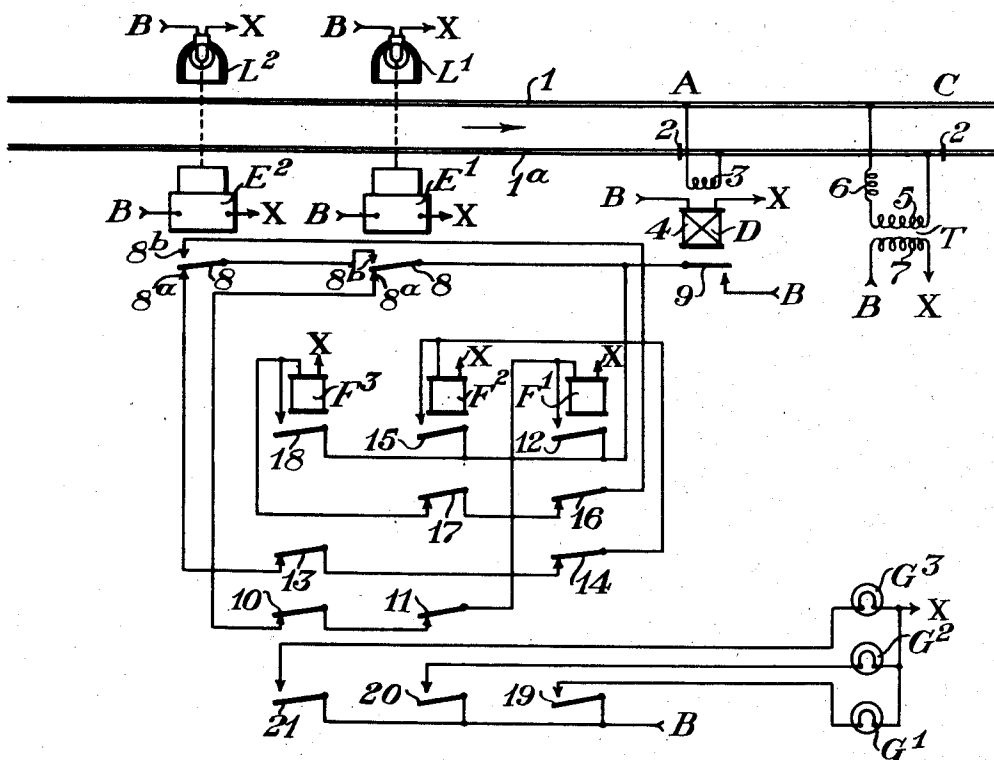


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ELECTRICAL SIGNALING

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ELECTRICAL SIGNALING

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My invention relates to electrical signaling apparatus, and particularly to apparatus for indicating the length of a railway train.

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

The accompanying drawing is a diagrammatic view illustrating one form of electrical signaling apparatus embodying my invention.

Referring to the drawing, the reference character 1 and 1^a designate the track rails of a stretch of railway track over which traffic normally moves in the direction indicated by the arrow. Rail 1^a is divided by means of insulating joints 2 to form a track section A—C. This track section is provided with a track relay D comprising two windings 3 and 4, one of which, 3, is constantly connected across the rails adjacent the entrance end of the section, and the other of which, 4, is constantly supplied with current from the terminals B and X of a suitable source of energy not shown in the drawing. This track section is also provided with a source of track circuit current here shown as a track transformer T, the secondary 5 of which is connected across the rails adjacent the exit end of the section in series with the usual current limiting impedance 6, and the primary 7 of which is constantly connected with the terminals B and X of the source.

Located in the trackway in rear of the entrance end of section A—C a distance which is just slightly less than the length of a train composed of a predetermined number of cars, for example six cars, is a light sensitive device E¹ which normally receives light from a lamp L¹, these elements being so disposed that the supply of light to the device E¹ is discontinued while a train is passing between these elements. Preferably the lamp and the device are disposed on opposite sides of the track, and are so arranged that the supply of light to the device is continuously cut off during the passage of a train. The device E¹ comprises an enclosing tube which is open at the end toward the track, in order to prevent the light sensitive element of this device from being influenced by light other

than that which is received from the lamp L¹. Similarly, the lamp L¹ comprises an enclosing tube which is open at the end toward the track, and the inner end of which constitutes a reflector. The device E¹ also comprises a contact 8—8^a which is closed when the device E¹ is receiving light from the lamp L¹, but which becomes opened when the supply of light to the device is cut off by the passage of a train, and a contact 8—8^b which is open when the device is illuminated, but which becomes closed at other times. A second light sensitive device E², similar to the device E¹, is located in the trackway a predetermined distance in rear of the device E¹, for example, four car lengths in rear of the device E¹, and is arranged to be normally supplied with light from a lamp L². Each lamp and its associated light sensitive device are constantly supplied with operating current from the terminals B and X of the source, and may be similar to the elements now commonly employed to control street traffic signals.

The light sensitive devices E¹ and E² and the track relay D control three stick relays F¹, F² and F³. Stick relay F¹ is provided with a pick-up circuit which passes from terminal B through back contact 9 of track relay D, contact 8—8^a of light sensitive device E¹, back contact 10 of stick relay F³, back contact 11 of stick relay F², and winding of relay F¹ to terminal X. Relay F¹ is also provided with a stick circuit which passes from terminal B through back contact 9 of track relay D, front contact 12 of relay F¹, and winding of relay F¹ to terminal X. Relay F² is provided with a pick-up circuit which passes from terminal B through back contact 9 of track relay D, contact 8—8^b of light sensitive device E¹, contact 8—8^a of light sensitive device E², back contact 13 of relay F³, back contact 14 of relay F¹, and winding of relay F² to terminal X. Relay F² is also provided with a stick circuit which passes from terminal B through back contact 9 of track relay D, front contact 15 of relay F², and winding of relay F² to terminal X. Relay F³ is provided with a pick-up circuit which passes from terminal B

through back contact 9 of track relay D, contact 8—8^b of light sensitive device E¹, contact 8—8^b of light sensitive device E², back contact 16 of relay F¹, back contact 17 of relay F², and winding of relay F³ to terminal X. Relay F³ is also provided with a stick circuit which passes from terminal B through back contact 9 of track relay D, front contact 18 of relay F³, and winding of relay F³ to terminal X.

The relays F¹, F² and F³, in turn, each control an indicating device, here shown as an electric lamp, and designated by the reference character G with an exponent corresponding to the exponent of the relay which controls it. The indicating devices will usually be located at a remote point as in a signal tower or train despatcher's office. The electric lamp G¹ is provided with a circuit which passes from terminal B through front contact 19 of relay F¹ and electric lamp G¹ to terminal X. The electric lamp G² is likewise provided with a circuit which passes from terminal B through front contact 20 of relay F² and electric lamp G² to terminal X. Similarly, electric lamp G³ is provided with a circuit which passes from terminal B through front contact 21 of relay F³ and electric lamp G³ to terminal X. It will be apparent, therefore, that when one of the relays F is energized, the lamp G controlled thereby will be lighted, but that when such relay is deenergized, the electric lamp controlled thereby will be extinguished.

As shown in the drawing, the light sensitive devices E are each receiving light from the associated lamp L, and the contact 8—8^a of each of these devices is therefore closed while the contact 8—8^b is open. Track section A—C is unoccupied. Both windings of track relay D are therefore energized, and back contact 9 of this relay is therefore open. All circuits for the stick relays F¹, F² and F³ are therefore open, so that each of these relays is deenergized. Since the stick relays F are deenergized, the lamps G controlled thereby are extinguished.

In explaining the operation of the apparatus, I will first assume that with the parts in the conditions just described, a train which is shorter than the distance from the device E¹ to the entrance end of section A—C, traverses the stretch of track shown in the drawing from some point to the left of device E to some point sufficiently beyond the exit end of section A—C for the train to completely clear this section. While the train is passing the device E², it cuts off the supply of light to this device, and this device therefore opens its contacts 8—8^a and closes its contacts 8—8^b. Similarly, while the train is passing the device E¹, it cuts off the supply of light to this device, so that this device operates to open its contact 8—8^a and close its contact 8—8^b. The operation of these devices under

these conditions, however, has no effect on the remainder of the apparatus, because the train is shorter than the distance from the device E¹ to the entrance end of section A—C, and the train will have passed beyond both of these devices, and these devices will have returned to their normal conditions, before the train enters section A—C; and, as long as section A—C is unoccupied, all circuits previously traced for the relays F¹, F² and F³ are open at front contact 9 of track relay D. When the train enters section A—C, it shunts winding 3 of track relay D, and relay D therefore closes its back contact 9. When back contact 9 of relay D becomes closed, since contact 8—8^a of device E¹ is then closed, the pick-up circuit for relay F¹ is completed, and relay F¹ therefore becomes energized. When relay F¹ becomes energized, it opens its back contacts 14 and 16 and closes its front contacts 12 and 19. When back contacts 14 and 16 of relay F¹ become opened, the pick-up circuits for the stick relays F² and F³ are opened at these contacts respectively, and these relays are therefore prevented from becoming energized as long as relay F¹ remains energized. When front contact 19 of relay F¹ becomes closed, lamp G¹ becomes lighted, thereby informing the towerman or train despatcher that the train which has just entered section A—C is shorter than the distance from the device E¹ to the entrance end of section A—C. When front contact 12 of relay F¹ becomes closed, it completes the stick circuit previously traced for this relay, thus insuring that this relay will remain energized until after the train has completely passed out of section A—C. When this happens, winding 3 of track relay D again becomes energized, so that relay D opens its back contact 9. Both the pick-up and stick circuits for relay F¹ are then interrupted, and relay F¹ therefore becomes deenergized. Lamp G¹ then becomes extinguished, and the parts are restored to their normal conditions in which they are illustrated in the drawing.

I will next assume that with the parts in their normal conditions, a train which is longer than the distance from the light sensitive device E¹ to the entrance end of section A—C, but which is shorter than the distance from the light sensitive device E² to the entrance end of section A—C, traverses the stretch of track illustrated in the drawing. While the train is passing device E², this device is operated in the manner previously described, but the operation of this device has no effect on the remainder of the apparatus under these conditions because all circuits for relays F¹, F² and F³ are then open at back contact 9 of relay D. Light sensitive device E¹ is likewise operated while the train is passing this device, and since the train is longer than the distance from the device E¹

to the entrance end of section A—C, this device will still be in its operated condition when the train enters section A—C and shunts winding 3 of relay D. As a result, when back contact 9 of relay D becomes closed under these conditions, contact 8—8^b of device E¹, and contact 8—8^a of device E² are closed, and the pick-up circuit for relay F² is therefore completed, so that relay F² becomes energized. Relay F² therefore opens its back contacts 11 and 17 and closes its front contacts 15 and 20. When back contacts 11 and 17 of relay D become opened, the pick-up circuits for the relays F¹ and F³ are opened at these contacts respectively, thus preventing either of these relays from becoming energized as long as relay F² remains energized. When front contact 20 of relay F² becomes closed, the circuit for lamp G² is closed, and lamp G² becomes lighted to indicate that the train which has entered section A—C is shorter than the distance from the device E² to the entrance end of section A—C, but longer than the distance from the device E¹ to the entrance end of section A—C. When front contact 15 of relay F² becomes closed, it closes the stick circuit previously traced for this relay and this relay therefore remains energized when contact 8—8^b of device E¹ opens due to the train having passed beyond this device. When the train passes out of section A—C, relay D opens its back contact 9. The stick circuit for relay F² is then interrupted at this contact, and relay F² becomes deenergized. Lamp G² therefore becomes extinguished, and the parts are then restored to their normal conditions in which they are illustrated in the drawing.

I will now assume that with the parts in their normal condition, a train which is longer than the distance from the device E² to the entrance end of section A—C, traverses the stretch of track shown in the drawing. Under these conditions, both light sensitive devices E² and E¹ will still be obscured by the train at the instant the train enters section A—C and shunts winding 3 of relay D, so that contact 8—8^b of both of these devices will then be closed. As a result, when back contact 9 of relay D becomes closed, it completes the pick-up circuit for relay F³. Relay F³ therefore becomes energized and opens its back contacts 13 and 10 and closes its front contacts 18 and 21. When back contacts 13 and 10 of relay F³ become opened, the pick-up circuits for relays F² and F¹, respectively are opened and these relays are thus prevented from becoming energized when the devices E² and E¹ close their contacts 8—8^a due to the train having passed beyond these devices. When front contact 21 of relay F³ becomes closed, lamp G³ becomes lighted to indicate that the train is longer than the distance from the device E² to the entrance end of section A—C. When front contact 18 of relay F³

becomes closed, it completes the stick circuit previously traced for this relay, which circuit maintains relay F³ in its energized condition after contacts 8—8^b of the device E² and E¹ become opened. When the train passes out of section A—C, back contact 9 of track relay D opens and interrupts the stick circuit for relay F³, so that relay F³ becomes deenergized, and deenergizes lamp G³. The parts are then all restored to their normal conditions in which they are illustrated in the drawing.

It will be apparent from the foregoing that, with apparatus embodying my invention, the relative lengths of trains entering section A—C may be automatically indicated at a remote point. This is particularly valuable where trains of different lengths upon reaching an interlocking plant are diverted over different routes, because it enables the operator or train despatcher at the interlocking plant to line up the routes before the train reaches the interlocking plant.

While in describing my invention, I have shown only two light sensitive devices and three stick relays arranged to indicate whether a train entering section A—C has a length falling within one of three groups of lengths, it will be readily seen that by providing additional light sensitive devices and additional stick relays, the apparatus may be made to indicate whether a train entering section A—C has a length falling within any one of any other desired number of groups of lengths.

Although I have herein shown and described only one form of electrical 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 a stretch of railway track, a first contact, means for operating said first contact when the front end of a train passes a first point along the trackway and for subsequently maintaining said first contact in its operated condition until the rear end of the train has passed beyond said first point, a second contact, means for operating said second contact when the front end of the train passes a second point along the trackway which is spaced from said first point, and means selectively controlled by said two contacts for indicating whether said train is longer or shorter than the distance between said two points.

2. In combination a stretch of railway track, a first contact, means for operating said first contact when the front end of a train passes a first point along the trackway and for subsequently maintaining said first contact in its operated condition until the

rear end of the train has passed beyond said first point, a second contact, means for operating said second contact when the front end of the train passes a second point along the trackway located a predetermined distance in advance of said first point and for subsequently maintaining said second contact in its operated condition until the rear end of said train has passed beyond said second point, a third contact, means for operating said third contact when the front end of the train passes a third point along the trackway located a predetermined distance in advance of said second point, and means selectively controlled by said three contacts for indicating the length of a train passing said third point.

3. In combination, a section of railway track provided with a track circuit including a track relay, a light sensitive device located along the track at a predetermined distance in rear of said section, means for supplying said device with operating current, a source of light so arranged that it normally illuminates said device but that the rays passing from the source to the device are intercepted while a train is passing said device, and means controlled by said track relay and said device for indicating whether said train is longer or shorter than the distance between said device and the entrance end of said section.

4. In combination, a section of railway track provided with a track circuit including a track relay, a first light sensitive device located along the track a predetermined distance in rear of the entrance end of said section, a second light sensitive device located along the track a predetermined distance in rear of said first light sensitive device, means for supplying each of said devices with operating current, two sources of light one cooperating with each of said devices and each arranged in such manner that it normally illuminates the associated device but that the rays passing from the source to the associated device are intercepted while a train is passing such associated device, and means controlled by said track relay and by said two devices for indicating the length of a train entering said section.

5. In combination, a section of railway track provided with a track circuit including a track relay, a light sensitive device located along the track in rear of the entrance end of said section said device having a first contact which is closed when said device is illuminated and a second contact which is closed when said device is not illuminated, a source of light so arranged that it normally illuminates said device but that the rays passing from the source to the device are intercepted while a train is passing said device, a first indicating device controlled by said track relay and by said first contact, and a

second indication device controlled by said track relay and by said second contact.

6. In combination, a section of railway track provided with a track circuit including a track relay, a light sensitive device located along the track in rear of the entrance end of said section, said device having a first contact which is closed when said device is illuminated and a second contact which is closed when said device is not illuminated, a source of light so arranged that it normally illuminates said device but that the rays passing from the source to the device are intercepted while a train is passing said device, a first indicating device controlled by a back contact of said track relay and by said first contact, and a second indication device controlled by a back contact of said track relay and by said second contact.

7. In combination, a section of railway track provided with a track circuit including a track relay, a first light sensitive device located along the track in rear of the entrance end of said section, said first device having a first contact which is closed when said device is illuminated and a second contact which is closed when said device is not illuminated, a second light sensitive device located along the track in rear of said first light sensitive device, said second device being provided with a third contact which is closed when said second device is illuminated and with a fourth contact which is closed when said second device is not illuminated, means for supplying both of said devices with operating current, two sources of light one cooperating with each of said devices and each arranged in such manner that it normally illuminates the associated device but that the rays passing from the source to the associated device are intercepted while a train is passing such associated device, a first indicating device controlled by a back contact of said track relay and by said first contact, a second indicating device controlled by said back contact of said track relay and said second contact as well as said third contact, and a third indicating device controlled by said back contact of said track relay and by said second contact as well as by said fourth contact.

8. In combination, a section of railway track provided with a track circuit including a track relay, a first light sensitive device located along the track in rear of the entrance end of said section, said first device having a first contact which is closed when said device is illuminated and a second contact which is closed when said device is not illuminated, a second light sensitive device located along the track in rear of said first light sensitive device, said second device being provided with a third contact which is closed when said second device is illuminated and with a fourth contact which is closed when said second device is not illuminated.

nated, means for supplying both of said devices with operating current, two sources of light one cooperating with each of said devices and each arranged in such manner that it normally illuminates the associated device but that the rays passing from the source to the associated device are intercepted while a train is passing such associated device, three stick relays, a pick-up circuit for a first one of said stick relays controlled by a back contact of said track relay and by said first contact, a stick circuit for said first stick relay including its own first contact and said back contact of said track relay, a pick-up circuit for a second one of said stick relays including said back contact of said track relay and said second contact as well as said third contact, a stick circuit for said second stick relay including its own front contact and said back contact of said track relay, a pick-up circuit for the third one of said stick relays including said back contact of said track relay and said second contact as well as said fourth contact, a stick circuit for said third stick relay including its own front contact and said back contact of said track relay, and three indicating devices one controlled by each of said stick relays.

9. In combination, a section of railway track provided with a track circuit including a track relay, a first light sensitive device located along the track in rear of the entrance end of said section, said first device having a first contact which is closed when said device is illuminated and a second contact which is closed when said device is not illuminated, a second light sensitive device located along the track in rear of said first light sensitive device, said second device being provided with a third contact which is closed when said second device is illuminated and with a fourth contact which is closed when said second device is not illuminated, means for supplying both of said devices with operating current, two sources of light one cooperating with each of said devices and each arranged in such manner that it normally illuminates the associated device but that the rays passing from the source to the associated device are intercepted while a train is passing such associated device, three stick relays; a pick-up circuit for a first one of said stick relays including a back contact of said track relay, said first contact, a back contact of a third one of said stick relays, and a back contact of a second one of said stick relays; a pick-up circuit for said second stick relay including said back contact of said track relay, said second contact, said third contact, a back contact of said first stick relay, and a back contact of said third stick relay; a pick-up circuit for said third stick relay including said back contact of said track relay, said second contact, said fourth contact, a back contact of said first stick relay, and a back

contact of said second stick relay; a stick circuit for said first stick relay including its own front contact and said back contact of said track relay, a stick circuit for said second stick relay including its own front contact and said back contact of said track relay, a stick circuit for said third stick relay including its own front contact and said back contact of said track relay, and three indicating devices one controlled by each of said stick relays.

10. In combination a stretch of railway track, a first normally closed contact, means for opening said first normally closed contact when the front end of a train passes a first predetermined point along the trackway and for subsequently holding said first normally closed contact open until the rear end of the train has passed beyond said first point, a first normally open contact, means for closing said first normally open contact when the front end of said train passes said first point and for subsequently holding said first normally open contact closed until the rear end of said train has passed beyond said first point, a second normally closed contact, means for opening said second normally closed contact when the front end of the train passes a second predetermined point in the trackway located a predetermined distance in advance of said first point and for subsequently holding said second normally closed contact open until the rear end of said train has passed beyond said second point, a second normally open contact, means for closing said second normally open contact when the front end of said train passes said second point and for subsequently holding said second normally closed contact open until the rear end of said train has passed beyond said second point, a third normally open contact, means for closing said third normally open contact when the front end of said train passes a third predetermined point along the trackway located a predetermined distance in advance of said second point; three stick relays; a pick-up circuit for a first one of said stick relays including said third normally open contact, said second normally closed contact, a back contact of a third one of said stick relays, and a back contact of a second one of said stick relays; a stick circuit for said first stick relay including a front contact of said first stick relay and said third normally open contact; a pick-up circuit for said second stick relay including said third normally open contact, said second normally open contact, said first normally closed contact, a back contact of said third stick relay, and a back contact of said first stick relay; a stick circuit for said second stick relay including said third normally open contact and a front contact of said second stick relay; a pick-up circuit for said third stick relay including said third normal-

ly open contact, said second normally open contact, said first normally open contact, a back contact of said first stick relay, and a back contact of said second stick relay; a stick circuit for said third stick relay including said third normally open contact and a front contact of said third stick relay, and three indicating devices one controlled by each of said stick relays.

11. In combination with a section of railway track provided with a track circuit including a track relay, a contact, means for operating said contact when the front end of a train passes a point in rear of said section and for subsequently restoring said contact to its original condition as soon as the rear end of the train has passed such point, and indication means controlled by said contact and by said track relay.

12. In combination with a section of railway track provided with a track circuit including a track relay, a contact, means for operating said contact when the front end of a train passes a point in rear of said section and for subsequently restoring said contact to its original condition as soon as the rear end of the train has passed such point, a stick relay having a pick-up circuit controlled by said track relay and by said contact, a stick circuit for said stick relay controlled by said track relay, and indication means controlled by said stick relay.

In testimony whereof I affix my signature.
ROBERT M. GILSON.

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