L. F. HOWARD.

RAILWAY SIGNALING SYSTEM.

APPLICATION FILED SEPT. 8, 1909.

955,402. **Patented Apr. 19, 1910.**

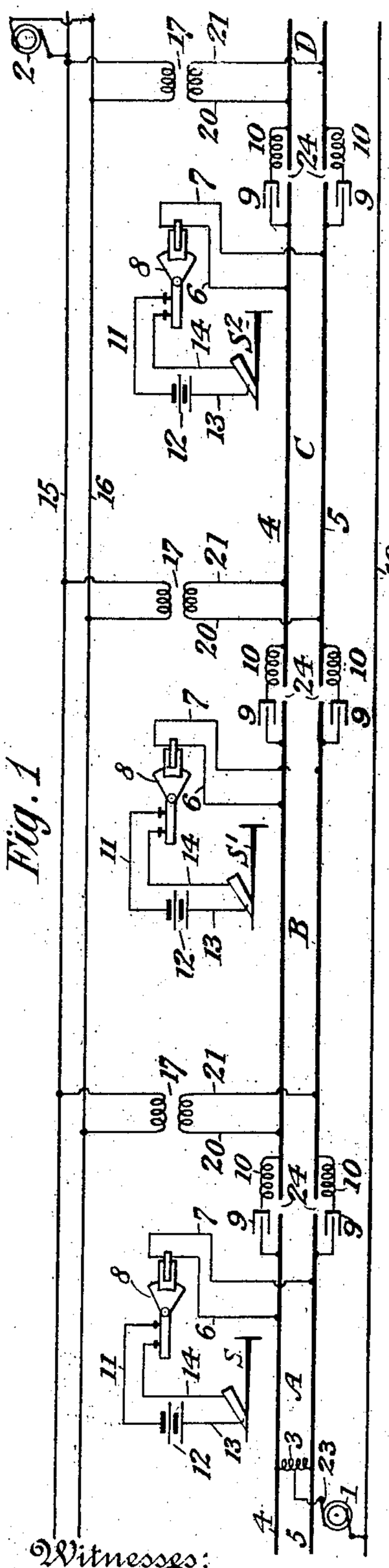

Fig. 1

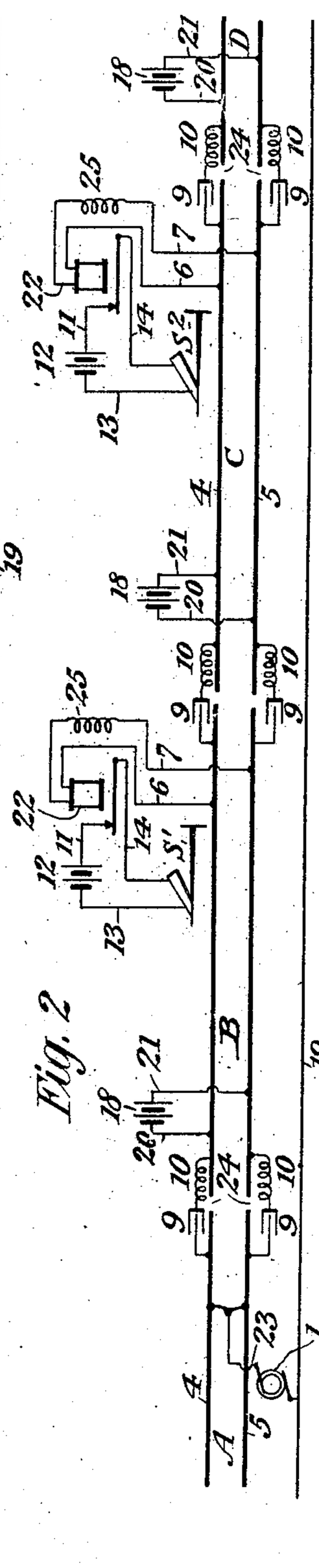

Fig. 2

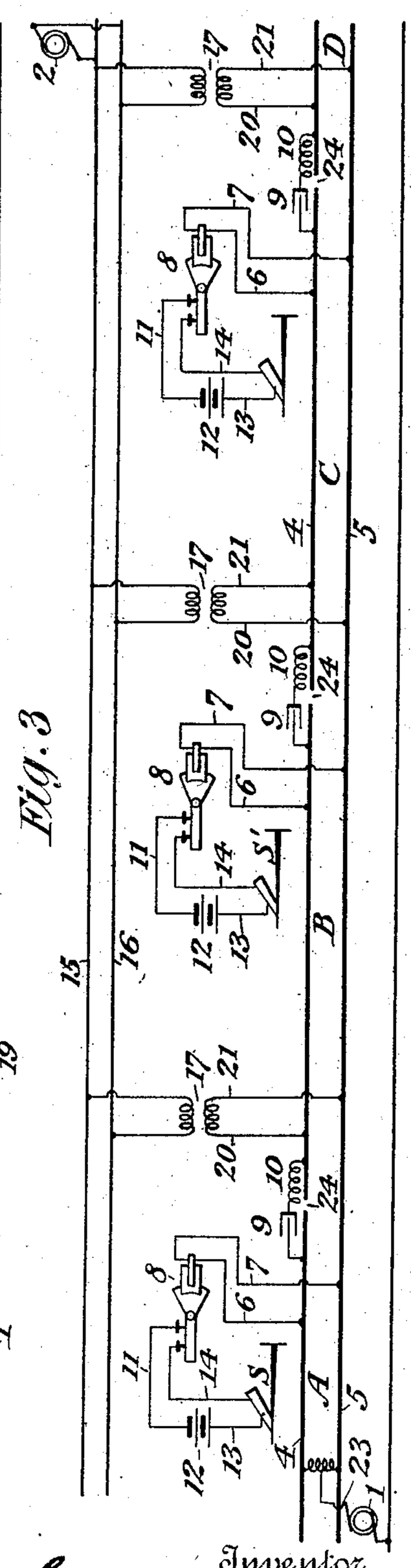

Fig. 3

Witnesses:

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RAILWAY SIGNALING SYSTEM.

955,402. Specification of Letters Patent. Patented Apr. 19, 1910.

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To all whom it may concern:

Be it known that I, LEMUEL F. HOWARD, a citizen of the United States, residing at Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway Signaling Systems, of which the following is a specification.

My invention relates to signaling systems for railways in which alternating current is used for the propulsion of vehicles along the track, and its object is to provide a novel means of dividing the track into block sections for signaling purposes without breaking the electrical conductivity of said track for the return of the propulsion current.

It is well known in the electrical art that a combination of an inductive winding and a condenser connected in series can be so adjusted relatively to each other as to offer small impedance to an alternating current of a given frequency, but to offer a comparatively great impedance to an alternating current of any other frequency.

My invention consists in the use of an inductive winding and a condenser connected in series across the breaks in the rails at the ends of each block section, the combination being so adjusted as to offer the least impedance to current of the frequency of the propulsion current, and also to oppose the flow of the signaling current, which is of another frequency, from track section to track section.

My invention is also adapted to the use of direct current for signaling purposes on railways having alternating propulsion current, and in this case there can be no flow of signaling current from track section to track section.

I will first describe the application of my invention to railway signaling systems, and will then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a diagrammatic view illustrating a portion of an electric railway having applied thereto a signaling system embodying my invention. Fig. 2 is a similar view illustrating my invention applied to a modified form of signaling system. Fig. 3 is a view similar to Fig. 1 and illustrating my invention applied to another modified form of signaling system.

Similar reference characters refer to corresponding parts throughout the several views.

Referring now to all of the drawings, in the practice of my invention one or both of the lines of rails of the railway is divided into block sections A, B, C, D, by means of insulation 24 at suitable points. Around these insulation points 24 I place electric circuits comprising a condenser 9 and an inductive winding 10. These circuits constitute selective bonds, and serve to freely conduct current of the frequency of the propulsion current, but to choke back, or offer a high impedance to, currents of other frequencies, such as that of the signaling current. This result is accomplished by so "tuning" or adjusting the parts of the bond circuit to each other that the capacity of the condenser 9 is exactly neutralized by the inductance of the inductive winding 10 for a current of the frequency of the propulsion current. This method of adjustment is well understood by those skilled in the electrical art, and no further explanation is necessary.

My invention relates only to the selective bonds above described, but I will, however, explain in a brief manner the operation of the signaling systems named in the accompanying drawings.

In Fig. 1, the numeral 1 designates a generator of alternating current for propulsion purposes, the propulsion circuit being as follows: generator 1, wire 23, inductive winding 3, track rails 4 and 5, condensers 9, inductive windings 10, cars or vehicles (not shown), trolley or third rail 19, back to generator 1. The function of the inductive winding 3 is merely to conduct the propulsion current to the rails without offering a short-circuit for the signaling current of that particular block. This result is accomplished by tapping the inductive winding at its middle point for the inlet of the propulsion current, and allowing the current to branch equally through the two halves of the winding, thereby neutralizing the inductive effect of the coil to this current. Thus the impedance to the propulsion current is very low, whereas a comparatively high impedance is offered to any alternating signaling current which attempts to pass through the entire inductive winding from end to end.

The numeral 2 designates a generator of alternating current for signaling purposes,

of a different frequency from that used for propulsion purposes. Signaling mains 15 and 16 conduct this current along the trackway, transformers 17 being used at each block to reduce the voltage to a desirable value for the track circuits. The track circuit, for example that of block B, may be traced as follows: transformer 17, wire 20, track rail 4, wire 6, relay 8, wire 7, track rail 5, wire 21, to transformer 17. The relay 8 is of the selective type; that is, it will respond to close its armature contacts only when energized by an alternating current of the frequency used for signaling purposes, and hence will not respond to current of the frequency of the propulsion current. At the entrance of each block is a signal S—S^1 S^2, etc., which may be any of the types of signal known in the art. The local signaling circuit may also be of any form desired controlled by the relay 8, but as here shown, it may be traced as follows: battery 12, wire 11, armature contacts of relay 8, wire 14, signal S, wire 13, to battery 12.

Fig. 2 is a modification of Fig. 1, using direct current for the track circuit supplied by a battery 18. In other respects the system is similar to that of Fig. 1, and it is, therefore, unnecessary to specifically trace any of the circuits. In this system the track circuit current is absolutely confined within the limits of the block section owing to the impossibility of the direct current passing through the condensers 9. A relay 22 is constructed to respond to direct current, and it may be protected by suitable means, such as inductive resistances 25, against the effects due to any difference of potential of alternating propulsion current across the rails.

In Fig. 3, one rail 5 is electrically continuous. The other rail 4 has insulated joints 24 at the ends of each block section, these joints being bridged by the selective bonds of my invention. In other respects, this system is similar to that of Fig. 1.

While I have shown and described several particular signaling systems embodying my invention, I do not wish to be limited to these systems, as any system may be used which involves the use of the rail bond circuits described, without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A selective rail bond for a railway signaling system, comprising a condenser and an inductive winding.

2. A selective rail bond for a signaling system of a railway using alternating propulsion current, comprising a condenser and an inductive winding, adjusted to offer low impedance to the propulsion current, but high impedance to a current of another frequency.

3. In combination with an electric railway the trackway of which is used as a return path for the propulsion current, a plurality of block sections formed by insulated joints in the rails, a source of alternating propulsion current, a source of signaling current for each block section of a frequency different from that of the propulsion current, and a selective bond for each insulated joint comprising a condenser and an inductive winding.

4. In a signaling system for electric railways using alternating propulsion current, the combination of a plurality of insulated block sections formed by insulations in the rails; a plurality of track circuits, one for each of said sections; a generator giving alternating signaling current of a frequency differing from that of the propulsion current, a plurality of transformers, one for each track circuit; a translating device for each track circuit, operable by current of the frequency of the signaling current but inoperable by current of the frequency of the propulsion current, and constructed to control a railway signaling device; a plurality of railway signaling devices, one for each track circuit; and a plurality of selective bonds, one for each insulation joint, comprising a condenser and an inductive winding.

5. In a signaling system for electric railways using alternating propulsion current, the combination of a plurality of insulated block sections formed by insulations in the rails, a plurality of track circuits, one for each of said sections; a source of signaling current for each of said track circuits; a plurality of translating devices, one for each track circuit, operable only by the signaling current, and constructed to control a railway signaling device; a plurality of railway signaling devices, one for each track circuit; and a plurality of selective bonds, one for each rail insulation, comprising a condenser and an inductive winding.

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

LEMUEL F. HOWARD.

Witnesses:
J. B. STRUBLE.
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