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J. S. HOLLIDAY.

ALTERNATING CURRENT SIGNALING APPARATUS FOR ELECTRIC RAILWAYS.

APPLICATION FILED JUNE 3, 1907.

Fig. 1.

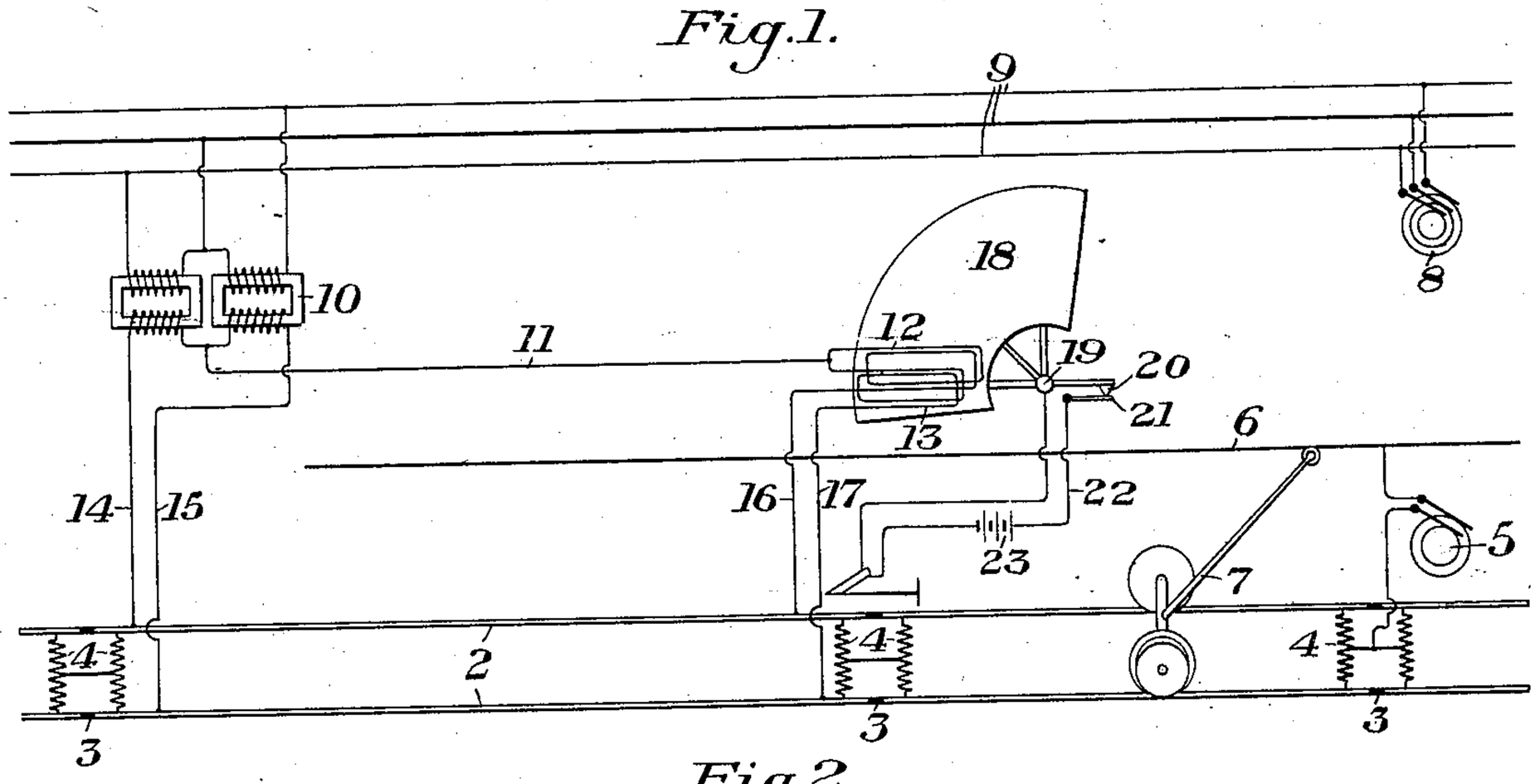


Fig. 2.

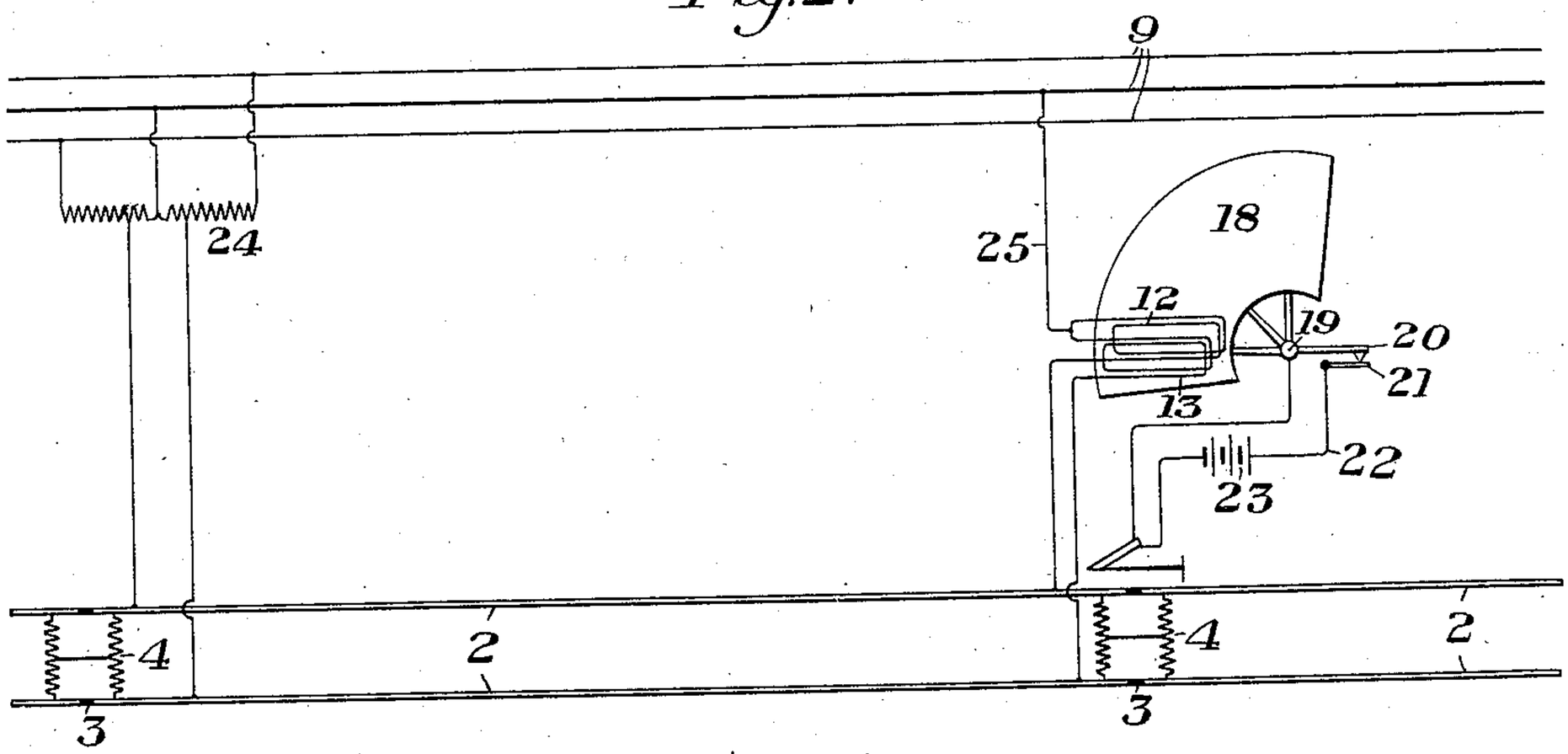
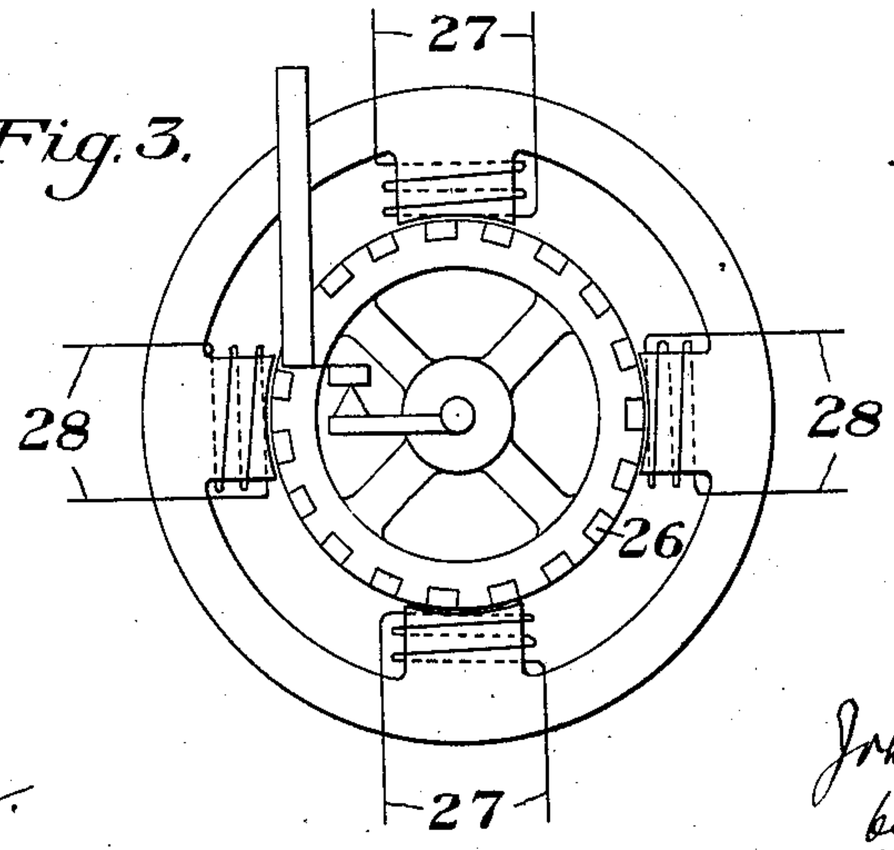


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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ALTERNATING-CURRENT SIGNALING APPARATUS FOR ELECTRIC RAILWAYS.

No. 878,138. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed June 3, 1907. Serial No. 376,897.

To all whom it may concern:

Be it known that I, JOHN S. HOLLIDAY, of Wilkinsburg, Allegheny county, Pennsylvania, have invented a new and useful Alternating-Current Signaling Apparatus for Electric Railways, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are diagrammatic views illustrating two different forms of my invention; and Fig. 3 is a detail view showing another form of the two-phase motive device.

This invention has relation to signaling systems for electric railways where a single-phase alternating current is used for propulsion, the object being to provide a system of signaling such that the propulsion current cannot operate the signals or interfere with their operation.

My invention consists essentially in the employment of a two-phase current for signaling purposes, together with signal relays, which are responsive to two-phase currents only.

Referring to the accompanying drawings, the numeral 2 designates the track rails, which are divided into insulated sections, as indicated at 3.

4 indicates inductive bonds, which connect the track rails at the ends of the sections.

5 indicates a single-phase generator, which supplies the conductor 6, from which the cars or other vehicles, one of which is indicated diagrammatically at 7, receive their supply of propulsion current.

8 designates a two-phase generator for supplying the signaling current, this current being carried along the line by the three wires or conductors 9. At one end of each block or section, is a two-phase transformer 10, which steps down the voltage from that of the line to a suitable value for signaling. From this transformer the common wire 11 is lead back to the other end of the block to the relay, and is there connected to one terminal of each of the two windings 12 and 13 of the relay. The windings are displaced with reference to each other, as indicated. The other two conductors 14 and 15 from the transformer 10 are connected to the respective track rails. The other terminals of the coils or windings 12 and 13 are also connected to the respective track rails by the conductors 16 and 17. The two windings 12 and 13 are displaced with reference to each other and are arranged to act inductively upon a vane 18 which is pivoted at 19, and which carries a movable contact 20 which coöperates with a relatively fixed contact 21 to control the signal actuating circuit 22.

When there is no train in the block, the transformer 10 is connected to the relay by three conductors. One of these consists of the wire 14, the rail to which that wire is connected, and the wire 16; the second consists of the wire 15, the other rail, and the wire 17; while the third conductor consists of the wire 11. Under these conditions the relay is supplied with two-phase current and takes its closed position as shown in the figure. This closes the contacts at 20 and 21 and completes the signaling circuit 22 from the battery 23 and holds the signal clear. When a train enters the block, the two rails are connected, so that any current coming from either part of the transformer is transmitted to each of the windings 12 and 13 of the relay 18, and both windings receive current in the same phase. There is, therefore, no tendency for the rotating part of the relay to revolve, and it opens by gravity, breaking the circuit at 21 and allowing the signal to go to the danger position.

In Fig. 2 I have shown another arrangement of the two-phase system, in which, instead of the transformer 10, an auto-transformer 24 is used. In this arrangement the conductor 11 is replaced by a connection 25 from one terminal of the relay coils 12 and 13 to the middle or common wire of the two-phase transmission line 9. This arrangement has the advantage over that shown in Fig. 1, that it obviates the necessity for the conductor 11 and requires only three wires or conductors for the signaling system.

Instead of using a vane motor of the form shown in Figs. 1 and 2, I may employ a motor such as shown in Fig. 3, consisting of a squirrel cage armature 26 surrounded by four or more coils or windings 27 and 28. When this motor is used, the two coils 27 will be connected to receive one phase of the two-phase current, and the two coils 28 connected to receive the other phase.

The advantages of my invention result from the fact that it is impossible for the propulsion current to operate the signals. If the potential of the two track rails is not the same, current may flow from one rail to the other through the wire 16, the windings 12 and 13, and the wire 17. Both windings of the relay are then receiving current in the same phase, and there is no tendency to operate the relay. In case a rail breaks, current will be cut off from one winding of the relay, which will cause the relay to open and the signal will then go to the danger position.

It will be noted that the two windings 12 and 13 are in fact connected in series across the track rails, so that they are in series with respect to any propulsion current which may flow from one of the track rails to the other, due to differences of potential therein; while at the same time, the coils are in parallel in so far as the signaling current is concerned. Any propulsion current which flows through the coils will therefore be without effect upon the relay, even though it is of the same frequency as the signaling current.

It will be obvious that various changes may be made by those skilled in the art in the particular arrangement illustrated, without departing from the spirit and scope of my invention, since

What I claim is:—

1. In an electric railway system, employing a single-phase propulsion current, a signaling circuit, a two-phase generator for supplying the same with two-phase current, and a relay having two windings connected one to each track rail and in parallel with respect to the signaling current and in series with respect to any propulsion current which may flow through them from one track rail to the other; substantially as described.

2. In an alternating current signaling system, sectional track rails, a two-phase transmission line, a two-phase transformer having its primaries connected to the transmission line and one terminal of each of its secondaries connected to opposite track rails, and a relay having two windings, one terminal of each of which is connected to the transformer secondaries and the other terminals of which are connected respectively to opposite track rails, said windings and track rails, and the connections for the windings constituting two permanently closed track circuits for each block; substantially as described.

3. In alternating current signaling apparatus, a relay having two windings forming parts of two different permanently closed track circuits for the block controlled by said relay, one of said circuits including one track rail only, and the other circuit including the opposite track rail only; substantially as described.

4. In alternating current signaling apparatus, a relay having two windings forming parts of two different permanently closed track circuits for the block controlled by said relay, and means whereby the currents in said circuits are made to differ in phase; substantially as described.

5. In an alternating current signaling system, a relay having two windings which are connected in series across the track rails, and in parallel in the signaling circuit; substantially as described.

6. In signaling apparatus for electric railway systems, sectional track rails forming part of a two-phase signaling circuit, each rail being connected to carry one phase of the current, and a relay device having two windings connected to the respective rails and responsive to the two-phase current only; substantially as described.

7. In signaling apparatus for railway systems, sectional track rails, a relay having two windings connected to opposite track rails, and means for maintaining an alternating difference of potential between said rails and a third conductor which completes the circuit of said coils; substantially as described.

8. In signaling apparatus for electric railway systems, sectional track rails, a two-phase generator, a two-phase auto-transformer connected to the generator and to opposite track rails, and a relay having two windings, each of which is connected to one winding of the auto transformer through one of the track rails, the opposite ends of the relay windings being connected to a common return wire; substantially as described.

9. In signaling apparatus for electric railway systems, sectional track rails, means for supplying opposite rails with currents different in phase, and a relay having two windings one for each phase, the said windings being connected in such a manner that when a train is in that section or block, the currents in the two windings are thereby placed in phase with each other; substantially as described.

In testimony whereof I have hereunto set my hand.

JOHN S. HOLLIDAY.

Witnesses:
JOHN L. HOFFMAN,
J. E. SKIPP.