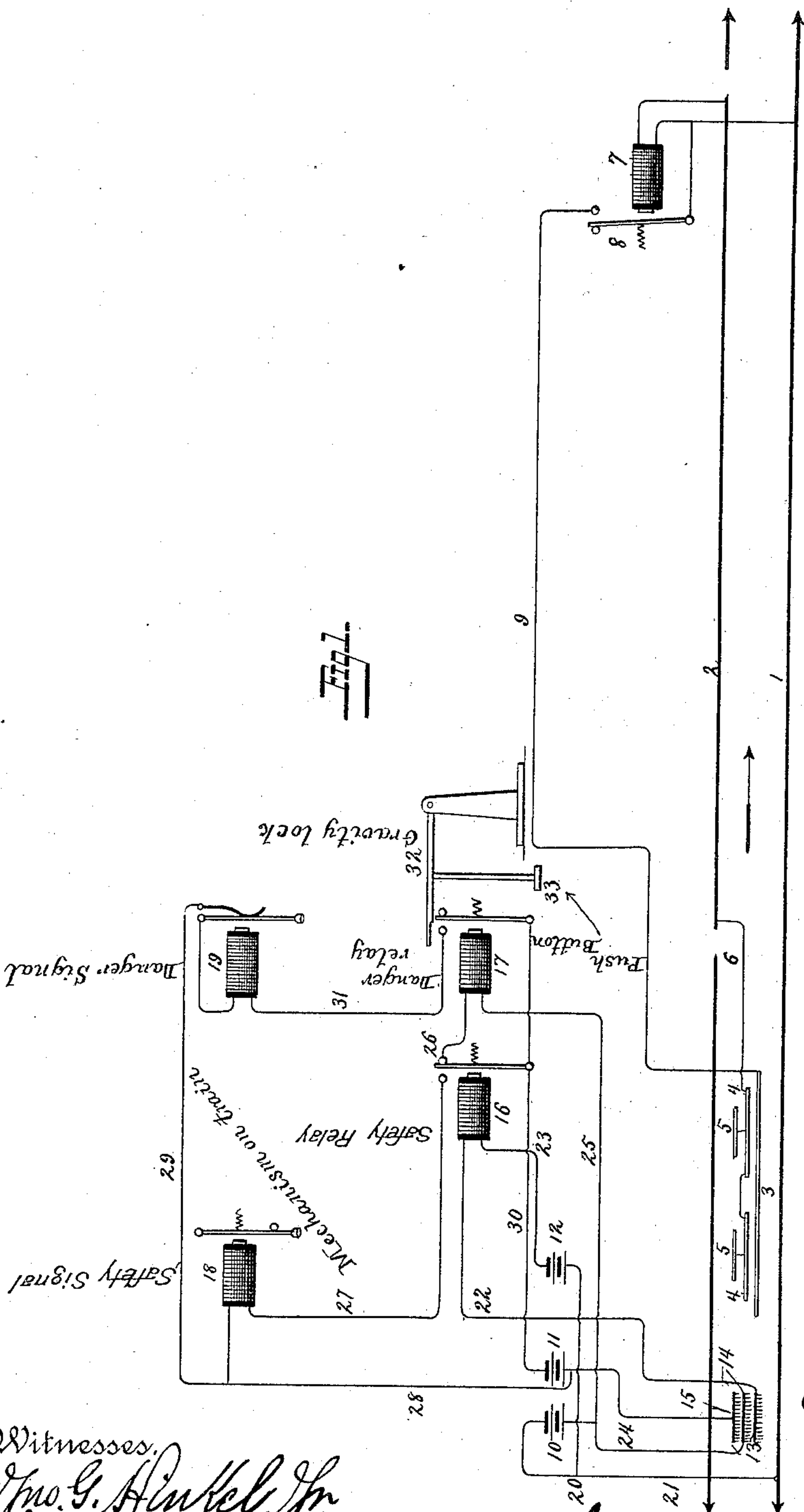


E. L. ORCUTT.  
RAILWAY SIGNALING SYSTEM.

No. 387,316.

Patented Aug. 7, 1888.



Witnesses.  
Geo. G. Dunkel, Jr.  
Wm. A. Harries

E. L. Orcutt,  
Inventor.

By *he* Attorneys  
Foster & Freeman.

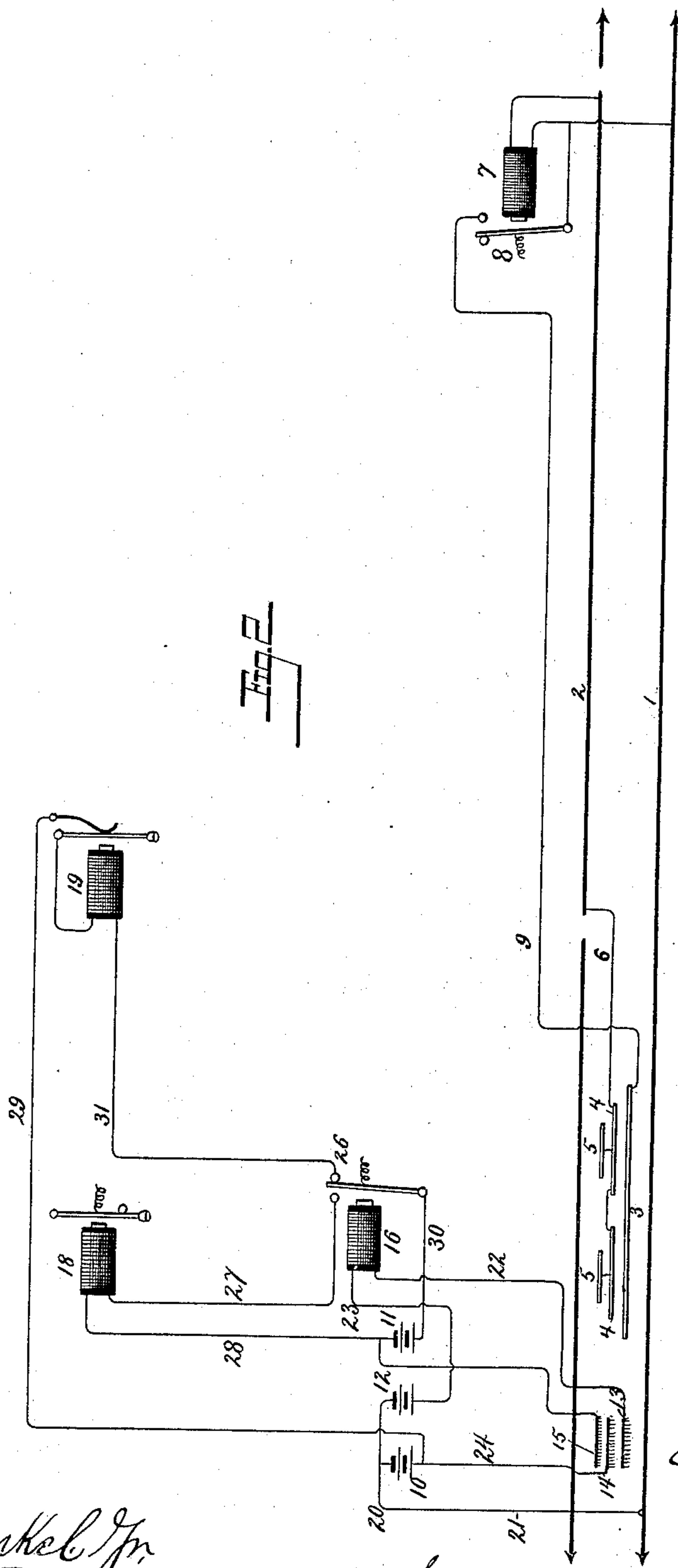
(No Model.)

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*Geo. G. Hinkel Jr.*  
*Wm. A. Harris*

*E. L. Orcutt.*  
Inventor, by  
*Josiah S. Freeman.*  
By the Attorneys



# UNITED STATES PATENT OFFICE.

EDWARD L. ORCUTT, OF SOMERVILLE, MASSACHUSETTS.

## RAILWAY SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 387,316, dated August 7, 1888.

Application filed February 7, 1887. Serial No. 227,067. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD L. ORCUTT, a citizen of the United States, and a resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Electric Railway Signaling Systems, of which the following is a specification.

My invention relates to railway-signals, and the arrangement is such that the train upon entering a section of a track which is equipped with my arrangement will receive either a positive safety or a positive danger signal, thus enabling engineers to stop the train in time to avoid accident.

The general arrangement of my signaling system involves the use of one continuous and one sectional rail, and I have arranged between the rails near the track a system of contact-plates which coact with a system of contact-brushes carried by a locomotive to establish circuits charged by batteries carried on board the train for operating acoustical or visual signals on the train.

In the annexed drawings, forming a part of this specification, I have shown in Figure 1 my system in diagram in one of the forms which the same may assume. Fig. 2 represents my system, also in diagram, in a modified form.

Referring now more especially to Fig. 1, 1 and 2 represent the rails of a railway, 1 being the continuous rail and 2 a rail composed of longitudinal sections insulated from each other, as is common in this kind of apparatus. Between the two rails, and a short distance before the entrance to one of the insulated sections of rail 2, is located a series of contact-plates, 3, 4, and 5, the one 3 being the longest and extending at both ends beyond the contact-plates 4 5, the latter being repeated one or more times and connected with each other electrically, as indicated in the drawings. In the drawings I have shown two groups only of contact-plates, 4 5; but any number of them may be employed, and they are all connected by conductor 6 with the forward end of the section of rail 2. Near the other end of this section of rail 2, and suitably located and housed near the track, is an electro-magnet, 7, electrically connected at this point with the two rails. An armature, 8, actuated by said magnet 7, is arranged to make connection with a conductor, 9, leading back to the contact-

plate 3; but such connection is normally broken, being only established when the magnet is energized, as will be hereinafter more fully explained.

On the locomotive are carried three batteries, 10 11 12, and three contact-brushes, 13 14 15, which latter in the order mentioned are adapted to make contact with the contact-plates 3 4 5. A number of magnets, 16, 17, 18, and 19, are also carried by the locomotive, two of which, 16 and 17, I name, respectively, the "safety" and the "danger" relays, and the two others, 18 and 19, each of which operates a bell, I call the "safety" and "danger" signals proper. Batteries 10 and 12 are each connected with one pole to the same metallic portion of the locomotive. The point 20 is supposed to indicate such metallic portion, which by the wheel or otherwise is in electrical contact with the continuous rail 1. This is indicated diagrammatically by the conductor 21. Brush 13 is in electrical connection with one terminal of magnet 16 by conductor 22, the other terminal of which is connected with battery 12 by a wire, 23. Brush 14 is connected with one pole of battery 10 by a wire, 24, and also by a continuation of said wire, 25, with one terminal of magnet 17, the other terminal of which proceeds through the back-stop 26 of the armature of magnet 16, the front stop of which is connected with one terminal of magnet 18 by wire 27. The other terminal of the said magnet leads on one side to one pole of battery 11 by wire 28, and on the other side it connects with danger-bell 19 by wire 29, which is preferably of the trembler type. Brush 15 is connected with the same pole of battery 11 at which wire 28 terminates, while the other pole of said battery is in connection with the armatures of magnets 16 and 17 by a wire, 30. The front stop of magnet 17 is connected by wire 31 with one terminal of the trembler-bell, the other terminal of which is connected with wire 29, as above described.

By preference I arrange a gravity-lock, 32, for locking the armature of magnet 17 in position when the same has been attracted, which lock may be released by hand, by push-button 33, or otherwise.

In the operation of this system it will be seen that when the locomotive proceeds in the direction indicated by the arrow brush 13 will first come in contact with contact-plate 3, and



a moment later brush 14 will make contact with the system of plates 4, and some little time afterward brush 15 will establish contact with the system of plates 5; and I will now describe the operation of my apparatus under the assumptions, first, that the track ahead is unobstructed and uninterrupted, and, second, that the track is either obstructed or interrupted.

When the track is in good condition, and as soon as contact is established by brushes 13 and 14 with their respective contact-plates 3 and 4, the circuit will be completed through magnet 7 at the farther end of section 2, as follows: From one pole of battery 10 through a metallic portion, 20, of the locomotive by the wheels or otherwise, as indicated at 21, to the continuous rail 1, and through magnet 7, rail 2, conductor 6, contact-plates 4, brush 14, and by wire 24 back to the other pole of battery 10. This energizes magnet 7, which attracts its armature 8, whereby another circuit is completed, as follows: From one pole of battery 12 through metallic portion 20 of the locomotive by the wheels or otherwise, through continuous rail 1 to armature 8, conductor 9, contact-plate 3, brush 13, wire 22, to and through magnet 16, and by wire 23 back to the other pole of battery 12. By the current from this battery magnet 16 is energized, causing its armature to make contact with the front stop, whereby a new circuit is closed through battery 11 and bell-magnet 18, which circuit does not include any portion of the track, but is entirely local. It may be traced from battery 11 by wire 28 to and through magnet 18, wire 27, front contact of magnet 16, and armature of said magnet by wire 30 back to other pole of battery 11. The armature of magnet 18, being thus actuated, may be caused to strike a bell or produce any other signal that may be desirable. If a bell is struck by said armature, it will be understood that the action will be repeated as many times as there are contact-plates 4, giving for each plate a single stroke of the bell, which in my system indicates that the track ahead is in good condition. Safety-signals therefore consist of single strokes of the bell repeated at definite intervals, depending upon the distance from each other of plates 4. It will also be understood that the closing of the circuit of magnet 18 depends upon the prompt action of magnet 16, which in turn depends upon the prompt action of magnet 7, which magnet can receive its actuating-current only when there is neither a short circuit between the rails nor a breakage in any one or both. Thus the safety-bell can only ring when the track is in perfect condition.

If, for any reason whatever, magnet 7 fails to receive its actuating-current—as, for instance, by reason of a short circuit in the rails produced by a train of cars, or by reason of breakage of one or both of the rails—my system will operate to positively indicate this condition of the track, as follows: The contact of

brushes 13 and 14 with plates 3 and 4 will produce no result whatever; but as soon as brush 15 makes contact with plate 5 a circuit will be established between battery 11 and relay-magnet 17, as follows: From one pole of battery 11 to brush 15, contact-plate 5, from there, by a short connection, as indicated, to contact-plate 4, brush 14, wires 24 and 25 to and through magnet 17, back contact, 26, of magnet 16, through the armature of said magnet, and by wire 30 back to the other pole of battery 11. Magnet 17, being thus energized, will attract its armature, which will make contact with its front stop and will be locked in this position by gravity-lock 32. This closes the circuit of the trembler-bell 19, as follows: From one pole of battery 11 by wire 30 through armature of magnet 17, by front contact-stop of the same, wire 31, to and through magnet 19, and by wires 29 and 28 back to the other pole of battery 11. This causes the operation of the trembler-bell 19, which will continue until stopped by opening the circuit at the armature of magnet 17, which is done by raising the gravity-lock 32, whereupon armature of magnet 17 is drawn to its back-stop by its retractile spring. Thus the continual sounding of the trembler-bell indicates to the engineer that the track ahead is in such condition as to prevent magnet 7 receiving its operative current. As has been said above, this failure of magnet 7 to respond may be due to several causes, each of which is a source of danger to a moving train.

It will thus be seen that in my system when bells are employed as signals "safety" will be indicated by single strokes of the bell, while "danger" will be announced by a continuous sounding of the trembler-bell. The distinction between the two is so clear that it is impossible to confound one with the other; but it will be understood that the arrangement may be just reversed, so as to make single strokes of the bell indicate "danger" and the continuous sounding of the bell to indicate "safety;" but the arrangement shown is preferable.

In the arrangement shown in Fig. 2 one of the relay-magnets is omitted; but in other respects the arrangement is essentially the same as that shown in Fig. 1 and the same numerals represent similar parts of the construction. The operation of this modified arrangement is the same for indications of "safety" as in the form described with reference to Fig. 1; but for indications of "danger" the operation is slightly modified. If by a short circuit across the rails, or by breakage of one or both of the same, magnet 7 fails to respond, then, as is clear, the circuit of magnet 16 will remain open, its armature remaining in contact with its back-stop 26. The circuit of trembler-magnet 19 therefore remains complete, except at the plate 5, where in the further progress of the train it is closed by brush 15, the circuit then being complete, as follows: From one pole of battery 11 by wire 30, armature of mag-



net 16, back contact, 26, wire 31 to and through trembler-magnet 19, wire 29, wire 24, brush 14, contact-plate 4, contact-plate 5, and by brush 15 back to the other pole of battery 11. There being an interruption of that circuit, as soon as brush 15 has passed the first of the series of plates 5 the circuit will be again closed when the next plate 5 is reached, and the danger-signal will thus be composed of as many series of bell-alarms as there are plates.

From the foregoing description it will be seen that the signaling devices carried on the train are placed in the circuit for operation by a magnet located on or near the track and charged by the same, and that the arrangement is such that the unimpeded operation of the track-magnet will actuate one kind of signals and the failure of that magnet to operate will cause the operation of another kind of signal through the intervention of suitable brushes carried by the train and the contact-plates on the road arranged in proper relation thereto.

I wish it to be understood that my invention is not limited to the details of construction shown in this case, but that it comprises all means by which the same result may be accomplished in substantially the same manner.

Having now fully described my invention, what I claim is—

1. In an electric railway signaling system, the combination of an incomplete circuit partly composed of the rails of the track and including an electro-magnet, two incomplete circuits on the train, each operating signals, said circuits being controlled by said electro-magnet, and contact plates and brushes for completing such circuits, substantially as described.

2. In an electric railway signaling system, the combination of an incomplete circuit partly composed of the rails of the track and including an electro-magnet, an incomplete circuit operating a safety-signal and controlled by said magnet, contact plates and brushes for completing said track-circuit, another incomplete circuit controlling a danger-signal, and other contact plates and brushes for completing the last said circuit when the safety-signal circuit fails to operate, substantially as described.

3. In an electric railway signaling system, the combination of an incomplete track-circuit including an electro-magnet, a battery on the train for charging said circuit when completed, and a second circuit including another battery composed in part of the track and controlled by the track-magnet, with signaling devices on the train controlled by said circuit, substantially as described.

4. In an electric railway signaling system, the combination of the incomplete circuit composed partly of the rails, having an electro-magnet included therein, a second circuit parallel with the track controlled by said magnet, contact brushes and plates for completing

the track-circuit, and an incomplete circuit controlling signaling devices on the train and controlled by the circuit under the control of the magnet, substantially as described.

5. In an electric railway signaling system, the combination of safety and danger signals mounted on the train, a battery for actuating either of them, with a magnet on the track, and circuit-connections, as described, for completing the circuit of the battery to either the safety or the danger signal, according to the condition of the road, substantially as described.

6. In an electric railway signaling system, the combination of a safety and a danger signal mounted on the train, a single battery for charging either of them, automatic switching mechanism for diverting the current of the battery through one or the other of the signals, with an electro-magnet on the road charged by a circuit composed partly of the track, another circuit parallel therewith controlled by said magnet, and contact brushes and plates for completing the circuits to the switching mechanism, substantially as described.

7. In an electric railway signaling system, the combination of two series of contact-plates located on the track, two contact-brushes carried by the train, separate signaling-circuits closed by said brushes and plates at one end, and an electro-magnet on the track for closing said circuits at the other end, substantially as described.

8. In an electric railway signaling system, the combination of a circuit composed partly of the rails and an electro-magnet therein, a contact-brush on the train, and a contact plate or plates on the track for closing said circuit, with a circuit parallel to the first closed at one end by contact brush and plate and controlled at the other by the magnet, relays on the train controlled by said parallel circuit, and separate safety and danger signals controlled by said relay, substantially as described.

9. In an electric railway signaling system, a single-stroke safety-bell and a trembler danger-bell, both charged by the same battery located on the train, with a relay for momentarily diverting the current of the battery into the single-stroke bell, a relay for permanently diverting the current of the battery into a trembler-bell, with a magnet charged through the rails and a circuit parallel with the track controlled by said magnet, and contact plates and brushes, substantially as described, for actuating the safety or danger signal according with the condition of the road, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD L. ORCUTT.

Witnesses:

F. L. FREEMAN,  
WM. A. HARRIES.