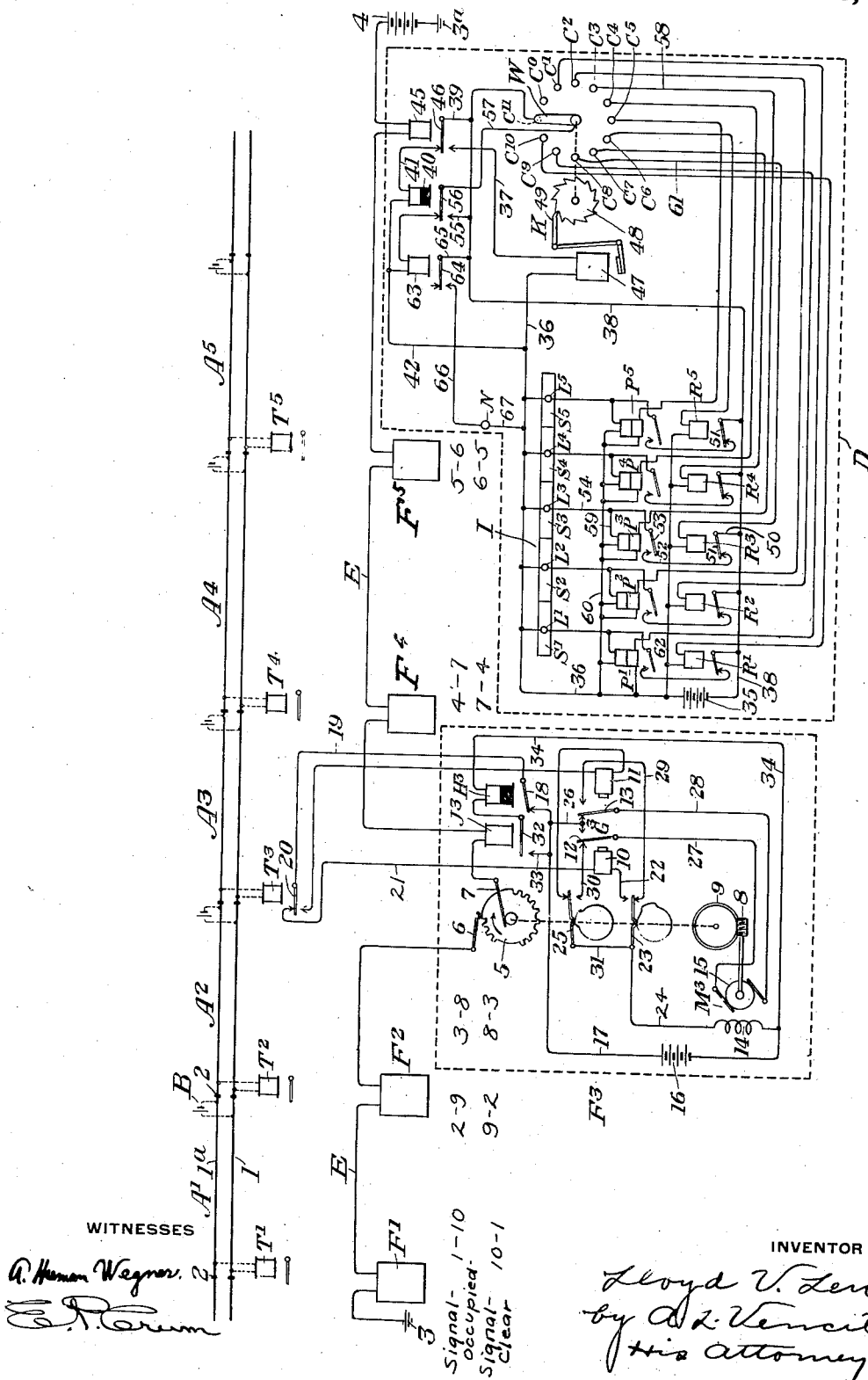


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RAILWAY TRAFFIC INDICATING APPARATUS.
APPLICATION FILED NOV. 27, 1917.

1,342,635.

Patented June 8, 1920.



UNITED STATES PATENT OFFICE.

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RAILWAY-TRAFFIC-INDICATING APPARATUS.

1,342,635.

Specification of Letters Patent.

Patented June 8, 1920.

Application filed November 27, 1917. Serial No. 204,183.

To all whom it may concern:

Be it known that I, LLOYD V. LEWIS, a citizen of the United States, residing at Edgewood borough, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway-Traffic-Indicating Apparatus, of which the following is a specification.

My invention relates to traffic indicating apparatus for railways, and particularly to apparatus for indicating at a certain point the location of cars or trains on a stretch of railway track.

One object of my invention is the provision of means for controlling a plurality of indicators selectively, from a plurality of corresponding track sections, over a single line circuit.

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

The accompanying drawing is a diagrammatic view showing one form and arrangement of apparatus embodying my invention.

Referring to the drawing, the reference characters 1 and 1^a designate the track rails of a stretch of railway track, which rails are divided by insulated joints 2 into a plurality of track sections A¹, A², A³, A⁴ and A⁵. Each section is provided with a track circuit comprising as usual the track rails of the section, a track battery B, and a track relay designated by the reference character T with an exponent corresponding to the particular track section to which the relay is connected. It follows, then, that each track relay is energized, that is, its front contact is closed, when the corresponding section is unoccupied, but that each relay is deenergized, that is, its back contact is closed, when the corresponding section is occupied by a car or train.

Located at some convenient point along the railway track is a central station or dispatcher's office D in which is an indicating device I, the purpose of which device is to show the location and progress of cars or trains along the stretch of track. This indicating device, as here shown, is in the form of an illuminated track model comprising an oblong box divided into a plurality of

sections S¹, S² . . . S⁵, one for each section of the track. Each section of the box contains an electric lamp L¹, L² . . . L⁵, and the front of each section is preferably of ground glass so that an observer can see at a glance whether or not the lamp in the section is illuminated. Each lamp L¹, L², etc., constitutes an indicator for the track section having the same exponent. These lamps are so controlled, by means hereinafter described, that when a track section is occupied by a car or train the corresponding lamp is illuminated, but that when the track section is unoccupied the lamp is extinguished.

The lamps constituting the indicators are controlled over a single line circuit E extending along the stretch of track, which circuit comprises a line wire grounded at its ends at points 3 and 3^a, and which circuit includes a battery 4. Each track section is provided with a device for transmitting two distinctive signals over the line circuit, which device is designated F with the same exponent as that of the track section. The transmitting device F² for section A³ is shown in detail in the drawing, it being understood that the transmitting device for all of the sections are the same except that each device transmits a pair of signals differing from the signals transmitted by any of the other devices. The central station D is provided with receiving apparatus controlled by the line E and in turn controlling the lamps in the indicating device I.

The line circuit E is normally closed, and the signal transmitted by each device consists of a plurality of signal units, which units, with the apparatus here shown, are interruptions of the circuit. Considering the transmitting device F³ for track section A³, for example, these interruptions are accomplished by a circuit controller comprising a rotatable drum 5, a contact finger 7 constantly contacting with the hub of the drum, and a second contact finger 6 cooperating with the periphery of the drum, the two contact fingers being included in the line circuit E. The periphery of the drum is provided with two groups of different numbers of short recesses separated by a relatively long recess, which recesses, as they pass the finger 6, interrupt the line cir-

cuit. If, then, the drum is rotated through nearly a complete revolution from the position in which it is shown, it will cause two groups of different numbers of short interruptions to the line circuit, separated by an interruption of longer duration, and one or the other of these groups will occur first, depending on the direction in which the drum is rotated. The two groups of short recesses in the drum for section A³ have three and eight recesses respectively, so that the signal transmitted by this drum may be described as 3—8 or 8—3, depending on the direction in which the drum is rotated.

The total number of short recesses in the circuit controller drum for each section is the same, but these recesses are differently divided in the two groups on the several drums, so that the signals transmitted by the several drums are distinctive. These signals are indicated by the legends 1—10, 10—1, 2—9, 9—2, etc., adjacent the transmitting devices for the several track sections.

The drum 5 is operatively connected with an electric motor M³ through the medium of reduction gearing comprising a worm 8 and a toothed wheel 9. This motor M³ is controlled by a relay device G³, which in turn is controlled by the track relay T³. Relay device G³ comprises two magnets 10 and 11 which pull in opposite directions on an armature comprising contacts 12 and 13, so that these contacts are swung in one direction or the other according as one magnet or the other is energized. When these contacts have been swung to either extreme position by one or the other of the magnets, they remain in such position until the other magnet is subsequently energized, even though the magnet which pulled them there becomes deenergized in the meantime. The control of the relay device G³ by track relay T³ is such that magnet 10 or 11 is energized according as the track relay is energized or deenergized. The circuit for magnet 10 is from a battery 16 through wire 17, back contact 18 of a slow-releasing relay H³, wire 19, front point of track relay contact 20, wire 21, magnet 10, wire 22, upper point of a contact 23, wire 24, field winding 14 of motor M³ to battery 16. The circuit for magnet 11 is similar, but includes the back point of track relay contact 20 instead of the front point of this contact, and the upper point of contact 25 instead of contact 23. Contacts 23 and 25 are controlled by cams operated by the shaft to which drum 5 is attached, and their operation is hereinafter explained.

To explain the control of the motor M³ by relay device G³, I will assume that a car or train enters track section A³. The consequent deenergization of relay T³ closes at contact 20 the circuit for magnet 11, the circuit for this magnet being already closed at contact 25, so that relay contacts 12 and 13 are swung to the right. Motor M³ is then energized by a circuit which is from battery 16 through wires 17 and 26, contact 12, wire 27, motor armature 15, wire 28, contact 13, wire 29, lower point of contact 23, wire 24, motor field 14 to battery 16. Current in this circuit causes the motor to operate in such direction as to rotate drum 5 in the direction indicated by the arrow, so that this drum transmits the signal 3—8, indicating that track section T³ has become occupied. Upon the completion of this signal, contact 23 is raised, thus opening the motor circuit so that the drum 5 comes to rest. Shortly after the drum began to revolve, contact 25 was released by its cam, thus opening at that point the circuit for magnet 11, and this contact remains down after the motor comes to rest. The raising of contact 23 as the motor comes to rest closes at this point the circuit for magnet 10, so that as the car or train leaves section A³ the circuit for this magnet becomes closed due to the closure of the front point of track relay contact 20, whereupon contacts 12 and 13 are pulled back to the positions in which they are shown. Motor M³ is then energized in the opposite direction, the circuit being from battery 16 through wires 17 and 26, contact 13, wire 28, motor armature 15, wire 27, contact 12, wire 30, lower point of contact 25, wires 31 and 24, field 14 to battery 16. The motor then operates in the opposite direction, revolving drum 5 in the direction opposite to that indicated by the arrow, so that this drum then transmits the signal 8—3 indicating that the car or train has passed out of the section. Upon the completion of this signal, the drum comes to rest due to the opening of the motor circuit at the lower point of contact 25. The circuit for magnet 11 is then closed at contact 25, so that this magnet will again be energized when a car or train enters section A³. Magnet 10 was deenergized at contact 23 soon after drum 5 started to revolve.

The function of the slow-releasing relay H³ is to prevent the simultaneous transmission of two signals from two track sections over the line circuit E. This relay is controlled by a back contact 32 of a relay J³ which is included in the line circuit and which, therefore, becomes deenergized at each interruption to the circuit during the transmission of a signal. The circuit for relay H³ is from battery 16 through wires 17 and 33, contact 32, relay H³, wire 34 to battery 16. When the transmitting device for any other track section sends a signal over the line circuit, relay J³ becomes deenergized upon the first interruption of the line circuit, whereupon relay H³ immediately becomes energized. The time required for relay H³ to release is greater than the inter-

vals between the interruptions which comprise the code signals, hence the contact 18 of relay H^3 remains open during the transmission of the entire signal from the other transmitting device. If, during such signal, a car or train should enter or leave section A^3 , relay device G^3 would not reverse because the circuits for its magnets are open at contact 18 of relay H^3 ; hence no signal would then be transmitted by device F^3 . Immediately upon the completion of the signal from the other transmitting device, however, relay H^3 would release, relay G^3 would reverse, and drum 5 would be operated to transmit its signal.

If track relay T^3 should become deenergized and again energized immediately thereafter, drum 5 would be operated to transmit the complete signal 3—8, and would then immediately be operated in the other direction to transmit the complete signal 8—3, thus returning all the parts of the device F^3 to the positions in which they are shown. The reason for this is as follows: The deenergization of relay T^3 would energize magnet 11 to reverse relay device G^3 , whereupon motor M^3 would start to operate. The immediate subsequent energization of relay T^3 would not, however cause magnet 10 to become energized, because the circuit for this magnet would be held open at contact 23 and also at contact 18 of relay H^3 until the complete signal 3—8 has been transmitted. Upon the completion of signal 3—8, magnet 10 would become energized to reverse relay G^3 , whereupon the device would operate in the reverse direction to transmit signal 8—3.

The receiving apparatus at the central station D comprises a step-by-step selector device K controlled by the line circuit E through the medium of a relay 45 included in the line circuit. The selector device K comprises a plurality of contacts $C^0, C^1, C^2, \dots, C^{11}$, arranged in a circle as shown, and a wiper W pivotally mounted at the center of the circle. The wiper is revolved by a ratchet wheel 48, which in turn is rotated step-by-step by a pawl 49 operated by the armature of a magnet 47. The number of ratchet teeth in wheel 48 is the same as the number of contacts C, so that the wiper is advanced one contact each time the magnet 47 is energized. Magnet 47 is provided with a circuit which is closed only when the back point of contact 46 of relay 45 is closed, this circuit being from a battery 35 through wires 38 and 39, back point of contact 46, wire 37, magnet 47, wire 36 to battery 35. Inasmuch as the back point of relay contact 46 will close at each interruption of the line circuit, it follows that the wiper W will be advanced from one contact to the next at each interruption of the line circuit. As has already been said,

the total number of interruptions constituting each signal is the same, viz., twelve. The number of contacts C^0, C^1 , etc., is the same as this total number of interruptions, consequently during each signal the wiper W makes a complete revolution from an initial position, which initial position is on contact C^{11} . Each signal, however, includes a long interruption, and this interruption comes at a different place in each signal, so that the wiper W pauses for a comparatively long time on a different one of the contacts during each signal. This long pause of the wiper is utilized to select the indicator lamp corresponding to the track section from which the signal is sent, and also to determine whether the lamp shall be illuminated or extinguished. The selection is accomplished as follows:

The front point of contact 46 of relay 45 controls a slow-releasing relay 40, the circuit being from battery 35 through wires 38 and 39, contact 46, wire 41, relay 40, wires 42 and 36 to battery 35. This relay is, therefore, energized while no signal is being transmitted over the line circuit, but is deenergized at each interruption during the transmission of a signal. The relay is so designed that it does not release during the short interruptions, but that it does release and so closes its back contact, during the long interruption in each signal.

Each indicator lamp L', L^2 , etc., is provided with a setting relay designated P, with an exponent corresponding to that of the lamp, and with a releasing relay designated R, with an exponent corresponding to that of the lamp. Each lamp is provided with a circuit including a front contact of the corresponding setting relay and a back contact of the releasing relay, the circuit for lamp L^3 , for example, being from battery 35 through wires 38 and 50, back contact 51, wire 52, front contact 53, wire 54, lamp L^3 , and wire 36 to battery 35. Each lamp will be illuminated, therefore, only when its corresponding setting relay is energized and releasing relay deenergized.

The setting relay for each lamp is provided with two coils. The lower or pick-up coil is provided with a pick-up circuit, which includes the back contact of the slow-releasing relay 40 and the selector contact C on which the wiper W rests during the long interruption in the signal which is transmitted due to the entrance of a car or train upon the track section corresponding to such lamp. For example, the pick-up circuit for relay P^3 is from battery 35 through wires 38 and 55, back point of contact 56, wire 57, wiper W, contact C^3 , wire 58, pick-up coil of relay P^3 , wires 60 and 36 to battery 35. This setting relay, then, will become picked up during the long interruption in the signal 3—8 from track

section A³, because during such interruption the wiper will rest on contact C³ and relay 40 will release. As soon, however, as the wiper resumes its movement, this circuit will be opened, but a holding circuit for relay P³ has in the meantime been closed, this circuit being from battery 35 through wires 38 and 50, back contact 51, wire 52, front contact 53, wire 59, upper or holding coil of relay P³, wires 60 and 36 to battery 35. Relay P³ continues to be energized, therefore, so that lamp L³ continues to be illuminated, until releasing relay R³ becomes energized.

The releasing relay for each lamp is provided with a circuit which includes the back contact of the slow-releasing relay 40 and the selector contact C on which the wiper W rests during a long interruption in the signal which is transmitted due to the passage of the car or train out of the track section corresponding to such lamp. For example, the circuit for the releasing relay R³ is from battery 35, through wires 38 and 55, back contact 56 of relay 40, wire 57, wiper W, contact C³, wire 61, relay R³ and wire 62 to battery 35. This releasing relay will become energized during the long interruption in signal 8—3 from track section A³, because during such interruption the wiper will rest on contact C³ and relay 40 will release. The energization of relay R³ opens the holding circuit for relay P³ so that the latter relay becomes deenergized and causes lamp L³ to be extinguished.

It will be seen from the foregoing that when a car or train enters any one of the track sections A, it will cause the corresponding indicator lamp to become illuminated, and that such lamp will continue to be illuminated until the car or train leaves the corresponding section.

It will be noted that it is essential for the correct operation of the receiving apparatus that the wiper W should rest on contact C¹¹ when no signal is being transmitted over the line circuit. In other words, contact C¹¹ is the initial position of the wiper. In order to indicate immediately any irregularity in the operation of the apparatus which might cause this wiper to rest on some other contact, or which might cause the line circuit to become deenergized when no signal is being transmitted, I provide a synchronizing lamp N, which lamp will indicate at once if the wiper should fail to return to its initial position upon the completion of a signal. This lamp N is controlled by the back contact 64 of a relay 63, the circuit for the lamp being from battery 35, through wires 38 and 65, contact 64, wire 66, lamp N, wires 67 and 36 to battery 35. Relay 63 is controlled by the front contact 56 of the slow-releasing relay 40 and also by contact C¹¹ of the step-by-

step device K, so that this relay is energized when the wiper W is at rest in its initial position and the line circuit is energized. The circuit of the relay 63 is from battery 35, through wire 38, contact C¹¹, wiper W, wire 57, front contact 56, relay 63, and wires 42 and 36 to battery 35. It will be obvious from the foregoing that the synchronizing lamp N is extinguished only when wiper W occupies its initial position on contact C¹¹ and the line circuit is energized, but that if the wiper should come to rest on any other contact due to an imperfect or incomplete signal, or due to any irregularity in the operation of the receiving device, relay 63 would become deenergized and would illuminate lamp N, thus calling the attention of the operator to the fact that the apparatus is out of order.

Although I have herein shown and described only one form and arrangement of the 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 divided into a plurality of sections, a central station having a plurality of indicators, one for each section, a setting device and a releasing device for each indicator, and selective means for each section controlled by a train entering the section for operating the setting device for the indicator corresponding to such section, and controlled by a train leaving the section for operating the releasing device for the indicator corresponding to such section.

2. In combination, a normally closed line circuit, a plurality of transmitting stations each comprising a circuit controller for sending a signal over said circuit by successive brief interruptions of the circuit, a slow-releasing relay at each station for preventing operation of the circuit controller at such station while the armature of the relay is in attracted position, the time required for said relay to release being greater than the interval between interruptions in the signals, a quick-releasing relay at each station included in said line circuit and having a back contact, and a circuit for each slow-releasing relay including the back contact of the quick-releasing relay at the same station.

3. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a single normally closed line circuit extending along said stretch of track, a transmitter at each section for transmitting a distinctive code

signal over said line circuit by interrupting the circuit; and a receiving device controlled by said line circuit for selecting one or another of the said indicators, depending on the code signal transmitted over the line circuit.

4. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a setting device and a releasing device for each indicator, a single line circuit extending along said stretch of track, a train-controlled device at each section for transmitting a distinctive signal over the line when a train enters the section and for transmitting the same signal in the reverse direction when a train leaves the section, and a single receiving device at the central station governed by said line circuit for selectively operating the setting device for each indicator when the corresponding signal is transmitted in the first direction and for selectively operating the releasing device for the indicator when the same signal is transmitted in the reverse direction.

5. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a single line circuit extending along said stretch of track, train-controlled means at each section for transmitting a distinctive signal over said line when a train enters the section and another distinctive signal when a train leaves the section, and signal-receiving means at the central station governed by said line circuit for setting each indicator in response to the signal transmitted when a train enters the corresponding section and for releasing each indicator in response to the signal transmitted when a train leaves the corresponding section.

6. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a setting device and a releasing device for each indicator, a single normally closed line circuit extending along said stretch of track, a circuit controller at each section for sending a signal over said line circuit comprising two groups of a different number of short signal units separated by a signal unit of longer duration, train-controlled means for each section for operating the corresponding circuit controller in one direction or the other according as a train enters or leaves the section, and a signal receiving device at the central station governed by said line circuit for controlling the setting device for each indicator when the corresponding signal is transmitted over the line by operation of the circuit controller in the first direction, and for controlling the releasing device for

each indicator when the corresponding signal is transmitted by operating the circuit controller in the other direction.

7. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a setting relay and a releasing relay for each indicator, a normally closed line circuit extending along said stretch of track, means for each track section for transmitting over said line circuit a distinctive signal comprising two groups of different numbers of short interruptions separated by an interruption of longer duration, the total number of interruptions in the signals for the several sections being the same, train controlled means for each section for causing operation of said signal transmitting means in one direction or the other according as a train enters or leaves the section, a signal receiving device at the central station controlled by said line circuit and comprising a wiper moved step by step through a complete revolution by each signal and a plurality of contacts one closed by the wiper at each step in its movement, a slow-acting relay controlled by said line circuit and arranged to open only during the long interruption in each signal, a pick-up circuit for each setting relay controlled by a contact of said slow-acting relay and by the contact closed by said wiper during the long interruption when a signal is transmitted due to the entrance of a train upon the corresponding track section, a holding circuit for each setting relay controlled by a front contact of the setting relay itself and a back contact of the releasing relay for the same indicator, and a circuit for each releasing relay controlled by a back contact of said slow-acting relay and by the contact closed by said wiper during the long interruption when a signal is transmitted due to a train leaving the corresponding track section.

8. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a line circuit extending along said stretch of track, means for each track section for transmitting over said line circuit a distinctive signal comprising two groups of different numbers of short signal units separated by a signal unit of longer duration, the total number of units in the signals for the several sections being the same, train controlled means for each section for causing operation of said signal transmitting means in one direction or the other according as a train enters or leaves the section, a signal receiving device at the central station controlled by said line circuit and comprising a wiper moved step by step through a complete revolution from an initial position by each signal and a plurality

of contacts one closed by the wiper at each step in its movement, setting means for each indicator controlled by the contact which is closed by the wiper during the long unit in the signal transmitted by the entrance of a train upon the corresponding track section, and releasing means for each indicator controlled by the contact which is closed by said wiper during the long unit in the signal transmitted upon the passage of a train out of the corresponding track section.

9. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a line circuit extending along said stretch of track, means for each track section for transmitting over said line circuit a distinctive signal comprising two groups of different numbers of short signal units separated by a signal unit of longer duration, the total number of units in the signals for the several sections being the same, train controlled means for each section for causing operation of said signal transmitting means in one direction or the other according as a train enters or leaves the section, a signal receiving device at the central station controlled by said line circuit and comprising a wiper moved step by step through a complete revolution from an initial position by each signal and a plurality of contacts one closed by the wiper at each step in its movement, setting means for each indicator controlled by the contact which is closed by the wiper during the long unit in the signal transmitted by the entrance of a train upon the corresponding track section, and releasing means for each indicator controlled by the contact which is closed by said wiper during the long unit in the signal transmitted upon the passage of a train out of the corresponding track section, and a synchronizing indicator controlled by said wiper when in said initial position.

10. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a line circuit extending along said stretch of track, means for each track section for transmitting over said line circuit a distinctive signal, each signal comprising the same total number of signal units, a signal receiving device at the central station controlled by said line circuit for governing said indicators and comprising a step-by-step device movable through a complete cycle from an initial po-

sition by each signal, and a synchronizing indicator controlled by said step-by-step device when in said initial position.

11. In combination, a stretch of railway track divided into a plurality of sections, a central station having a plurality of indicators one for each section, a line circuit extending along said stretch of track, means for each track section for transmitting over said line circuit a distinctive signal, each signal comprising the same total number of signal units, a signal receiving device at the central station controlled by said line circuit for governing said indicators, and means for indicating the reception of the correct total number of impulses.

12. In combination, a stretch of railway track divided into a plurality of sections, a track circuit for each section including a track relay, a line circuit extending along said stretch of track, a circuit controller for each section for sending a signal over said line circuit comprising groups of different numbers of signal units, an electric motor for operating each circuit controller, means for each section controlled by the track relay for such section for operating the motor in one direction or the other according as the relay is energized or deenergized, contacts controlled by each circuit controller for deenergizing the motor after one complete operation of the circuit controller for each change of the track relay, and a plurality of indicators controlled by said line circuit, one for each track section, each of which indicators is set or released according as the circuit controller for the corresponding track section is operated in one direction or the other.

13. In combination, a normally closed line circuit, a plurality of transmitting stations each comprising a circuit controller for sending a signal over said line circuit by successive brief interruptions of the circuit, means for operating each circuit controller, a slow-releasing relay at each station for controlling said means, the time required for said relay to release being greater than the interval between interruptions in the signals, and means at each station for energizing the slow-release relay at such station each time the circuit is interrupted.

In testimony whereof I affix my signature in presence of two witnesses.

LLOYD V. LEWIS.

Witnesses:

A. HERMAN WEGNER,
FAY GLASGOW.