(No Model.)

3 Sheets—Sheet 1.

C. L. RENREW.

ELECTRIC RAILWAY SIGNAL.

No. 605,798. Patented June 14, 1898.

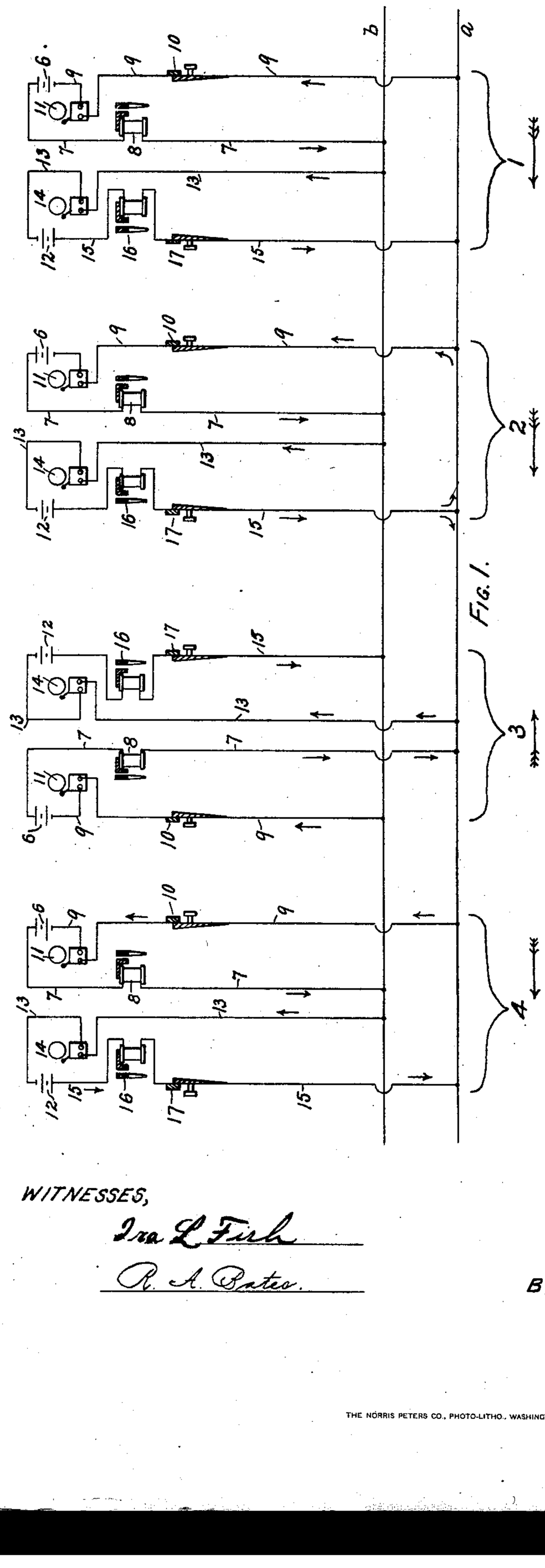

FIG. 1.

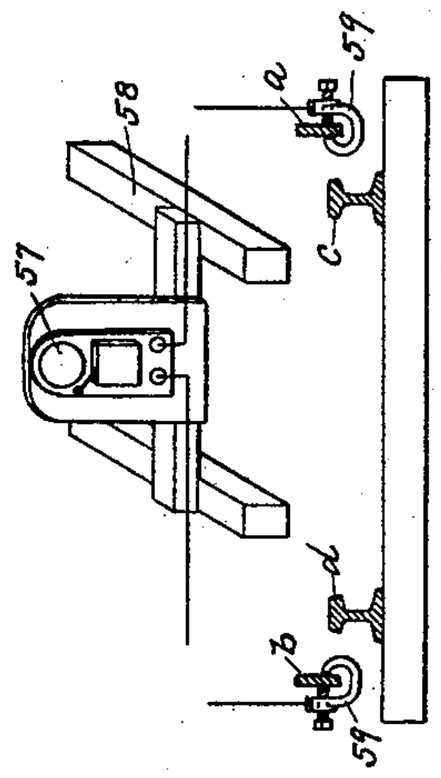

FIG. 7.

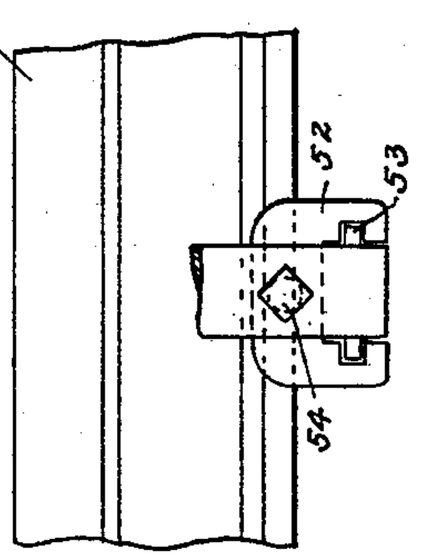

FIG. 9.

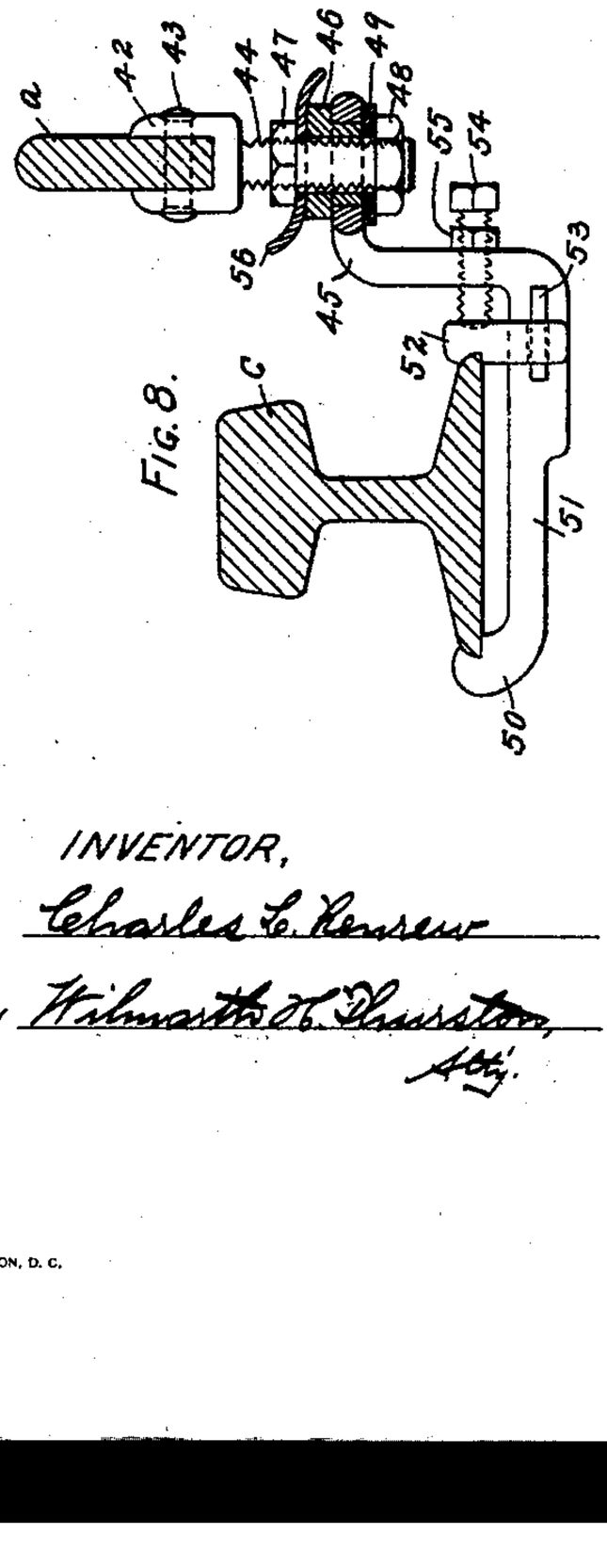

FIG. 8.

WITNESSES,

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(No Model.)

3 Sheets—Sheet 2.

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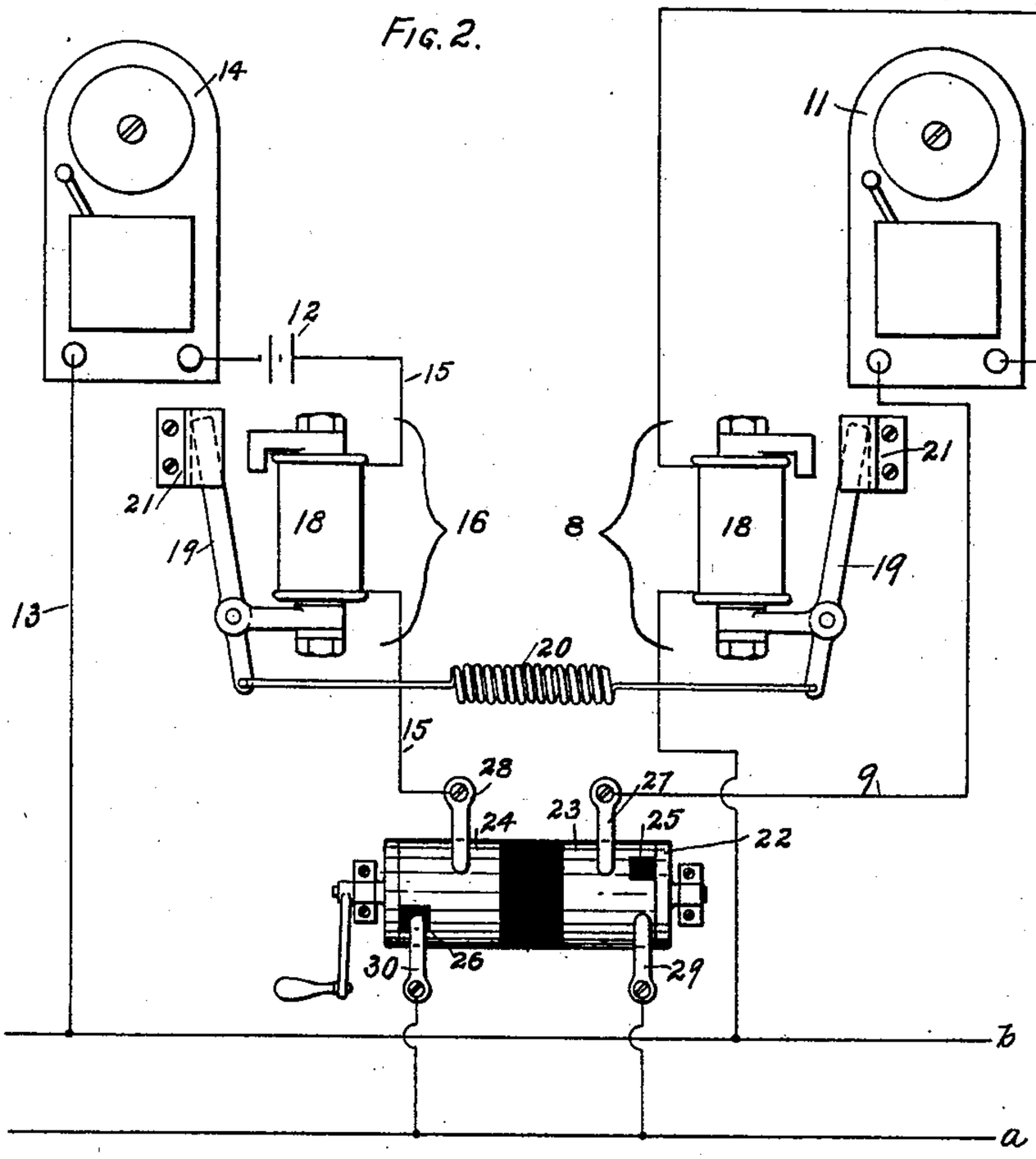
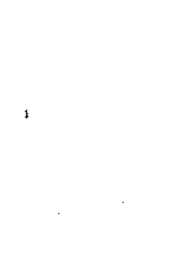
ELECTRIC RAILWAY SIGNAL.

No. 605,798. Patented June 14, 1898.

FIG. 2.





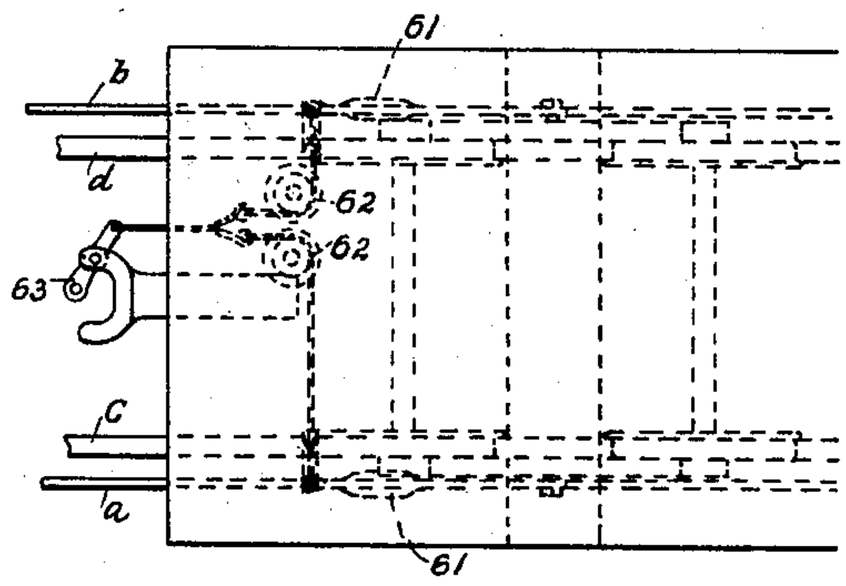


FIG. 10.

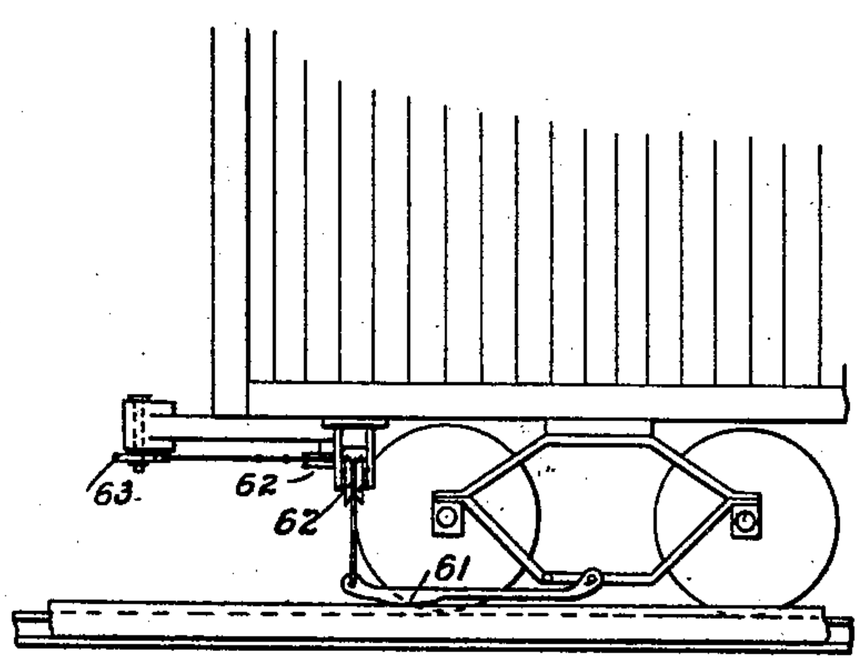


FIG. 11.

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(No Model.) 3 Sheets—Sheet 3.

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ELECTRIC RAILWAY SIGNAL.

No. 605,798. Patented June 14, 1898.

FIG. 3.

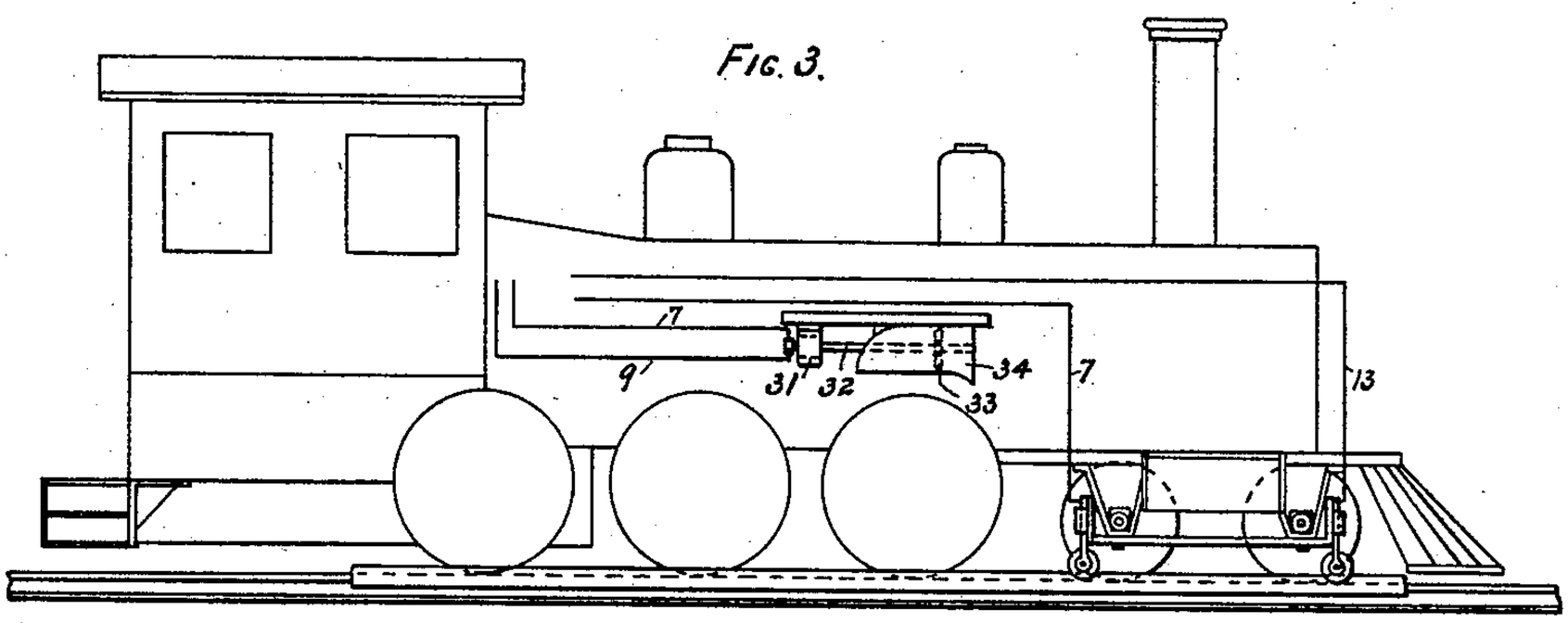


FIG. 5.

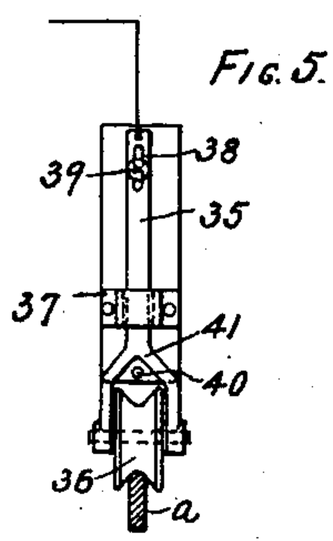
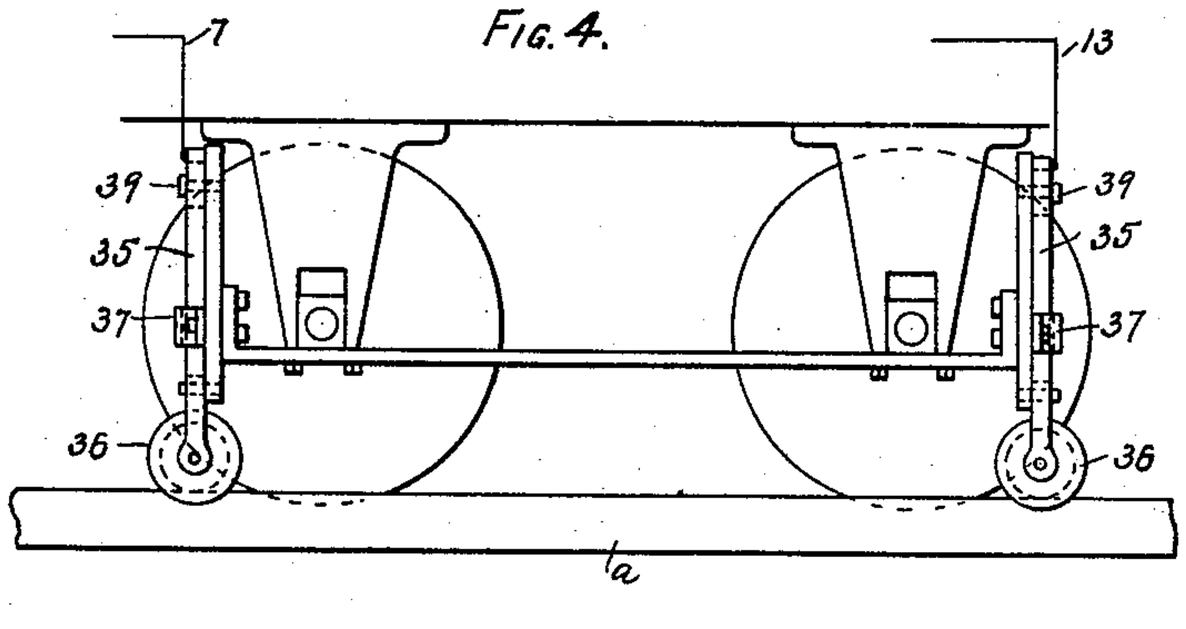


FIG. 4.



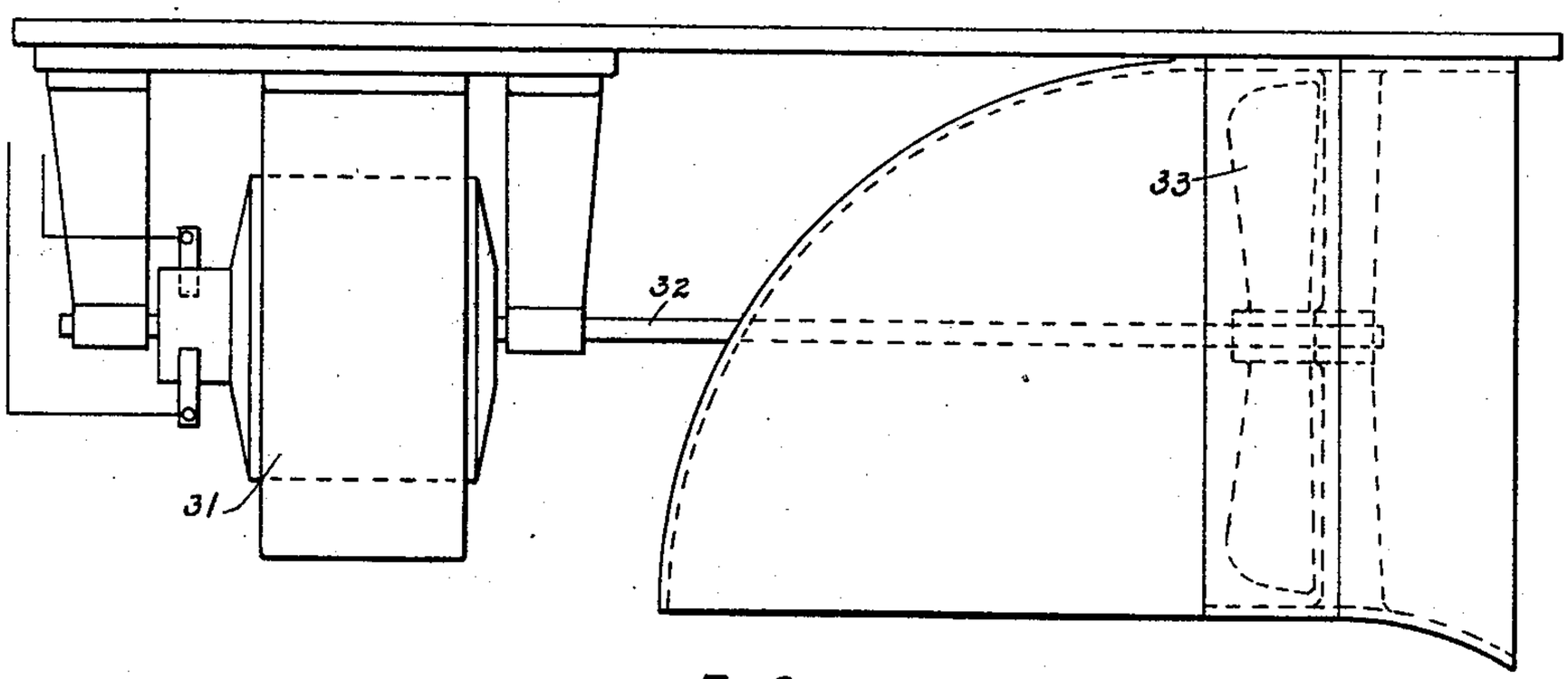


FIG. 6.

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UNITED STATES PATENT OFFICE.

CHARLES L. RENREW, OF EAST WINDSOR, CONNECTICUT.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 605,798, dated June 14, 1898.

Application filed March 2, 1897. Serial No. 625,711. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. RENREW, of East Windsor, Hartford county, State of Connecticut, have invented certain new and useful Improvements in Electric Railway-Signals; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

This invention relates to that class of railway-signals which are used to warn a person, usually the engineer, upon one railway-vehicle of the presence of another vehicle or obstruction upon the same track; and its object is to provide a system which will be simple and efficient in construction, and which will enable an engineer to determine whether the other train or vehicle is running in the same direction in which his train is running or in an opposite direction, and which will also enable him when the trains are running in opposite directions to tell whether the other train is in the front or rear.

This object is accomplished by providing two conductors, one of which may be the railway-rail, insulated from each other, and providing the railway-vehicles, preferably the engines, with two electric generators, which are connected in series through electrical connection with said conductors, one or more electric indicators being connected with each of said generators. Any form of generator may be used; but it is preferred to use a generator in the form of a dynamo and to connect said dynamo to a wind-wheel which is driven by the current of air produced by the motion of the vehicle.

The invention also includes certain other details and combinations, as will be more fully described, and set forth in the claims.

Referring to the drawings, Figure 1 is a diagrammatic view illustrating the operation of the improvements under various conditions. Fig. 2 is a detail, partly in diagram, showing the indicators and the circuit-breaker. Fig. 3 is a view showing the preferred form of generator and the manner of connecting said generator with the conductors. Figs. 4 and 5 are details of the devices for connecting the generator with the conductors. Fig. 6 is a detail of the generator. Fig. 7 is a detail showing the portable alarm and the manner of connecting the same to the conductors. Figs. 8 and 9 are details showing the brackets for supporting the conductors. Figs. 10 and 11 are views showing a car provided with means for completing a circuit between conductors *a b*.

Referring to the diagram shown in Fig. 1, *a b* represent two conductors properly insulated from each other and extending along the road-bed of the railway.

1, 2, 3, and 4 indicate engines provided with signal devices, and the arrows below said figures indicate the direction in which the engines are supposed to be moving upon the road-bed. The signal devices and the arrangement of the same in each of the engines is the same, and a description of one system of such devices only will be given. Each engine is provided with two electric generators, (indicated in the diagram as batteries 6 12.) The generator 6 has its positive pole connected with one of the conductors *a b* by means of a wire 7 and has its negative pole connected with the other of said conductors by means of the wire 9. An electric indicator 8, consisting in the form shown of a magnet and its armature, is inserted in the wire 7, and a second indicator, consisting in the form shown of an electric bell, is inserted in the wire 9. The circuit-breaker 10 is also inserted in the wire 9 for the purpose of breaking the circuit to cut out the generator 6. The generator 12 has its positive pole connected with the conductor to which the wire 9 is connected by means of a wire 15, in which is inserted an electric indicator 16, similar to indicator 8, and a circuit-breaker 17, similar to circuit-breaker 10. The negative pole of generator 12 is connected with the conductor to which the wire 7 is connected by means of a wire 13, in which is inserted an electric indicator 14, similar to indicator 11. In the following description the generator 6 and the wiring connecting said generator with the conductors *a b* will be termed "rear" circuit, and the generator 12 and wire connecting the same with the conductors will be termed the "front" circuit.

It will be seen from the above description that the generators 6 12 are connected in series through the conductors *a b* and that a

current is constantly passing through both the rear and front circuits except at the times when the circuits are broken by means of the circuit-breakers 10 or 17. The indicators, however, are so constructed that the current due to the generators 6 and 12 is not sufficient to operate said indicators, and the indicators are also so constructed that it requires a greater current to operate the indicators 11 14 than is required to operate the indicators 8 16.

In using this system it will be the duty of each engineer to break the rear circuit at frequent intervals and the operation will be as follows: Supposing a second engine, No. 2, is upon the same track with engine No. 1 and is provided with signaling devices similar to No. 1, then when the rear circuit in No. 1 is broken the current from generator 12 will pass down the wire 15 along the conductor *a* and up the wire 9 of No. 2, thus increasing the amount of current which passes through the rear circuit of engine No. 2. The increase in the current passing through the rear circuit of engine No. 2 will depend upon the distance between the engines Nos. 1 and 2, and by regulating the resistance of the circuits and of conductors *a b* and also the amount of current produced by the generators the distance that the engines must be from each other when this addition to the current of the rear circuit in the engine No. 2 is sufficient to operate the indicator 8 in said circuit may be regulated as desired. If the engines are within this prescribed distance when the engineer in No. 1 breaks the rear circuit, the rear indicator 8 will be operated in engine No. 2 and when the engineer in engine No. 2 breaks his rear circuit the rear indicator 8 in engine No. 1 will be operated. When the rear indicator is operated, therefore, the engineer in that engine is informed that there is another engine upon the same track and moving in the same direction in which his engine is moving. He is not informed, however, whether or not the engine is in the front or the rear.

The operation above described will be repeated at frequent intervals, and if the engines approach dangerously near to each other the increase of current through the circuits, due to the cutting out of a generator in the other engine, will be sufficient to operate the indicators 11.

Supposing now that two engines upon the same track are approaching each other, as engines 2 and 3, then when the engineer in engine No. 2 breaks the rear circuit the front indicator 16 in engine No. 3 will be operated if the engines are sufficiently near to each other, and when the engineer in engine No. 3 breaks the rear circuit in his engine the front indicator 16 in engine No. 2 will be operated, and as these operations are repeated the front indicators will continue to be operated and the engineers know, therefore, that there is another engine upon the same track with their engine and that said engine is moving, since the forward indicator only is operated, in the direction opposite to the direction in which they are moving. If after an interval the indicators 14 as well as indicators 16 are operated, each engineer then knows that the other engine upon the track is in front of him and he will therefore immediately stop his engine. If two engines were upon the same track and moving away from each other, as engines 3 and 4, then the front indicators 16 would be operated as in the preceding case; but as the engines would be moving away from each other the indicators would cease to be operated after an interval and each engineer would know that the alarm sounded was from an engine which was moving in the opposite direction and away from his engine. It will thus be seen that when two engines are upon the same track and running in opposite directions the engineers are warned when the engines are dangerously near each other by the operation of the front indicator, and they are also enabled to tell whether the other engine is in the front or rear by reason of the fact that if the engine is in front the second indicator in the front circuit will be operated shortly after the first indicator is operated, while if the engine is in the rear the first indicator will soon cease to be operated. In case the two engines are running in the same direction the engineers are warned when they are dangerously near each other by the operation of the rear indicator, but are not informed whether the other engine is in the front or rear. In case any engine is running backward then the indicators 16 and 14 in that engine will become the rear indicators and their circuit the rear circuit, and the indicators 8 and 11 will become the front indicators for that engine, and in such engine it will be the duty of the engineer to break the circuit at 17—that is, the rear circuit of that engine—at frequent intervals—that is to say, the terms "front" and "rear" apply to the direction in which the engine is running upon the road-bed rather than to the ends of the engine.

Any suitable form of indicators may be used in this system, but it is preferred to use the form shown in Fig. 2. As shown in said figure, the indicators 8 16 consist of electromagnets 18 and armatures 19, which are normally held away from said magnets, and it is preferred to connect the armatures of the magnets 18 by means of a single spring 20, so that the tension upon each of said armatures may be the same. When in its normal position, the end of armature 19 lies behind a screen 21, secured to the base-plate upon which the indicator is mounted, and this screen, as well as the base-plate and the magnet 18, is preferably black, as is also all of the armature 19 except that part which lies behind the screen 21. This portion of the armature 19 is preferably white, so that when the armature is attracted by the magnet its white portion will

move from behind the screen 21 and will be brought into prominence against the black background. It will also be understood that any form of indicator may be used in place of the electric bells 11 14, although it is preferred to use electric bells for these auxiliary indicators and to use a different-toned bell in the rear circuit from that used in the front circuit.

Instead of so constructing the indicators 8 16 that the current produced by the two generators will not be sufficient to operate these indicators these indicators may be, if desired, so constructed that the current from one of the generators will be sufficient to operate the same. With this construction of indicators when the rear circuit is broken and there is no engine or other obstruction upon the track which completes the circuit between the conductors *a b* there will be no current passing through either the front or rear circuit and indicators 8 16 would cease to be operative—that is to say, in the form shown in Fig. 2 the armatures 19 will fall away from their magnets. If there is another engine upon the track, however, or some obstruction which completes the circuit between *a b*, there will be a current through the front circuit when the rear circuit is broken and indicator 16 of the front circuit will remain in its normal position, thus showing the engineer that there is an obstruction upon the track. If the obstruction is an engine upon another train and is dangerously near, then the indicators 11 14 will be operated in the same manner as above described with relation to the construction in which the current generated by the two generators is not sufficient to operate the indicators 8 16.

In connection with the system in which the indicators 8 16 are so constructed that they will be operated by the current of one generator the cars may be equipped with devices for completing the circuit between the conductors *a b* if they become detached from the train, and in Figs. 9 and 10 is shown one form of such equipment. In this construction two contact devices 61 61 are pivoted to the trucks of the car and are held from contact with the conductors *a b* by means of cords passing over pulleys 62 and connected to the car-coupling 63 in such a manner that when the coupling is in position to couple the car the contact device 60 will be out of engagement with the conductors *a b;* but when said coupling is thrown into inoperative position the devices 60 will engage the conductors *a b* and complete the circuit between said conductors through the iron-work of the car.

Any suitable form of circuit-breaker may be used in the above system; but it is preferred to use the form of breaker shown in Fig. 2, which consists of a cylinder mounted in suitable bearings and having portions of its periphery provided with the metallic coverings 23 24, insulated from each other. The coverings 23 24 are provided with recesses 25 26, in which are placed insulating material. Brushes 27 28 are connected to the wires 9 15, which brushes bear upon the coverings 23 24, respectively. A brush 29 also bears upon the covering 23 and is in position to engage the insulating material 25 when the cylinder 22 is turned into the proper position. A wire leads from said brush 29 to one of the conductors *a b*. A similar brush 30 bears upon the covering 24 and is in position to be engaged by the insulating material 26 when the cylinder 22 is turned into proper position, and said brush is connected with one of the conductors *a b* by a suitable wire. By oscillating the cylinder 22 backward and forward within certain limits the rear circuit may be broken and closed intermittently, while the front circuit remains closed, and by giving the cylinder 22 a further movement the front circuit may be broken, while the rear circuit remains closed. Any suitable means may be employed for giving the cylinder 22 the proper movement at the proper times, and in the drawings a crank-handle is shown attached to the trunnion of the cylinder 22 for such purpose.

Any suitable form of generator may be used for generating the currents used in the above system; but it is preferred to use the form of generator illustrated in Figs. 3 and 6 and to drive said generator by the means shown. As shown in said figures, the generator consists of a small dynamo 31, suitably mounted upon the engine, and shaft 32 of said dynamo is extended and has secured thereto a wind-wheel 33, inclosed in a suitable open-ended casing 34. When the engine is in motion, a current of air is forced through the casing 34 and acts upon the wind-wheel 33, thus driving the dynamo 31 and generating a current of electricity, which passes from the brushes of the dynamo through the circuits indicated by the diagram Fig. 1.

The wires 7, 9, 13, and 15 may be connected with the conductors *a b* by any suitable devices, and in Figs. 3 and 4 is shown one manner of connecting said wires with said conductors. As shown in said figures, the ends of the wires are connected to slides 35, which are suitably insulated and carry at their lower end trolleys 36, which run upon said conductors. The slide 35 passes through a guide 37 and has a slight lateral play therein, so that the trolley 36 may adapt itself to lateral variations in the conductors *a b*. The upper end of the slide 35 is slotted at 38, and a pin 39 passes through said slot and serves to guide the slide 35, while allowing vertical play of said slide, so that the trolley 36 may accommodate itself to vertical variations in the conductors.

As the conductors *a b* in the form shown project slightly above the tops of the railway-rails, it is necessary at certain points—as, for instance, at grade crossings—to interrupt the conductors and to conduct the current at these points across the interruptions by means

of wires below the surface of the ground, and means are therefore provided for centering the trolleys 36 when said trolleys pass from the end of one of the conductors, so that the said trolley will be in the correct position to engage the end of the conductor at the other side of the interruption. This means in the form shown consists of a pin 40, projecting into an inverted-V-shaped recess 41 in the slide 35. When the trolley 36 passes from the end of one of the conductors, the slide 35 drops downward and the pin 40 engages the point of the V-shaped recess 41, thus holding the trolley in its central position. The slides 35 may be mounted upon any suitable part of the engine and are shown as mounted upon the forward trucks, the end of the front circuit being connected to the slide at the front of the trucks and the end of the rear circuit being connected to the trolleys at the rear of the trucks.

The conductors *a b* may be arranged in any suitable manner and may be supported by any suitable devices, care being taken that said conductors are insulated from each other, and, if desired, the railway-rails may be used as one of said conductors. It is preferred, however, to use two conductors independent of the rails of the railway and to mount said conductors outside of the railway-rails and in a slightly higher plane, and it is also preferred to mount said conductors in brackets secured to the railway-rails, and in Figs. 8 and 9 the preferred form of bracket for so supporting said conductors is shown. The conductor *a* is secured in the jaws of a support 42 by means of bolt 43, the support 42 being provided with a screw-threaded stud 44, which passes down through the bracket 45. The stud 44 is surrounded by an insulating-sleeve 46 and is held in position by means of two nuts 47 48, one above and one below the bracket 45, an insulating-washer 49 being interposed between the nut 48 and the bracket 45. The bracket 45 is provided with a clamp for engaging the railway-rail *c*. One jaw, 50, of the clamp is formed upon an arm 51, extending from the bracket 45, and the other jaw, 52, is guided upon lugs 53, projecting from the sides of arm 51, and is forced against the side of the rail *c* by means of a bolt 54. A check-nut 55 serves to hold the bolt 54 in its adjusted position. A water-guard 56 is inserted between the nut 47 and the sleeve 46 and serves to prevent collection of water about the insulation, which collection of water might form a connection between the nut 47 and the bracket 45, and thus ground the conductor *a*. This water-guard consists of a circular washer which is bent upward at its inner end and serves to conduct the water beyond the end and sides of the bracket 45.

In order that section-men or other persons working upon the road-bed may be warned of the approach of an engine or train, a portable indicator is provided, the preferred form of which is shown in Fig. 7. As shown in said figure, the indicator consists of an electric bell 57, mounted upon a suitable standard 58 and provided with wires which are connected at their outer ends with clamps 59, constructed to be secured to the conductors *a b*. This indicator is connected to the conductors *a b*, as shown in Fig. 7, and upon the approach of a train the current of electricity will pass from the generators on the engine through the electric bell 57 and ring said bell, thus warning the men at work upon the road-bed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a railway signal system, a railway-vehicle provided with two branch circuits, each containing a generator and an indicating device, the branches being connected into complete circuit with the generators in series through the conductors, and the indicating devices requiring more current to operate them than is generated by the generators, substantially as described.

2. In a railway signal system, a railway-vehicle provided with two branch circuits, each containing a generator and an indicating device, the branches being connected into complete circuit with the generators in series through the conductors, and the indicating devices requiring more current to operate them than is generated by the generators, and a circuit-breaker for cutting out one of said generators substantially as described.

3. In a railway signal system, the combination of two conductors suitably insulated, of a railway-vehicle, two generators on said vehicle, connections from each of said generators to said conductors arranged to connect said generators in series through said conductors, an indicator connected with each of said generators, and an auxiliary indicator connected with each of said generators, said auxiliary indicators requiring more current to operate the same than is required to operate the other indicators, substantially as described.

4. In a railway signal system, the combination with two conductors suitably insulated, a railway-vehicle, two electric generators on said vehicle, connections from each of said generators to said conductors arranged to connect said generators in series through said conductors, an indicator connected with each of said generators, and a circuit-breaker for cutting out one of said generators, substantially as described.

5. In a railway signal system, the combination with two conductors suitably insulated, a railway-vehicle, two electric generators on said vehicle, connections from each of said generators to said conductors arranged to connect said generators in series through said conductors, an indicator connected with each of said generators, and circuit-breakers for cutting out either of said generators, substantially as described.

6. In a railway signal system, a railway-vehicle, two generators on said vehicle, conductors leading from each of said generators and arranged for connection with stationary conductors, an indicator in the conductors leading from each of said generators comprising an electromagnet and its armature, and a single spring connected to the armature of both magnets, substantially as described.

7. A circuit-breaker comprising a movable member, two conducting-surfaces on said movable member insulated from each other, a non-conducting surface adjacent each conducting-surface and out of line with each other, brushes bearing on each of said conducting-surfaces out of the path of said non-conducting surface, and brushes bearing on said conducting-surfaces and in the path of said non-conducting surfaces, substantially as described.

8. In a railway signal system, the combination of a bracket, a support for a conductor mounted thereon, an arm extending from said bracket, a stationary jaw on said arm, guides on said arm, a movable jaw on said guides, and a bolt for forcing said movable jaw against the base of the railway-rail, substantially as described.

9. In a railway signal system, a support for a conductor, a bracket, means securing said bracket to the railway-rail, insulating material between the support and bracket, and a water-guard above said insulating material, substantially as described.

10. In a railway signal system, a bracket, means for securing said bracket to the railway-rail, a support for a conductor provided with a stud passing through said bracket, insulating material between said stud and bracket, and a water-guard above said insulating material, substantially as described.

11. In a railway signal system, a conductor, a trolley for engaging said conductor, and means comprising a V-shaped recess and a stud for centering said trolley when it leaves the conductor, substantially as described.

12. In a railway signal system, a slide, a trolley carried by said slide, an inverted-V-shaped recess in said slide, and a pin projecting into said recess, substantially as described.

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