

**Feb. 21, 1933.**

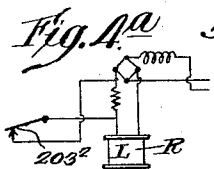
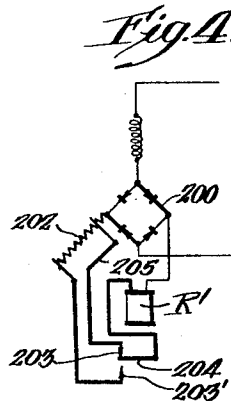
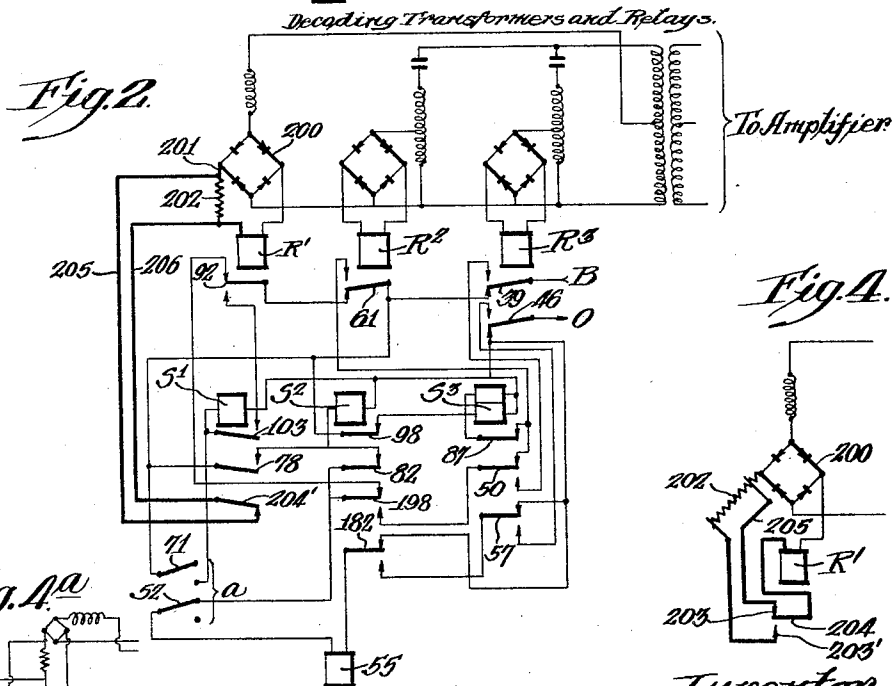
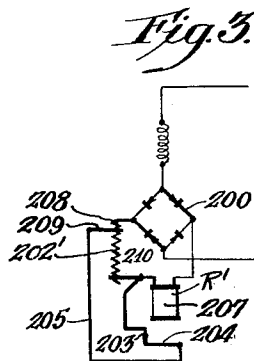
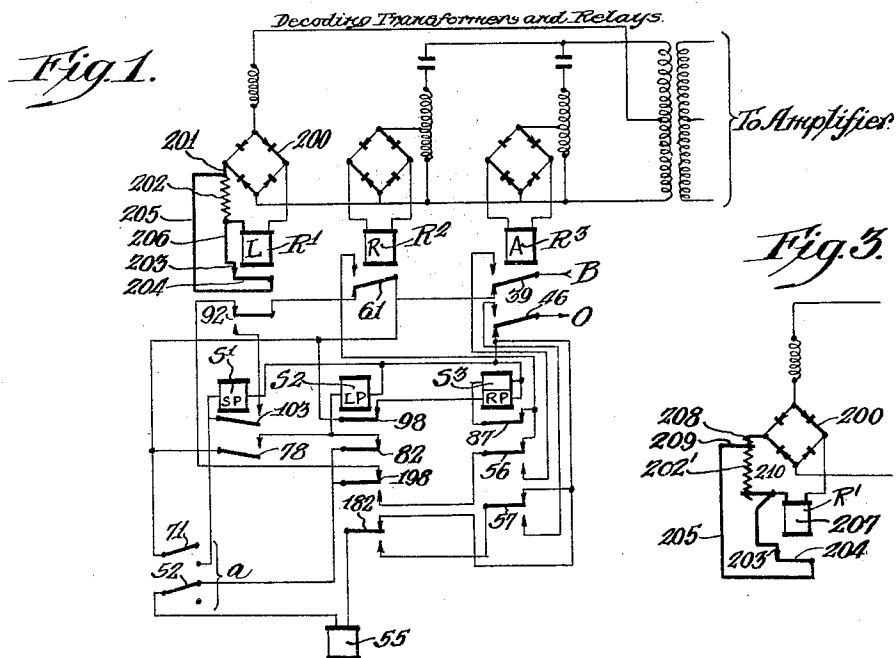
J. H. BROADBENT

**1,898,478**

# METHOD AND APPARATUS FOR PREVENTING IMPROPER CUT-IN OF CAB SIGNALS

Filed April 2, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

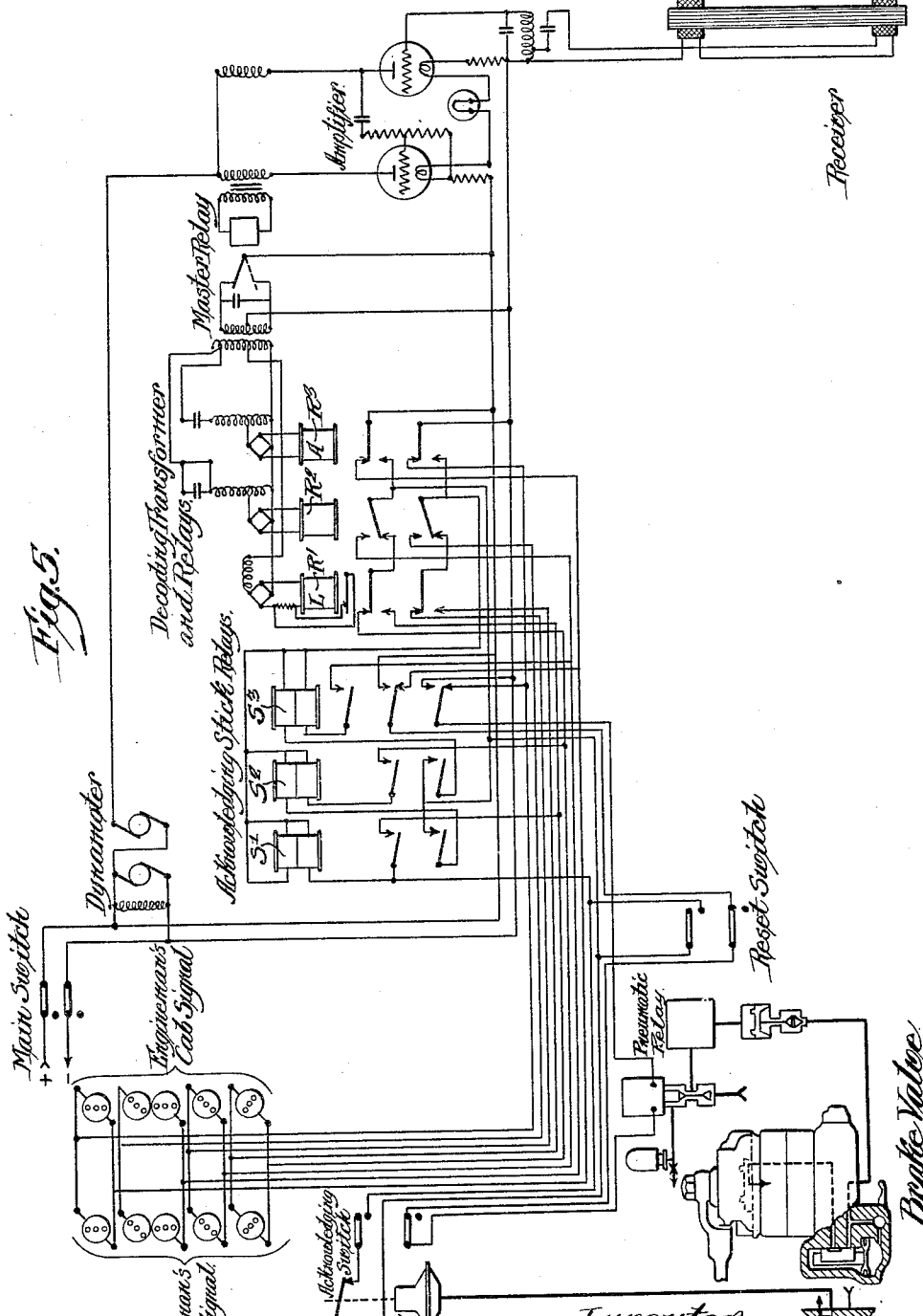


Fig. 5.

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## UNITED STATES PATENT OFFICE

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## METHOD AND APPARATUS FOR PREVENTING IMPROPER CUT-IN OF CAB SIGNALS

Application filed April 2, 1931. Serial No. 527,122.

My invention relates to railway traffic control apparatus and particularly to an electrical detail of the train-carried portion of the so-called coded system of continuous train control and cab signals and comprises means for correcting a feature that has hitherto given considerable trouble in operating this type of control.

There are various forms of cab signal operating devices, all subject to the fault of improper actuation in uncoded track sections. By the illustration of my inventions in conjunction with a special form of cab signalling system it is, therefore, not my intention to suggest that it is applicable to such a form only, but merely, in compliance with the statute, to show one application of my invention by which to the best advantage the operation may be explained.

In order that this illustrative setting may appear to greater advantage I have shown in diagram much more of the cab signal system than is immediately involved in the changing of the circuits to accommodate my invention.

A purpose of my invention is to avoid any unintended cutting in of the cab signal and stop equipment, particularly when moving in non-coded territory or when moving on at slow speed in coded territory, as during a cross over movement through a route for which no coding is provided.

A further purpose is to retard the pick-up operation of the so-called L relay of a system of the character indicated without affecting the speed of release.

A further purpose is to materially increase the impedance (conveniently the resistance but optionally the inductance or the inductance and resistance) of the energizing circuit of the L relay during its periods of pick-up without materially changing the impedance of the circuit during its releasing periods, using the pick-up to effect a by-passing of the added impedance so that the relay circuit will have its normal impedance during releasing periods.

A further purpose is to secure the full benefit of the engine cab train control in coded track while avoiding casual or accidental operation in uncoded sections.

A further purpose is to short circuit a retarding impedance of the L relay directly or indirectly by the pick-up of the relay, as directly by the closing movement of the L relay or indirectly by a resultant opening movement of the so-called SP stick relay of the circuit.

Further purposes will appear in the specification and in the claims.

A signaling system of the type to which the present invention is applicable is explained in United States Patent No. 1,744,832, granted to McCann.

My invention relates both to the processes involved and to apparatus by which the processes may be carried out.

I have elected to show one main form only of my invention, showing, however, minor modifications and selecting a main form and modifications thereof that are practical and efficient in operation and which well illustrate the principles involved.

Figure 1 is a diagrammatic view corresponding generally to the figure of the McCann United States Patent, No. 1,749,082, showing additional connections to embody a desirable form of my invention, the contacts of the relays being shown in the positions for normal running under "slow" while in the McCann drawing the relay contacts are shown positioned for the "clear" track condition.

Figure 2 is a view corresponding to Figure 1 with the single exception that a switch of my added electrical connections is closed and opened directly by the closing and opening of the L relay in Figure 1, and in Figure 2 by the opening and closing respectively of the SP stick relay.

Figures 3, 4 and 4a are diagrammatic views that may be considered somewhat differently modified fragments from either Figures 1, 2 or 5.

Figure 5 is a diagrammatic view showing an illustrative setting within which my invention is applicable. In order that the following description of my invention may be more clearly understood I have shown in Figure 5 a four-indication automatic stop signal system which, except as I have changed the control circuit for the L relay, is in considerable

use on railroads at the present time and of which the illustrations in the other figures form a part. This has been done in order that the release of the apparatus shown in the other figures may be made more clear and the parts there shown may be better understood.

In this Figure 5, I have shown not only a receiver such as is used in picking up a signal from a track but a two-stage vacuum tube amplifier, a master relay, decoding transformers and relays and acknowledging stick relays, for clear, approach restricting and approach indications, engineman's and fireman's cab signals, dynamotor, main switch, cab signals, acknowledging switch, power relay, resetting switch and pneumatic equipment embraced generally under the terms pneumatic relay, brake valve and timing mechanism.

Much of the apparatus shown in the figures has been well illustrated in U. S. Patent, No. 1,749,082, dated March 4, 1930 to R. A. McCann and for this reason and in order to avoid excessive explanation of electrical circuits that do not in themselves include part of my present invention, I have used figures that include the electric circuits shown in the McCann patent adding in somewhat heavier lines in the different views somewhat different desirable embodiments of my present invention.

In any system of the character illustrated the time of pick-up of the relay having to do with resumption of operation in coded territory after train operation in uncoded territory becomes quite important and my invention directly affects control of the relay selected. This may be the so-called "L relay".

The best speed of release for the L relay has been the subject matter of much expensive investigation and careful determination. A too rapid speed of release is undesirable in that the L relay will then release when merely passing over rail joints, particularly if the train is moving slowly. On the other hand a too slow speed of release is also undesirable in that prompt release is needed in normal operation to indicate quickly to the engineer the sudden presence of a very dangerous track condition.

As a result the extent of retardation of release of the L relay, designated R' in the drawings (to follow the nomenclature of the McCann patent) is normally predetermined and specified within narrow limits of value, which value is merely great enough to insure against unintended releases when passing over rail joints, any materially greater retardation beyond this requisite specified value being forbidden because of the need for bringing the release indication of sudden danger promptly to the attention of the engineer.

Any of the forms illustrated may be preferable, according to circumstance.

Referring in detail to the drawings, (Figures 1-4) the three decoding relays, R<sup>3</sup>, R<sup>2</sup>

and R' in a coded continuous inductive train control system are commonly called the A, R and L relays or more formally respectively the "clear", the "approach restricting" and the "approach" or "slow" relays.

Under "clear" track conditions the A and L relays R<sup>3</sup> and R' are energized and the R<sup>2</sup> relay is de-energized.

Under track conditions for "restricted approach" the R and L relays R<sup>2</sup> and R' are both energized with the A decoding relay R<sup>3</sup> open.

When the track conditions are for "approach" or "slow" the L relay R' is energized with the A and R relays R<sup>3</sup> and R<sup>2</sup> open.

All three relays are de-energized under "stop" or "caution slow speed" conditions and also during periods of travel over unprotected or non-coded track.

It will be understood that the track ahead of the advancing train is energized through suitable code transmission mechanism whereby an impressed track current, normally of 100 cycles per second, is interrupted or coded at different frequencies according to the track condition, for example respectively 180, 120 and 80 times each minute during conditions for "clear track", "restricted approach" and "limited clear track" and that during "stop" conditions the track is normally de-energized continuously. Code transmission mechanism is shown in United States Patent No. 1,773,472, granted August 19, 1930, to Bossart.

The A and R relays R<sup>3</sup> and R<sup>2</sup> are on tuned circuits to respond only to their respective codes, as to 180 and 120 interruptions of the impressed current per minute while the L relay R' may and usually does respond not only to its own code of, for example 80 interruptions per minute, but also to the codes of the A and R relays.

Associated with the decoding relays R<sup>3</sup>, R<sup>2</sup> and R' are three relays designated on the drawing S<sup>3</sup>, S<sup>2</sup> and S'. These relays, known as acknowledging stick relays, are frequently called respectively the RP stick relay, the LP stick relay and the SP stick relay, and are frequently mounted respectively directly under the R<sup>3</sup>, R<sup>2</sup> and R' decoding relays.

The reference character "a" designates the manually operable acknowledging switch having a normally open contact 71 and a normally closed contact 52. When this switch is thrown momentarily out of its normal position, the normally open contact 71 becomes momentarily closed and the normally closed contact 52 becomes momentarily open.

The reference character 55 designates a brake-controlling magnet; this magnet is normally energized and, if de-energized, causes an automatic application of the brakes.

Four different circuits are used selectively for energizing the brake-controlling magnet

55, each of these circuits including the contact 52 of the acknowledging switch, the track condition determining which circuit is available for energizing the magnet 55.

5 If the train moves from clear conditions under which the A and L relays  $R^3$  and  $R'$  are both energized and the three stick relays are all de-energized into "approach restricting" conditions, the release of the  $R^3$  relay  
10 opens a circuit of the brake-controlling magnet 55 and, in order to prevent an automatic application of the brakes by reason of the de-energization of the magnet 55, the engineer must operate his acknowledging  
15 switch  $\alpha$ .

The closing of the acknowledging switch effects a closure of first the SP stick relay  $S'$ ; this in turn energizes the LP stick relay  $S^2$  and thereby the RP stick relay  $S^3$ , the pick-up of the RP stick relay  $S^3$  and the energizing of the R relay  $R^2$  together closing a circuit adapted to continue to energize the RP stick relay  $S^3$  after the de-energization of the SP and LP stick relays  $S'$  and  $S^2$ .

25 The immediate opening of the acknowledging switch closes a second circuit to the slow-acting, brake-operating magnet 55 through the contacts at 52, as outlined in McCann United States Patent No. 1,749,082.

30 It will be understood that the brake-operating magnet 55 is a slow-operating magnet, permitting adequate time for the engineer to close and open the acknowledging switch to avoid a release of the magnet 55 which  
35 would result in an application of the train brake.

In the same manner if the track conditions become "slow" the R relay  $R^2$  releases, opening the second circuit of the brake-operating magnet 55, and in order to prevent  
40 a resultant automatic application of the brake the engineer must again close and open his acknowledging switch  $\alpha$ .

The closure of the acknowledging switch effects an energization of the SP stick relay  $S'$  which in turn closes a circuit of the relay  $S^2$  which in turn closes a stick circuit of the latter relay, and the almost immediate opening of the acknowledging switch provides  
50 closure of a third circuit for the brake magnet which again includes the contact 52 of the acknowledging switch, the movable contact members of the different relays being now as indicated in Figures 1 and 2 with the L relay  
55  $R'$  and the stick relays  $S^2$  and  $S^3$  energized and the relays  $R^2$ ,  $R^3$  and  $S'$  on open circuits. The detailed change in the circuit connections is discussed in McCann United States Patent No. 1,749,082.

60 If the track condition at the train now passes from "slow" to "stop" or if the train passes from a coded or protected track section on to an unprotected or non-coded track section, the L relay  $R'$  becomes de-energized  
65 opening the third circuit of the magnet 55,

the engineer having to again open and close the acknowledging switch  $\alpha$  in order to prevent an application of the brake.

The opening throw of the acknowledging switch then energizes the SP stick relay  $S'$  70 through the contact 71, the energizing of the SP stick relay  $S'$  then effecting a closure of a stick circuit of the SP relay through the contacts 92 and 103, and the closing of the SP relay effecting successive closures of the  
75 stick relays  $S^2$  and  $S^3$ .

The return throw of the acknowledging switch closes the fourth circuit of the brake-controlling magnet 55 from the supply terminal B through the contacts 39, 82 and 52, 80 the coil of the magnet 55, and the contacts 182 and 46 to the other supply terminal O.

The three decoding relays  $R^3$ ,  $R^2$  and  $R'$  are now on open circuit and the three stick relays are energized, with the train running  
85 on a section of unprotected track or else on a protected track with the track condition at the train corresponding to "stop" or caution slow speed.

It will be understood that the operation 90 of the acknowledging switch by the engineer avoids any automatic application of the brakes incident to the condition of the train passing from one track condition to another track condition less safe, or from a protected  
95 or coded to an unprotected non-coded track section. In the ordinary case, the acknowledging switch is air operated, so that use of the acknowledging switch cannot continue indefinitely because the air supply available  
100 for the engineer is deliberately restricted and excessive attempted use of the acknowledging switch will result in application of the brakes without regard to the wishes of  
105 the engineer. There is of course no need for operating the acknowledging switch when the train passes from an unprotected to a protected track section or from one track condition to another more safe.

My invention is directed to means for 110 avoiding unintended and improper energization (pick-up) of the L relay  $R'$  which has frequently occurred with trains traveling along unprotected or non-coded track  
115 sections, that is, when moving over a route for which no code is provided.

The receiving coil of the equipment then passes through a magnetic field causing a full cycle operation of the master relay (Figure 5), which in itself forms no part of the present invention. In the past this has effected  
120 an unintended energization of the L relay  $R'$ , resulting in an unintended pick-up of the L relay, followed almost immediately by a releasing movement of the relay that has  
125 had to be acknowledged by the engineer in order to prevent the automatic application of the train brakes above mentioned.

In the past these unintended pick-up and releasing movements of the L relay  $R'$  have 130

resulted in the necessity for repeated operation by the engineer of the acknowledging switch in order to avoid an application of the brakes and many times the pick-ups and opening movements have been repeated at such near intervals as to make automatic applications of the brake unavoidable, a train having had in each such case to be brought to a complete stop.

My invention avoids these unintended pick-ups and thereby relieves the engineer from the need for operating the acknowledging switch when there is no proper occasion for it and also prevents occasional automatic stopping of the train without need.

The L relay is energized from the rectifier 200 and I include in the energizing circuit 201 of the relay an impedance 202 that is most conveniently a simple resistor but may optionally include inductance with or without material resistance.

I provide connections for by-passing the impedance or any predetermined portion thereof through relatively movable cooperating contacts 203 and 204, closed and opened respectively directly or indirectly by the pick-up and release of the L relay R'.

Electrical connections 205 and 206 connect opposite ends respectively of the impedance 202 to cooperating fixed and movable contacts which are adapted to be closed by the pick-up of the L relay R' and to be opened by the release thereof.

In Figure 1 the movable contact 204 is controlled directly by the L relay R', the by-passing circuit being closed as soon as the relay is sufficiently energized to pick up the contact 204 and being opened as soon as the relay has become sufficiently de-energized to drop the contact.

In Figure 2 the movable contact 204' is controlled indirectly by the L relay R', the by-passing circuit being closed by the release of the SP stick relay S' which always follows the pick-up of the L relay R'.

The impedance 202 is thus by-passed during the releasings of the L relay R' and not by-passed during the pick-ups of the relay, thereby securing for the L relay unchanged retardations during the releasings and a suitably increased retardation during the pick-ups to avoid unintended pick-ups incident to momentary energizings of the rectifier 200 due for example to the train travelling along an unprotected track, or during movement, crossing a track for which no coding is provided.

It will be understood that when the track conditions of the train change from "slow" conditions corresponding to Figures 1 and 2 to "stop" condition, the relay R' opens with a retardation after the change sufficient to prevent the relay from opening during a momentary failure in the continuous energization of the rectifier 200, a momentary

failure that usually takes place when the train carrying the equipment merely runs from one track section to another.

Under "stop" conditions all of the stick relays are closed with all of the decoding relays open.

When the train conditions change from "stop" conditions to a "limited clear track" or when the train leaves an unprotected track to a track having coding protection, the relay R' closes, for example to the position shown in the Figures 1 and 2 representing the "limited clear" track condition.

It will be seen that the L relay R' may well have considerable retardation during the pick-up in that this movement is one not needing acknowledgment by the engineer.

I have discovered that I can secure this increased retardation for the pick-ups without interfering with the normal retardation for the releases by suitably increasing the impedance of the energizing circuit of the relay during the pick-ups with a by-passing of the added impedance throughout the periods that the L relay is subject to release. Each such release must be acknowledged by the engineer to avoid an automatic application of the engine brake.

After the L relay picks up, the SP relay S' opens so that I may most conveniently use either the opening of the SP relay or the closure of the L relay R' to effect a by-passing reduction of the impedance of the energizing circuit of the R' relay to that found to provide a retardation merely great enough for the avoidance of unintended releases when the train passes from track section to track section.

Normally the impedance of the energizing circuit of the L relay will be substantially the same when the added impedance 202 has been by-passed as if it were absent with the usual direct connection between the terminals of the rectifier 200 and the relay R'. For this reason the whole of the added impedance may be by-passed while the track condition is that for "limited clear track" advance without materially changing the retardation of release of the relay from that which it would have with the usual direct connections between the rectifier and the relay.

I may, however, provide means, as indicated in Figure 3 permitting adjustment of the retardation of the relay during release and optionally also adjustment of the retardation during the pick-up of the L relay.

It will be understood that the releasing retardation of the L relay needs to be greater for slow trains or for normally "fast" trains when not travelling at full speed than for fast trains while the need for quickly bringing to an engineer the knowledge of the sudden presence of the unsafe "stop" condition indicated by the release of the L relay

R' is more great on fast trains than on slow trains so that when trains are to run abnormally fast it may be desirable to operate the L relay with a quicker release.

5 The L relay 207, Figure 3, should be designed with an abnormally quick release when its energizing circuit is without added impedance 202' and I show an adjustable portion 208 of the added impedance not by-passed by the pick-up of the relay.

10 Shifting the contact 209 to reduce the portion 208 of the added impedance not by-passed speeds up the release or vice versa; shifting it the other way correspondingly delays the release of the relay.

15 In the same way the retardation during the pick-up may be varied by suitable variation in the position of the contact member 210.

20 Figure 4 illustrates somewhat different connections for providing the L relay with an abnormally high impedance during its pick-ups and a normal impedance during its releases, thereby securing abnormally retarded pick-ups and normally retarded releases.

25 In Figures 1 to 3, I keep the impedance 202 continuously connected between the rectifier 200 and the L relay, substantially neutralizing its effects upon the retardation of the relay during its releases by electrically by-passing the impedance whenever the relay is closed.

30 I may however, as illustrated in Figure 4, cut all or any portion of the impedance out of circuit during the period that the relay is closed, the contact member 204 then for example connecting alternatively with the contacts 203 or 203' in order to make connection between the relay and rectifier alternatively through the impedance 202 or through the "by-passing" connection 205 but never through both simultaneously.

35 It will be seen that the electrical connections of Figure 4 are in effect the same as those of Figure 3 except that the connection between the impedance 202 and the relay now includes the cooperating contacts 203' and 204, open when the relay is closed or has picked up and closed when the relay is open or has effected its release.

40 The short-circuiting or the adding of impedance in the L relay (R') theoretically not only need not be effected by the L relay itself, nor by the release of the stick relay in Figure 2 but can be effected by any other means synchronized with the L relay which is intended to be symbolized by the separation of the contacts at 203' from the relay in Figure 4a.

45 The shifting of the position of this switch makes no difference in the character of the increase of impedance which is short-circuited, so that any type of added impedance can be used.

It will be seen that all of the illustrated forms are broadly the same in that each provides the L relay with increased impedance when the relay is open in order to provide the relay with increased retardation during its pick-ups and with another and materially lower impedance when the relay is closed, thereby securing the more normal retardation during the releases of the relay.

50 It will be seen that, though Figure 5 shows a somewhat more elaborate arrangement than Figure 1, some of the relays carrying more contacts than in Figure 1, for purposes there shown, both figures represent the same type of code train control system.

55 Figure 1 shows that the change in the electrical connections to the L relay effected by the pick-up and release of the L relay may be conveniently effected by direct physical connection between the armature of the L relay and an operating switch.

60 Figure 2 illustrates that it may alternatively and with some installations more conveniently be operated directly by the operation of the SP stick relay which in turn is electrically operated by the pick-up and release of the L relay.

65 Figure 3 illustrates that I may make the retardations of release and optionally also those of pick-up adjustable in order to accommodate the respective retardations to different train conditions while Figure 4 illustrates that the impedance may or may not be in continuous connection between the rectifier and L relay.

70 In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

75 Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a railway signal system, clear, approach restricting and approach relays responsive to energy at different frequencies of coding, which energy is transmitted at a given frequency of coding during one track condition and not during another track condition, connections by which the clear and approach restricting relays may receive energy at the proper frequencies of coding, an impedance having one of the electrical quantities resistance and inductance, a first circuit adapted to receive energy at a frequency of coding which will energize the approach relay and including the approach relay and cooperating contacts closed by the energization (pick-up) of the approach relay and opened by the release of the approach relay and a second circuit adapted to receive energy at a

frequency of coding which will energize the approach relay and including the approach relay and the impedance, said second circuit being closed while the approach relay is released.

2. In a railway signaling system, clear, approach restricting and approach relays responsive to energy at different frequencies of coding, which energy is transmitted at a given frequency of coding during one track condition and not during another track condition, connections by which the clear and approach restricting relays may receive energy at the proper frequencies of coding, an impedance having one of the electrical quantities resistance and inductance, an electric circuit adapted to receive energy at a frequency of coding which will energize the approach relay and including an adjustable portion of the impedance, the approach relay and contacts relatively closed by the energization (pick-up) of the approach relay and opened by the release of the approach relay and a second electric circuit closed while the approach relay is released, adapted to receive energy at a frequency of coding which will energize the approach relay and including the impedance and the approach relay.

3. In a railway signaling system, clear, approach restricting and approach relays responsive to energy at different frequencies of coding, which energy is transmitted at a given frequency of coding during one track condition and not during another track condition, connections by which the clear and approach restricting relays may receive energy at the proper frequencies of coding, an adjustable impedance having one of the electrical quantities resistance and inductance, a first electric circuit adapted to receive energy at a frequency of coding which will energize the approach relay and including the approach relay and cooperating contacts closed when the approach relay is energized and opened when the approach relay is released and a second electric circuit closed when the approach relay is released, adapted to receive energy at a frequency of coding which will energize the approach relay, and including the impedance and the approach relay.

4. In a railway signaling system, clear, approach restricting and approach relays responsive to energy at different frequencies of coding, which energy is transmitted at a given frequency of coding during one track condition and not during another track condition, connections by which the clear and approach restricting relays may receive energy at the proper frequencies of coding, approach relay connections adapted to receive energy at a frequency of coding which will operate the approach relay, an impedance in said approach relay connections and other connections adapted to by-pass the impedance

and including relatively movable cooperating contacts adapted to be closed and opened respectively by the pick-up and release of the approach relay.

5. In a railway signaling system, clear, approach restricting and approach relays responsive to energy at different frequencies of coding, which energy is transmitted at a given frequency of coding during one track condition and not during another track condition, connections by which the clear and approach restricting relays may receive energy at the proper frequencies of coding, approach relay connections adapted to receive energy at a frequency of coding which will energize the approach relay, a resistor in said approach relay connections and other connections adapted to by-pass the resistor and including relatively movable cooperating contacts adapted to be closed and opened respectively by the pick-up and release of the approach relay.

6. In a coded railway signal system a relay responsive to coded current, a source of energy for the relay, said source being adapted to transmit energy during one track condition and not during another track condition, electrical connections between the source and relay, an impedance in said connections, and other connections adapted to by-pass the impedance and including relatively movable cooperating contacts adapted to be closed and opened respectively by the pick-up and release of the relay, one of the contacts having mechanical connection with the armature of the relay.

7. In mechanism of the character indicated, a relay, a source of energy for the relay, said source being adapted to transmit energy during one track condition and not during another track condition, electrical connections between the source and relay, an impedance in said connections, other connections adapted to electrically by-pass the impedance and including relatively movable cooperating contacts, and means adapting the contacts to be closed and opened indirectly respectively by the pick-up and release of the relay and including a second relay normally in a de-energized condition before and during the pick-up of the first relay, and a mechanical connection between one of the contacts and the second relay.

8. A locomotive cab signal system, comprising a receiver and relays operated by the current picked up by the receiver, circuits for the relays, two of which relay circuits are tuned and one of which is untuned, means for increasing the impedance of the untuned relay circuit by addition of one of the electrical quantities resistance and inductance and means for short-circuiting the added electrical quantity to restore the normal characteristics of the relay.

9. In a cab signal for coded territory having

- ing an alternating current circuit periodically interrupted at code frequencies, a transmitter, an approach restricting relay group including relays responsive to the code frequency and an approach relay group having decoding relay indicators operated through the relays and means for retarding the pick-up of one of the decoding relays, which means is cut out during the further operation of the relay.
10. In railway cab signalling in which in coded territory a coded current is present along the track and a cab receiving coil picks up the current from the track through operation of a master relay and decoding relays, the circuit of one of which decoding relays is untuned to respond to either of two code currents, the art which consists in altering the resistance of the untuned relay circuit during the pick-up of this relay and restoring the normal condition of the circuit of this relay after the relay has picked up.
11. In railway cab signalling in which in coded territory a coded current is present along the track and a cab receiving coil picks up the current from the track through operation of a master relay and decoding relays, the circuit of one of which decoding relays is untuned to respond to either of two code currents, the method which consists in increasing the impedance of the controlling circuit of the untuned relay preparatory to its pick up and reducing the impedance of this relay subsequent to its pick up.
12. In a railway signalling system operating upon coded energy picked up along the track and including a relay responding to one frequency of coding and a relay responding to a plurality of frequencies of coding, the art which consists in passing current at the proper frequency of coding for the relay responding to one frequency of coding through a path of relatively lower impedance, in passing current for the relay responding to a plurality of frequencies of coding through a path of relatively higher impedance and in short circuiting the relatively higher impedance after the relay responding to a plurality of frequencies of coding has picked up.
13. In a railway signal system, a plurality of relays, circuits for the respective relays, one of which circuits is untuned and certain of which are tuned, the relays being adapted to respond to energy at different frequencies of coding intermittently applied at intervals to operate individual relays, an impedance comprising one of the electrical quantities resistance and inductance in the circuit of the untuned relay during pick-up of that relay and out of the circuit of the untuned relay during release of the untuned relay.
14. The method of operating a railway signal system to avoid false indications in uncoded sections, using a plurality of relays in relay circuits, which consists in tuning the circuits of certain of the relays to make the relays responsive to different frequencies of coding, while leaving one of the relays untuned, in energizing the various relays selectively by impressing upon the system energy at the proper frequency of coding for an individual relay, and in increasing the impedance of the untuned relay during pick-up with respect to its impedance during release.
15. The method of operating a railway signal system to avoid false indications in uncoded sections, using a plurality of relays in relay circuits, which consists in tuning the circuits of certain of the relays to make the relays responsive to different frequencies of coding, while leaving one of the relays untuned, in energizing the various relays selectively by impressing upon the system energy at the proper frequency of coding for an individual relay, and in increasing the resistance of the untuned relay during pick-up with respect to its resistance during release.
- JOHN H. BROADBENT.