Sept. 13, 1932. O. H. DICKE 1,877,562

SIGNALING SYSTEM FOR RAILROADS

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FIG. 1.

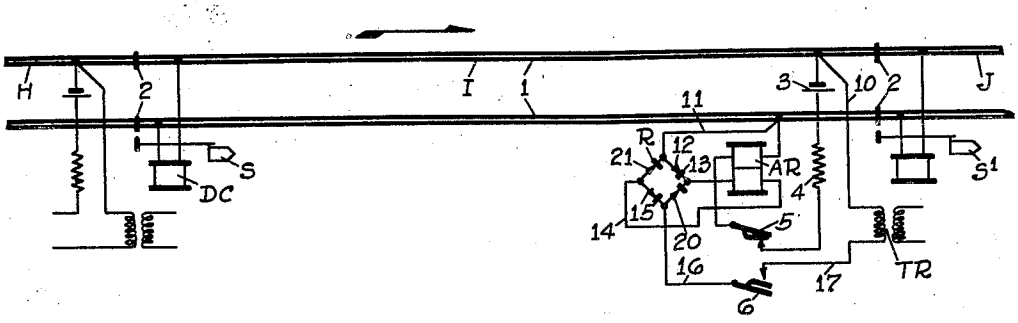
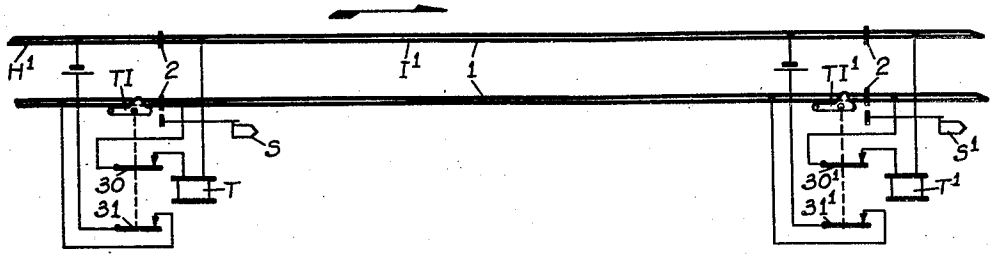


FIG. 2.



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SIGNALING SYSTEM FOR RAILROADS

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This invention relates to track circuits for railway signaling systems.

A track circuit of the usual construction comprises an insulated section of trackway having a source of current connected across the rails at one end thereof, preferably including a resistance in series with said source, and having a track relay responsive to such source connected across the track rails at the other end thereof. Obviously, even though the track circuit source in such a track circuit supplies a uniform and constant voltage, the current flowing through the track relay is not necessarily the same for all weather conditions, this because the ballast resistance between the track rails varies in accordance with the moisture and frost in such ballast. It is thus seen that when the ballast resistance from rail to rail is low a correspondingly lower current will flow in the track relay, and consequently the track relay might even be de-energized in the absence of a train in the section. Also, relays of the usual construction, and especially relays of the tractive soft iron armature type, require more current for picking them up than is required for holding them up when they have once reached their energized position. From the foregoing, it is apparent that it would be desirable to effect de-energization of the track relay of a particular track circuit upon entrance of a train upon such track circuit, in that with the track relays once de-energized it would probably remain de-energized even though the train shunt were rather poor. In this connection, it is of course understood that during extremely dry weather the ballast resistance is extremely high and a poor train shunt might be ineffective to drop the track relay upon entrance of the train into the track section.

With the above and other important considerations in mind, it is proposed in accordance with the present invention to provide auxiliary means for effecting de-energization of the track relay upon entrance of a train upon a track circuit in spite of variable ballast conditions.

Other objects, purposes and characteristic features of the present invention will in part be obvious from the accompanying drawing and will in part be more specifically pointed out hereinafter.

In describing the invention in detail reference will be made to the accompanying drawing, in which:—

Fig. 1 shows a track circuit embodying the present invention, in which a series track relay is used for removing the track circuit source upon entrance of a train into the track section; and

Fig. 2 shows a modified construction, in which the track circuit is physically opened by the entrance of a train into the track section.

In Fig. 1 has been shown a railway track 1, divided by insulating joints 2 into blocks of which the block I and the adjacent ends of blocks J and H only have been shown. Since the various blocks are the same, like parts of each block have been designated by like reference characters having distinctive exponents.

The track circuit of the block I includes a track relay DC connected across the track rails at the entrance end of the block, the normal direction of traffic being from left to right as indicated by the arrow, includes the track battery 3, the usual series resistance 4 and the upper winding of a series approach relay AR. This approach relay AR has two windings the upper winding of which is normally included in series with the track circuit through the medium of a back contact 5 of this same relay, from which it appears that energization of the approach relay AR will open the normal track circuit, thus cutting the battery 3 off of the track circuit. When the approach relay AR has assumed

its energized position, as it would during the entrance of a train into the block I, this relay AR is held up through an auxiliary alternating current track circuit including the secondary winding of the transformer TR, the front contact 6 of the approach relay AR, the rectifier R and the axles of the train in series, so that the approach relay AR is really included in a stick circuit including its stick contact 6. In this connection, it may be mentioned, that the contacts 5 and 6 are of the make-before-break type, so that the current flow through one winding of the relay AR is not interrupted until a circuit through the other winding has been completed. Also, the flow of alternating current through the rectifier R results in the flow of direct current through the lower winding of the relay AR.

Operation Fig. 1

Let us assume that the ballast resistance between the track rails of the block I is extremely high, so that the track relay DC is slightly over energized. Under this condition it is possible that the entrance of a train from the block H into the block I, especially if it is a light train, would not sufficiently shunt the track relay DC to effect its dropping to the retracted position. The increased current flowing in the track circuit through the wheels and axles of the train in question, would however, cause the approach relay AR to pick up, thereby cutting the battery 3 off of the track circuit and effecting deenergization of the track relay DC, this track relay DC not responding to the application of alternating current to the track circuit. This movement of the approach relay AR from its deenergized to its energized position, however, cuts in an auxiliary source of alternating current, which auxiliary source although it is alternating insofar as the current flow in the track rails 1 is concerned, is a direct current insofar as the flow of current in the auxiliary or lower winding of the approach relay AR is concerned. During a particular wave of an alternating current cycle current will flow from the transformer TR through the lower winding of the approach relay AR through the following circuit:—beginning at the secondary winding of the transformer relay TR, wire 10, rail 1, wheels and axles of the train, rail 1, wire 11, rectifier element 12, wire 13, lower winding of the relay AR, wire 14, rectifier element 15, wire 16, stick contact 6 of the relay AR, wire 17, back to the transformer TR. In the other wave of said particular cycle the current will, of course, flow in the same circuit as just traced except that it will flow through elements 20 and 21 of the rectifier R instead of the elements 12 and 15, from which it is apparent that the direction of current flow through the wires 13 and 14 and the lower winding of the relay AR has not been changed.

If the train under consideration now moves out of the block I the flow of alternating current through the rails 1 of the block I will fall to an extremely low value, this because very little current can flow through the track relay DC by reason of its high impedance, so that practically the only current flowing would be the current flow through the ballast resistance, so that the approach relay AR is denergized thereby breaking its stick circuit including the contact 6 and reestablishing the original track circuit including the back contact 5.

Applicant has thus provided an arrangement of devices in Fig. 1 of his drawing, in which the entrance of a train into a block removes the track circuit source of current and substitutes another and distinctive source of current which is incapable of picking up the track relay, all of which is carried out through the medium of an approach relay AR, which approach relay in addition to the functions already mentioned may also be used for carrying out the usual approach lighting function of wayside signals, such as the lighting the signal S^1 illustrated only when there is a train in the block I. The signals S and S^1, althhough conventionally shown as signals of the semaphore type, may of course be light signals of any suitable construction, if desired.

If desired, the transformer TR, the rectifier R and the front contact 6 of the relay AR may be dispensed with, in which case the entrance of a train into the block I will cause the relay AR to be intermittently energized, thereby changing the track circuit current from continuous direct current to pulsating current, and thereby deducting materially the quantity of current flowing in the track circuit. Furthermore, since the track circuit is an inductive circuit the pulsating current that may flow during the presence of a train in the block is still further restricted.

Structure Fig. 2

In Fig. 2 of the drawing, the track rails 1 have been similarly shown divided into blocks by insulating joints 2, of which the block I^1 and the adjacent ends of two blocks H^1 and J^1 have been shown. In the construction shown in Fig. 2 there is provided a track instrument TI having contacts 30 and 31 at the junction of the various blocks, one of these track instrument contacts being included in the track circuit of the block, in advance, whereas the other contact of this track instrument is included in the track circuit of the block in the rear, these track instrument contacts being normally closed and being opened during the passage of a train from one block into the next block. It is thus apparent that

by the provision of suitable means it is assured that the track relay of a particular block will be completely deenergized upon the entrance of a train into that block, this because the track circuit is actually opened during such entrance of a train into the block. It is of course understood that any suitable means other than the treadle TI may be used to open the track circuits of the blocks, such as for instance magnetically, inductively and optically operated contacts.

In this respect, the arrangement shown in Fig. 2 functions the same as the arrangements shown in Fig. 1, that is, the track relay will assume its deenergized position, and since more current is required to pick up a track relay than is required to hold such track relay up, a decided advantageous margin of operation of the track circuit is accomplished. In other words, should the ballast resistance of a particular track circuit be so high that the track relay is over energized and would not drop by the shunting action of an entering train, but is still insufficiently high to pick up the track relay, the track circuit would function properly, providing of course that the track circuit is momentarily opened during the entrance of a train into the block, all as is proposed in accordance with Fig. 2 of the present invention.

Having thus shown and described several specific embodiments of the present invention it is desired to be understood that the particular arrangements shown in the drawing have not been selected to illustrate the scope of the invention nor the exact construction preferably employed in practicing the invention, but have been selected to facilitate the description of the invention as well as its operating characteristics, and it is further desired to be understood that various changes, modifications and additions may be made to adapt the invention to the particular problem encountered in practicing the same, all without departing from the spirit or scope of the invention or the idea of means underlying the same, except as demanded by the scope of the following claims.

What I claim as new is:—

1. In combination, a section of track isolated by insulating joints from the remaining track, a track relay connected between the rails at one end of said section, a source of current to which said track relay is responsive connected between the rails at the other end of said section, and electro-responsive means independent of said track relay and responsive to the entrance of a train in said section for disconnecting said source and substituting another and distinctive source ineffective to operate said track relay.

2. In combination, a section of track isolated by insulating joints from the remaining track, a track relay connected between the rails at one end of said section, a source of current to which said track relay responds connected between the rails at the other end of said section, and electro-responsive means responsive independently of said track relay to the entrance of a train in said section for disconnecting said source and substituting another and distinctive source incapable of energizing said track relay and for maintaining said electro-responsive means active until said train has passed out of said section.

3. In combination, a track section divided from the remaining track by insulating joints, a track circuit for said section including a source of current at one end and a track relay responsive to said source at the other end, and means governed in part by distinctive current incapable of controlling said track relay for disconnecting said source from said track circuit rendered effective upon the entrance of a train into said track circuit and which when effective maintains said source disconnected until such train has passed off of said track circuit and then reconnects said source to said track circuit.

4. In combination, a track section divided from the remaining track by insulating joints, a track circuit for said section including a source of direct current at one end and a relay responsive only to direct current at the other end, and means initiated by direct current upon entrance of a train in said section and responsive to alternating current flowing through the axles of a train in said section for disconnecting said source of direct current during the presence of a train in said section.

5. In combination, a track section divided from the remaining track by insulating joints, a track circuit for said section including a source of current of a particular character at one end and a relay responsive only to current of said particular character at the other end, and means initiated upon entrance of a train in said section and responsive to current of a different character incapable of operating said relay and flowing through the axles of a train in said section for disconnecting said source of said particular character during the presence of a train in said section.

6. In combination, a track section divided from the remaining track by insulating joints, a track circuit for said section including a source of current at one end and a track relay responsive to said source at the other end, and a stick relay picked up by current derived from said source and having a stick circuit including rails of said section and the axles of a train in said section and energized by current of a different and distinctive character for when energized disconnecting said source from said track circuit.

7. In combination, a track section divided from the remaining track by insulating joints, a track circuit for said section including a source of direct current at one end and

a relay responsive only to direct current at the other end, a stick relay having two windings one included in series with said direct current source and including a back contact of said relay and the other connected to a rectifier energized by alternating current flowing through a front contact of said relay and through the axles of a train in said section, whereby alternating current only flows in said track circuit during the presence of a train in said section.

In testimony whereof I affix my signature.

OSCAR H. DICKE.