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J. D. TAYLOR.

RAILWAY SIGNALING APPARATUS.

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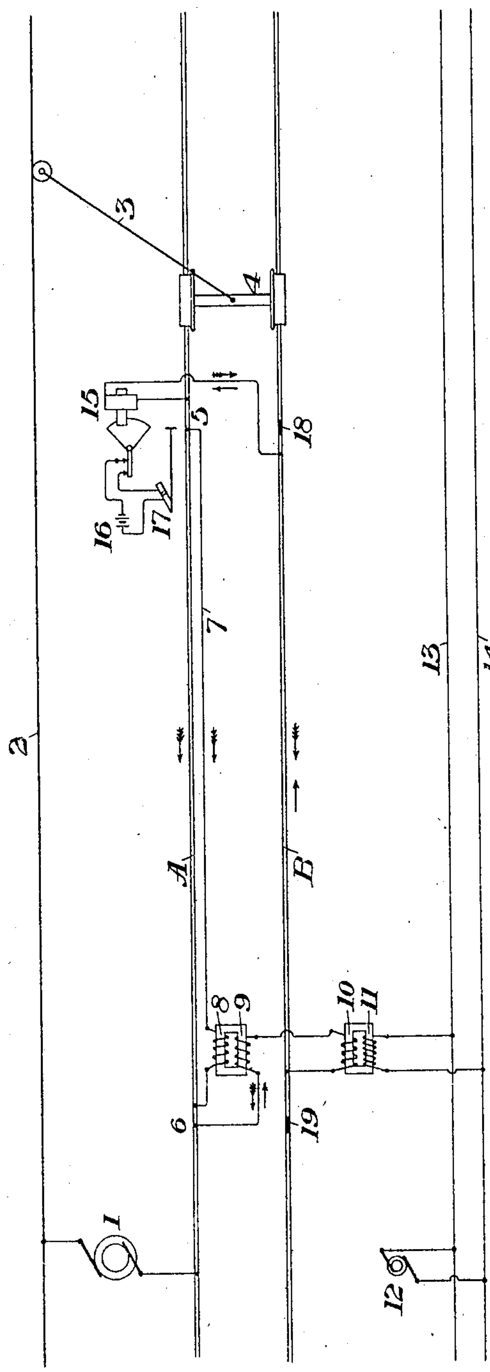

WITNESSES

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JOHN D. TAYLOR, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RAILWAY SIGNALING APPARATUS.

No. 882,275. Specification of Letters Patent. Patented March 17, 1908.

Application filed January 4, 1908. Serial No. 409,250.

To all whom it may concern:

Be it known that I, JOHN D. TAYLOR, of Edgewood Park, Allegheny county, Pennsylvania, have invented a new and useful Railway Signaling Apparatus, 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—

The figure is a diagrammatic view illustrating one embodiment of my invention.

My invention has relation to railway signaling apparatus, and is more particularly applicable to roads using alternating current propulsion and using one of the track rails for the purpose of carrying the signaling current exclusively while the other rail is used for carrying both the propulsion return current and the signaling current, this arrangement of the track circuit being commonly known as the "single rail return system". On account of the very considerable impedance which is offered by the track rail to the alternating propulsion current, there is a large drop of potential in this rail between one end of the block and the other. This difference of potential tends to cause a flow of the propulsion current through the signal-controlling relay and the track transformer, which interferes with their proper action, and also necessitates the use of a much higher voltage on the track circuits.

The object of my invention is to provide means which will generate a counter-electromotive force which will oppose this fall of potential and will prevent the propulsion current from flowing through the relay and the track transformer.

The precise nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown diagrammatically one embodiment thereof, it being premised, however, that various changes may be made therein by those skilled in the art without departing from the spirit and scope of my invention as defined in the appended claims.

In this drawing, 1 designates an alternating current generator for supplying the propulsion current. One terminal of this generator is connected to the trolley wire or third wire 2, and its other terminal is connected to the track rail A, which is used as the return circuit for the propulsion current.

3 indicates the trolley or other means for leading this current from the conductor 2 to the train motor.

4 is a conventional representation of a train.

5 and 6 designate points in the return rail A, which are respectively opposite the insulated joints 18 and 19 in the other track rail B. The insulating joints 18 and 19 form between them a track section or block, which is thereby insulated from adjacent blocks.

8 and 9 are the primary and secondary coils respectively of a transformer, which I employ for the purpose of neutralizing the drop in potential above referred to.

10 and 11 are the secondary and primary coils respectively of a track transformer.

12 is an alternating current generator, which supplies current to the signaling mains 13 and 14, and to which mains the terminals of the primary coil 11 are connected. The generator 12 should, in practice, have a frequency higher than that of the generator 1, in order that the signaling current may be differentiated from the propulsion current.

15 is a track relay or other similar instrument, which is operated by the signaling current flowing in the track circuit and controlling the circuit 16 which operates the signal 17.

The operation is as follows:—Supposing the train 4 to be in the position shown in the drawing and approaching the signal 17, the propulsion current will flow from the generator 1 through the conductor 2 and trolley 3 to the motor of the train, and will return to the generator 1 through the rail A. Assuming this current to flow in the rail A in the direction indicated by the feathered arrow, there will be a fall of potential between the points 5 and 6 which will tend to cause a flow of the propulsion current through the relay 15 in the direction indicated by the feathered arrow, and through the rail 20 and secondary coil 10 of the track transformer to the point 6 in the rail A. The primary coil 8 of the neutralizing transformer has one of its terminals connected to the point 5 through the conductor 7, and its other terminal connected to the rail A at the point 6. The fall of potential above described will cause current to flow from the point 5 through the wire 7 and the coil 8 to the point 6. The current flowing in the coil 8 will react on the secondary coil 9, and will induce therein an electro-motive force having a ratio to the fall of potential which is equal to the ratio of the number of turns in the coil 9 to the number of turns in the coil 8, and acting in the direction shown by the solid arrows. If the number of turns in the coil 8 is equal to the number of turns in the coil 9, the electro-motive force induced in the coil 9 will be practically equal to the drop of potential between the points 5 and 6. The coil 9 is shown as connected in series with the secondary coil 10 of the track transformer in such a way that the electro-motive force of this coil 9 will tend to oppose and will practically balance the fall of potential between the points 5 and 6 in the rail A. This will almost entirely prevent the flow of propulsion current through the relay and track transformer in the manner above described. With an equal number of turns in the coils 8 and 9, this balance will not be exact, on account of the resistance of the wire 7 and coil 8; but the difference between the fall of potential and the induced electromotive force of the coil 9 need not be more than one-tenth of one per cent. of the fall of potential, and may be made to disappear entirely by putting a few more turns in the coil 9 than in the coil 8.

It will be apparent that coil 8 may be connected to points on the return rail A any convenient distance apart, provided that the number of turns in the coil 8 bears to the number of turns in the coil 9 approximately the same ratio that the length of the return rail embraced between the terminals of the coil 8 bears to the total length of the track section.

The coil 9 offers very little impedance to the flow of the track circuit current generated by the track transformer, because the coil 8 is on practically a short circuit. The resistance introduced into the track circuit by this arrangement is practically equal to the sum of the resistances of the coils 8 and 9 and the wire 7, and can be made as small as desired by employing a suitable size for the wire 7 and the coils 8 and 9.

The advantages of my invention will be apparent to those skilled in the art, since it provides a very simple and convenient means for neutralizing the effect of the drop of potential in the return rail, thereby preventing the propulsion current from interfering with the proper action of the track transformers and track relays, and enabling the voltages used on the signaling circuit to be kept much lower than would otherwise be required.

I claim:—

1. In a signaling system of the character described, a generator and connections arranged to produce a counter-electro-motive force which will substantially balance the fall of potential in the return rail, and thereby prevent the flow of propulsion current in the signaling circuit; substantially as described.

2. In a signaling system of the character described, a counter-electro-motive force generator connected in shunt with the return rail for the propulsion current and arranged to oppose the flow of propulsion current in the signaling circuit; substantially as described.

3. In a signaling system of the character described, a transformer having a primary coil connected in shunt with the return rail for the propulsion current and having its secondary in the signaling circuit; substantially as described.

4. In a railway signaling system of the single rail return type, a transformer having its primary coil connected in shunt with the return rail, and its secondary in series with the secondary of the track transformer; substantially as described.

5. In an electric railway signaling system employing an alternating propulsion and using one rail for the purpose of carrying a signaling circuit, while the other rail is used for carrying both the propulsion return current and the signaling current, a transformer having its primary in parallel with a section of the return rail for the propulsion current, and its secondary in series with the secondary of the track transformer and arranged to oppose the flow of propulsion current therein; substantially as described.

6. In an electric railway signaling system of the class described, a transformer having its primary connected in parallel with a section of the return rail for the propulsion current, and its secondary connected in the signaling circuit, said primary and secondary coils being proportioned in a manner such that the electro-motive force induced in the secondary coil will be approximately equal to the drop of potential in the return rail between the terminals of the primary coil; substantially as described.

7. In an electric railway signaling system of the class described, a transformer having one coil in the propulsion circuit and its other coil in the track circuit; substantially as described.

In testimony whereof, I have hereunto set my hand.

JOHN D. TAYLOR.

Witnesses:
J. B. Struble,
L. Frederic Howard.