Feb. 22, 1944. G. W. BAUGHMAN 2,342,315

TRAIN DETECTING AND REPORTING APPARATUS

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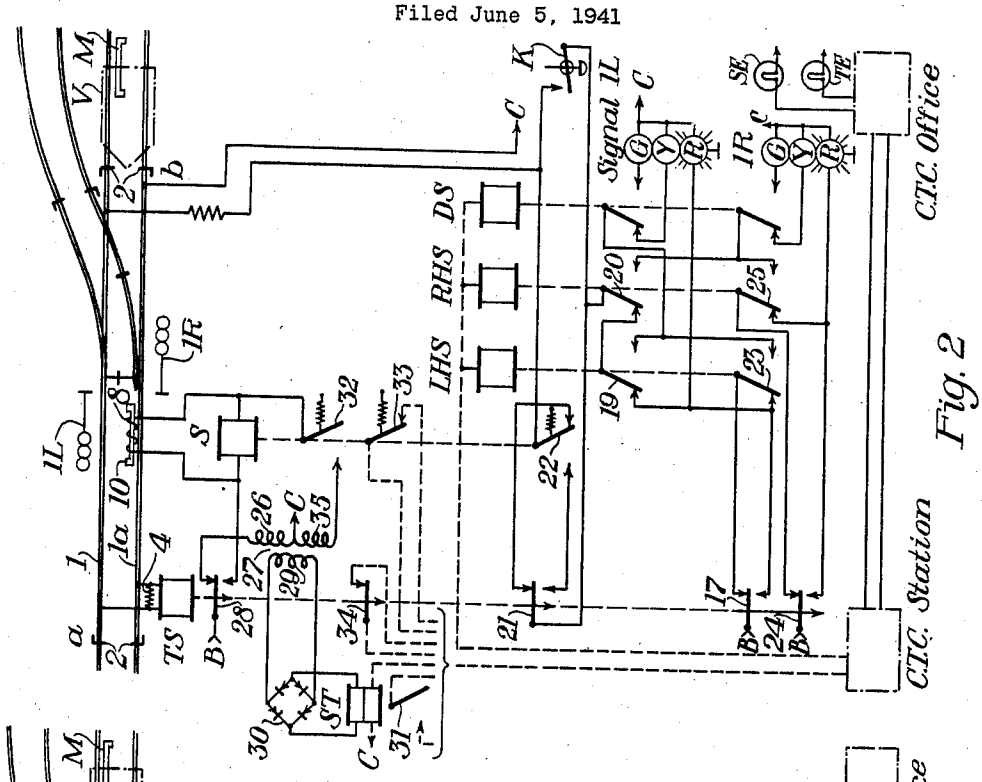

Fig. 2

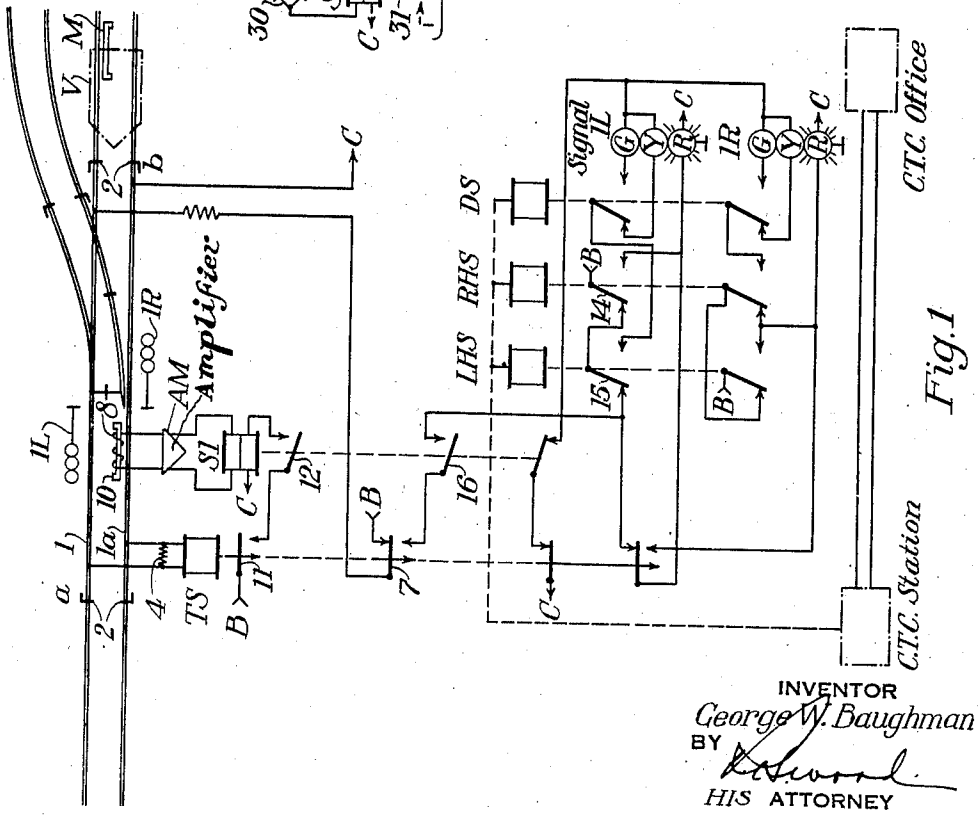

Fig. 1

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TRAIN DETECTING AND REPORTING APPARATUS

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Application June 5, 1941, Serial No. 396,745

13 Claims. (Cl. 246—122)

My invention relates to train detecting and reporting apparatus, and it has particular reference to the organization of such apparatus into novel and improved means for detecting and reporting the passage of an entire or intact train. More particularly, my invention relates to the provision of train detecting and reporting apparatus of the type adapted for use in connection with remote control or centralized traffic control systems applied to manual block or other non-track-circuited stretches of track for OS'ing trains at the remote office or central station.

In manual block territories where continuous track circuits are not employed, the signalmen at the various block stations are required to observe all passing trains and note whether or not they are complete and in order, and the marker signals required by the rules are properly displayed. Should a train without markers pass a block station, the signalman at such station is required to notify the signalman at the next block station in each direction and must not report that a train is clear of the block nor unlock the next block in the rear unless he has ascertained that the train is complete by observing the train markers.

At an unattended block station where signals are manually controlled from a central office by means of a communication or remote control system, suitable train detecting apparatus, usually of the type involving a detector track circuit, may be employed as a tripping means to set the associated signals at stop and also to cause an indication to be transmitted over the communication system to the office to indicate the presence of a train, as is well known. When a train passes the train detecting apparatus, for example, the remote control system may be conditioned to "OS" the train, that is, to transmit an indication reporting its movement past the block station to the control office. The usual train detecting apparatus, however, is not effective to detect whether or not the train is intact, hence such as "OS" indication might be transmitted to the office when only a portion of a train passes the detector apparatus. An operator relying upon the "OS" indication received from a block station location and assuming that a complete train has passed that point, might therefore signal other traffic through the block, whereas in fact a portion of the first train may be in the block and thus constitute a hazard to the other traffic.

In view of the above-mentioned and other important considerations, it is an object of my invention to provide novel and improved means for detecting and reporting the passage of an entire or complete train.

A further object is to provide novel and improved means adapted for use with centralized traffic control systems, for reporting or "OS'ing" trains at a central office when and only when the block signal locations are passed by complete trains.

An additional object is the provision of wayside apparatus cooperating with apparatus carried on the rear of a train for indicating that the train is complete and intact when it passes a given point on the stretch of track, which is an improvement upon that disclosed in a copending application, Serial No. 396,731, filed June 5, 1941, by Herbert A. Wallace, for Train detecting and reporting apparatus.

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 train detecting apparatus, such as a track circuit, in cooperation with means in the trackway adapted to be influenced by a device attachable to the rear of a train, to govern suitable apparatus responsive to the passage of a train and to the influence on the trackway means of the train-carried device, and by utilizing such apparatus to condition the centralized traffic control system to transmit suitable indications to the control office.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view illustrating one form of apparatus embodying my invention arranged to function as train detecting apparatus. Fig. 2 is a diagrammatic view illustrating a modified form also embodying my invention of the apparatus represented in Fig. 1 arranged to function as both train detecting and train reporting apparatus.

In each of the views, similar reference characters have been employed to designate corresponding parts.

Referring to Fig. 1, the reference characters 1 and 1a designate the track rails of a stretch of track such as a manual block, which usually is not provided with continuous track circuits. Positioned at spaced points along the track are signals similar to those designated by the reference characters 1L and 1R for governing traffic movements in opposite directions through the

stretch. These signals may be of any suitable type and as shown are three-indication signals comprising a plurality of signal lamps R, Y and G, which lamps when illuminated indicate "stop," "permissive" and "clear," respectively. Signal 1R governs traffic movements from left to right as viewed in the drawing, while signal 1L governs traffic movements from right to left.

The signals 1L and 1R are adapted to be controlled in any suitable manner, and as shown, are governed by remotely controlled polar stick relays LHS, RHS and DS. These relays may be manually controlled from a central office in a well-known manner by means of any suitable communication or centralized traffic control system, such for example as that shown in the Lewis Patent No. 2,197,130, granted April 16, 1940, for Remote controlling apparatus. For the purpose of the present description it is deemed sufficient to state that when relays LHS, RHS and DS occupy their respective normal or left-hand positions, as shown in the drawing, each signal 1L and 1R displays its most restrictive or stop indication, respectively, that signal 1L or 1R is conditioned to display an indication less restrictive than stop according as relay LHS or RHS, respectively, is operated to its reverse or right-hand position, and that the selection between the "permissive" and the "clear" indications of the two signals is determined according as relay DS is in its normal or its reverse position, respectively.

A short stretch of track adjacent the location of the signals 1L and 1R is provided with suitable train detecting apparatus which may, for example, comprise a track circuit provided for a tripping track section *a*—*b* formed by dividing the track rails by means of the usual insulated joints 2. Section *a*—*b* may be of any convenient length preferably longer than the distance between the trucks of any vehicle traveling thereover, and may for example have a length of the order of 60 feet.

Section *a*—*b* is provided with a track circuit comprising a suitable source of current, such as a battery not shown but having its opposite terminals designated in the drawing by the reference characters B and C, and a track relay TS. Terminal C is permanently connected to one of the track rails, while terminal B is normally connected to the other track rail over a front contact of the track relay. In the particular arrangement illustrated in Fig. 1, relay TS is permanently connected across the rails 1 and 1*a* and terminal B of the source is at times connected through a front contact 7 of relay TS to the track rails. Relay TS is therefore normally energized when section *a*—*b* is unoccupied, over a track circuit arranged on the stick circuit principle.

The train detecting or track circuit apparatus hereinbefore mentioned is supplemented by additional apparatus involving a wayside detector or receiver which cooperates with a train-carried transmitting device positioned preferably on the rear of the last vehicle of a train, to govern suitable control means arranged to be operated from a normal to an operated position only in response to the passage over the wayside receiver of a vehicle carrying the train-carried transmitting device. These cooperating wayside and train-carried means may be of any suitable type wherein the train-carried means is a source of control influences and the wayside means is a receiver responsive to and affected by such control influences. For example, the train-carried device may be a magnet, either a permanent magnet or an electromagnet, carried on a vehicle and disposed for inductive relationship with a wayside receiver located on the ties or in the roadbed.

In accordance with my present invention, it is contemplated to include the train-carried transmitting device as one of the train-carried marker signals required under the rules to be placed on the rear of the last vehicle of a train. Each train in order to be considered complete when operating over the particular stretch under consideration is, therefore, required to carry, in addition to the usual markers, a readily portable and attachable magnet so positioned at the rear of the train that it will come into inductive relation with the wayside receiver when the rear of the train passes a block station. In Fig. 1, a vehicle V illustrated in dotted lines is represented as carrying a magnet M of the permanent magnet type.

The wayside apparatus which cooperates with the train-carried magnet referred to preferably comprises a receiver or inductor 8 having a winding disposed on a magnetizable core 10. The core and winding are preferably completely enclosed in a non-magnetic casing for mechanical protection and the entire device is secured to the track ties with the core of the receiver parallel to the rails and disposed within the limits of the associated tripping section *a*—*b*, either between the rails or alongside either rail in a position for inductive relationship with the train-carried magnetic device. The winding of inductor 8 is connected to a control device, which may, for example, be a two-winding restoring relay S1 having one winding connected through suitable amplifying means AM indicated conventionally in the drawing but preferably including a rectifier, to the winding of inductor 8, and having its other winding at times energized over a stick circuit including back contact 11 of relay TS and its own front contact 12. The restoring relay S1 is normally released, and is picked up in response to the electromotive force momentarily induced in the inductor winding and applied to relay S1 when a vehicle-carried magnet M passes over inductor 8. This of course happens only when a train occupies section *a*—*b*, hence at such times relay TS is shunted and released so that after relay S1 is picked up due to the electromotive force induced in the winding of inductor 8 by the passage of the train-carried magnet, relay S1 is held energized over its stick circuit until relay TS again picks up.

As is obvious from the drawing, the lighting circuits for signals 1L and 1R are so arranged that the signals are manually controllable only when relay TS is picked up, but when relay TS is released, circuits are closed to light the lamps R of both signals regardless of the positions of relays LHS, RHS and DS, so that the signals are put to stop automatically by the passage of a train. The apparatus is further arranged so that after relay TS has released and relay S1 has picked up, terminal B of the source remains disconnected from the rails until the signal control relays have been restored to normal to correspond with the stop indication displayed by the signals. With relay TS released and relay S1 held energized over its stick circuit, when relays LHS and RHS are manually restored to normal a

pick-up circuit is closed for relay TS extending from terminal B over the normal or left-hand contact 14 of relay RHS, normal contact 15 of relay LHS, front contact 16 of relay S1, back contact 7 of relay TR, rail 1, the winding of relay TS to rail 1a, and thence to the other terminal C of the source. The train in the section of course shunts energy away from relay TS, but when the train vacates section a—b, relay TS picks up over the circuit just traced, and closes its front contact 7 to complete the previously traced track circuit. Relay TS is arranged so that it is capable of picking up reliably over its back contacts, as described, by the provision of a suitable resistor 4 connected across its terminals. Resistor 4 provides a discharge path for the relay current, causing the relay to maintain its armature in the attracted condition for a time interval after its pick-up circuit is broken, sufficient to bridge the interval between the opening of its pick-up circuit and the closing of its stick circuit which occurs when the relay is picking up. Relay TS may be, for example, of the same type as the relay H of the Nicholson Patent No. 2,160,894, issued June 6, 1939.

Relay S1 releases when relay TS opens its back contact 11, and it follows, therefore, that with both relays RHS and LHS in the normal position wherein signals 1L and 1R are manually conditioned to display their stop indications, the train detecting or track circuit apparatus represented in Fig. 1 is restored to its normal condition after the section becomes vacated provided that the section is traversed by a complete train as evidenced by the presence at the rear end thereof of the magnetic device which cooperates with the trackway inductor to cause operation of stick relay S1.

If, however, either signal control relay LHS or RHS is retained in its reverse position, the above traced pick-up circuit over which the track circuit apparatus is restored to its normal condition cannot be completed, and relay TS remains released and relay S1 remains picked up, after the train vacates the section, as is readily apparent, and neither signal can be cleared for further train movements unless the operator first restores the signal control relays to their normay position and in addition, the passage of a complete train has been registered by the operation of relay S1. In the event that a train parts or breaks in two and only the forward portion traverses the tripping section, it will be evident that the apparatus functions to detect the passage of an incomplete train by preventing the restoration of the track circuit apparatus to its normal condition even though the portion of the train vacates the section. This feature of the track circuit apparatus whereby its restoration is prevented except when a complete train traverses a section renders the apparatus of my invention particularly effective for use in centralized traffic control systems to "OS" trains.

An application of the apparatus represented in Fig. 1 to the "OS'ing" or reporting of trains is represented in Fig. 2. The apparatus employed in Fig. 2 is, in general, similar to the apparatus represented in Fig. 1. That is to say, section a—b is provided with track circuit apparatus arranged on the stick circuit principle to incorporate a front contact of relay TS in the normal track circuit, relay TS having a pick-up circuit which is completed when and only when the signal control relays are controlled to condition the associated signals to display their respective most restrictive indications and a restoring relay S is caused to operate in response to the train-carried magnet passing over the wayside inductor 8.

In Fig. 2, however, relay S controlled by the wayside receiver is preferably of the biased polar type, as indicated diagrammatically in the drawing. This type of relay is extremely sensitive and has an armature biased to its right-hand position and operated therefrom only in response to current having a given relative polarity.

The relays S and TS in Fig. 2 also have contacts 33 and 34 which may be included in circuits for indicating the condition of these relays at the office from which the signals are controlled. These indication circuits may be of any suitable type, for example, they may include separate line wires extending to the office, or they may consist of distinctive frequency channels like those controlled by the track relays of the Zabel patent, No. 917,830, for governing the office indication apparatus continuously, or they may be local circuits for governing the character of elements of impulse codes transmitted by apparatus at the station, as in the Lewis patent hereinbefore referred to. In the latter case, suitable means for initiating the codes is also required, such as is illustrated by my relay ST.

It is to be understood that in Fig. 2, the relay ST is the starting relay of a remote control system, corresponding to relay 1H of this Lewis patent, and that my relay ST may function in such a system to initiate the transmission of indication codes for indicating the condition of station devices such as the relays S and TS, by closing its left-hand contact 31. It is to be understood that as in the case of relay 1H of the Lewis patent, the contact of relay ST normally occupies the right-hand position, as shown, and that it is restored to that position in response to the transmission of each indication code initiated as a result of a movement of contact 31 to the left.

Referring now to Fig. 2, section a—b is provided with a normally closed track circuit comprising a stick circuit for relay TS that extends from terminal B at front contact 17 of relay TS over normal polar contacts 23 and 19 of relay LHS, normal polar contact 20 of relay RHS, front contact 21 of relay TS, right-hand polar contact 22 of relay S, track rail 1, the winding of relay TS and track rail 1a to the other terminal C of the source. This circuit is, of course, completed only when the signal control relays are in their respective normal positions to condition the associated signals to display their most restrictive or stop indications. When relay TS is picked up, the operator at the control office may position the control relays LHS, RHS and DS as required to cause signal 1L or 1R to indicate "permissive" or "clear," in order to permit the movement of a train in either direction through section a—b, or may restore the signals manually to stop, without releasing relay TS. Whenever either signal is conditioned to display an indication less restrictive than stop, alternate circuit paths are completed and function to maintain the track relay TS normally energized over its own front contact. For example, when relay LHS is operated to its reverse position to condition signal 1L to indicate " permissive" or "clear," polar contacts 23 and 19 of relay LHS are operated to their reverse positions and these contacts in their reverse positions, as well as in their normal positions as already described, complete the stick cir-

cuit for relay TS extending to terminal B at front contact 17 of relay TS. Similarly, if relay RHS is operated to its reverse position to condition signal 1R to indicate "permissive" or "clear," relay TS is then energized over a stick circuit extending from terminal B at its front contact 24 over the reverse polar contacts 25 and 20 of relay RHS, front contact 21 of relay TR, normal polar contact 22 of relay S, track rail 1, the winding of relay TS and track rail 1a to the other terminal C of the source. Relay TS has a slow release characteristic as already described in connection with Fig. 1, and consequently is not released by the operation of the quick acting relays LHS and RHS.

When relay TS is picked up, a portion 26 of a center tapped primary winding of a transformer 27 is supplied with energy over an obvious circuit including front contact 28 of relay TS. Secondary winding 29 of transformer 27 is connected through a full-wave rectifier 30 to one winding of relay ST, with the rectifier poled in such manner that current delivered thereby has a polarity such as to cause relay ST to operate its contact 31 to the left. Whenever, therefore, relay TS is caused to release, as by a train entering the section *a*—*b* and shunting the track circuit, front contact 28 of relay TS opens to deenergize winding 26 of transformer 27, and the flux in the transformer accordingly decays quickly and induces in secondary winding 29 an electromotive force which is applied through rectifier 30 to cause operation of relay ST. Relay ST may therefore be utilized in a well-known manner to initiate the operation of the communication system to cause an indication controlled in accordance with the position of contact 34 of relay TS, for example, to be transmitted over the communication system, to the office to light a suitable indication lamp TE at the office to indicate that a train has entered the section *a*—*b*.

When track relay TS is released and stick relay S is in its deenergized position, as shown, terminal B of the source of track circuit current is disconnected from section *a*—*b* as long as relay LHS or RHS remains reversed. The track circuit apparatus is arranged to be restored to its normal condition only if the signal control relays are manually positioned so as to cause the associated signals to continue to display their most restrictive indications after relay TS picks up, and in addition, relay S has been caused to close its left-hand contacts, in response to a movement of a train-carried magnet M over the associated receiver 8. When relay TS released due to a train in the section, relay S is energized when the magnet M on the rear vehicle passes inductor 8 and causes an electromotive force to be induced in the inductor. This electromotive force is applied to relay S and causes it to operate its contacts to the left, where contact 32 completes a stick circuit extending from terminal B through back contact 28 of relay TS, the winding and the left-hand contact 32 of relay S, and a portion 35 of the primary winding of transformer 27 to the other terminal C of the source.

It is to be understood that magnet M induces a current impulse in one direction in relay S as it approaches inductor 8, and induces an impulse in the opposite direction as it recedes from inductor 8. It follows that regardless of the relative polarity of magnet M and the inductor winding, or of the direction of train movement, one impulse or the other will be in the proper direction to cause contact 32 to close. Furthermore, relay S is energized to a much higher degree by the local battery current than by the impulses, and it follows that the stick circuit when closed holds relay S in its operated position, regardless of the further movement of magnet M. The building up of flux in winding 35 when the stick circuit for relay S becomes closed is effective to cause an electromotive force to be induced in secondary winding 29, whereupon the starting relay ST is again caused to close its contact 31 to initiate the operation of the communication system, and the resulting indications transmitted to the office may include one controlled in accordance with the position of contact 33 of relay S to indicate the operation of that relay by the magnet M of a passing train, by the lighting of a suitable indication lamp SE at the central office of the C. T. C. system.

If the operator at the office, having thus ascertained that the train in section *a*—*b* has passed that section complete and intact, restores all signal control relays to their respective normal positions to hold the associated signals at stop, energy is applied to the rails of section *a*—*b* over a pick-up circuit for relay TS which extends from terminal B at back contact 17 of relay TS, normal contact 19 of relay LHS, normal contact 20 of relay RHS, back contact 21 of relay TS, left-hand contact 22 of relay S, rail 1, relay TS, and thence over rail 1a to terminal C. Relay TS is arranged to pick up over its own back contact as described in connection with Fig. 1, and when the train has vacated section *a*—*b* and removed the train shunt, relay TS picks up and opens at back contact 28 the stick circuit of relay S, which relay releases quickly and closes its right-hand contact 22 to prepare the previously traced normally closed track circuit, this circuit being completed by the closing of front contacts 17 and 21 of relay TS. The operation of contact 28 of relay TS causes winding 35 of transformer 27 to be deenergized and winding 26 to become energized, to thereby cause an electromotive force to be induced in winding 29 and applied to relay ST to cause that relay to operate, to again initiate the operation of the communication system. The resulting indications transmitted to the office may include one controlled by the closed contact 34 of relay TS, indicating that section *a*—*b* has been vacated and the track circuit has been restored to normal, and may also include one controlled by the closed contact 33 of relay S to cancel the train report, or "OS" signal last transmitted.

In the event an incomplete train traverses the tripping section, the operator will be unable to restore the track circuit apparatus by restoring the signal control relays to normal, and signals 1L and 1R will remain non-responsive to the operation of the centralized control system, until they are restored locally. The signals may be placed again under the control of the central office operator either by the operation of an emergency key K, or by the movement, under a special order, of a vehicle carrying a magnet M through the section *a*—*b* with the signals at stop.

It is readily apparent from the foregoing that I have provided means to detect the presence of a train or vehicle at a location on a track, and have provided other means which cooperates with the train detecting means to respond only to the passage of a complete and intact

train as indicated by the operation of a wayside receiver in response to the passage of a transmitter carried on the rear of a train as an element of the train signaling devices required under the rules of operation to be provided on the rear of the last vehicle of a train. This apparatus when employed to control the "OS'ing" of trains at a remote unattended location is therefore operative to automatically indicate that an intact or complete train has passed the location, and therefore may be utilized to report trains over communication systems in much the same manner that a train is reported from manual block locations when a local operator observes the train markers and then reports the train by telephone or telegraph to an operator at the train dispatcher's office.

Although I have herein shown and described only two forms of train detecting and reporting 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 including an insulated section, a track relay and a source of energy connected to the rails of said section in a normally energized train-shuntable track circuit including a front contact of said track relay, a train to travel said stretch, a magnet carried on the last vehicle of said train, an inductor disposed in the trackway of said section for inductive relation with said magnet, a stick relay, a circuit adapted to be energized to pick up said stick relay in response to passage of said train-carried magnet over said inductor, a stick circuit for said stick relay including its own front contact and a back contact of said track relay, and a circuit controlled by said stick relay when picked up for picking up said track relay to establish said track circuit.

2. In combination with a stretch of railway track including an insulated section, a track relay and a source of energy connected to the rails of said section in a normally energized train-shuntable track circuit including a front contact of said track relay, a train to travel said stretch, a magnet carried on the last vehicle of said train, an inductor disposed in the trackway of said section for inductive relation with said magnet, a stick relay, an operating circuit for energizing said stick relay in response to movement of said train-carried magnet over said inductor, said stick relay when energized operating its contacts from a normal to an operated position, a holding circuit for energizing said stick relay over its own contact in its operated position and a back contact of said track relay, and a circuit including a contact of said stick relay in its operated position and the rails of said section for connecting said track relay to said source for restoring said track circuit to its normally energized condition.

3. In combination with a stretch of railway track having an insulated section, a remotely controlled relay having a normal and an operated position, a signal for governing traffic on said stretch and caused to display a "stop" or a "permissive" aspect according as said remotely controlled relay is in its normal or operated position, respectively, a track relay and a source of energy connected in a normally energized track circuit including the rails of said section and a front contact of said track relay, a train to travel said stretch, and means in the trackway of said section cooperating with means on said train for connecting said track relay to said source over the rails of said section effective only when said track relay is released and said remotely controlled relay is in its normal position.

4. In combination with a stretch of railway track having an insulated section, a remotely controlled relay having a normal and an operated position, a signal for governing traffic on said stretch and caused to display a "stop" or a "permissive" aspect according as said remotely controlled relay is in its normal or operated position, respectively, a track relay and a source of energy connected in a normally energized track circuit including the rails of said section and a front contact of said track relay, means effective when said track relay is released for causing said signal to display "stop" irrespective of the position of said remotely controlled relay, a train to travel said stretch, and means in the trackway of said section cooperating with means on said train for connecting said track relay to said source over the rails of said section effective only when said track relay is released and said remotely controlled relay is in its normal position.

5. In combination with a stretch of railway track having an insulated section, a signal adjacent said section for governing traffic over said stretch, a signal control relay at said signal and having a normal and an operated position for causing said signal to display "stop" and permissive" aspects respectively, means for controlling said signal control relay from a remote office, a track relay and a source of energy connected to the rails of said section in a normally energized track circuit including a front contact of said track relay, a train to travel said stretch, and means in the trackway of said section cooperating with means on said train for connecting said track relay to said source over the rails of said section when said track relay is released provided that said signal control relay is in its normal position.

6. In combination with a stretch of railway track having an insulated section, a signal adjacent said section for governing traffic over said stretch, a signal control relay at said signal having a normal and an operated position for causing said signal to display "stop" and "permissive" aspects respectively, means for controlling said signal control relay from a remote office, a track relay and a source of energy connected to the rails of said section in a normally energized track circuit including a front contact of said relay, means controlled by said track relay when released for causing said signal to display "stop" irrespective of the position of said signal control relay, a train to travel said stretch, and means in the trackway of said section cooperating with means on said train for connecting said track relay to said source over the rails of said section when said track relay is released provided that said signal control relay is in its normal position.

7. A system for indicating at an office the condition of a track circuit at a remote station, comprising the combination with a stretch of railway track having an insulated section provided with a track circuit including a track relay connected over its own front contact in said track circuit, a remote control system extending between said office and station and having a starting relay at said station, a train to travel said stretch, wayside means in the trackway of said

section cooperating with means on said train for energizing said track relay when released over another track circuit including the rails of said section, and means operated by said track relay when picked up and also by said wayside means jointly with said track relay when released for operating said starting relay to thereby condition said remote control system to transmit an indication to said office of the condition of said track relay.

8. A system for indicating at an office the condition of a track circuit at a remote station, comprising the combination with a stretch of railway track having an insulated section provided with a track circuit including a track relay connected over its own front contact in said circuit, a remote control system extending between said office and station for indicating the condition of said track relay, a starting relay at said station effective when operated to initiate the operation of said system, a train to travel said stretch, wayside means in the trackway of said section cooperating with means on said train for energizing said track relay when released over another track circuit including the rails of said section, a transformer having primary and secondary windings, means for supplying the primary of said transformer wtih current of one relative polarity when said track relay is picked up and with current of the opposite relative polarity when said track relay is released and said wayside means responds to said train-carried means, and means including the secondary of said transformer for energizing said starting relay to cause operation thereof in response to a change in the current supplied to said transformer.

9. In a remote control system, an office and a station, a stretch of railway track having an insulated section at said station, a track relay connected over its own front contact in a normally energized track circuit provided for said section, a signal at said station for governing traffic on said stretch, a signal control relay manually controllable from said office to a normal or an operated position for causing said signal to display a "stop" or a "permissive" aspect respectively, means controlled by said track relay when released for causing said signal to display "stop" irrespective of the position of said signal control relay, means including a contact of said signal control relay in its normal position for restoring said track relay to its normally energized position, a starting relay for initiating the transmission of information from said station to said office, and impulse means for operating said starting relay, comprising a transformer having a secondary winding connected to said starting relay, together with means effective when said track relay is picked up for supplying unidirectional current to the primary winding of said transformer.

10. In a remote control system, an office and a station, a stretch of railway track having an insulated section at said station, a track relay connected over its own front contact in a normally energized track circuit provided for said section, a signal at said station for governing traffic on said stretch, a signal control relay manually controllable from said office to a normal or an operated position for causing said signal to display a "stop" or a "permissive" aspect respectively, means controlled by said track relay when released for causing said signal to display "stop" irrespective of the position of said control relay, a restoring relay, a train to travel said stretch, means in the trackway of said section cooperating with means on said train for causing operation of said restoring relay from a normal to an operated position, means effective when said restoring relay is in its operated position and said signal control relay is in its normal position for restoring said track relay to its normally energized condition, a starting relay for initiating the transmission of information from said station to said office, and impulse means for operating said starting relay, comprising a transformer having a secondary winding connected to said starting relay, together with means effective when said track relay is picked up for supplying unidirectional current to the primary winding of said transformer.

11. In combination with a stretch of railway track including an insulated track section, a normally energized track circuit including a source of current, the rails of said section, and the winding and a front contact of said track relay, an inductor located in the trackway adjacent said section, a portable rear end marker comprising a magnet adapted to be mounted on a train in a position to pass over said inductor to indicate when a train running in either direction past said track section is complete, a stick relay adapted to be inductively picked up in response to the movement of said magnet over said inductor, and a holding circuit for maintaining said stick relay picked up including a back contact of said track relay, and a circuit including a front contact of said stick relay for picking up said track relay when the train has passed out of said track section.

12. In combination, a stretch of railway track, an office and a station, an inductor located in the trackway at said station, a portable rear end marker comprising a magnet adapted to be mounted on a train in a position to come into inductive relation with said inductor when the last car of said train passes said station, a stick relay, a circuit including said inductor and said stick relay adapted to be inductively energized when said marker comes into inductive relation with said inductor to pick up said stick relay, means for maintaining said stick relay picked up until manually released, means controlled by said stick relay for indicating at said office when a complete train passes said station, and means manually controllable from said office for releasing said stick relay.

13. In combination, an office and a station, a stretch of railway track including an insulated track section at said station, a normally energized track circuit including a source of current, the rails of said section, and the winding of said track relay, an inductor located in the trackway at said station, a portable rear end marker comprising a magnet adapted to be mounted on a train in a position to come into inductive relation with said inductor when the last car of said train passes said station, a stick relay, a circuit including said inductor and stick relay adapted to be inductively energized when said magnet comes into inductive relation with said inductor to pick up said stick relay, means controlled by said track relay for holding said stick relay picked up until manually released, transmitting means controlled by said track relay and by said stick relay for indicating at said office when a complete train passes said station, and means manually controllable from said office for releasing said stick relay.

GEORGE W. BAUGHMAN.