and 18 may be effected in any desired manner; but we preferably employ brushes, which are conventionally illustrated at 33 and 34. Said brushes are of course stationary and contact with the rings 17 and 18 as the pole-changing device is rotated. Two other brushes, 35 and 36, are also provided to coact with the rings 19 and 20. The brush 35, which coacts with the ring 19, is electrically connected by conductor 37 with the arm 7 of the contact wheel, brush, shoe, or the like, which runs upon the continuous track-conductor A, and the brush 36 is similarly connected by a conductor 38 with the arm 7 of a similar contact device, the wheel 8 of which runs upon both of the interrupted conductors B and C. It will be seen that when the pole-changing device 14 is rotated the poles of the battery 12 will be reversed each time the brakes 21 22 and 21′ 22′ pass under the brushes 35 and 36.

Upon reference to Figs. 8, 9, and 10 of the drawings the electrical connections upon the two approaching trains or cars will be readily seen. The connections of the two batteries upon the said trains are such that their unlike poles are connected to the same track-conductor, so that whenever the two cars come within the same block or section the electrical circuit will be completed and the current will flow through the same. Should the like poles of the batteries be connected to the same conductor, the currents of the two batteries would oppose each other and there would be no circuit through the line. To avoid this possibility, said pole-changing device 14 is provided, and it will be seen that since the poles of the two batteries are constantly changing at irregular intervals the unlike poles of the two batteries will necessarily be brought into connection with the same track-conductor. In order that the changes in the polarity of the current may occur at different intervals on the two approaching trains, the interruptions 21 21′ and 22 22′ in the rings 19 and 20 are arranged at different angles in the pole-

changing devices upon different trains. The effect of this will be readily seen upon reference to Fig. 13 of the drawings. In said view the segments 29^a and 29^b and also the segments 27^a and 27^b are of different sizes, so that when they have made a partial rotation in the direction of the arrows and the segment 27^a is moved into contact with the brush 36^a the segment 29^b will still be in contact with the brush 36^b, and hence the current will flow through them, the segment 27^a and 29^b being of different polarity, as will be understood.

It will be seen that when the two trains X Y are in the position shown in Fig. 8 of the drawings the circuit through the conductor-rails and the apparatus of the two cars will be interrupted at the points *b* and *c*, so that the signals upon the two trains will not be operated; but as soon as the trains move to the position shown in Fig. 9 the circuit will be closed through one of the sections of the conductor-rail B, and the bells or other signaling devices upon the two trains will be sounded or operated. It will be understood that the signals will be operated whether both trains are in motion and moving toward each other or whether one is stationary or moving slowly and the other is moving toward it at a greater rate of speed.

In Fig. 14 we have illustrated our invention applied to a switch, so that the engineer or motorman of the train running toward the switch when the latter is improperly set will be notified of his danger. In said figure, M denotes the main line, and N and O the two branches. The switch is of well-known construction, and, as shown, comprises two pivoted switch-points 40 and 41, connected by a cross-bar 42. The conductor-rails A, B, and C are arranged, as previously described, between the tracks of both the main line and the two branches and terminate a short distance from the switch, as shown in Fig. 14. In order to bring the proper conductors A, B, and C of the main and the two branch lines into electrical communication with each other when the switch is in its different positions and also to close the circuit at the ends of the conductors B and C of the two branches N and O, we provide suitable electrical connections and electrical switches which are operated by the track-switch. Said connections and switches are illustrated diagrammatically in Fig. 14, and, as shown, we have provided three electrical switches 43, 44, and 45, which may be of any suitable form and construction and operated in any desired manner by the track-switch. Each of said switches, as shown, comprises a lever pivotally mounted upon a suitable base and pivotally connected to the connecting-bar 42 of the switch by depending points or studs 46, engaging apertures formed in said switch-levers. Each of said switch-levers coacts with two sets of contact-pins and completes the circuit through either set, according to the position of the switch. The switch 45 controls the electrical communication between the conductor C of the main line and the conductors C of the two branches. The switch 44 controls the electrical communication between the conductor B of the main line and the conductors B of the two branches. The switch 43 is adapted to complete the circuit through the ends of the conductors B and C of each branch N and O, according to the position of the track-switch. When the switch is set, as shown in Fig. 14, so that a train passing down the main line M will pass onto the branch N, the conductors B and C of the other branch, O, will be connected together through said switch, so that should a train pass along the branch O in the direction of the switch the circuit through the conductors A and B or C and the apparatus upon the train will be completed to operate the signaling devices upon the train. The conductor-rails A of the main and both the branch lines are connected together by suitable conductors, as shown.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

While we have shown and described the preferred forms of our invention, it will be understood that we do not wish to be limited to the precise construction herein set forth, since various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention. For instance, one of the track-rails 4 may be used in place of the continuous track-rail A, or instead of using signaling devices operated by the batteries 12 we may place an electromagnet in the battery-circuit, which when operated by the closing of said circuit will complete another electric circuit in which a continuously-operating signal is included. Also in suburban lines where the crossings are rather frequent and the trains are generally made up with the same cars, it may be convenient to arrange a stationary device upon the last car of the train, so that the conductor-rails may be interrupted at the crossings, provided one of the two sets of contact devices is always in contact with the line. It will be understood that the interrupted bars may be electrically connected together in any suitable manner.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an electric signal system for railways, an open circuit having a continuous and two alternately-interrupted track-conductors, a plurality of rotatable pole-changing devices in said circuit and carried by railway-vehicles, and a plurality of translating devices in said

open circuit and upon said vehicles, whereby, when said circuit is closed, said translating devices will be operated, substantially as described.

2. In an electric system for railways, an open circuit having a continuous and two interrupted track-conductors, with alternately-arranged interruptions, a pole-changing device carried by a railway-vehicle, means for effecting an electrical connection between said pole-changing device and said track-conductors, an electric generator upon said vehicle, and a signaling device upon said vehicle, said generator and signaling device being in circuit with said pole-changing device, whereby, when said open circuit is closed, said signaling device will be operated.

3. In an electric signal system for railways, an open circuit having a continuous and two alternately-interrupted track-conductors, rotatable pole-changing devices carried by railway-vehicles, means for effecting electrical connections between said pole-changing devices and said track-conductors, electric generators upon said vehicles and translating devices upon said vehicles, said generators and translating devices being in circuit with said track-conductors through said pole-changing devices, whereby said translating devices will be operated upon the closing of said open circuit.

4. In an electric-signal system for railways, an open circuit having a continuous and two interrupted conductor-rails, rotatable pole-changing devices carried by the railway-vehicles, electrical connections between said pole-changing devices and said conductor-rails, electric batteries upon said vehicles, and signaling devices upon said vehicles, said batteries and signaling devices being in said open circuit through said pole-changing device, whereby, when said open circuit is closed, said signaling device will be operated, substantially as described.

5. In an electric-signal system, an open circuit, electric batteries in said circuit, signaling devices in said circuit, and means whereby the poles of each of said batteries will be changed at different intervals, substantially as described.

6. In an electric signal system, an open circuit, electric batteries in said circuit, signaling devices in said circuit, and pole-changing devices in said circuit, said pole-changing devices being adapted to change the poles of said batteries at different intervals.

7. In an electric signal system, a pole-changing device comprising a rotatable body, a series of concentric insulated rings upon said body, some of said rings being continuous and the others interrupted, electrical connections between the alternate sections of said interrupted rings and said continuous rings, and brushes coacting with said rings, substantially as described.

8. In an electric signal system for railways, a track having three parallel electrical conductors extending therealong, one of said conductors being continuous and the other two being formed with interruptions, the interruptions in one alternating with the interruptions in the other, substantially as described.

9. In an electric signal system, the combination of a main track, two branch tracks and a switch therefor, of electrical conductor-rails extending along said tracks and interrupted at said switch, an electrical switch operated by said track-switch, and electrical connections between said conductor-rails and said electrical switch, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

EMILIO SERA.
FLORIANO STOLFI.

Witnesses:
JOSEPH MARTINO,
FRANCESCO RUGGIERE.