

**March 9, 1937.**

O. H. DICKE

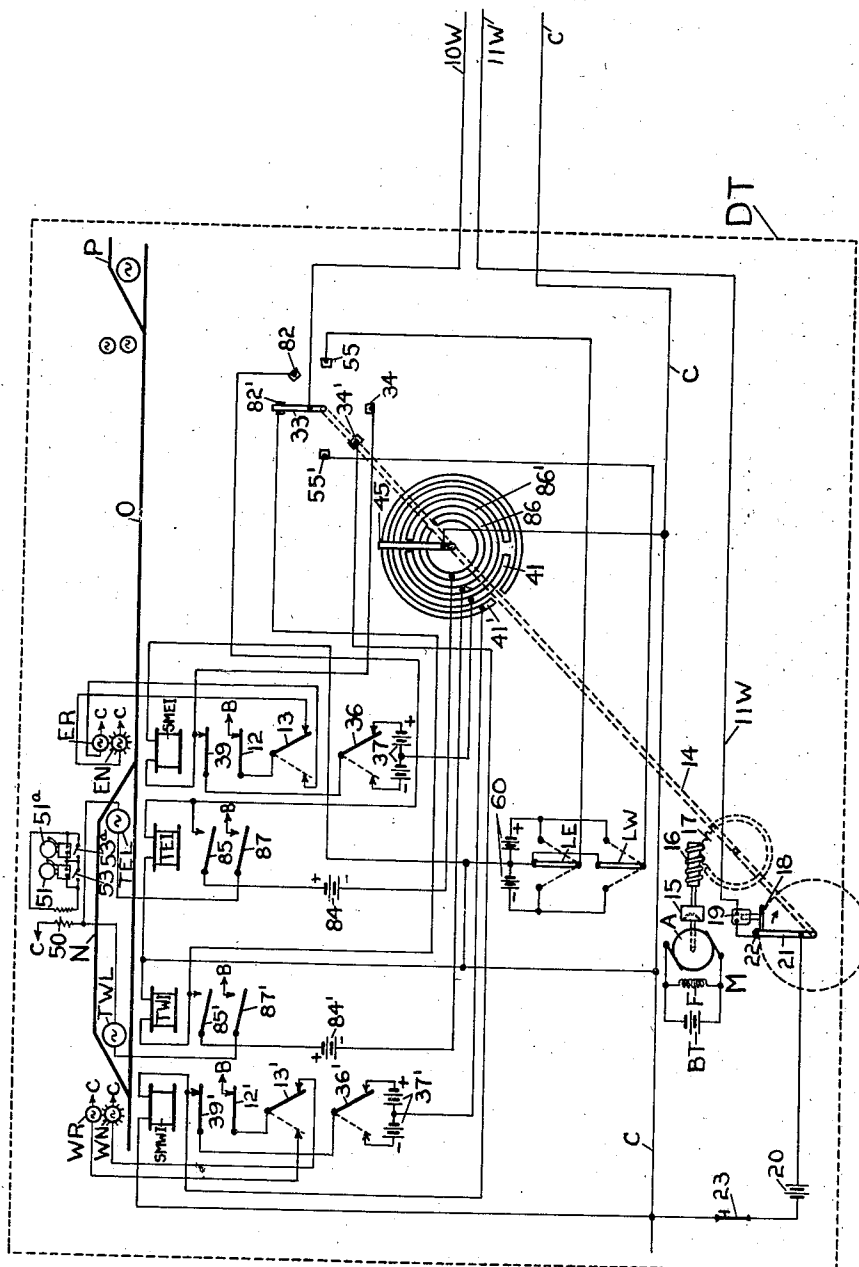
**2,073,050**

# TRAIN DISPATCHING SYSTEM FOR RAILROADS

Filed April 2, 1927

3 Sheets-Sheet 1

Fig. 1 A



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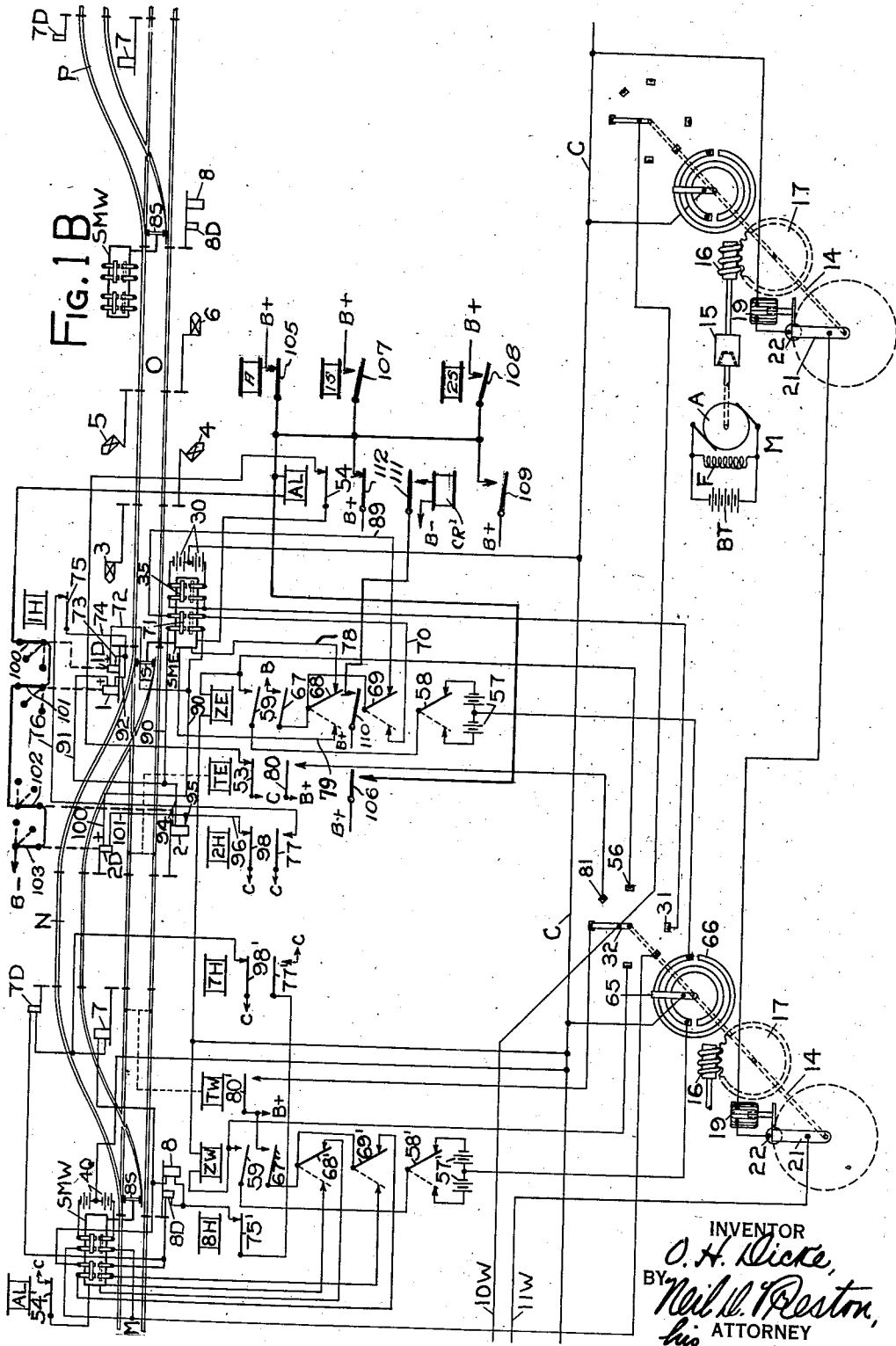
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**2,073,050**

# TRAIN DISPATCHING SYSTEM FOR RAILROADS

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3 Sheets-Sheet 2



March 9, 1937.

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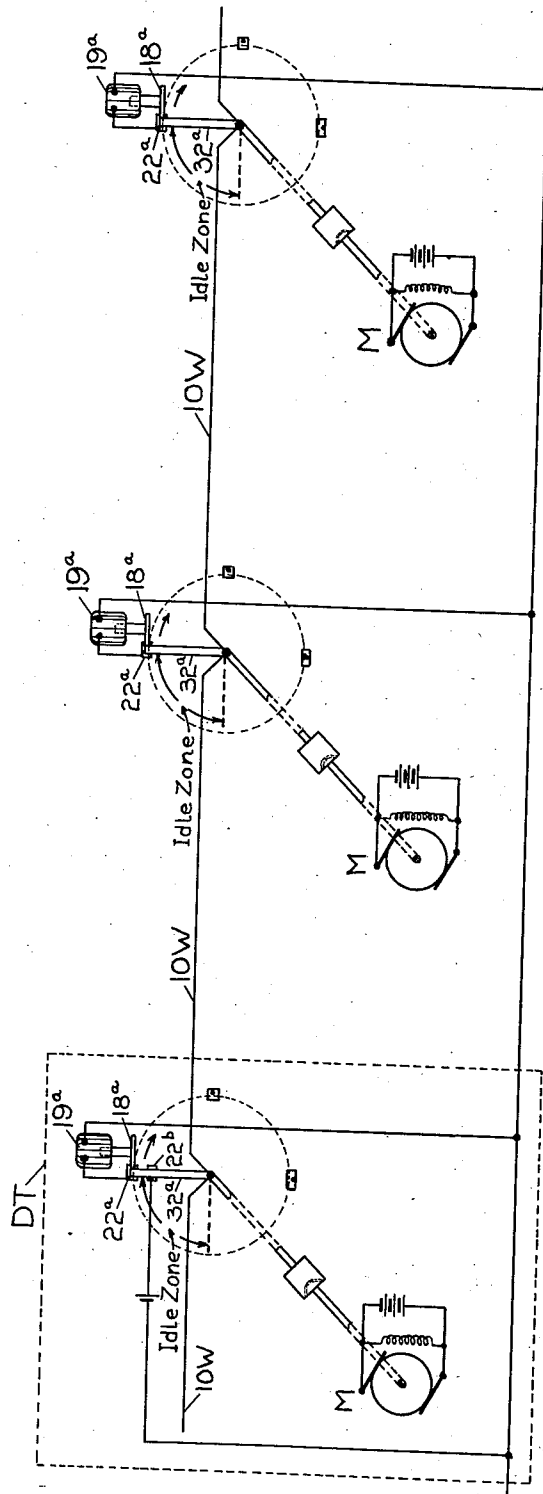
2,073,050

TRAIN DISPATCHING SYSTEM FOR RAILROADS

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3 Sheets-Sheet 3

Fig. 2



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## UNITED STATES PATENT OFFICE

2,073,050

TRAIN DISPATCHING SYSTEM FOR  
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Application April 2, 1927, Serial No. 180,475

26 Claims. (Cl. 246—3)

This invention relates to a train dispatching system in which the movement of trains is dispatched by wayside signal indications (or cab signal indications where cab signals are used) and more particularly to the control and indication mechanism, affording a large number of controls for governing or dispatching the train movements and affording a large number of indications for indicating the movement of the trains, employing a small number of line wires and circuits.

It has heretofore been proposed in an application for patent filed by S. N. Wight Serial No. 120,423 filed July 3, 1926, to dispatch the movement of trains through the medium of manual control superimposed upon starting and entering signals at passing sidings of a single, or double track railway system, which starting and entering signals are controlled by track circuits and the like in accordance with traffic conditions ahead. This superimposed manual control permits such signals to clear only in accordance with traffic conditions, and affords means whereby any one or more of such signals may be held at stop. In said Wight application provision has also been made for safely operating a switch machine at a distant point in response to manual control means controllable by the dispatcher at a local tower. In the particular arrangement of the apparatus disclosed in said Wight application the direction in which traffic may move through the single track joining two passing sidings is determined by the sequence in which signals governing the entrance of trains into such single track section are cleared. That is, assuming that all the signals governing the entrance and departure of trains into or out of either end of a single track section are held at stop, and it is desired to set up each bound traffic, this may be accomplished in the Wight application by permitting clearing of the signals at the west end of the single track section first and then permitting clearing of certain signals at the east end of such single track section, in which event the starting signals at the west end of such single track section will clear, but the starting signals at the east end of such single track section will be held at stop. Obviously, this idea of controlling the direction in which traffic may move in a single track section by the sequence in which signals are cleared was resorted to by Wight in order to obtain additional controls without the need of additional line circuits, bearing in mind that the distance between the dispatcher's tower and the passing siding in some cases is many miles. In

the application of Wight there has also been disclosed means for giving indications as to changes of the occupancy of track circuits, as distinguished from means for continuously indicating the condition of occupancy of a track circuit.

In accordance with the present invention it is proposed to control the clearing of signals for the purpose of dispatching the movement of trains in a signal system as shown in the Wight application, to operate the switch machines, to receive continuing indications as to the position of each of the various switch machines, and to indicate continuously the condition of occupancy of various track circuits of a section of the railroad including a large number of passing sidings, all through the medium of a very few control circuits, some of which include the same or common return wire. Before mentioning the specific objects, purposes and characteristic features of the invention it is deemed expedient to first consider the problems encountered in endeavoring to reduce the control circuits for a system such as above mentioned. In the first instance it should be understood that it is difficult to control by a single means an exceedingly large number of signals independently of each other, remembering that certain trains may be desired to be held at stop while it is desired to allow many other trains to proceed. In the second instance, if it is desired to give indications as to the condition of occupancy of all the track circuits of the railway system there is a possibility of not only a large number of track circuits being occupied at the same time but there is also a possibility of track circuits being entered upon at the same instant, so that it is very difficult to obtain simultaneous control as to the occupancy of these track circuits.

In view of the foregoing and other important considerations it is proposed in accordance with one form of the invention to provide a single line circuit which connects to a large number of synchronously rotated contacts, which contacts wipe over or otherwise close circuits to successive segments, these segments being connected to control suitable responsive means in such a way that if one of these segments at one location is energized a responsive means connected to corresponding segment at a distant point is energized as a result of the energy applied to the first mentioned segment. In other words, it is proposed to allot the use of the line circuit as to time to each of a plurality of functions, this allotment of the line circuit being repeated once during each revolution of the synchronized contacts.

More specifically, it is not only proposed to energize a relay at a distant point through the momentary connection of this relay to a control lever as a result of the allotment of the line circuit as just mentioned, but it is further proposed to complete a stick circuit for such relay throughout the entire remaining period or cycle of operation of the synchronous contact. In other words, if the line circuit is allotted to a particular function for the first 50th part of a revolution of the synchronized contacts, a relay can be picked up at a distant point during this first 50th of a revolution, and with the relay once picked up a stick circuit is completed which will maintain the relay energized through the remaining 49/50th of the control cycle.

Other objects, purposes and characteristic features of the invention will appear as the description thereof progresses, and will in part be obvious from the drawings when taken in connection with the application of Wight above mentioned.

In describing the invention in detail reference will be made to the accompanying drawings in which:—

Figs. 1A and 1B disclose a system of train dispatching wherein both the manual control of the distant signals and switch machines, and the indications as to the position of the switch machines and the occupancy of the various track circuits is continuously indicated through a system of synchronized control of the type above mentioned; and

Fig. 2 shows a synchronized control system similar to that shown in Figs. 1A and 1B employing a modified form of synchronizing means.

*Apparatus Figs. 1A and 1B.*—Referring to Figs. 1A and 1B, and bearing in mind that the system shown therein is one wherein the outlying signals and switch machines are controlled from the dispatcher's tower DT, and wherein indications are transmitted as to the operated positions of the various switch machines and the condition of occupancy of various track circuits to the tower, all through the medium of one line wire, one common return wire and associated mechanism whereby the use of the line wire is allotted as to time to a large number of functions. Referring to Fig. 1B in which there has been shown a single track section O, of a single track railway system, the passing siding N and a portion of the passing siding P. Although, the dispatching system embodying the present invention may be applied to double track railways signalled with any type of wayside signalling means, for convenience it is assumed that the signalling system shown is one of the absolute-permissive-block type such as shown in detail in the application of Wight mentioned. In the particular arrangement shown, the signals governing west bound traffic have been assigned reference numbers 1, 3, 5 and 7, as shown, the signals governing east bound traffic containing reference numbers 2, 4, 6 and 8, respectively, and the siding signals have been designated D with a prefix corresponding to that of the corresponding main signal.

Although the wayside signals illustrated are signals of the semaphore type, and although the starting and entering signals have been illustrated as two position signals, all of these signals are preferably three aspect signals, and may be either of the semaphore, the color light, position light or position color light signals, semaphore signals having been illustrated for convenience. In this

connection it should be noted that the signals shown adjacent the track switch 1S and 8S, namely signals 1, 1D, 2, 2D, 7, 7D, 8 and 8D all have square blades, whereas the remaining signals have pointed blades, this distinctive configuration of the various blades is to conventionally illustrate that the signals 1, 1D, 2, 2D etc. are stop and stay signals which must not be passed unless one of the governing signals indicate proceed, and the intermediate signals 3, 4, 5 and 6 having pointed blades conventionally designate permissive signals which may be passed at low speed even though they indicate stop. The switches at the west end of passing sidings N and P have been designated 8S and the track switch at the east end of passing siding N has been designated 1S. These switches are preferably operated by suitable power operated switch machines, and these switch machines have been designated SMW and SME, respectively. Adjacent the switches 8S and 1S are contained fouling or detector track circuits of the usual construction, which are used to indicate the presence of a train on those parts of the main track and siding which conflict with each other, and these detector track circuits include track relays TW and TE, respectively. In addition to the starting signals 2 and 7 there are provided dwarf signals 2D and 7D which govern the movement of traffic off of the siding into the main track, and in addition to the entering signals 1 and 8 shown there are provided take siding signals or lower arm signals 1D and 8D for governing the movement of trains into the siding. Each of the various signals is controlled by a home relay designated H with a prefix corresponding to the reference number of the signal, that is the signals 2 and 2D are governed by the home relay 2H, and the position the switch machine SME is assuming, the signals 1 and 1D are governed by the home relay 1H and the position the switch machine SME is assuming at the time; the signals 8 and 8D are controlled by the home relay 8H and in accordance with the position the switch machine SMW is assuming at the time, and the signals 7 and 7D are governed by the home relay 7H and in accordance with the position the switch machine SMW is assuming at the time. The switch machine SMW and the signals 1, 2, 1D and 2D at the east end of the passing siding N may be governed in accordance with the energization of the control relay ZE and in accordance with whether the signal 7 at the east end of the single track section O is clear or not, all in accordance with the arrangement shown in the application of Wight heretofore referred to, and the signals 8, 8D, 7 and 7D and the switch machine SMW are controlled in accordance with the position of the control relay ZW and also depending upon whether the signal 2 at the east end of the single track section M is clear at the time all in a manner as explained in said Wight application. In this connection it is desired to point out that the control circuits for the signals 1, 1D, 2, 2D, 7, 7D, 8 and 8D are not exactly the same as those shown in the Wight application mentioned, partly because the control for the caution indication has been omitted and partly because a slightly different interlock between signals is employed, and it is to be understood that the control circuits as shown in the Wight application may be used, if desired.

The system shown also includes an approach locking relay AL which may be controlled in the same way as is the relay CR shown in the Wight application. This approach locking relay pre-

vents the switch machine being operated in the face of an approaching train.

Referring more particularly to Fig. 1A of the drawings in which a portion of the apparatus in the dispatcher's tower DT has been illustrated, the dispatcher's tower DT shows a miniature track layout including the passing siding N, a single track section O and a portion of the passing P. At the east end of the passing siding N has been shown an indicator comprising an indicating lamp TEL, which is controlled to continuously indicate the condition of occupancy of the detector track circuit including track relay TE through suitable means more particularly described hereinafter. A similar indicating lamp TWL being provided at the west end of the passing siding N. Also, at the east end of the passing siding N of the miniature track layout are provided two lights preferably distinctive in color of which the light EN indicates, or is illuminated, when the track switch IS at the east end of passing siding N is in its normal position and the light ER indicates when this track switch is in its reversed or take siding condition, similar switch indicating lamp WN and WR being provided at the east end of the passing siding N in the dispatcher's miniature track layout. The detector track circuit indicating lights TEL and TWL are controlled by indicating stick relay TEI and TWI, and the switch machine indication lamps EN—ER and WN—WR are controlled by polar stick relays SMEI and SMWI, respectively, in a manner as more clearly described presently.

The apparatus in the dispatcher's tower also includes audible signals to inform the dispatcher as to the change in the occupancy of a track circuit, that is to say, a change in the indicating condition of any one of the lamps TWL, TEL etc. In the particular arrangement shown the direct current for energizing the lamps TWL, TEL etc., flows through a common wire including the primary winding of a transformer 50, the secondary winding of which transformer is connected in series with the single stroke polarized bells 51 and 51<sup>a</sup>. The bell 51 responds, that is sounds one tap, when current flows in one direction and the bell 51<sup>a</sup> responds when current flows in the other direction. Since the increase of current in the primary winding of transformer 50 causes current to flow in one direction in the secondary winding thereof and a decrease of current in the primary winding of transformer 50 causes current to flow in the other direction in the secondary thereof, one of the bells will sound when a lamp is lighted and the other bell will sound when an indicating lamp is extinguished. The bells are preferably distinctive in tone so that the dispatcher is distinctively audibly informed when a light is lighted and extinguished. Switches 53 and 53A have been provided for rendering the bells 51 and 51<sup>a</sup> respectively inoperative, which switches when closed shunt the respective bells out of the circuit.

As heretofore mentioned the line wire 10W is to be allotted with respect to time for serving a large number of different functions, and in order to have the line wire 10W complete the various independent circuits at different times it is proposed to provide contacts at the dispatcher's tower and at various points along the railway for making such connections simultaneously. In order to accomplish this, it is proposed to rotate contacts carried by different shafts synchronously. Although these contacts

may be rotated by synchronous motors having their field windings and rotor windings energized by alternating currents of different frequencies, may be rotated by suitable step by step mechanism, or may be rotated by motors, the particular arrangement shown in Figs. 1A and 1B of the drawings employ direct current motors, which motors are particularly designed to run at fairly constant speed in spite of certain variations of the voltage of the current source, and the like. These motors M, having a field winding F and an armature A, have each been shown energized from a suitable battery BT. The synchronously driven shafts 14 located at the various control and indication points are driven by the motors M through a suitable slip friction clutch 15, and through worms and worm wheels 16 and 17, respectively. The slip clutch 15 is provided for the purpose of allowing operation of the motor when the synchronous shaft 14 is prevented from starting for any reasons as, for instance, when held in its starting position by the lock pawl 18 of the lock magnet 19, as is at times the case, as more particularly pointed out hereinafter. In spite of the fact that the various motors M are designed to run at substantially the same constant speed it is probable that these motors would cause the various synchronizing shafts 14 to eventually get out of correspondence, and for this reason suitable synchronizing means is provided. The various synchronizing mechanisms have their lock pawls 18 so arranged about the shafts 14 that if the various motors are operated with the lock magnets 19 de-energized all of the shafts 14 will assume the same relative position with respect to the stationary contacts. In the particular arrangement shown the lock magnets 19 are all connected in series with a suitable source of energy, such as the battery 20, when all of these shafts assume corresponding starting positions, but all of these lock magnets 19 are de-energized so long as the synchronous shafts 14 do not assume the starting position. In the particular arrangement shown the series circuit for energizing the lock magnets 19 is closed when all of the rotating contact arms shown assume the upper vertical position through a circuit which may be traced as follows:—beginning at the battery 20, synchronizing contact 21 of the mechanism located in the dispatcher's tower DT, lock magnet 19 of said mechanism, synchronizing wire 11W, synchronizing contact 21 of the mechanism located at the passing siding N, stationary contact 22 of this same mechanism, lock magnet 19 of this same mechanism, synchronizing contact 21 of the synchronizing mechanism located at the passing siding P, stationary contact 22 and lock magnet 19 of this same mechanism, the common return wire C, through the switch 23 back to the battery 20. From this it will readily appear that so long as one of the synchronizing contacts 21 has not engaged its stationary contact 22 that the series circuit through the various lock magnets 19 is not completed and that the remaining synchronizing contacts and their shafts 14 are held from rotating until the slow synchronizing mechanism has caught up and completed the synchronizing circuit by engagement of contacts 21 and 22. By the provision of this synchronizing apparatus the various shafts 14 are kept rotating in substantially exact synchronism.

*Operation of Figs. 1A and 1B.*—In order to get a more clear understanding of the apparatus 75

conventionally illustrated in Figs. 1A and 1B it is deemed expedient to now consider the operation of the system. Before the movements of trains are considered in the operation of the system the position of the switch machine SME and SMW should first be ascertained as manifested by the indicating lights on the dispatcher's miniature track layout. Figs. 1A and 1B should be laid end to end to illustrate the system. Referring to Fig. 1B it will be noted that the switch machine SME is assuming the normal position, and that with it in this position the positive side of the battery 30 is connected to the stationary contact 31 of the synchronizing mechanism located at passing siding N. From this it will be seen that the moment the rotating arm 32 assumes a position to contact with the stationary contact 31 that the rotating contact 33 located at the dispatcher's tower DT is then in engagement with the stationary contact 34, so that, for an instant at least the positive side of the battery 30 is connected to the stationary contact 34 and in turn permits current to flow through the following circuit:—beginning at the plus (+) terminal of the battery 30, contact 35 of the switch machine SME, stationary contact 31 and movable contact 32 of the synchronizing mechanism located at siding N, line wire 10W, movable contact 33 and stationary contact 34 of the synchronizing mechanism located in the dispatcher's tower DT, through the winding of the indicating relays SMEI to the common return wire C connected to the midpoint of the battery 30. With this circuit momentarily completed the indicating relay SMEI is picked up closing its front contact and completing the following stick circuit:—beginning at the positive side of the battery 37 located in the dispatcher's tower, polar contact 36 of the indicating relay SMEI, front neutral stick contact 39 of this same relay, winding of this relay to the common return wire C, to the rotating arm 45 of the synchronizing mechanism located in the dispatcher's tower DT to the stationary contact 41 cooperating with the movable contact 45, back to the neutral point of battery 37. With this stick circuit completed the indicating relay SMEI is energized through the remaining part of the revolution, or until the rotating contact 33 again reaches the stationary contact 34. In other words, energy is transmitted from the distant passing siding N to the indication relay SMEI over the contacts 31 and 34 and the line wire 10W through a small fraction of one revolution of the synchronizing mechanisms, and this indicating relay is then stuck up for the rest of the revolution of the contacts 32 and 33, so long as the contact 31 at the passing siding N is connected to the positive pole of the battery 30 the indicating relay SMEI in the tower DT will remain energized. With the indicating relay SMEI energized positively, that is, with its polar contact 13 to the right the normal indicating lamp EN is illuminated through the following circuit to indicate that the switch machine SME is in the normal position:—beginning at the terminal B of a suitable source of current, front contact 12 of the indicating relay SMEI, polar contact 13 in its right hand position, through the indication lamp EN, back to the common return wire C connected to the other side of said source.

In the same manner as just described the indicating relay SMWI is picked up and stuck up through similar circuit and contacts which have been assigned the same reference numbers with distinctive exponents 1 (one). From this it will

be seen, that in the same manner as just explained the relays SMEI and SMWI may also be picked up and stuck up in their reverse position when the switch machines assume the reversed or take-siding position, in which event the lamps ER and WR, respectively, will be illuminated. It is to be understood that during operation of the switch machines, such as SME, the battery 30 is not connected to the contact 31 and therefore the relay SMEI is de-energized while the synchronous contacts 33 assume a position to engage contact 34 (the stick circuit for this relay then being open at the gap in stick contact 41); so that, this relay SMEI will thereafter assume the de-energized position. In this connection, if desired, the stick circuits for the relays SMEI and SMWI may be omitted and the energization of the indicating lamps EN, ER, WN and WR may be controlled by the polar contacts 13 and 13<sup>1</sup> alone (with contacts 12 and 12<sup>1</sup> omitted), it being understood that the polar contacts of these relays remain in the position to which they were last actuated.

Let us now assume that there is a train moving westwardly in the single track section O, and that the dispatcher wishes this train to move through the siding of the passing siding N and into the single track section M. In order that the train in question may move into the siding it will be necessary for the dispatcher to operate the switch machine SME to the reversed position. In order to accomplish this, the dispatcher will move the lever for the apparatus at the east end of the siding N designated LE to the left hand position, and in so doing will connect the negative or minus (—) side of the battery 60 to the stationary contact 55 of the synchronous mechanism located in the dispatcher's tower DT, so that the following circuit is completed when the rotating contact arm 33 engages the stationary contact 55 of the synchronizing mechanism at the dispatcher's tower DT:—beginning at the negative or minus (—) side of the battery 60 through the lever contact LE, through contacts 55—33 of the synchronous mechanism located at the tower DT, wire 10W through the contact 32—56 of the synchronizing mechanism located at the passing siding N, through the field of the control relay ZE to the common return wire C connected to the midpoint of the battery 60 at the dispatcher's tower. With this circuit momentarily completed the control relay ZE at the east end of the passing siding N will be energized to its left hand dotted position in which position a stick circuit for the relay is completed which may be traced as follows:—beginning at the negative terminal of the battery 57 through the polar contact 58 of the relay ZE assuming the left hand dotted position, the neutral contact 59 through the winding of control relay ZE to the common return wire C, to the rotatable contact 65 of synchronizing mechanism located at the passing siding N, through the stationary contact 66 cooperating with this rotating contact arm 65, back to the midpoint of the battery 57. With this stick circuit completed the control relay ZE will remain stuck up in its left hand dotted position through the remaining part of the revolution of the arms 65 and 32 of the synchronizing mechanism. This energizing of the control relay ZE will of course continue, so long as the dispatcher keeps the lever LE in the left hand position and maintains the stationary contact 55 energized with negative polarity.

With the polar neutral relay ZE energized to the left hand position the following circuit is completed for operating the switch machine to its reversed or take siding position:—beginning at the terminal B of a suitable source of current, preferably a battery, neutral contact 67 of the control relay ZE, polar contact 68 of this relay assuming the left hand dotted position, reverse wire 79, through suitable mechanism for operating the switch machine SME to the reverse position (not specifically shown), through the front contact 54 of the approach locking relay AL, the front contact 53 of the detector track relay TE, to the common return wire C connected to the other side of said source of current. With this circuit completed the switch machine SME will be operated to the reverse position, and upon completing its operating stroke will open the circuit just traced through the medium of suitable switch mechanism (not shown) within the switch machine. With the switch machine SME operated to the reverse position the negative side of the battery 30 will be connected to the stationary contact 31 of the synchronizing mechanism, and with negative energy applied to the stationary contact 31 and in turn momentarily applied to the contact 34 of the synchronizing mechanism in the dispatcher's tower, the polar indicating relay SMEI at the tower is momentarily energized to its left hand dotted position, and if once energized to that position it will remain stuck up through the same stick circuit heretofore traced, except that it includes the other half of the battery 37. In other words, the reversal of the switch machine SME causes reversal of the indicating relays SMEI and in turn causes the illumination of the reverse indicating lamp ER and causes the lamp EN to be extinguished. Also, with the control relay ZE at the passing siding N energized to the left hand dotted position, and with west bound traffic set up in the single track section O, as has been assumed, for which reason the home relay 2H is held de-energized through the usual tumble-down arrangement of the absolute-permissive block system, the lower arm signal 1D may assume the clear position, but the signals 1, 2 and 2D will be held at stop. The energizing clearing circuit for the signal 1 may be traced as follows:—beginning at the terminal B, front control contact 67 of the control relay ZE, polar contact 69 in its left hand dotted position, wire 70, contacts 71 of the switch machine SME closed only when the switch machine assumes its reversed position, wire 72, signal mechanism of the signal 1D, wires 73 and 74, front contact 75 of the home relay 1H, wire 76, back contact 77 of the home relay 2H, back to the common return wire C. It will be noted that the signal 1 cannot clear because its energizing circuit is open at the switch machine contact 71, and that the signals 2 and 2D cannot clear by reason of the fact that the home relay 2H is de-energized. The train may now proceed into the siding of the passing siding N and as soon as it passes the signal 1D and enters upon the detector track circuit the detector track relay TE is de-energized and causes the illumination of the indicator TEL in the tower by reason of the momentary completion of the energizing circuit for the detector track indicating relay TEI at the tower. The circuit whereby the relay TEI is energized may be traced as follows:—beginning at the terminal B of a suitable battery having its other terminal connected to the common return wire C,

back contact 80 of the track relay TE, stationary contact 81 cooperating with the rotatable contact 32 of the synchronizing mechanism located at passing siding N, line wire 16W through the contact 33—82 of the synchronizing mechanism located at the dispatcher's tower, winding of the indicating relay TEI, to the common return wire C connected to the other side of said battery. With the indicating relay TEI momentarily energized by reason of cooperation of contacts 32—81 and 33—82, this relay is caused to be picked up and closes a stick circuit which will remain closed through the remaining part of the revolution of the contact arms 32 and 33 which may be traced as follows:—beginning at the plus (+) side of the battery 84, front stick contact 85 of the indicating relay TEI, winding of this indicating relay TEI, to the common return wire C, through contacts 45—86 of the synchronizing mechanism, the stationary contact 86 of which is connected to the negative side of the battery 84. With the indicating relay TEI energized in response to de-energization of the track relay TE the indicating lamp TEL is illuminated by the flow of direct current through the circuit readily traced on the drawings and including the front contact 87 of the indicating relay TEI. The closure of the circuit for the indicating lamp TEL causes the flux in the core of the transformer to be increased irrespective of whether the current for illuminating other lamps is already flowing in the primary winding of said transformer, and this increase of current causes the bell 51 to sound a single tap.

The approach locking relay AL is preferably a stick relay controlled as shown in the prior application of S. N. Wight Ser. No. 120,423 filed July 3, 1926. Controlled in this way, the approach locking relay is provided with numerous pick-up circuits and a single stick circuit. The stick characteristic of this stick relay AL permits the relay to be picked up when it is safe to operate the switch, as when there is a departing train still in close proximity to the switch, and providing that the signals have remained in the stop position since the relay was so picked up. As shown each of the various pick-up circuits and stick circuits include the contacts 100, 101, 102 and 103 closed respectively when the signals 1D, 1, 2 and 2D are in the stop position. As shown there are four pick-up circuits for the relay AL one of which includes a front contact 105 of the approach relay A, this relay A being energized when there is no train approaching the track switch from either direction to a point extending one track circuit beyond the first signal governing traffic toward the switch. Another pick-up circuit for the approach lock relay AL includes the back contact 106 of the detector track relay TE. This back contact 106 is used to enable a train passing over the track switch to release the locking, that is, pick up the lock relay AL, so that the track switch may be operated during the entrance of a train into the siding. There are two other pick-up circuits for the lock relay AL, one of which includes a front contact 107 of the stick relay 1S, and the other of which includes a front contact 108 of the stick relay 2S. These stick relays 1S and 2S are the usual directional stick relays used in absolute-permissive-block signaling, and therefore need not be described here. These contacts 107 and 108 afford other means for releasing the locking in response to a departing train. There is still another pick-up circuit

for the lock relay AL, and this pick-up circuit includes a front contact 109 of a slow acting relay CR<sup>1</sup>, which relay CR<sup>1</sup> is energized a predetermined time after it is attempted to operate the track switch to a new position, as manifested by the closure of contact 110 of relay ZE, while the approach lock relay AL is deenergized, as manifested by the back contact 111 of the relay AL. The time delay imposed by this slow acting relay CR<sup>1</sup> is of sufficient duration to allow an approaching train moving at high speed to have reached the switch or if moving at lower speed to have given the engineer of such train sufficient warning by having had the signals at stop a sufficient period of time to bring such train to a stop. All of these pick-up circuits, of course, include the signal-at-stop contacts 100 to 103, inclusive. This approach lock relay AL also includes a stick circuit including its own front contact 112, and the signal-at-stop contacts 100—103, inclusive, all in series.

As soon as the train has entirely entered the siding of passing siding N, the indicating lamp TEL at the tower will again be extinguished, because the stick circuit for this relay just traced will be open while the contacts 33 and 32 of the synchronizing mechanism in the dispatcher's tower are in contacting relationship, and since the pick-up circuit including the contacts 33—32 is open at the back contact 30 of the detector track relay TE, the indicating relay TEI will assume its deenergized position thereby extinguishing the lamp TEL and sounding a single tap on the bell 51<sup>a</sup>. In other words, the bell 51<sup>a</sup> is sounded when a lamp is lighted and the bell 51<sup>a</sup> is sounded when a light is extinguished. Further, by use of the synchronized indicating system shown one light cannot be lighted and another extinguished simultaneously.

If the dispatcher now wishes to return the switch IS to its normal straight track position he will operate his lever LE to the right hand position, and in so doing will effect de-energization of the control relay ZE and re-energization of the same to its right hand normal position. With the control relay ZE energized to the right hand position the switch machine SME will be returned to the normal main track position by the completion of the following circuit:—beginning at the terminal B, contact 67 and 68 of the control relay ZE, wire 78, through the mechanism of the switch machine, through front contact 54 of the approach locking relay AL, front contact 53 of the front detector track relay TE, to the common return wire C connected to the other side of the battery. With this circuit completed the switch machine SME will return the switch IS back to the main track position. With the relay ZE energized to its right hand position and the switch machine SME assuming the normal position, and with the relay 2H de-energized (on the assumption that west bound traffic is still set up in the single track section O because the signal 7 or 7D is assuming the clear position or a west bound train is moving in the single track section O) the signal 1 will be actuated to its clear indicating position through the following circuit:—beginning at the terminal B, contacts 67 and 69 of the control relay ZE, wire 89, contacts 71 of the switch machine when assuming the main track position, wires 90 and 91, operating mechanism of the signal 1 (not shown), wires 92 and 74, front contact 75 of the home relay 1H, wire 76, back contact 77 of the home relay 2H, to the common return wire C. It will be noted that

the signal 1D cannot clear at this time because its energizing circuit is broken at the contacts 71 of the switch machine, because the switch machine is now in the normal straight track position. It will also be noted that the signals 2 and 2D cannot be cleared because the energizing circuits therefor are open at the front contact of the home relay 2H.

Let us now assume that the operator at the tower puts the signals 7D and 7 at the east end of the single track section O both to the stop position and in so doing permits energization of the home relay 2H (assuming there is no train in the single track section O). With the control relay ZE still energized to its normal position the signal 2 is actuated to its clear condition by the completion of the following circuit:—beginning at the terminal B of a suitable battery, the neutral contact 67 of relay ZE, polar contact 69 in its right hand position, wire 89, contacts 71, wires 90 and 94, mechanism of the signal 2, wires 95 and 96, front contact 98 of the home relay 2H to the common return wire C connected to the other side of said battery. The signal 2 may therefore assume its clear position permitting the movement of traffic from the main track of passing siding N into the single track section O. Let us now assume that the switch machine SME is assuming the reversed dotted or take siding position, and that the control relay ZE is assuming the left hand dotted position, and that the home relay 2H is energized because the signals 7 and 7D at the east end of single track section O are at stop, an energizing circuit for the dwarf signal 2D may be completed as follows:—beginning at the terminal B of a suitable battery, contact 67 of relay ZE polar contact 69 in its reversed dotted position, wire 70, contacts 71 of the switch machine SME when in its reversed position, wire 100, mechanism of the dwarf signal 2D, wires 101 and 96, front contact 98 of the home relay 2H to the common return wire C connected to the other side of said battery.

Although the signals 1, 1D, 2 and 2D have been conventionally shown, and the circuits have been described as comprising two position signals, it is desired to be understood that in practice three position signals would be used in substantially the same manner as described in the application of Wight above mentioned. Further, it is desired to be understood that the exact circuit arrangement shown and described for controlling the various signals and the switch machine in the present application are somewhat different than those shown in the Wight application, and that the exact circuit arrangement shown in the Wight application may be used as desired, and further if the circuit arrangement shown is employed suitable supplemental means may be provided for giving caution indications. The switch machine and signals at the west end of passing siding N are controlled by the lever LW in exactly the same way as are the switch machine and signals at the east end by lever LE, and for this reason like parts have been assigned like reference numbers having distinctive exponents 1 (one). Also, the apparatus located at other sidings such as the siding P are controlled by the same control and indication system over the same line wire.

Having now explained how the switch machines may be operated to either of their two extreme positions, and how any one of the four signals at each end of a passing siding may be cleared, and having explained how the passage

of a train over the detector track circuit is manifested at the dispatcher's tower by the illumination of a lamp properly associated with the miniature track layout in the dispatcher's tower, it is deemed unnecessary to specifically describe how two trains may be caused to make a meet at the passing siding N, or how one train may pass another train from the rear, all in accordance with the wishes of the train dispatcher through the medium of wayside signal indication. In the particular arrangement shown indicating lamps have been provided in the miniature track layout only to show the positions of the switch machines at the ends of a single passing siding and indicating lamps which if illuminated show the occupancy of the detector track circuits associated with the switches at the end of the passing siding, it is desired to be understood that the indicating condition of three condition wayside signals may be indicated by polar relays in exactly the same way as the position of a switch machine is indicated, and that the occupancy of the main track of the passing siding, the siding itself of the passing siding and any one of the various track circuits in the single track section may be indicated at the tower in exactly the same way as the occupancy of the detector track circuits is indicated in Figs. 1A and 1B. In other words, if desired, the miniature track layout may be a complete reproduction of the railway system itself with all of the track circuits repeated to the tower and all of the switch machine positions and signal indicating conditions repeated to the tower so that the dispatcher is informed of the position or condition of all of the apparatus on the railway system and the locations of trains, this may even be extended to the operation and indication of the operated condition of derails, drawbridges, and the like.

On certain railway systems there is already installed a telephone line, and in order to avoid crowding the synchronous control system such as shown in Figs. 1A and 1B, it may be considered expedient to use the synchronous control system for indicating at the tower the condition of the various devices along the track, and to use the telephone line and suitable code responsive selecting devices for controlling the various switch machines and wayside signals. In this connection it should be remembered by the use of the synchronous control system described a large number of simultaneous controls may be transmitted over the same line wire, and therefore this method of indicating is particularly applicable for transmitting various indications even though changes in these indications happen simultaneously, and on the other hand that the control of the various signals and switch machines by reason of the fact that they are manually made by a single person, namely the dispatcher, and for this reason there is no need for operating more than one traffic controlling device along the railway track at the same time, there should never be a conflict due to the simultaneous transmission of different codes. These features are covered in a divisional application.

*Modified synchronizing mechanism Fig. 2.*—Referring to Fig. 2 of the drawings, the construction of the various synchronously driven mechanisms is the same as that shown in Figs. 1A and 1B of the drawings and includes the worm reduction gearing, slip friction clutch, direct current motor, and so forth, but in the arrangement shown in Fig. 2 the direct current motor M located in the tower DT is purposely made

to run slower than all the other motors M, and the various lock magnets 19<sup>a</sup> are connected in multiple between the main line wire 10W and the common return wire C, including in series therewith the synchronizing contacts 22<sup>a</sup>. It will be noted that the synchronous mechanism located in the tower DT is provided with an additional synchronizing contact 22<sup>b</sup> which is connected to one terminal B of a suitable battery, the other terminal thereof being connected to the other return wire C. The various synchronously driven contact arms 32<sup>a</sup> are all rotated in a clockwise direction by their respective motors M, and since the motor in the tower DT has purposely been made to run at a slightly lower speed the contact arms 32<sup>a</sup> of the remaining synchronous mechanisms will have completed their revolution and have been stopped by the arm 32<sup>a</sup> engaging the stop pawl 18<sup>a</sup>, and will be held in this starting position until the contact arm 32<sup>a</sup> of the apparatus in the tower DT has also reached this starting position. When this occurs the main line wire 10W will have energy applied therethrough through the contact 22<sup>b</sup> and all of the various lock release magnets 19<sup>a</sup> will be energized and all of the synchronous mechanism will be started off together. Although the synchronous mechanism in the tower has been shown provided with a lock releasing magnet 19<sup>a</sup>, this magnet may be omitted in practice, if desired, because there will be no need for ever holding the contact arm 32<sup>a</sup> of this mechanism from rotating because this mechanism is purposely made to operate at a lower speed than any other. It should be noted that a portion of the circle about which the various contacts 32<sup>a</sup> rotate has been designated "idle zone". This has been done in order to allow for the difference in the speeds of the synchronous mechanisms along the railway track and the speed of the synchronous mechanism in the dispatcher's tower. In other words, the relation of the speeds between these motors is such that the contact arm 32<sup>a</sup> of the mechanism in the tower has already reached the idle zone when the contact arm 32<sup>a</sup> of the fastest synchronous mechanism along the track has reached the starting contact 22<sup>a</sup>, so that the line wire 10W is not energized to release any of the synchronous mechanisms until the contact 32<sup>a</sup> of the mechanism in the tower reaches its starting position and engages the contact 22<sup>b</sup>. Although the idle zone as illustrated extends almost one fourth of the way about the circumference, this zone in practice, would only be a comparatively small arc, sufficient to take care of the speed inaccuracies of direct current motors of constant speed construction. In other words, the apparatus shown in Fig. 2 of the drawings include a large number of synchronous mechanisms located along the railway track all of which are started out when the mechanism located in the dispatcher's tower reaches the starting point of a cycle of operation, and the mechanism in the dispatcher's tower requires a slightly longer period of time to complete its cycle of operation than does any other synchronous mechanism and for this reason all of the remaining synchronous mechanisms will have reached the starting position and will be held there by suitable locking mechanism until the synchronous mechanism in the dispatcher's tower has reached the starting point, at which time all of the synchronous mechanisms will be started on

their cycle of operation together. In this connection, it is desired to point out, that the gear ratio of the mechanism in the tower may be slightly different than that of the other synchronous mechanisms, so that motors of exactly the same construction may be used.

It is desired to be understood that synchronous alternating current motors may be used to drive the rotary synchronizing contacts 21, 33, 45, 32 and 65 shown in Figs. 1A, 1B and 2 of the drawings.

Having thus shown and described several specific embodiments of the present invention, it is desired to be understood that this has been done for the purpose of disclosing an application of the invention and in order to describe the invention rather than for the purpose of illustrating the exact apparatus preferably employed in practicing the same or illustrating the scope thereof; and it is further desired to be understood that various changes, modifications and additions may be made to adapt the invention to a particular railway system whether single track or double track and irrespective of the specific signaling system superimposed thereon, and that the synchronous and code responsive control systems may be used for operating switch machines irrespective of whether such switch machines are used on a railway system employing a train dispatching system of the wayside signal indicating type, and that other changes may be made as the particular exigencies of the case require, all without departing from the scope of the invention or the idea of means underlying the same except as demanded of the scope of the following claims.

What I claim is:—

1. In a train dispatching system of the synchronous selector type wherein control or indication impulses for controlling a particular relay can be transmitted at a particular instant in a time cycle of operation of a synchronous selector only, the combination with an indicating relay at a dispatcher's office, of a distant track circuit including a track relay, and a synchronous selector system for intermittently electrically controlling said indicating relay to a particular position depending on the condition of energization of said track relay and including means for tending to cause said indicating relay to assume another position just prior to said instant in the next time cycle.

2. In a train dispatching system of the synchronous selector type wherein control or indication impulses for controlling a particular relay can be transmitted at a particular instant in a time cycle of operation of a synchronous selector only, the combination with an indicating relay of the stick type at a dispatcher's office, of a distant track circuit including a track relay, and a synchronous selector system for closing the pick-up circuit of said stick relay at a particular instant providing said track relay assumes its retracted position and including means for maintaining the stick circuit of said stick relay closed for substantially one time cycle following such closure of the pick-up circuit.

3. A train dispatching system of the synchronous selector type comprising, a railway system, a dispatcher's office, means for sequentially rendering available for communicating between said dispatcher's office and various points on said railway system a plurality of distinct circuits during each cycle of operation each circuit including the

same line wire and return wire and including synchronously operated circuit closing devices located at the dispatcher's office and at each of said various points, a polar relay and energy supplying means in each of said distinct circuits, whereby a particular polar relay may be operated to either of its energized positions, and a stick circuit for said polar relay closed through the portion of said cycle when the main circuit is not closed, whereby said polar relay remains energized to a particular polar position so long as said main circuit is energized by the same polarity momentarily during each cycle of operation and whereby three distinctive conditions may be transmitted over the distinct circuit containing said particular polar relay.

4. In a train dispatching system of the selector type wherein control or indication impulses for controlling a particular relay can be transmitted at a particular instant in a cycle of operation of a selector only, the combination with an indicating relay at a dispatcher's office, of a distant track circuit including a track relay, and a selector system for intermittently electrically controlling said indicating relay to a particular position depending on the condition of energization of said track relay and including means for tending to cause said indicating relay to assume another position just prior to said instant in another cycle.

5. In a train dispatching system of the selector type wherein control or indication impulses for a particular relay can be transmitted at a particular instant in a cycle of operation of a selector only, the combination with a control relay at a way station, a lever, and a selector system for intermittently electrically controlling said control relay to a position depending on the position of said lever and including means tending to cause said control relay to assume another position just prior to said instant in another cycle of operation.

6. In combination; a railway system including a distant track switch; a switch machine for operating said track switch; a polar control relay having a polar contact which remains in the last energized position thereof even if said relay has in the meantime been deenergized; a selector system for controlling a plurality of such polar control relays including said polar relay over the same circuit; a normal operating circuit for said switch machine including said polar contact assuming one of its polar positions; a reverse circuit for said switch machine including said polar contact assuming the other of its polar positions; a signal for governing traffic over said track switch, and a front contact of an approach locking relay, which assumes its deenergized position even though said signal is at stop if there was a train approaching while said signal indicated proceed, included in both said normal and said reverse operating circuit.

7. In combination, a railway system including a distant track switch, a switch machine for operating said track switch, a polar control relay having a polar contact which remains in the last energized position thereof even if said relay has in the meantime been deenergized, a selector system for controlling a plurality of such polar control relays including said polar relay over the same circuit, a normal operating circuit for said switch machine including said polar contact assuming one of its polar positions, a reverse circuit for said switch machine including said polar contact assuming the other of its polar positions, and a front contact of an approach locking relay which

assumes its deenergized position when a signal governing traffic over said switch is at proceed included in both said normal and said reverse operating circuit.

5 8. In combination with an office and a plurality of stations, a first series of contacts at the office, an additional series of contacts at each station, apparatus effective when actuated to operate the contacts of all said series successively and in synchronism, means at the office and at  
10 each station for actuating said apparatus, a plurality of electro-responsive devices one associated with each contact of said first series, a plurality of movable devices at least one located  
15 at each station, a line circuit extending from the office to each station, means operating when any contact of said first series is operated for connecting a selected one of said electroresponsive devices with said line circuit, and means  
20 controlled by the additional series of contacts at each station for supplying said line circuit with current under the control of a selected one of said movable devices when a corresponding one of said electroresponsive devices is connected  
25 with said line circuit.

9. In combination with a central office on a railway system and a plurality of stations along a railway track, passing sidings in said track with at least one station for each siding, a switch machine at each station for operating a track  
30 switch at such station, a signal for governing traffic over the main track over each of said track switches, a two-position relay for each switch machine for controlling the same, selector apparatus at said central office and at each of  
35 said stations operated in synchronism for controlling the relays of said switch machines and for controlling the signals at all of said stations over a comparatively few line wires, and a circuit for each signal which may be closed only  
40 when both the corresponding switch machine and its two-position control relay assume the main track position and controlled by said selector apparatus.

45 10. In combination; a railway system having a plurality of stations; two signals at the same station on said system; a selector system for transmitting a positive electrical impulse, a negative electrical impulse and a zero current im-  
50 pulse to a particular station, a polar relay at said particular station having a pick-up circuit controlled by said selector system and having a polar contact which assumes one or the other extreme position to clear one or the other of said  
55 signals depending upon whether a positive or negative impulse was last transmitted to said particular station, a holding circuit for said polar relay closed if said last transmitted impulse was either positive or negative but open  
60 if a zero current impulse was last transmitted, said holding circuit including a front contact of said polar relay and a contact opened only during a period when a pick-up circuit for said polar relay may be closed.

65 11. In combination, a railway system including a distant track switch, a switch machine for operating said track switch, a polar control relay having a polar contact which remains in the last energized position thereof even if said relay  
70 has in the meantime been deenergized, a selector system for controlling a plurality of such polar control relays including said polar relay over the same circuit, a normal operating circuit for said switch machine closed when said polar con-  
75 tact assumes one of its polar positions, a reverse

circuit for said switch machine closed when said polar contact assumes the other of its polar positions, a signal for governing the movement of traffic over said track switch, and a front contact of an approach locking relay which assumes  
5 its deenergized position due to a train approaching when said signal is at proceed even though said signal is subsequently put to stop included in both said normal and said reverse operating  
10 circuits.

12. In a centralized traffic controlling system, the combination with an office and a plurality of stations, a message wire connecting said office and said stations, selector means operable through  
15 a cycle of operations to momentarily close in turn each of a series of message circuits for communicating from each station in turn to said office over said message wire, a series of indication relays at said office, a pick-up circuit for each relay each arranged to be closed when a  
20 particular message circuit is rendered available and said message circuit is closed, a holding circuit for each of said relays each arranged to be opened while said message circuit is available, and indication lamps for each of said relays  
25 each arranged to be lighted in one position of the said relay.

13. A centralized traffic controlling system for railroads comprising an office and a plurality of traffic governing devices located along the track-  
30 way, a plurality of relays at the office one for each said device, a pick-up circuit and a holding circuit for each said relay, apparatus for rupturing all said holding circuits one at a time in a predetermined sequence, means for controlling  
35 the pick-up circuit for each relay in accordance with the condition of the corresponding device during the time the holding circuit for such relay is ruptured, and indication means controlled by said relays to give a substantially continuous  
40 indication of the condition of all of said devices.

14. A centralized traffic control system for governing the operation of a power-operated track switch and its associated signals at a distant field location from a control office comprising, relay  
45 means at the field location operable to any one of a plurality of controlling conditions for concurrently governing the operation of said switch to the normal or reverse position and controlling said signals to indicate stop or clear, clearing cir-  
50 cuits for said signals selectively controlled by said relay means, contacts operated in accordance with the position of said switch for selectively governing said clearing circuits, line wires extending from the control office to the field location, means  
55 in the control office for applying to said line wires time spaced code elements each variable in character, manually operable control means in the control office for determining the character of certain of said code elements, and means at the  
60 field location operated synchronously with the transmission of said code elements for rendering said relay means responsive to the character of such certain code elements and at other times maintaining said relay means in its last operated  
65 condition.

15. A system for governing railway traffic at a distant field location from a control office comprising, in combination with a line circuit extending from the control office to the field location, a  
70 selector device in the control office and another selector device at the field location each operated from a local source of current for closing a series of contacts in succession at corresponding times, means including a line wire extending from the  
75

control office to the field location for causing synchronous operation of said selector devices, a plurality of signals at the field location, relay means at the field location operable to clear one or the other of said signals or neither, means including said selector device at the field location for rendering said relay means responsive to the condition of energization of said line circuit at a particular time when certain of said contacts are closed during the operation of said selector devices and for maintaining said relay means in its last operated condition at other times, manually operable control means in the control office, and means including the selector device at the control office for governing the condition of energization of said line circuit at said particular time to conform with the then existing condition of said manually operable control means.

16. A centralized traffic control system for governing the operation of a power-operated track switch and its associated signals at a distant field location from a control office comprising, relay means at the field location operable to control the operation of said switch and to close circuits for clearing said signals, contacts operated in accordance with the position of said switch for selectively governing said signal clearing circuits, manually operable control means in the control office, a communication system including line wires extending from the control office to the field location and selector devices at said control office and field location operated synchronously for temporarily governing said relay means as a unit at a particular time in the cycle of operation of said selectors to conform with the existing condition of said control means, and means for retaining said relay means in its actuated condition after each operation by said communication system until subsequently changed.

17. A centralized traffic control system for governing train movements at a distant field location from a control office comprising, in combination with a portion of track provided with track circuits, a plurality of signals governing traffic over said portion of track, clearing circuits for said signals automatically controlled by said track circuits, relay means at the field location for selectively closing said clearing circuits to cause clearing of a selected signal subject to the control of said track circuits, a communication system including a line circuit extending from a control office to a field location and selector means at the control office and at the field location operated synchronously, said communication system rendering said relay means responsive to the condition of energization of said line circuit at a particular time in the operation of said communication system, a manually operable control device in the control office, circuit means governed by said manually operable device and the selector means in the control office for changing the condition of energization of said line circuit at said particular time to cause an operation of said relay means to conform with the then existing condition of said control device, and means for maintaining said relay means in the condition to which it is operated by said communication system until subsequently changed.

18. A centralized traffic control system for roads comprising, in combination with a power-operated track switch and associated signals for governing traffic over said switch in its different positions, operating circuits for said switch, clearing circuits for said signals, relay means adjacent the switch operable to different controlling

conditions for concurrently controlling selectively the operating circuits for said switch and for closing a clearing circuit for the corresponding signal, contacts operated in accordance with the position of said switch for closing the clearing circuit for the signal governing traffic over the switch in the corresponding position, a communication system including a line circuit extending from the control office to the field location and selector means at the control office and at the field locations operated synchronously for rendering said relay means temporarily responsive to the existing condition of said control means at a particular time in the cycle of operation of said communication system, and means for maintaining said relay means in its actuated condition after each operation of said communication system until subsequently changed.

19. A centralized traffic control system for railroads of the multiple impulse type comprising, in combination with a line circuit extending from the control office to a field location having applied thereto a series of code elements each variable in character, a control relay at the field location having a pick-up circuit and a stick circuit, selector means at the field location operated synchronously with said series of code elements to control the energization of said pick-up circuit for said control relay in accordance with the character of a particular code element of said series, and means for interrupting said stick circuit for said control relay only temporarily during the time the energization of said pick-up circuit is being controlled.

20. A centralized traffic control system for railroads of the multiple impulse type comprising, in combination with a line circuit extending between two locations, means at one location for energizing or deenergizing said line circuit at spaced time intervals, selector means at the other location operating to close a series of contacts successively and at the same time as the energization or deenergization of said line circuit, a control relay at said other location having a pick-up circuit and a stick circuit, means including a particular contact of said series for energizing said pick-up circuit only if said line circuit is energized at that particular time, and means operated in timed relation with said selector means for breaking said stick circuit only temporarily during the particular interval of time said pick-up circuit may be energized.

21. A centralized traffic control system for railroads of the multiple impulse type comprising, in combination with a line circuit extending between two stations, means at one station for determining the character of energization or the deenergization of said line circuit at time spaced intervals, relay means at the other station adapted to assume any one of three different conditions, circuit controlling means at said other station operated from a local source of current in synchronism with the time intervals of energization or deenergization of said line circuit, said circuit controlling means rendering said relay means operable to a condition dependent upon the character of energization or the deenergization of said line circuit at a particular time interval, means for retaining said relay means in its operated condition, and means operated in timed relation to said circuit controlling means for rendering said retaining means ineffective only temporarily during said particular time interval.

22. A centralized traffic controlling system for governing train movements at a distant field

location from a local control office comprising, a power operated track switch having normal and reverse operating circuits, signals for governing traffic over said switch in its different positions, clearing circuits for said signals selectively closed in accordance with the position of said switch, control means at said field location for concurrently closing one or the other of said operating circuits for said switch and the clearing circuit of the signal for the corresponding position of the switch, a communication system of the multiple impulse type including a line circuit between the control office and the field location for transmitting any one of a plurality of distinctive code signals, each consisting of a plurality of code elements, and means at the field location operated in timed relation with the transmission of said code elements for rendering said control means responsive to the character of certain of said code elements and for maintaining said control means at all other times in the condition to which it was last operated.

23. In a centralized traffic control system for railroads, the combination with a plurality of track circuits along a railroad track, indication means in a distant control office for each of said track circuits and changeable to indicate the occupied or unoccupied condition of said track circuit, means for operating a particular indication means to conform with the condition of the corresponding track circuit, an audible signal in the control office, and means controlled by current flowing in a common wire leading to all of said indicating means for causing momentary operation of said audible signal only when the condition of any one of said indication means is changed to conform with the unoccupied condition of its associated track circuit.

24. In a centralized traffic control system of the character described, the combination with a miniature track diagram in a control office, of an indicating lamp on said diagram, an indication relay for closing a lighting circuit for said lamp, a transformer having a primary included

in said lighting circuit, and audible signal means connected to the secondary of said transformer and responsive to closure of said lighting circuit.

25. In a system for centralized traffic control for railroads, in combination with a track switch and a switch machine for operating the switch points, normal and reverse indicating lamps for said switch at a distant control office, relay means in the control office operable to any one of three distinctive conditions to light one or the other of said lamps or neither, impulse transmitting means for at times momentarily controlling said relay means to conform with the existing condition of said track switch, and means for maintaining said relay means in its last operated condition at all other times.

26. In a centralized traffic control system for governing traffic on railroads comprising, in combination with track circuits at various field locations, an indication relay in a distant control office for each of said track circuits and having a pick-up circuit and a stick circuit, and a communication system for governing said relays in accordance with the occupied or unoccupied condition of the corresponding track circuits comprising, a line circuit extending between the control office and the several field locations, selector means in the control office and at the field location operated synchronously, means controlled by said selector means at each field location and by the track circuit at that location for determining the condition of energization of said line circuit at a particular time during the operation of said selector means, means controlled by the selector means in the control office for controlling the energization of the pick-up circuit of each of said indication relays at the particular time when the condition of energization of said line circuit is controlled by the corresponding track relay, and means for temporarily breaking the stick circuit for each indication relay only during the time its pick-up circuit is being controlled.

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