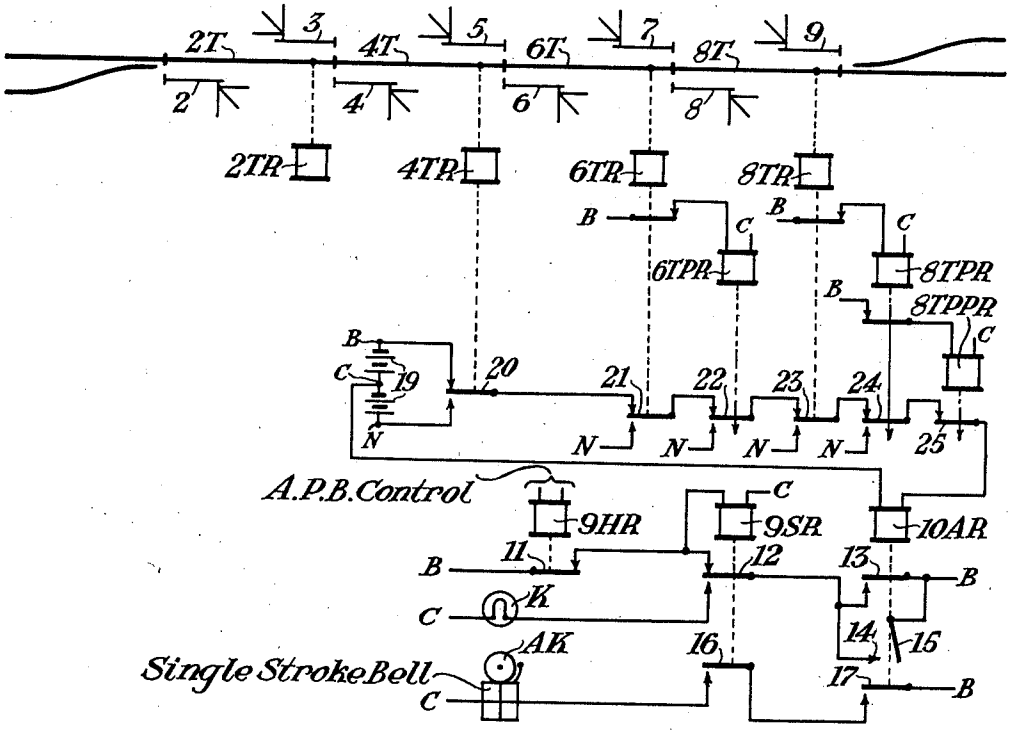
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SIGNALING APPARATUS

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SIGNALING APPARATUS

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My invention relates to signaling apparatus; and it has particular reference to the organization of such apparatus into systems for indicating at a remote or office station the movements of railway trains along a stretch of track. More particularly, it relates to the organization of systems wherein a minimum of line wires are required to transmit indications relating to the occupany of a plurality of track sections.

It has been found desirable in railway signal and traffic controlling systems to indicate at a remote or central office station not only that a stretch of railway track is occupied by a train, but also to indicate the progress of the train along the stretch. In the interest of economy, it is desirable that the transmission of such indications be effected by a minimum number of line wires extending along the stretch of track, thereby reducing to the minimum both the initial and maintenance cost of providing such indications.

In view of the above-mentioned and other important factors, it is an object of my present invention to provide novel and improved means for indicating at an office station the progress of trains along a stretch of track.

Another object is to provide novel and improved means for indicating at an office station that a given stretch of track is occupied and also for indicating the entrance of the train into each of the track sections forming such stretch.

An additional object is to provide means utilizing a two-wire line circuit extending along a stretch of track, for controlling means governing a first indicator relating to the occupancy of the stretch as a whole and second indicators relating to the particular sections of such stretch entered by the train as it proceeds along the stretch.

A further object is to provide novel and improved means for indicating at an office station train movements on a stretch of track.

The above-mentioned and other important objects and characteristic features of my invention which will become readily apparent from the following description, are attained in accordance with my invention by utilizing a two-wire line circuit extending along a stretch of track to control means governing two indicators located at an office station. The control means governed by the line circuit is responsive both to the polarity of energization of the circuit and to momentary interruptions of such energization, and controls one of the indicators in response to the polarity of energization of the line circuit and the other indicator in response to each momentary interruption of such circuit. Traffic responsive means such as track relays associated one with each section of track, are utilized to control the polarity of energization of the line circuit and momentarily to interrupt such circuit, certain of the track relays being provided with slow acting auxiliary relays which aid in the control of the line circuit in such manner that the entrance of a train on a track section causes the line circuit to become interrupted a distinctive number of times, the number of interruptions differing for each section entered.

I shall describe one form of apparatus embodying my invention, and shall then point out the novel features thereof in claims.

The accompanying drawing is a diagrammatic view illustrating a preferred form of apparatus embodying my invention.

Referring to the drawing, the diagram at the top represents a stretch of single track railway divided in the customary manner into a plurality of successive adjoining track sections 2T, 4T, 6T and 8T. Each of these sections is provided with the usual closed circuit track circuit including a normally energized track relay as indicated diagrammatically in the drawing, these relays being designated by the reference characters 2TR, 4TR, 6TR and 8TR, respectively.

The reference characters 6TPR and 8TPR designate slow releasing repeater relays provided for relays 6TR and 8TR, respectively; and the reference character 8TPPR designates a slow releasing repeater relay provided for repeater relay 8TPR.

The movement of traffic along the track from left to right as viewed in the drawing, is governed by signals 2, 4, 6 and 8, while the movement of traffic from right to left is governed by signals 3, 5, 7 and 9. These signals are preferably controlled by traffic on the stretch in any suitable manner by apparatus not shown in the drawing since the control of the signals forms no part of my present invention. For the purpose of this application, however, it will be assumed that the signals governing traffic over the stretch are controlled by apparatus organized to provide an absolute permissive block signal system of signaling.

The reference character 9HR designates a signal control relay for controlling headblock signal 9. This relay as indicated conventionally in the drawing is preferably controlled through the medium of the usual absolute permissive block signaling circuits, and in accordance with the

usual practice such relay is arranged to be released when relay 2TR drops in response to a train, moving from left to right in the drawing, entering section 2T.

The reference character 9SR designates a stick relay associated with relay 9HR. Relay 9SR is provided with an obvious pick-up circuit which extends from one terminal B of a suitable source of current, such as a battery 19, through front contact 11 of relay 9HR and the winding of relay 9SR to another terminal C of the source of current. Relay 9SR also is provided with a stick circuit which includes its own front contact 12 as well as a back contact 13 or a reverse polar contact 14—15 of a polarized indication relay 10AR, which relay is of the class characterized by the fact that the polar armature is retained at its last operated position when the relay is deenergized.

The reference character K designates a first indicator, represented as a visual indicator comprising an electric lamp, and the reference character AK designates a second indicator represented as an audible signal in the form of a single stroke bell, that is, a bell arranged in such manner that when energized, it does not break its own energizing circuit. The indicators K and AK preferably are located at an office or central station.

The apparatus is in its normal condition, as represented in the drawing, when the stretch of track comprising sections 2T, 4T, 6T and 8T is unoccupied. In this condition of the apparatus, the track relays 2TR, 4TR, 6TR and 8TR; repeater relays 6TPR, 8TPR and 8TPPR; and relays 9HR and 9SR, are energized. Relay 10AR also is energized by current of what I shall term normal polarity supplied over a circuit which may be traced from terminal B through front contact 20 of relay 4TR, front contact 21 of relay 6TR, front contact 22 of relay 6TPR, front contact 23 of relay 8TR, front contact 24 of relay 8TPR, front contact 25 of relay 8TPPR, the winding of relay 10AR and the common return wire of the signaling system to mid terminal C of battery 19. Relay 10AR accordingly operates its neutral armature to hold open the associated back contacts 13 and 17, and operates its polar contact member 15 to its normal or right-hand position, as represented in the drawing. Indicators K and AK are both deenergized.

If, with the apparatus in the normal condition above described, a train, operating from left to right as viewed in the drawing, enters section 2T, relay 2TR releases and causes relay 9HR also to release in response to the arrangement of the circuits employed in the well-known absolute permissive block system of signaling. Relay 9HR in releasing opens its front contact 11 to thereby deenergize relay 9SR and cause that relay to open its front and close its back contacts 12 and 16.

When the train enters section 4T, relay 4TR releases to open its front and close its back contact 20. During the travel of contact 20 of relay 4TR from its front to its back point, the previously traced normal circuit of relay 10AR is opened, and relay 10AR releases to close its back contacts 13 and 17. Back contact 13 of relay 10AR completes an easily traced energizing circuit for indicator K, this circuit passing from terminal B through back contacts 13 and 12 of relays 10AR and 9SR, respectively, and the filament of lamp K to terminal C, whereupon lamp K becomes illuminated to indicate that the stretch of track is occupied. Indicator AK also becomes energized when relay 10AR drops, due to current supplied over a circuit passing from terminal B through back contacts 17 and 16 of relays 10AR and 9SR, respectively, and the winding of bell AK to terminal C.

When contact 20 of relay 4TR drops to its back point, another terminal N of battery 19 is connected to the previously traced circuit of relay 10AR, and relay 10AR accordingly becomes energized by current opposite in polarity to that supplied over its previously traced normal circuit when front contact 20 of relay 4TR is closed. Relay 10AR thereupon reverses its polar contact member 15 to close reverse polar contact 14—15 and thereby complete an obvious alternate path in the circuit of indicator K, which alternate path retains lamp K illuminated after back contact 13 of relay 10AR opens. Bell AK now becomes deenergized due to the opening of back contact 17 of relay 10AR. It follows from the foregoing that relay 10AR is momentarily deenergized and its energization reversed when section 4TR is entered by the train with the result that indicator K is illuminated and bell AK is sounded once.

The circuit of relay 10AR is twice momentarily interrupted when the train enters section 6T, the first interruption being effected during the travel of contact 21 of relay 6TR from its front to its back point, at which back point terminal N of battery 19 again is connected to the line circuit to energize relay 10AR. The second interruption follows closely upon the first, and is effected when at the end of the slow release interval of relay 6TPR, contact 22 of relay 6TPR drops from its front to its back point, at which back point terminal N of the source of current again is connected to the line circuit to energize relay 10AR. It is, of course, obvious that during each interruption of the line circuit above mentioned, relay 10AR is deenergized and drops its neutral contacts to complete momentarily the previously traced circuit of audible indicator AK, thereby causing that indicator to sound one stroke for each interruption of the circuit of relay 10AR, but since polar armature 15 of relay 10AR is retained in its last operated position, indicator K is controlled to maintain a constant indication.

Three interruptions of the circuit of relay 10AR are effected when the train enters section 8T, the first and second interruption coming when contacts 23 and 24 of relays 8TR and 8TPR, respectively, travel between their front and back points, and the third coming after the second interruption when relay 8TPPR opens its front contact 25 at the end of its slow release interval. When relay 8TPPR drops, battery 19 is disconnected from relay 10AR so that the latter relay remains deenergized to constantly energize audible indicator AK, but as was pointed out heretofore, bell AK is preferably a single stroke bell and hence sounds only one stroke each time it is energized. Indicator K, however, continues to display its indication until such time as relay 10AR is energized by current of normal polarity.

When the train vacates section 8T, relays 8TR, 8TPR and 8TPPR pick up to complete the previously traced normal energizing circuit of relay 10AR, whereupon that relay picks up and operates its polar contact member 15 to its normal position, thereby deenergizing both indicators K and AK. Relay 9HR also picks up by virtue of the absolute permissive block signal circuit, and in turn causes relay 9SR to pick up, thereby restoring the apparatus to its normal condition.

It is, of course, to be understood that if indi-

cations relating to the occupancy of additional sections of track are desired, such additional indications may easily be furnished by providing the track relays of such sections with a sufficient number of slow acting repeater relays, and by controlling the line circuit of relay 10AR through contacts of the additional track relays and their associated repeater relays in substantially the manner hereinbefore described in detail whereby each track section entered by a train is represented by a series of successive single strokes of a bell, each succeeding track circuit including one more stroke in its series than the section just preceding it.

With the apparatus arranged as shown in the drawing, a westbound train operating over the stretch of track will not cause operation of indicators K and AK, since relay 9HR remains up until the train enters section 8T to release relay 8TR and thereby reverse the energization of relay 10AR to cause polar contact 14—15 to close and hold relay 9SR energized over its stick circuit. Relay 9SR may be provided with slightly slow releasing characteristics so as to enable contact 14—15 of relay 10AR to close prior to front contact 12 of relay 9SR opening when front contact 11 of relay 9HR opens due to the train in section 8T. Relay 10AR remains in its reverse position until the westbound train vacates section 4T, whereupon relay 10AR is energized in its normal direction to open polar contact 14—15, but relay 9HR is of course energized (due to the train proceeding along the stretch) prior to the opening of contact 14—15 of relay 10AR, so that relay 9SR is held energized to hold open its back contacts 12 and 16 and thus prevent operation of indicators K and AK for a westbound train.

Also, it is to be understood that if it is desired to provide indications relating to the occupancy of the stretch and the progress of a train along the stretch for a westbound train operating from right to left in the drawing, such system may readily be provided, as for example by utilizing another stick relay similar to relay 9SR but arranged to be released only by a westbound train, and employing such relay together with the track and repeater relays of the stretch to control indicators K and AK, or similar indicators.

From the foregoing description, it is readily apparent that apparatus embodying my invention provides means whereby a first indication device is controlled to provide a constant indication as long as a train is on a stretch of track and a second indication is controlled to provide a distinctive number of momentary indications as each section comprising the stretch is occupied, the number of momentary indications provided differing for each section. This control of the two indications is effected by utilizing only a single control line wire extending along the stretch of track, and the common return wire of the signaling system provided for the stretch. It follows, therefore, that my invention requires a minimum of apparatus to control the two separate indications in the manner described, thereby enabling the initial and maintenance cost of providing such indications to be reduced to a minimum.

Although I have herein shown and described only one form of signaling apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination with a stretch of railway track divided into a plurality of track sections each provided with a track circuit including a track relay, two indication devices, a control relay for controlling the operation of said two indication devices, and means governed by said track relays for controlling said control relay to cause a first of said indication devices to provide a constant indication as long as a train is on said stretch and to cause the second indication device to provide a distinctive number of momentary indications as each section is occupied by the train, the number of momentary indications provided differing for each section.

2. In combination with a stretch of railway track divided into a plurality of track sections each provided with a track circuit including a track relay, two indication devices, a polarized control relay, means governed by said track relays for controlling the polarity of energization of said control relay and for momentarily interrupting the energization of such relay, each track relay causing the energization of said control relay to be interrupted a different number of times, and means governed by said control relay for controlling a first of said two indicators in response to the polarity of energization of said relay and for controlling the second indicator in response to each interruption of such energization.

3. In combination with a stretch of railway track divided into a plurality of track sections each provided with a track circuit including a track relay, two indication devices, a polarized relay, a two-wire line circuit for said polarized relay, means governed by at least one of said track relays for controlling the polarity of energization of said circuit and by each of said track relays for momentarily interrupting such energigation a series of times, the number of interruptions of the energization of said polarized relay differing for each track relay, and means governed by said polarized relay for controlling a first of said indicators in response to the polarity of energization of said circuit and for controlling the other indicator in response to each interruption of the energization of said circuit.

4. In combination with a stretch of railway track divided into a plurality of track sections each provided with a track circuit including a track relay, a plurality of track repeater relays one for each of certain of said track relays, a repeater relay controlled by one of said track repeater relays, a polarized relay, a two-wire line circuit for said polarized relay, means governed by at least one of said track relays for controlling the polarity of energization of said circuit and by said track relays and said repeater relays for momentarily interrupting such circuit, the number of interruptions of said circuit differing for each track relay, two indication devices, and means governed by said polarized relay in response to the polarity of energization of said circuit for controlling a first of said indication devices and for controlling in response to each interruption of said line circuit the second of said indication devices.

5. In combination, a plurality of track relays, a plurality of repeater relays of which one or more is associated with each of said track relays but

one, a polarized relay, means controlled by said one track relay for controlling the polarity of energization of said polarized relay and by said track and repeater relays for momentarily interrupting such energization, the number of interruptions of such energization differing for each track relay, two indication devices, means governed by said control relay for controlling a first of said indication devices in response to the polarity of energization of said polarized relay and for controlling the other of said devices in response to each interruption of the energization of said polarized relay.

6. Indicating apparatus for use with a stretch of railway track divided into a plurality of track sections each provided with a track circuit including a track relay, comprising a polarized relay, a two-wire line circuit for energizing said polarized relay, means controlled by one of said track relays for reversing the polarity of energy supplied to said polarized relay over said circuit, means controlled by the other track relays for momentarily interrupting said circuit, each track relay causing said circuit to be interrupted a different number of times respectively, a first indication device controlled by the polarity of energization of said polarized relay, and a second indication device controlled by the interruptions in energization of said polarized relay.

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