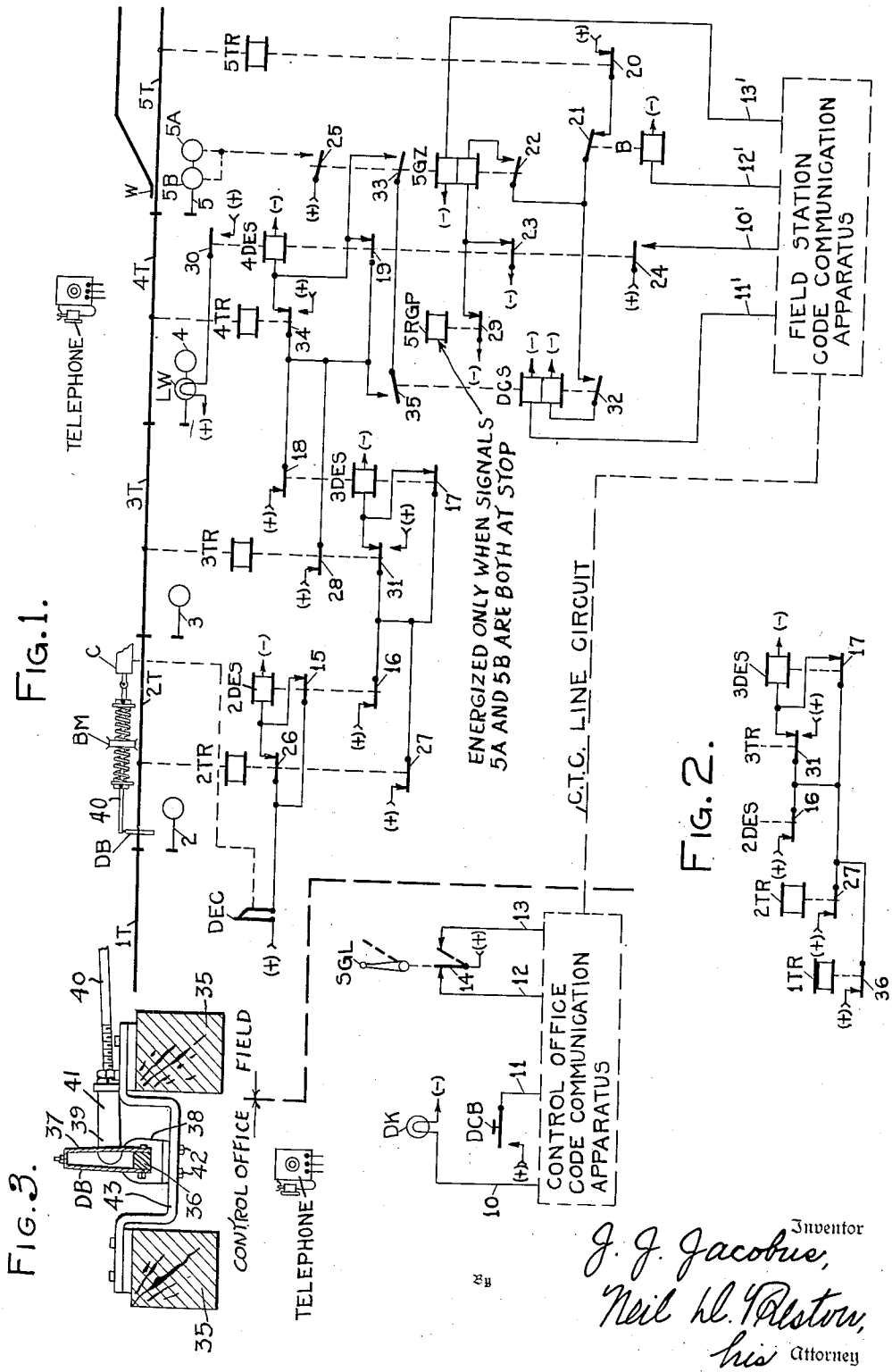
Jan. 1, 1952

J. J. JACOBUS

2,581,108

DRAGGING EQUIPMENT DETECTOR SIGNALING SYSTEM FOR RAILROADS

Filed March 6, 1947



Inventor

J. J. Jacobus,

Neil H. Preston,

his Attorney

Patented Jan. 1, 1952

2,581,108

UNITED STATES PATENT OFFICE

2,581,108

DRAGGING EQUIPMENT DETECTOR SIGNALING SYSTEM FOR RAILROADS

John J. Jacobus, Greece, N. Y., assignor to General Railway Signal Company, Rochester, N. Y.

Application March 6, 1947, Serial No. 732,781

8 Claims. (Cl. 246—219)

1

This invention relates to signaling systems for railroads, and it more particularly pertains to means for indicating the presence of dragging equipment upon the passage of a train over a detector barrier disposed across the trackway.

The present invention is to be considered as providing improvements in the dragging equipment detecting system disclosed in the prior application of G. H. Dryden, Ser. No. 731,735, filed March 1, 1947.

An object of the present invention is to automatically restore an office controlled signal to stop upon the momentary actuation of a yieldable dragging equipment detector barrier included in a track section located one or more track sections in the rear of that signal, and to distinctively indicate such detection at the office.

Another object of the present invention is to locate the detector barrier in a track section several track sections in the rear of the signal it governs for the purpose of preventing the changing of the indication of the signal governing exit from that track section in which the barrier is located because of actuation of the barrier, and yet prevent a following train, in actuating the barrier, from putting the office controlled signal to stop for a first train.

Another object of the present invention, where several track sections are included between a barrier and an office controlled signal, is to cause each train to be stopped by the detector barrier control of the office controlled signal, only if that train has actuated the detector barrier, irrespective of whether or not each of the several track sections between the barrier and the office controlled signal is occupied by a train.

Another object of the present invention is to provide a distinctive indication for a signal in approach to the office controlled signal when the office controlled signal is put to stop by reason of the actuation of a dragging equipment detector barrier.

Another object of the present invention, when an operator at the office has been notified that a train is ready to proceed after having been stopped by an office controlled signal for checking dragging equipment, is to allow the operator at the office, by actuation of specially manually controlled means, to cause the office controlled signal to be cleared, irrespective of the effectiveness of the dragging equipment detector means that has put that signal to stop.

Other objects, purposes, and characteristic features of the present invention will be in part obvious from the accompanying drawings and in

2

part pointed out as the description of the invention progresses.

In describing the invention in detail, reference is made to the accompanying drawing in which Fig. 1 illustrates one embodiment of the present invention as applied to a stretch of railway track assumed to be remotely located from a control office, and Fig. 2 illustrates a modified circuit organization that may be employed in accordance with the requirements of practice. Fig. 3 is a sectional elevational view of a detector barrier disposed across a stretch of railway track.

For the purpose of simplifying the disclosure of the present invention the organization of the system according to the present invention is illustrated by a schematic wiring diagram in a manner to more particularly disclose the mode of operation and the principles involved in the present invention, rather than for the purpose of illustrating the specific instruction and arrangement of parts that would be employed in practice. The symbols (+) and (—) have been used to indicate connections to the respective positive and negative terminals of suitable batteries or other sources of direct current.

The trackway of this embodiment of the present invention is illustrated as being divided into track sections 1T, 2T, 3T, 4T and 5T, each track section having a track relay TR associated therewith in a conventional manner. The signals 2, 3, 4 and 5 are provided for governing entrance into the respective track sections 2T, 3T, 4T and 5T for a direction of traffic to the right, which, for the purpose of this disclosure, is assumed to be for eastbound traffic.

The signals are assumed to be of the searchlight type such as is shown, for example, in the patent to O. S. Field, No. 2,239,316, dated April 22, 1941, although it will be readily apparent that other types of signals such as semaphore, position light, or color light signals having individual color lamp units, could as well be employed. The signal 5 is illustrated as having conventional upper and lower arm signals for governing traffic through the track switch W in its respective normal and reverse positions. The signal 5A governs traffic through the track switch W in its normal position, and the signal 5B governs traffic over the track switch W in its reverse position. The track switch W is preferably power operated from the control office according to usual practice.

Disposed across the trackway in the track section 2T, and preferably near the signal 2, is a detector barrier DB which is biased to an upright position by a suitable biasing mechanism BM, and

connected to the circuit controller C. The circuit controller C provides a suitable housing for the contact DEC and a means for opening such contact when the barrier B is actuated by an eastbound train. Inasmuch as it is contemplated that the structure of the barrier DB, the biasing mechanism BM, and the circuit controller C, for this embodiment of the present invention, be of the general character fully disclosed in the above mentioned application of G. H. Dryden, it is believed unnecessary for the purpose of this application to disclose all of the details of the structural organization of the dragging equipment detector. Although the barrier DB for this embodiment of the present invention is assumed to be actuated only by eastbound traffic, if there is a possibility of westbound trains being run over the trackway, the circuit controller C should have a structure as fully disclosed in such Dryden application so as to prevent the opening of contact DEC in case the barrier DB is actuated by the passage of westbound trains.

With reference to Fig. 3, the detector barrier DB extends across the track way between two railway ties **35**. This barrier comprises at its base a square rod **36** to which is secured side plates **37** extending upwardly to a height to be actuated by equipment dragging beneath a train. The rod **36** is journaled by a suitable bearing **38** at each end of the rod, and the rod **36** at the end illustrated has a suitable operating crank **39** secured thereto which extends upwardly and operates an actuating rod **40**, the rod **40** being connected to the crank **39** by a suitable adjustable lug **41**. The bearing **38** at each end of the rod **36** is secured by suitable bolts **42** to a supporting bracket **43** which is secured across the ends of the ties **35**.

Although various means well-known to those familiar with the art can be employed for the manual control of signal **5** and of the track switch W, it is assumed that this embodiment of the present invention is a part of a conventional centralized traffic control system in which an operator, or a dispatcher, at the control office maintains communication with his respective manually controlled switches and signals by a code communication system over a CTC line circuit as illustrated in block form and by dotted lines in the accompanying drawing. It is to be understood that the code communication apparatus can be provided according to various suitable code communication systems such, for example, as according to the system fully disclosed in the patent to W. D. Hailes et al., Pat. No. 2,399,734, dated May 7, 1946, to which reference is to be made for a more complete disclosure of the communication system.

It is illustrated that a signal control lever SGL is provided at the control office for the designation of the respective stop and proceed indications to be displayed by signal **5**. The signal SGL is illustrated as being normally in its center (at-stop) position, and in accordance therewith energy is applied to wire **12** through the normally closed contact **14** of the lever SGL to select a stop control for transmission to the signal **5** in case the code communication apparatus is set into a cycle of operation for transmission of controls to that field station. The signal **5**, however, is assumed to be in its stop indication position as is normally effective by the slotting of that signal upon the passage of a train. With signals **5A** and **5B** both at stop, the stop repeater relay **5RGP** is normally energized in accordance with the signals **5A** and **5B** both being at stop in a manner such as is disclosed, for example, in the T. J. Judge Patent No. 2,298,946, dated October 13, 1942, for the control of relay **16RGP** in Fig. 4 of that patent.

In accordance with the normally closed position of the contact DEC of the dragging equipment detector, a detector stick relay **2DES** is normally maintained picked up by an obvious stick circuit including contact DEC and front contact **15** of relay **2DES**.

With relay **2DES** in its picked-up position, the stick relay **3DES**, which is more particularly associated with the track section **3T**, is maintained picked up by its stick circuit including front contact **16** of relay **2DES** and front contact **17** of relay **3DES**.

Similarly the relay **4DES**, which is more particularly associated with the track section **4T**, is maintained normally picked up by a stick circuit including front contact **18** of relay **3DES** and front contact **19** of relay **4DES**.

In accordance with the relay **4DES** being in its picked-up position, the circuit including wire **10¹** is opened at back contact **24** to condition the selection of an indication for transmission by the code communication apparatus to the control office of a character to cause the dragging equipment detector indication lamp DK, which is illustrated as being connected by wire **10** to the code communication apparatus, to be deenergized.

The relays GZ, B and DCS, which are assumed to be subject to control of an operator at the control office via the code communication system, are normally deenergized, and are used for purposes governing the control of signal **5** in a manner to be hereinafter considered.

Having thus described the conditions which are assumed to be the normal conditions of the system to which the system is restored subsequent to the passage of trains, consideration will now be the mode of operation of the system according to a typical assumed operating condition for the passage of an eastbound train.

In anticipation of the approach of an eastbound train, the dispatcher actuates the signal control lever SGL to its right-hand position to allow the clearing of the signal **5A** (assuming the track switch W to be in its normal position). When the code communication system apparatus is set into operation for the communication of such control to the field, the application of energy by the contact **14** of lever SGL to wire **13** is effective momentarily during the control cycle of operation of the code communication apparatus to apply energy to wire **13¹**, and thus to the upper winding of the signal control relay **5GZ** to cause the picking up of that relay.

The picking up of relay **5GZ** (with the relay **4DES** picked up) closes a stick circuit for the lower winding of that relay. Such circuit extends from (+), including front contact **20** of a track relay **5TR**, back contact **21** of relay B, front contact **22** of relay **5GZ**, and front contact **23** of relay **4DES**, to (−).

A consideration of this stick circuit reveals that the relay **5GZ** can be dropped away due to any one of three conditions. One of the conditions for the opening of the stick circuit for the relay **5GZ** is that the track section **5T** become occupied by a train, as upon the acceptance of the signal **5A** by an eastbound train, to open front contact **20** of relay **5TR**. Another condition under which the stick circuit for the relay **5GZ** can be opened is by the restoration of the lever SGL to its center position to apply energy to

the wire 12 through contact 14 and by the operator setting the code communication system into operation whereby energy can be applied momentarily at the field station to the wire 12^1, and thus to the winding of relay B. The picking up of relay B is effective to open the stick circuit for relay 5GZ at back contact 21. It is also provided that the relay 5GZ can be dropped away by the opening of its stick circuit at front contact 23 of relay 4DES as by the actuation of the detector barrier DB in a manner to be hereinafter considered.

The picking up of relay 5GZ in a manner which has been described is effective by the closure of front contact 25 to allow the clearing of signal 5A or signal 5B, as selected by the position of the track switch W, and by automatic track circuit control, all of which selections are not shown but are well known to those skilled in the art, and have been merely indicated by dotted lines for the purpose of simplification of this disclosure.

The signals 2, 3 and 4 are assumed to be conventional automatic block signals which are normally clear, in accordance with the condition of occupancy of the various blocks in advance thereof. Thus, assuming the trackway to be unoccupied by trains, signal 4 provides a caution indication when signal 5 is at stop as an indication to a train in approach of signal 4 to proceed prepared to stop at signal 5. Assuming the signal 5A to be cleared as described above the signals 2, 3 and 4 are all clear. Although the circuits for the controls of signals 2, 3, and 4 has not been shown, it will be readily apparent to those skilled in the art that these signals may be controlled in accordance with practically any of the well-known signal control systems generally employed in practice.

It will be assumed that an eastbound train accepts the clear signal 2 at a time when the signals 2, 3, 4 and 5A are clear, and that such train passes over the detector barrier DB. It will also be assumed that the detector barrier DB is actuated by dragging equipment beneath the train, and thus the contact DEC is momentarily opened. Upon the opening of such contact, the stick circuit which has been described for the relay DES is interrupted, and thus the relay 2DES is dropped away. The restoration of the contact DEC to its normally closed position does not cause the restoration of the relay 2DES because the presence of the train in the track section 2T causes the track relay 2TR to be dropped away, and the closure of front contact 26 of relay 2TR is essential to allow relay 2DES to be picked up. Relay 2DES, therefore, is not restored until the track section 2T becomes unoccupied in the rear of the train.

Upon the dropping away of relay 2DES, the relay 3DES is dropped away because of the opening of its stick circuit at front contact 16. The front contact 27 of the track relay 2TR that is connected in multiple with front contact 16 of relay 2DES is open at that time because of the presence of the train in the track section 2T.

Upon the dropping away of relay 3DES, the relay 4DES has its stick circuit opened at front contact 18 but, assuming the eastbound train as yet not to have entered the track section 3T, the front contact 28 of relay 3TR is maintained closed to supply energy to the stick circuit for relay 4DES to maintain that relay picked up.

Assuming further passage of the eastbound train so as to accept the signal 3 and enter the track section 3T, the dropping away of relay 3TR, by the opening of front contact 28 with the front contact 18 of relay 3DES already open, removes energy from the stick relay 4DES to cause that relay to be dropped away.

The relay 4DES in dropping away opens the stick circuit for the lower winding of relay 5GZ at front contact 23, and causes the relay 5GZ to be dropped away. A front contact 29 of the relay 5RGP is connected in multiple with contact 23 of relay 4DES, but such contact is open at that time because of the signal 5A being clear. The signal 5A is restored to stop upon the opening of front contact 25 of relay 5GZ in order that the train in approach of signal 4 may be stopped at signal 5 for checking its cars for dragging equipment.

In accordance with the putting to stop of signal 5A, the signal 4, because of its automatic control, changes its indication from clear to caution, and in order that the trainmen of the approaching train may be informed that the train is being stopped because of the dragging equipment detector being actuated, a special indicator lamp at signal 4 in the form of the lunar white lamp LW is energized. This lamp is energized in accordance with the dropping away of the relay 4DES in response to the actuation of the dragging equipment detector barrier DB in an obvious manner upon the closure of back contact 30. It is thus provided that the eastbound train will reduce its speed in accordance with the caution indication at signal 4 and prepare to check its cars for dragging equipment in accordance with the energization of the lunar white lamp LW.

The operator at the control office is notified of the actuation of the detector barrier DB upon the dropping away of relay 4DES in accordance with the closure of back contact 24. The closure of back contact 24 is effective, through the code communication system to apply energy to wire 10 for the energization of lamp DK at the control office.

When the track section 2T becomes unoccupied in the rear of the train, the closure of front contact 26, upon the picking up of relay 2TR, closes an obvious pick-up circuit for the relay 2DES, thus allowing the stick circuit to be again established for that relay so that front contact 15 of relay 2DES shunts front contact 26 of relay 2TR out of the control circuit and renders the continued energization of relay 2DES dependent entirely upon the contact DEC of the dragging equipment circuit controller C.

Assuming the eastbound train to accept signal 4 and leave the track section 3T, the picking up of relay 3TR in the rear of the train is effective by the closure of front contact 31 to cause the picking up of relay 3DES by the closure of the pick-up circuit for that relay. Such pick-up circuit extends from (+), including front contact 16 of relay 2DES, front contact 31 of relay 3TR, and winding of relay 3DES, to (−). The closure of front contact 17 of relay 3DES shunts front contact 31 of relay 3TR out of the circuit just described to cause the relay 3DES to be maintained picked up, dependent upon the front contacts 16 and 27 of relays 2DES and 2TR respectively.

There is generally a telephone located near the office controlled signal 5 by which a trainman can communicate with the operator at the control office to inform the operator when the train has been checked for dragging equipment and

thus when it is ready to proceed. Upon the reception of such information from a trainman, the operator at the control office can proceed to cause the signal 5A to again be cleared by the actuation of the signal control lever SGL to its right-hand position as has been heretofore described, and in addition depressing the detector cancel button DCB. The depression of the detector cancel button DCB applies a positive potential to wire 11, and through the communication system during a cycle of operation provides for the momentary energization of the wire 11' at the field station, the energization of which provides for the energization of the upper winding of the relay DCS to cause that relay to be picked up. Upon the picking up of the relay DCS, a stick circuit is established for its lower winding to maintain that relay picked up, such stick circuit extending from (+), including front contact 20 of relay 5TR, back contact 21 of relay B, front contact 32 of relay DCS, and lower winding of relay DCS, to (—). It will be noted that this stick circuit can either be opened by the passage of the train into the track section 5T, as is effective in the slotting of the signal 5A, or such stick circuit can be opened by the picking up of the relay B in response to the designation by the operator at the control office of a stop signal control to be transmitted by the code communication system to the field station.

The reception of the assumed control cycle of operation during which the signal lever SGL is in its right-hand position to allow the clearing of signal 5 is effective to cause the picking up of relay 5GZ in a manner similar to that which has been described. Inasmuch as the energization of the upper winding of the relay RGZ is only momentary, the stick circuit must be immediately established for the lower winding of that relay in order that such relay may be maintained picked up to allow the clearing of signal 5A in accordance with the closure of front contact 25. Thus it is provided that the front contact 29 of relay 5RGP (in multiple with the front contact 23 of relay 4DES which is open at that time) allows the closure of the stick circuit for the lower winding of relay 5GZ immediately upon the picking up of that relay because the signals 5A and 5B are at stop at the time when the relay 5GZ is picked up, and thus the relay 5RGP is energized.

Upon the closure of front contact 33 of relay 5GZ, with the detector cancellation stick relay DCS picked up, a circuit is closed for picking up the relay 4DES so that such relay, by the closure of front contact 23 is effective to maintain a stick circuit for the relay 5GZ after the signal 5A has had time to clear and cause the dropping away of the stop repeater relay 5RGP to open front contact 29. The circuit by which the relay 4DES is picked up under such conditions extends from (+), including back contact 34 of relay 4TR, front contact 35 of relay DCS, front contact 33 of relay 5GZ, and winding of relay 4DES, to (—). The closure of front contact 19 of relay 4DES upon the picking up of that relay shunts the contacts 33 and 35 of relays 5GZ and DCS respectively out of the circuit just described, and thus causes the relay 4DES to be maintained picked up by a stick circuit dependent upon the closure of either back contact 34 of relay 4TR, front contact 18 of relay 3DES or front contact 28 of relay 3TR. The lamp DK at the control office is extinguished by the opening of back contact 24 of relay 4DES.

Assuming the eastbound train to accept the signal 5A after it has been cleared, the entrance of the train into the track section 5T is effective to restore the relays 5GZ and DCS to their normally deenergized positions because of the opening of the stick circuit for such relays at front contact 20 of relay 5TR.

When the track section 4T becomes unoccupied in the rear of the eastbound train, the picking up of relay 4TR opens the stick circuit that has been described for relay 4DES at back contact 34 and such relay is then maintained picked up dependent upon front contacts 18 and 28 of relays 3DES and 3TR respectively. The picking up of relay 5TR, when the track section 5T becomes unoccupied in the rear of the eastbound train, by the closure of front contact 20 conditions the stick circuit for the relays 5GZ and DCS so that such relays can again be energized as required in a manner similar to the heretofore described procedure.

From the description as it has been set forth upon considering the passage of a train which it is assumed has actuated the detector DB, it is believed to be readily apparent to those skilled in the art that, should the barrier DB not be actuated by a train, the relays 2DES, 3DES, and 4DES would remain picked up because of their stick circuits which bridge around the track relay contacts in the pick-up circuits of these relays, and thus if the barrier DB is not actuated, the passage of the eastbound train becomes effective under signal indications in the conventional railway signaling manner. It will also be apparent that the relays 2DES, 3DES, and 4DES are not affected by passage of a westbound train over the trackway, if such train movement were permitted, because of the shunting around the track contacts in the pick-up circuits of the respective relays 2DES, 3DES, and 4DES by the respective stick contacts of such relays.

Assuming that eastbound trains move over the trackway strictly according to signal indications, and move only on proceed or caution signal indications so that no track section can be occupied by two trains at the same time, and that each track section is long enough to accommodate at entire train, the circuit organization of the relays 2DES, 3DES and 4DES is such that the tripping of the detector barrier DB by a second train can not put the signal 5 to stop for a preceding train, but will put that signal to stop for the particular train which is assumed to have tripped the detector barrier DB.

To consider a specific example of the mode of operation under such conditions it will be assumed that an eastbound train has passed over the detector barrier DB without tripping such barrier and has moved into the track section 3T and allowed the restoration of the track relay 2TR for the track section 2T in the rear of that train. The contact DEC has not been opened, and thus the relay 2DES, is maintained picked up, and because of relay 2DES being picked up, the front contact 16 is maintained closed to maintain the relay 3DES energized. When the track section 2T becomes unoccupied in the rear of the train, the signal 2 is put to caution in accordance with track section 2T being unoccupied and track section 3T being occupied.

It will be assumed that under such conditions a second eastbound train accepts the caution signal 2 and passes over the detector barrier DB. It will also be assumed that the second east-

bound train has dragging equipment which actuates the detector barrier DB. In accordance with the actuation of such barrier, the relay 2DES is dropped away in a manner which has been described, and the dropping away of that relay opens the stick circuit for relay 3DES at front contact 16, the front contact 27 of relay 2TR being opened at that time because of the presence of the second eastbound train in the track section 2T.

The relay 3DES, however, is not dropped away under the above described conditions because the first eastbound train, by occupying the track section 3T, is effective to maintain the relay 3DES picked up by a stick circuit including back contact 31 of relay 3TR and front contact 17 of relay 3DES, irrespective of the opening of front contacts 16 and 27 of relays 2DES and 2TR respectively. Thus, the first eastbound train, because it has not actuated the detector barrier DB, maintains the relay 3DES picked up, and the front contact 18 closed to apply energy to the relay 4DES for maintaining that relay energized. Thus the stick circuit for the lower winding of the signal control relay 5GZ is maintained closed at front contact 23.

To consider the mode of operation upon further movement of the eastbound trains, it will be assumed that the first eastbound train moves into the track section 4T so as to allow the track section 3T to become unoccupied in the rear of that train. In accordance with such train movement, the picking up of the relay 3TR opens the stick circuit by which the relay 3DES has been maintained picked up at back contact 31, and thus causes the dropping away of that relay because of the barrier DB having been tripped by the second eastbound train.

The dropping away of relay 3DES, by the opening of front contact 18 cannot cause the dropping away of relay 4DES however, because energy is applied to that relay through front contact 28 of relay 3TR at that time, and also through back contact 34 of relay 4TR because of the presence of the first eastbound train in the track section 4T.

Due to the track section 3T being unoccupied in the rear of the first eastbound train, the signal 3 is put to caution to allow passage of the second eastbound train into the track section 3T.

When the track section 2T becomes unoccupied in the rear of the second eastbound train, the picking up of the relay 2TR, by the closure of front contact 26, provides for the picking up of the relay 2DES, but the picking up of that relay, by the closure of front contact 16 cannot effect the picking up of relay 3DES, because the pick-up circuit for that relay is open at that time at front contact 31 due to the presence of the second eastbound train in the track section 3T.

To assume further progress of the trains, it will be assumed that the first eastbound train accepts the signal 5 and enters the track section 5T, and that the track section 4T becomes unoccupied in the rear of the train so as to allow the picking up of the track relay 4TR. The picking up of relay 4TR, by opening back contact 34 in the stick circuit for relay 4DES, causes relay 4DES to be dropped away because of the relay 3DES being dropped away and the track section 3T occupied as a result of the passage of the second eastbound train. The dropping away of relay 4DES, by the closure of back contact 24 applies energy to wire 10^1 to effect the transmission during an indication cycle of the code communication system of

an indication to the control office so as to apply energy at the control office to wire 10, and thus effect the energization of the dragging equipment detector indicator lamp DK.

The operator at the control office, upon observing the illumination of the indicator lamp DK is informed that the second train must stop at signal 5 and check its cars for dragging equipment, and thus he will not designate as signal control for transmission to signal 5 for the clearing of that signal until he receives telephone communication from a trainman informing him that the train has been checked over for dragging equipment and is ready to proceed. Under such conditions, the clearing of signal 5 is accomplished in response to the actuation of the detector cancel button DCB in combination with the signal lever SGL in a manner which has been described.

It will be noted that the dropping of relay 4DES, when the track section 4T becomes unoccupied in the rear of the first eastbound train causes the illumination of the lunar white lamp LW at signal 4 by the closure of back contact 30, and at that time the picking up of the track relay 4TR is effective to allow the signal 4 to indicate caution. It is thus provided that the second eastbound train can move into the track section 4T under a caution indication, the energization of the lunar white lamp LW being effective at signal 4 to inform the trainmen that they must stop at the next signal and check their train for dragging equipment.

It is believed to be readily apparent that the system control apparatus is restored to its normal condition in a manner which has been described when it is assumed that the eastbound trains under consideration have progressed so as to leave the stretch of trackway illustrated in this embodiment of the present invention.

Assuming briefly another typical condition involving the movement of following trains, if a first eastbound train has actuated the detector barrier DB and moved into the track section 3T so as to leave the track section 2T unoccupied in the rear of the train, the picking up of the track relay 2TR allows the restoration of the relay 2DES. The relay 3DES, can be picked up upon the closure of front contact 31 of relay 3TR when the track section 3T becomes unoccupied in the rear of the first train, thus conditioning the dragging equipment detector system so that if the passage of a second train fails to actuate the barrier DB, the signal 5 will not be put to stop for the second train as such train has not tripped the detector barrier DB.

Although the dragging equipment detector organization according to Fig. 1 can be rendered effective only when a train is in the track section with which the detector barrier is associated, there are some conditions to be encountered in practice where there is a possibility of the barrier DB being actuated manually by an unauthorized person after a train has passed over the barrier, but while the train is still within that track section. Such condition might readily be found where the barrier DB is located near a highway crossing, and the track section with which the barrier is associated is of considerable length so that the train could very readily still be in the track section with which the barrier DB is associated at a time when such barrier could be actuated by an unauthorized person passing along the highway.

If it is desired to prevent such unauthorized operation from being rendered effective, the relay

3DES may have its control circuit modified as illustrated in Fig. 2, for example, so as to allow the tripping of the yieldable barrier DB to be effective to put the signal 5 to stop only when the track sections 1T and 2T are simultaneously occupied. In accordance with this arrangement the detector barrier DB is located relatively close to the entrance end of the track section 2T for purposes of allowing its response to dragging equipment of the last cars of a train to be effective to put the signal 5 to stop.

It is thus provided that the relay 3DES, according to Fig. 2, is maintained picked up by stick circuit means corresponding to that which has been described except that front contact 36 of relay 1TR is added in multiple with the front contact 27 of the relay 2TR.

According to the circuit organization of Fig. 2, it is desirable that the track relay 2TR be relatively quick in dropping away so that the relay 2TR is dropped away immediately upon the entrance of a train into the track section 2T, the front contact 36 of the relay 1TR having been previously opened due to the presence of the train in the track section 1T. Thus, by the track relay 2TR being relatively quick acting, the actuation of the barrier DB by equipment dragging from beneath the front of the train can be rendered effective to cause the signal 5 to be put to stop.

The track relay 1TR is made sufficiently slow in picking up to allow the actuation of the detector barrier DB by equipment dragging beneath the last cars of the train to be effective to put the signal 5 to stop. In other words, the track relay 1TR is made sufficiently slow in picking up to allow the rear of the train to pass over the barrier DB so as to render the actuation of the barrier DB beneath any car of the train effective to put signal 5 to stop.

The circuit organization just described is obviously effective to prevent the manual actuation of the barrier DB after passage of a train from being effective to put the signal 5 to stop (assuming the train to still be in the track section 2T), provided of course that there is no following train entering the track section 1T. The entrance of such following train into the track section 1T would of course drop the relay 1TR at a time when the relay 2TR is dropped away and thus rendered the control of signal 5 subject to the actuation of the barrier DB although there is no train passing directly over the barrier at that time. It will be readily recognized however that this is an extraordinary condition which would not generally be encountered in practice, and that the requiring of the track relays 1TR and 2TR to be both dropped away to render the signal 5 subject to actuation of the barrier DB generally requires that the barrier DB be actuated when under a train in order for it to be effective.

Having thus described a signaling system comprising dragging equipment detector apparatus for a specific stretch of trackway as one embodiment of the present invention, it is desired to be understood that this form is selected to facilitate the disclosure of the invention rather than to limit the number of forms which the invention may assume, and it is to be further understood that various alterations, modifications and adaptations may be applied to the specific form shown to meet the requirements of practice, without in any manner departing from the spirit or scope of the present invention except as limited by the appending claims.

What I claim is:

1. In a signaling system for a stretch of railway track having a manually controlled signal for governing a given direction of traffic and having a plurality of track sections in approach to said signal, a train actuated barrier across said track in one of said track sections, electro-responsive means effective to allow the clearing of said signal in response to a manual control, said electro-responsive means being effective to put said signal to stop in response to the actuation of said barrier, and circuit means for rendering said electro-responsive means non-responsive to the actuation of said barrier if said barrier is actuated when its associated track section is unoccupied by a train.

2. In a signaling system for a stretch of railway track divided into respective first and second track sections for a given direction of traffic and having a signal for governing passage of a train out of said second track section for said given direction of traffic, a dragging equipment detector barrier disposed across the trackway in said first track section, said barrier having a normally closed contact momentarily opened when said barrier is actuated by equipment dragging from beneath a train, a detector stick relay having a stick circuit including said normally closed contact, said stick relay having a pick-up circuit closed only when said first track section is unoccupied, and circuit means dependent upon the dropping away of said detector stick relay for putting said signal to stop.

3. A signalling system for railroads comprising in combination, a stretch of track having several track sections in approach to a signal, a dragging equipment detector barrier disposed across the trackway in the track section most remote from said signal, a stick relay for each of said track sections, stick circuit means for maintaining said stick relay energized dependent upon the energization of the stick relay for the next adjoining track section away from said signal, said stick circuit means for the first of the stick relays being subject to deenergization by the actuation of said barrier, whereby said stick relays are tumbled down for the respective track sections in approach to said signal in response to the actuation of said barrier, track circuit governed means for rendering the initiation of the tumble-down ineffective in response to the actuation of said barrier if the track section in which the barrier is disposed is unoccupied, and signal control means for putting said signal to stop upon actuation of said barrier only provided that the tumble-down of all of said stick relays has become effective.

4. In a signalling system for a stretch of railway track divided into several track sections approaching a signal comprising in combination, a dragging equipment detector barrier of the self-restoring type disposed across the trackway in the track section most remote from said signal and biased to an upright position, a normally closed contact subject to actuation only when said barrier is depressed from its upright position, a two-position electroresponsive means normally assuming one of said two positions and controlled to its other of said two positions by a momentary opening of said normally closed contact only if a train is in approach to said signal, said electroresponsive means remaining in its said other position throughout the presence of such train unless manually restored, a signal control relay effective when picked up to clear

said signal, a stick circuit for said signal control relay maintained closed only if said electroresponsive means is in its said other position, and circuit means effective to restore said electroresponsive means to its said one position in response to a manual control provided said signal control relay is subsequently picked up.

5. In a railway signaling system having first and second signals respectively governing a given direction of traffic through a stretch of trackway and a track section in approach to each signal, a dragging equipment detector barrier disposing across the trackway, signal control means allowing the clearing of said second signal, said signal control means being effective to put said second signal to stop in response to the actuation of said barrier by equipment dragging beneath a train, and detector indication means associated with said first signal effective to indicate distinctively when said barrer has been actuated as compared to the signal indications normally provided upon passage of trains which do not actuate the detector barrier, whereby said first signal indicates distinctively to an approaching train that such train is being stopped at said second signal because of said barrier having been actuated by equipment dragging beneath the train.

6. In a signaling system for a stretch of track having a signal manually controlled from a control office, a dragging equipment detector barrier disposed across the trackway in approach to said signal, circuit means momentarily effected for manually controlling said signal from the control office to permit said signal to clear, stick circuit means for said signal normally effective to allow said signal to remain clear until it is accepted by a train, detector circuit means responsive to the actuation of said dragging equipment detector barrier for rendering said stick circuit means ineffective, and circuit means manually controlled from the control office for rendering said detector circuit means ineffective and thereby permit the clearing of said signal.

7. In a signaling system of the character described for a stretch of track having several track

sections in approach of a signal, a dragging equipment detector barrier disposed across the track in the track section most remote from said signal, a stick relay for each of said track sections, stick circuit means for maintaining each of said relays energized dependent upon the energization of said stick relay for the next adjoining track section away from said signal, said stick relay for said track section in which said barrier is disposed being subject to deenergization by the actuation of said barrier, and stick circuit means for each of said stick relays except said stick relay associated with said barrier for maintaining the stick relay energized when its associated track section is occupied by a train, irrespective of the actuation of said barrier, and circuit means responsive to the deenergization of said stick relay for the track section immediately in approach of said signal for putting said signal to stop.

8. In a signaling system for a stretch of railway track having a manually controlled signal for governing a given direction of traffic and having a plurality of track sections in approach to said signal, a dragging equipment actuated barrier disposed across the track in one of said track sections, electro-responsive means for permitting the clearing of said signal in response to a manual control, said electro-responsive means being effective to put said signal to stop in response to the actuation of said barrier, and circuit means for rendering said electro-responsive means effective to put said signal to stop only when said one track section and an adjoining track section are simultaneously occupied.

JOHN J. JACOBUS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,063,336	Post	Dec. 8, 1936
2,095,616	Post	Oct. 12, 1937