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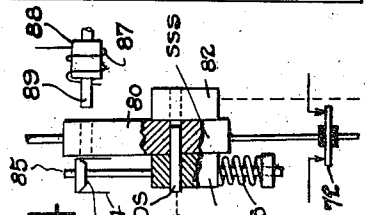
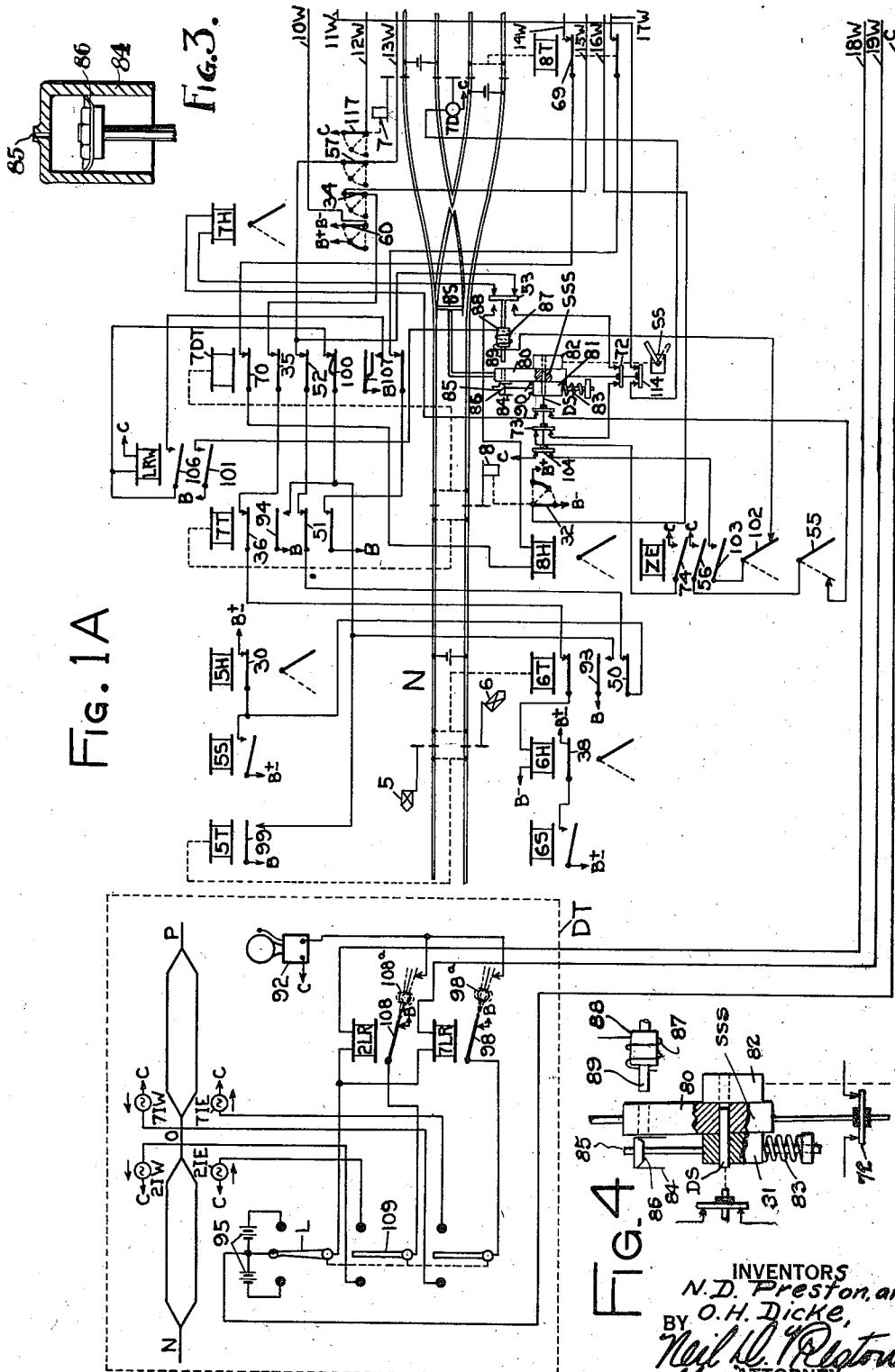
N. D. PRESTON ET AL

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TRAIN DISPATCHING SYSTEM FOR RAILROADS

Filed April 29, 1927

4 Sheets-Sheet 1



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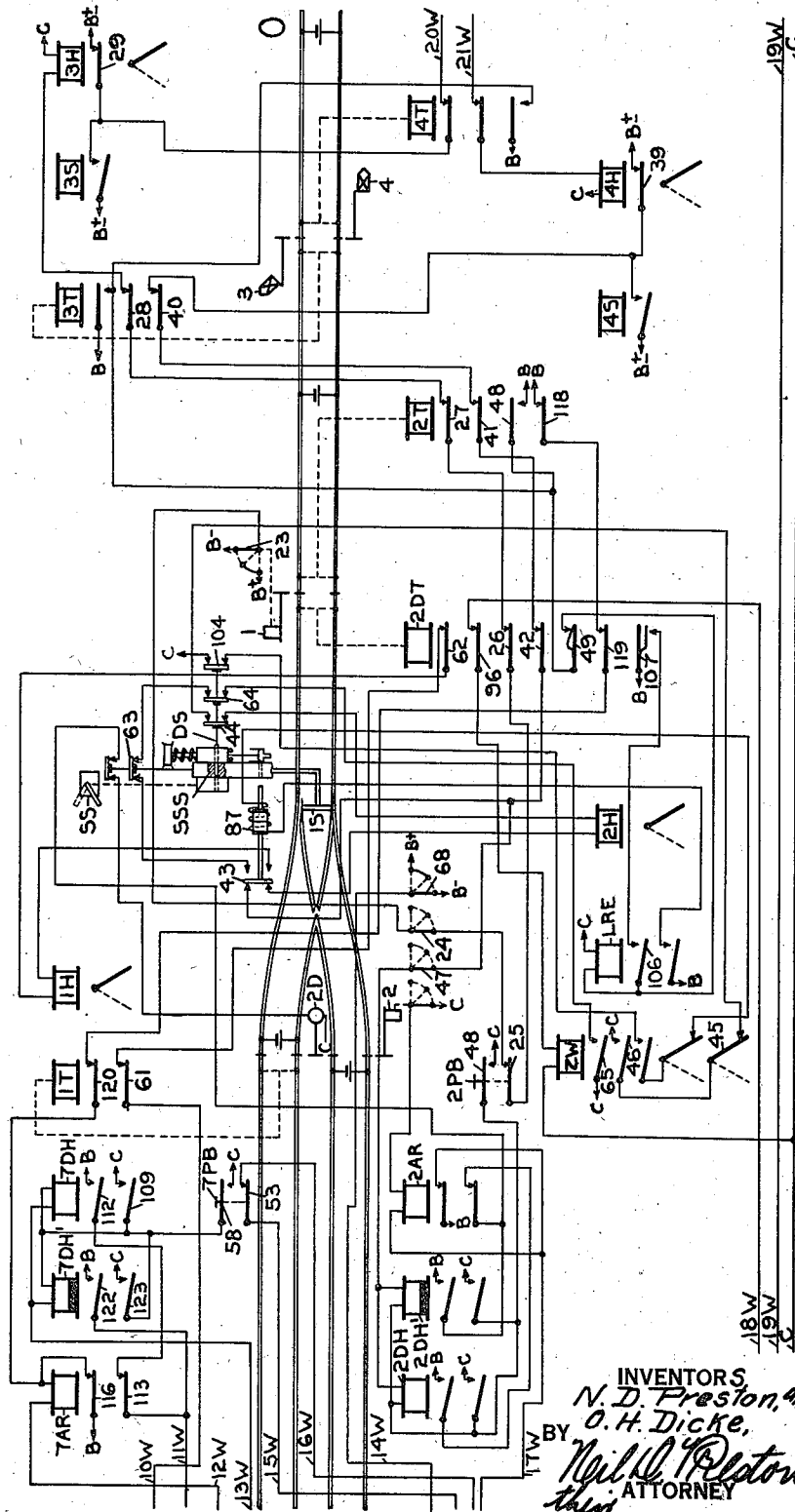
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TRAIN DISPATCHING SYSTEM FOR RAILROADS

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FIG. 1B



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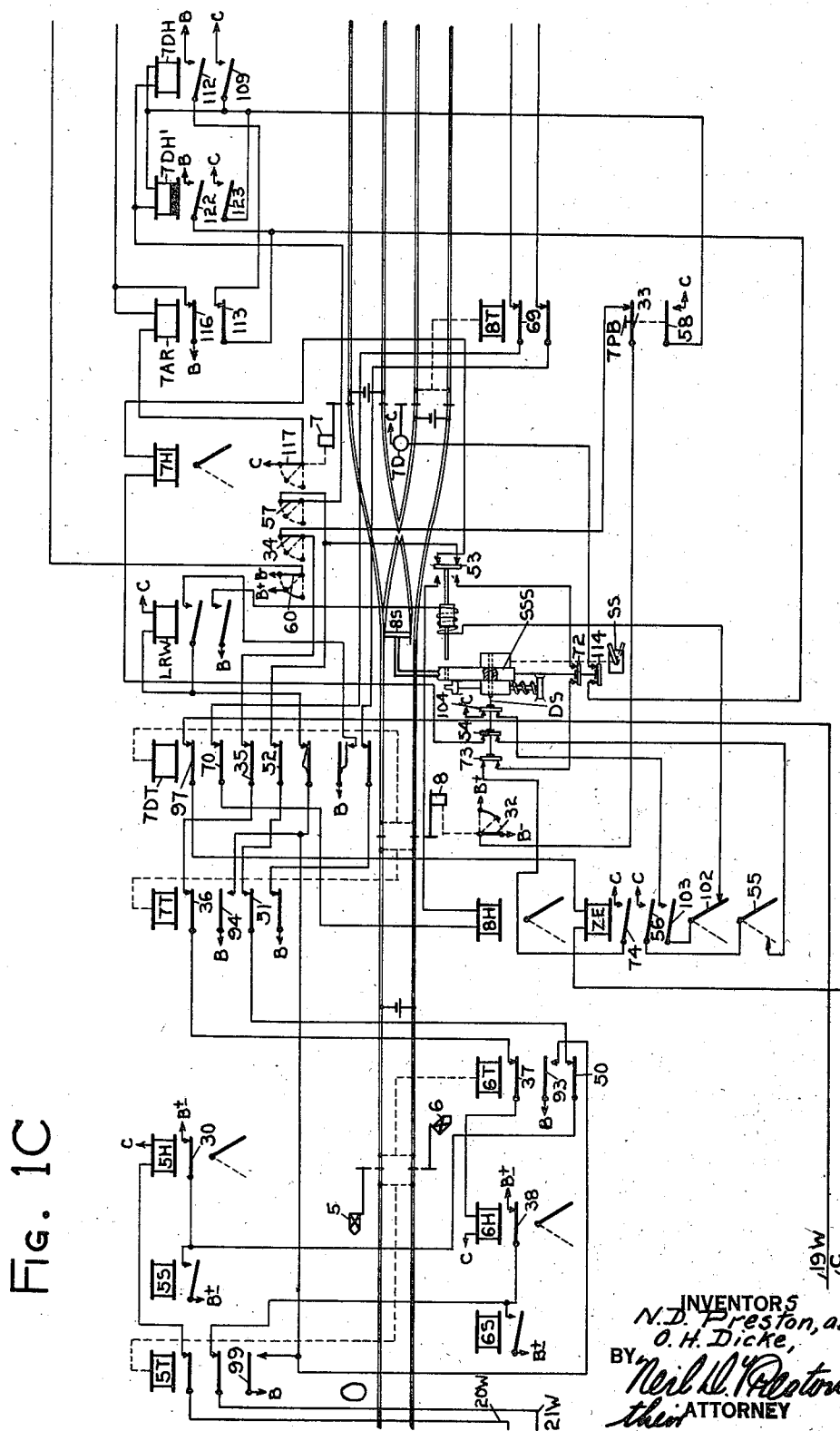
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TRAIN DISPATCHING SYSTEM FOR RAILROADS

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TRAIN DISPATCHING SYSTEM FOR RAILROADS

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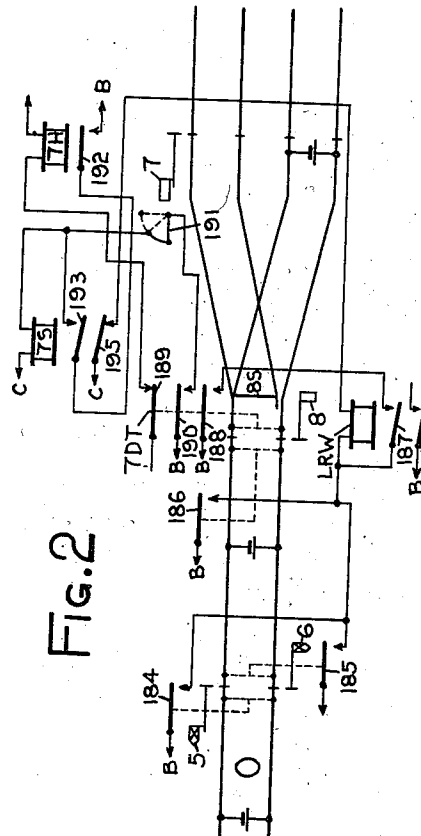


FIG. 2

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2,018,765

TRAIN DISPATCHING SYSTEM FOR
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Application April 29, 1927, Serial No. 187,490

74 Claims. (Cl. 246—3)

This invention relates to a system of train dispatching by wayside signal indications, and more particularly to such a system wherein spring switches are employed at the passing sidings.

Although the present invention is applicable to double track railroads, it is deemed expedient to show it applied to a single track railroad wherein traffic moves in both directions; and for this reason the invention has been shown applied to a single track railroad employing wayside signals of the absolute-permissive-block type.

In employing spring switches, namely switches which are held in a certain position by spring pressure but which may be trailed to the opposite position by the wheel flanges, to a single track railway system it is important to assure that the points are in the spring pressed position when a train moves in a direction against the points of the spring switch, and further if the points are at times locked it is important to assure that the points are not locked when a train moves in the trailing direction through the switch.

In view of the foregoing and other important considerations, it is proposed to employ spring switches wherein the switch points are held in one extreme position by a spring, and to employ a slow releasing means whereby if the switch points are trailed to the abnormal position against the action of such spring their return to the normal position will be appreciably retarded, so that, as a train trails through the spring switch the switch points will not be returned to the normal position between the passage of the successive trucks of the train, and in the particular arrangement shown this retarding means consists of a dash pot.

It is further proposed to provide an electrically operated lock which is controlled by a directional approach locking circuit, and to prevent the clearing of a signal in the face of an approaching train running toward the switch points if such approaching train has not locked the switch points in the normal position. Similarly, it is proposed to prevent clearing of a signal permitting movement of a train in a direction to trail the switch unless the electric lock mentioned is in its unlocked condition. Further, it is proposed to provide a switch stand for operating the switch points manually, and to provide a dual control selector whereby the switch points may be mechanically connected to either the spring actuated switch operator or the switch stand. As

a further feature of a railway system of the single track type employing spring switches, it is proposed to have both of the tracks of a passing siding offset from the main single track section to the same extent, so that trains passing in one direction diverge from their normal direction of traffic the same as do trains moving in the opposite direction when passing through a passing siding. This is, however, not essential and the invention is not limited to such a track layout.

In dispatching the movement of trains over a single track railroad employing absolute-permissive-block signals by wayside signal indications, it has heretofore been proposed to hold the starting and entering signals at each end of each single track section at stop and provision was made for permitting clearing of one of these signals in response to manual control, provided traffic conditions are proper for the clearing of such signal. This has been proposed in the application of S. N. Wight, Ser. No. 120,423 filed July 3, 1926, and the present invention is an improvement on the system proposed in the application just mentioned.

It is of course recognized that the principal interference between movements of trains on a single track railway system resides principally in the passage of trains moving in the opposite direction by each other, that is, trains making a meet, but that there are instances where it is desirable to have a higher class or higher speed train pass another train, moving in the same direction, from the rear. In other words, the use of spring switches in a single track railway train dispatching system is extremely desirable as far as meets between trains is concerned, but that in spite of the rare necessity of a train passing another train from the rear it is deemed expedient to make provision for one train overtaking another. It is proposed in accordance with the present invention to provide a dwarf signal for the leaving end of the left hand track for each direction of traffic through a passing siding, so that if a train is to pass another train from the rear and one of the trains takes the left hand track in response to oral instructions given by the train dispatcher over a telephone (a telephone instrument preferably being located at each end of each passing siding), this train on the left hand track may proceed in response to this dwarf signal, and which dwarf signal may be cleared in response to manual acknowledgment made from a point near said telephone and

providing traffic conditions are proper for clearing of such dwarf signal.

Another feature of the present invention resides in the provision of indicating means at the tower which not only indicates when a train is occupying the detector track circuit at the end of a passing siding, but also indicates the direction in which such train is moving, and resides in the provision of means whereby the presence or absence of train on two different detector track circuits can be indicated at the same time over the same line circuit, and audible means for directing the train dispatcher's attention to changes in these signals and indicating devices.

Other objects, purposes and characteristic features of the invention will in part be apparent from the drawings and in part be pointed out hereinafter.

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

Figs. 1A, 1B and 1C show a portion of a single track railway upon which the present invention is superimposed, and show the control relays at the ends of a single track section controlled over separate line wires;

Fig. 2 shows a modified form of approach locking circuit for locking the switch points of the spring switch against movement when there is a train approaching the points of such spring switch;

Fig. 3 shows the retaining or dashpot mechanism for the spring switch mechanism, which retains the switch points in the trailed position if once trailed and so long as the detector track circuit remains occupied; and

Fig. 4 shows the spring switch mechanism and dual control selector on an enlarged scale.

System shown in Figs. 1A, 1B and 1C

Referring to Figs. 1A, 1B and 1C it will be noted that the system disclosed is rather involved, and for this reason the absolute-permissive-block signal control features will be very briefly dealt with. In the particular arrangement shown the absolute-permissive-block signal system is one employing opposite signals as distinguished from staggered signals, although either arrangement of signals may be used. In the arrangement shown the east bound signals have been successively numbered 2, 4, 6 and 8, of which the signal 2 is the starting signal and the signal 8 is the entering signal. In a similar way, the west bound signals have been numbered 7, 5, 3, and 1, of which the signal 7 is the starting signal and the signal 1 is the entering signal. The signals 1, 2, 7, and 8 are stop-and-stay signals as conventionally shown by the square ended blades, as distinguished from permissive signals as conventionally indicated by pointed blades. Light signals may of course also be used if desired.

It will be noted that the various track relays have been numbered T with the proper numerical prefix corresponding to the signal immediately following such track relay, and that these track relays are normally energized by suitable track batteries which have been conventionally shown. Also, it will be noted that the various home relays have been designated H with a prefix corresponding to the signals which they control, and that the stick relays employed in the A. P. B. system have been designated S with a prefix corresponding to the signal with which they are associated. The control circuits for these various stick relays are well known to

those skilled in the art and have for convenience been omitted, but it may be pointed out here that if a train passes a particular signal governing traffic in the direction in which the train is moving that such passage of the train by such signal picks up the corresponding stick relay and sticks such relay up in a manner so that it will remain stuck up so long as the corresponding home relay is de-energized.

By studying the energizing circuits for the various home relays 2H, 4H, 6H, 3H, 5H, and 7H it will be noted the circuit for each of these relays includes a front contact of the home relay of the signal next in advance. From this it will appear that if the home relay 6H is de-energized it will cause de-energization of the home relay 4H and in turn will cause de-energization of the home relay 2H, and similarly that de-energization of the home relay 3H will in turn cause de-energization of the home relay 5H and which in turn will cause de-energization of the home relay 7H. In other words the entrance of a train (west bound train) into the east end of a single track section will cause de-energization of all of the east bound home relays and the entrance of a train (east bound train) into the west end of a single track section will cause de-energization of all of the west bound home relays, so that trains cannot possibly move in opposite directions and toward each other at the same time. It may be mentioned here that trains may follow each other through the single track section with proper signal protection in spite of the interdependence of the energizing circuits of the various home relays by reason of the provision of the stick relays S, the function of which will not be described in detail but may be ascertained from the application of Wight heretofore mentioned. The circuits whereby the signals are controlled by their respective home relays have for convenience been omitted.

It is considered expedient to now consider how the clearing of a starting signal will cause all of the signals governing traffic in the opposite direction in the single track section, at the end of which such starting signal is located, to assume the stop position. It should be noted that the home relay 3H is energized through the following circuit:—beginning at the terminal B— of a suitable source of energy, such as a battery, signal contact 23 of the signal 1, signal contact 24 of the signal 2 closed only when signal 2 is in the stop position, normally closed contact 25 of the push button 2PB, front contact 26 of the detector track relay 2DT, front contact 27 of the track relay 2T, front contact 28 of the track relay 3T, through the winding of the relay 3H, to the common return wire C connected to the other side of said source of energy. In this connection it should be noted that if the signal 2 is cleared in response to suitable manual control hereinafter described that the relay 3H will be de-energized, and that this relay 3H will drop its front contact 29 thereby de-energizing the relay 5H, and the dropping of contact 30 of the relay 5H will cause de-energization of the relay 7H, if this relay 7H is not already de-energized. Or in other words, the clearing of the starting signal 2 will cause all of the west bound signals to go to stop. Similarly, the home relay 6H is energized by a circuit including a signal contact of the signal 7, which contact is only closed when the signal 7 is at stop, which circuit is as follows:—beginning at the terminal B— of a suitable source of energy, signal contact 32 of the signal 8, nor-

5 mally closed contact 33 of the push button 7PB, signal contact 34 closed only when the signal 7 is in the stop position, from contact 35 of the detector track relay 7DT, front contact 36 of the track relay 7T, front contact 37 of the track relay 6T, through the winding of the relay 6H to the common return wire C connected to the other side of said source of energy. From this it will appear that clearing of the signal 7 will cause de-energization of the home relay 6H and that the opening of contact 38 of the relay 6H will cause de-energization of the relay 4H, and that dropping of the front contact 39 of the home relay 4H will cause de-energization of the relay 2H.

10 Having now considered the energizing circuits of the home relays 3H and 6H, and bearing in mind that the energizing circuits for the relays 4H and 5H have already been briefly considered, let us now consider the energizing circuits of the home relays 2H, 2DH, 7H and 7DH. The energizing circuit for the home relay 2H may be traced as follows:—beginning at the terminal B+ (+ or —) of a suitable source of energy, front contact 39 of the home relay 4H, front contact 40 of the track relay 3T, front contact 41 of the track relay 2T, front contact 42 of the detector track relay 2DT, contact 43 of the electric lock closed when the lock magnet is de-energized of the spring switch selector SSS (more fully described hereinafter), winding of home relay 2H, contact 44 of the dual control selector DS, (more fully described hereinafter) polar contact 45 of the control relay ZW, neutral contact 46 of this same control relay to the common return wire C connected to the other side of said source of energy. A similar circuit may be traced for the home relay 2DH as follows:—front contact 39 of the relay 4H, contact 40, contact 41, contact 42, signal contact 47 of the starting signal 2, winding of the home relay 2DH, and normal open contact 48 of the push button 2PB, so that the home relay 2DH is energized upon depression of this push button 2PB if traffic conditions ahead are safe. It should be noted that the supplemental home relay 2DH, the purpose of which will be described hereinafter, is connected in multiple with the home relay 2H.

15 In a manner similar to that just described the home relay 7H is normally energized through the following circuit:—beginning at the terminal B+ of a suitable source of energy, front contact 39 of the home relay 5H, front contact 50 of the track relay 6T, front contact 51 of the track relay 7T, front contact 52 of the detector track relay 7DT, electric lock contact 53 (closed when the electric lock is de-energized), winding of the home relay 7H, contact 54 of the dual selector DS (associated with the spring switch selector SSS of the switch 8S), polar contact 55 of the control relay ZE if energized to the left hand position, neutral contact 56 of this same control relay to the common return wire C connected to the other side of said source of energy. Similarly the home relay 7DH may be energized through the following circuit:—contact 30, contact 50, contact 51, contact 52 of the detector track relay 7DT, signal contact 57 of the signal 7, winding of the home relay 7DH, normally open contact 58 of the push button 7PB, to common return wire C connected to the other side of said source of energy. From this it will be noted that depression of the push button 7PB permits energization of the home relay 7DH and clearing of the dwarf signal 7D.

20 Having now considered the circuits for all the home relays except the home relays for the entering signals 1 and 8, let us now consider the energizing circuits for the home relays 1H and 8H. The circuit for the relay 1H may be traced as follows:—beginning from the terminal B+ or B—, the polarity depending on the position of the signal 7, signal contact 60 of this signal, wire 10W, front contact 61 of the track relay 1T, front contact 62 of the detector track relay 2DT, winding of the relay 1H, lock contact 43 of the switch mechanism governing the switch 1S and closed only when the switch is locked in its normal position, switch box contact 63 of the same switch mechanism, contact 64 of the dual control selector of this same switch mechanism, neutral contact 65 of the control relay ZW at the west end of the single track section O, to common return wire C connected to the neutral point of said source of energy. The energizing circuit for the home relay 8H may be traced as follows:—beginning at the terminal B+ or B—, depending on the indicating condition of the signal 2, signal contact 68 of the signal 2, wire 14W, contact 69 of the track relay 8T, front contact 70 of the detector track relay 7DT, winding of the relay 8H, lock contact 53 of the electric lock of switch mechanism governing the switch 8S closed when the switch is locked in its normal position, switch stand contact 72 of the same switch mechanism, dual control selector contact 73 of the same switch mechanism, neutral contact 74 of the control relay ZE at the east end of the single track section N, to the common return wire C.

25 As heretofore mentioned the present invention largely centers about the use of properly protected spring switches in a single track railway system having a train dispatching system superimposed thereon. It is now desired to point out more specifically what the general construction of the spring switch mechanism is and the manner in which the same is protected against accidental misplacement and failures of other kinds. Since the three spring switch mechanisms shown in the portion of the system illustrated in Figures 1A, 1B and 1C are the same, like parts of this mechanism (except the various protective contacts) have been assigned like reference numbers and characters. Referring to any one of the switches 1S or 8S, it will be noted that the switch points are operated by a switch bar 80, and that this switch bar 80 may be connected to either the spring switch bar 81 or the switch stand bar 82 depending upon the position of the dual control selector bar DS. This dual control selector DS in practice includes a suitable handle which is locked in one or the other extreme position by a padlock, and which handle if it assumes its normal extreme position will lock the switch bar 80 to the spring bar 81, but if this handle is in its abnormal extreme position it will lock the switch bar 80 to the switch stand bar 82, as more clearly shown in Fig. 4 of the drawings. For a more detailed description of mechanism of this type reference may be had to the prior patent to Winthrop K. Howe, No. 1,667,473 granted April 24, 1928. If the switch bar 80, as is the case normally, is locked to the spring bar 81 the points of the switch are held in their normal position (a position for passage of a train into the right hand track) by the tension of the spring 83. It will be noted that if the track switch, such as 1S or 8S, is trailed to the abnormal position that spring 83 is further compressed, thus allowing free trailing of the switch. In order to avoid the

switch points returning to their normal position very quickly, and between the passage of each successive pair of trucks of a passing train moving at a moderate speed, suitable retarding means has been provided for retarding the return of the switch points to their normal position. Although this retarding means may comprise slow acting means of any kind, such as, an electromagnetic drag, a dash pot, an inertia device, or the like; the particular construction conventionally shown comprising a dash pot 84 having an orifice and having a valve type plunger 86. From this construction it readily appears that if the plunger or valve 86 is moved in a direction to compress spring 83, this valve will not retard such movement of the spring bar 81, but if the spring bar 81 is moved in the opposite direction its movement will be retarded by reason of the necessity of the fluid in the dash pot 84 passing through the orifice 85. In practice, this dash pot mechanism may operate on air or may be entirely immersed in a fluid such as oil. The dash pot arrangement shown in Figs. 1A, 1B, and 1C of the drawings merely delays the return of the switch points to their normal position.

If now the dual control selector handle (not specifically shown) is moved to its abnormal position, the dual control selector bar DS is moved to a position to disconnect the switch bar 80 from the spring bar 81, and to connect this switch bar 80 to the switch stand bar 82. With the dual control selector DS in its abnormal position the switch points of the track switch 1S, or 8S, may be operated by the usual switch stand SS in a manner well understood by those skilled in this art. It is desired to point out here that the various protective contacts associated with the switch mechanism will be discussed in connection with the operation of the system hereinafter, these contacts having been provided to protect trains by wayside signal indications under certain conditions of the switch mechanism. As is well recognized by those skilled in the art, it is extremely dangerous for a train to run into the face of a spring switch if it is possible for this switch to assume an intermediate position or in some cases an abnormal position. In order to prevent a train running toward the switch points from running thereover at high speed unless the points are in the proper extreme position, provision has been made for locking the points in their normal position under certain conditions of train movement and the apparatus. For this purpose the electric lock comprising the lock winding 87, the lock plunger or core 88 and the lock rod 89 have been provided. It will be noted that if the lock magnet 88 is energized that the switch bar 80 is locked against movement by the lock rod 89. The showing is of course only conventional and in practice will include locking features such as are now used in railway interlocking machines. It may be pointed out here that the spring bar 81 is limited in its movement due to the spring 83 by stops 90. The operation of the essential parts of the switch mechanism including the spring switch point operating mechanism, the means for retarding the return of the switch points after trailing, the switch stand mechanism for operating the switch points by hand, and the dual control selector mechanism whereby the switch control may be shifted from the spring mechanism to the switch stand mechanism and vice versa, can best be taken up in connection with train movement, and it is deemed expedient to take up the operation of this mechanism

when the operation of the system as a whole is considered hereinafter.

Superimposed manual control.—As heretofore pointed out certain manual control is superimposed on the single track absolute permissive block signal system which permits the dispatcher to hold certain trains so as to enable the making of train meets and passes from the rear in accordance with the wishes of the dispatcher and so as to facilitate train movement as a whole. Although the dispatcher may supervise the control of trains over the entire system, only the mechanism at the dispatcher's desk for the portion of the system shown in Figs. 1A, 1B and 1C has been illustrated in the tower, which tower has been conventionally shown by the dotted square DT. In this tower DT is shown a miniature track layout showing the single track section O, portions of the single track sections N and P, and the passing sidings joining these sections. This tower DT also shows a control lever L which may control the control relays ZW and ZE of the single track section O in a manner more clearly pointed out when the operation of the system is considered. In order to indicate the dispatcher the presence of a train on the detector track circuit at signal 2, or indicating the presence of such train on the detector track circuit adjacent the signal 7, the line relays 2LR and 7LR have been provided. These line relays 2LR and 7LR in combination with the lever L govern the illumination of the indicating lamp 2IW, 2IE, 7IW and 7IE. In addition to these visual signals there is also provided a suitable audible signal of any suitable construction, as illustrated by the bell 92, which is sounded momentarily upon each de-energization of a line relay.

Operation of system shown in Figs. 1A, 1B and 1C

In order to get a better understanding of the system shown, let us first consider the movement of a single train through the single track sections N and O. Let us assume that the operator moves the lever for the single track section N (which lever has not been specifically shown) toward the right thereby setting up east bound traffic in the single track section energizing the control relay ZE at the east end of single track section N toward the right. Let us further assume that the dispatcher moves the lever L shown in Fig. 1A to the right for the purpose of setting up east bound traffic in the single track section O. Movement of the lever L to the right energizes the control relay ZW at the west end of single track section O toward the right through a circuit which may be traced as follows:—beginning at the neutral point of the battery 95 located in the tower DT through the right hand portion of this battery, lever L, winding of the line relay 2LR, wire 18W, front contact 96 of the detector track relay 2DT, winding of the control relay ZW, to the common return wire C connected to the middle point of the battery 95. A similar circuit may be traced for the control relay ZE located at the east end of single track section O as follows:—starting from the battery 95, the lever L moved to the right hand position winding of the line relay 7LR, wire 19W, front contact 97 of the detector relay 7DT, winding of the control relay ZE, to the common return wire C connected to the middle point of battery 95. This will cause the control relay ZE to be energized to the right hand position.

With the control relay ZW energized to its right hand position the circuit for the home relay 2H 75

heretofore traced is completed at the neutral contact 46 of the control relay ZW, thus causing the home relay 2H to assume its right hand energized position in which position it will cause the signal 2 to assume its vertical clear position through suitable circuits and control mechanism which has for convenience been omitted from the drawings. In this connection it may be stated that each of the home relays controls the signal adjacent thereto having a number corresponding to the prefix of the reference number for such home relay, that is, home relay 2H controls the signal 2, home relay 3H controls the signal 3, and so forth. As the signal 2 moves from its stop position the energizing circuit for the home relay 3H is broken at the signal contact 24 of the signal 2, thereby causing the home relay 3H to be de-energized and causing the signal 3 to move from the caution to the danger position. In the same way, de-energization of the home relay 3H causes dropping of the contact 29 and in turn causes de-energization of the home relay 5H; and dropping of the contact 30 of home relay 5H would cause de-energization of the home relay 7H if this relay were not already de-energized. It thus appears that movement of the lever L to the right hand position sets up east bound traffic in the single track section O. In the same way east bound traffic is assumed to have been set up in the single track section N. It may be stated here that all of the intermediate signals as well as the starting and entering signals may normally be at stop and the polar position of the control relays at the ends of the siding when energized determines whether east or west bound traffic shall be permitted to proceed. In other words instead of opening one of two normally closed tumble down circuits, one of two normally open tumble down circuits may be closed.

Let us now assume that there is a train moving from left to right, that is in an easterly direction, in the single track section N, bearing in mind that the home relay 8H is still de-energized holding the signal 8 at stop, because its energizing circuit is broken at the lock contact 53 of the switch control mechanism, and that for this reason the signal 8 is held at caution because the home relay 6H is energized in the reverse direction as a result of the signal 8 being at stop.

Let us assume that the train in the single track section N has now progressed to a point where it shunts the track relay 5T and thereby causes the retraction of contact 99 of this relay 5T to complete an energizing circuit for the lock relay LRW as follows:—beginning at the terminal B, back contact 99 or relay 5T, front contact 100 of the detector track relay 7DT, winding of the lock relay LRW, to common return wire C, thus causing this relay LRW to assume its energized position. As the train in question proceeds the lock relay LRW is maintained energized until the train has completely entered the passing siding. During the portion of travel of the train toward the passing siding until it reaches the fouling or detector track circuit the relay LRW is energized through one or more of the contacts 99, 93, or 94 of the track relays 5T, 6T and 7T. As the train enters the detector track circuit containing track relay 7DT the contact 107 is closed before the contact 100, of the make-before-break contacts 100—107, has been opened, so that the lock relay LRW is stuck up, so long as the entering train is occupying the detector track circuit. In regard to this lock relay LRW it remains de-ener-

gized upon movement of a train out of the passing siding, by reason of the fact that contact 100 opens before contact 94 closes, until such departing train has left the detector track circuit, and by reason of this fact, and for other reasons, the lock magnet 87 is not energized and the switch points are free to be trailed during such train movement.

With the lock relay LRW energized the electric lock winding 87 of the switch mechanism for switch 8S is energized through the following circuit:—beginning at the terminal B of a suitable source of current, front contact 101 of the lock relay LRW, winding 87 of the lock magnet, polar contact 102 of the control relay ZE, neutral contact 103 of this same relay, dual control selector contact 104 of the switch mechanism of switch 3S, to common return wire C connected to the other side of said source of current. The completion of this circuit causes the locking plunger 89 to assume its locked position thereby locking the switch bar 80 against movement and also causing the lock contact 53 to be shifted to its abnormal position.

The shifting of the contact 53 causes the energizing circuit for the home relay 8H heretofore traced to be completed. It should be noted that this circuit also includes a neutral contact of the control relay ZE, the function of which will be explained hereinafter. The completion of the circuit for the home relay just traced will cause this home relay 8H and in turn the signal 8 to assume the clear position, because the circuit for the home relay 8H receives its energy from terminal B+ through the contact 68 of the signal 2. In other words, the approaching train moving from left to right in the single track section N has locked the switch points of switch 8S, and after these points have been properly locked up, the signal 8 is permitted to clear and the train is permitted to take the right hand track of the passing siding at a moderately high speed, which speed of course depends upon the degree of curvature in the track rails, the grading of the track, and the like. Since the signals 8 and 2 both indicate clear traffic conditions ahead the train may proceed through the passing siding into the single track section O. It should however be noted that the signal 2 cannot assume its clear position unless the switch points of the switch 1S are unlocked and the dual control selector DS of the switch control mechanism is in its normal spring switch position. This is because the energizing circuit for the home relay 2H includes the contact 43 closed when the electric lock is in its unlocked condition, and also includes the contact 44 of the dual control selector. The train may therefore pass out of the passing siding into the single track section O, and in so doing trails the points of the switch 1S to a position to permit the wheel flanges to pass out of the siding, after which the dash pot 84—86, or other suitable retarding mechanism such as shown in Fig. 3, prevents the switch points from returning to the normal position between the passage of successive trucks through the switch. In other words, with the switch once trailed there is very little bounding of the switch points during the passage of the train therethrough, because these switch points are not permitted to return to their normal position very quickly. The train in question having now entered the single track section O may pass into the right hand track of the next passing siding in a manner as already explained.

Making a meet.—Let us now consider two

trains making a meet at the passing siding between the single track section N and O. Let us assume that the relay ZE at the east end of single track section N has been energized to the right hand position setting up east bound traffic for the single track section N, and let us assume that the lever L in the tower DT has been moved to the left hand position thereby setting up west bound traffic in the single track section O. This movement of the lever L to the left hand position energized the control relay ZW and ZE of the single track section O to the left hand position. Referring to the control relay ZE at the east end of single track section O it will be noted that closure of contacts 55 and 56 will permit the home relay 7H to assume its clear energized position thereby permitting the signal 7 to assume a clear position, providing of course that the switch points of the switch 8S are not locked and that the dual control selector DS of the mechanism for this switch 8S is in the normal spring actuating position. It should also be noted that if the relay ZW at the west end of single track section O is energized to the left hand position the signal 2 is prevented from clearing, but the signal 1 may clear by reason of closure of neutral contact 65 of relay ZW as soon as the approaching train locks the switch points in a manner as already explained in connection with the switch 8S of the single track section N.

Let us now assume that the two trains in question approaching each other in single track sections N and O are nearing the switch points, the electric locks of the two switching mechanisms will lock the switch points, thereby permitting the signals 8 and 1 to indicate proceed as far as the lock contacts 53 and switch box contacts 72 of the switch mechanism are concerned, all in a manner already described. It should however be noted that neither the signal 8 nor the signal 1 may assume the clear position, this because the signal 8 is held at caution because the signal 2 in advance thereof is held at stop, and similarly the signal 1 cannot clear because the signal 7 in advance thereof is held at stop. In this connection it should be noted that the home relays 8H and 1H receive their energy from the signal blade contact 68 of signal 2 and signal blade contact 69 of the signal 7, respectively, and that both of these contacts are connected to the terminal B— when the signal 2 and 7 are in the stop position.

Both trains thus receive a caution indication as they enter the passing siding, and these trains if they approach simultaneously will be compelled to come to a stop, or a low speed, each on its own or right hand track of the passing siding. As the train moving in a westwardly direction in the single track section O passes the signal 1 and treads on the detector track circuit, the detector track relay 2DT is de-energized thereby not only causing the signal 1 to go to stop, but also causing the energizing circuit for the control relay ZW to be opened at the front contact 96 of the detector track relay 2ST. This not only causes the relay ZW to be de-energized but also causes the line relay 2LR located in the tower DT to be de-energized, and since the lever L is in the left hand position, the de-energization of the line relay 2LR causes the indicating lamp 2IW to be energized through the following circuit:—beginning at the terminal B of a suitable source, back contact 108 of relay 2LR, contact 109 controlled by the lever L, lamp 2IW to a common return wire C connected to the other side of said source

of energy. This lamp 2IW will indicate to the dispatcher that the west bound train is entering the passing siding. In the same manner and for similar reasons the dispatcher is informed when the east bound train in the single track section N enters the passing siding between these sections N and O.

If the two trains under consideration are the only trains located in the sections N and O and in the passing siding between these sections, and the operator wishes these trains to make a meet on this passing siding as has been assumed, the operator may move the lever L from its extreme left hand position to its extreme right hand position as soon as the front end of the west bound train has passed the signal 1 of the single track section O. This is feasible and safe because the presence of this train holds the signal 2 at stop so that movement of the lever L to the right hand position by the dispatcher will not clear the signal 2 at the west end of single track section O, even though the relay ZW is energized to the right hand east bound position.

It thus appears that as soon as the west bound train passes off of the detector track circuit containing track relay 2DT, that the picking up of the detector track relay 2DT causes its back contact 107 to open the stick circuit for the lock relay LRE, thereby causing this lock relay to assume its de-energized position and in turn cause the electric lock magnet winding 87 to be de-energized, thus unlocking the switch points and permitting the signal 2 to assume the clear position, so that the east bound train may proceed in response to clearing of the signal 2 as soon as the rear end of the west bound train has passed off of the detector track circuit 2DT. This is of course on the assumption that there is no other west bound train in single track section O. In this connection it should be noted that the lock relay LRE would not have dropped upon picking up of detector track relay 2DT had any one of the track relays 2T, 3T or 4T been de-energized by reason of the presence of another train.

Similarly, the west bound train may proceed into the single track section N in response to clearing of the signal 7 as soon as the east bound train has passed off of the detector track circuit containing track relay 7DT, this signal 7 will of course not clear unless the switch mechanism of the switch 8S has been properly unlocked in response to dropping of the lock relay LRW, the dispatcher has energized the control relay ZE toward the left, and traffic conditions in advance are favorable.

From the operation of the system as thus far considered it appears that trains may be caused to meet each other at a passing siding with very little delay and possibly with delay to one train only, because the presence of a train on the right hand track for one direction of travel does not interfere with the free movement of a train over the right hand track for the other direction of travel. Putting it another way, a west bound train may be standing on the right hand track for west bound traffic and an east bound train may pass over the right hand portion of the passing siding for east bound traffic at normal running speed which may be as high as 60 miles an hour, assuming that the switches are constructed to be taken at such speed.

Pass from the rear.—Although the more common and usual conflict between trains operating on a single track section consists of trains meeting each other, there are rare occurrences where

one train is to overtake another train by passing it from the rear. This is often the case where a through passenger train overtakes a local passenger train or a freight train, or the like. In accordance with the present invention it is proposed to handle passes from the rear by train order given through the medium of telephone communication together with suitable manually operable means located along the track, so that if the train crew moves its train only in response to signal indications there cannot be a collision even though a train takes the left hand track in order to let another train pass it from the rear over the right hand track. There are several different ways, in which they may be safely accomplished, and these methods will be considered separately.

First method.—Let us assume that there are two west bound trains following each other on the north track of the passing siding at the east end of single track section O, and that the first train is a local or slow passenger train and that the second train is a first class passenger train. In order to permit these trains to continue their westward movement through the single track section O, the train dispatcher will move his lever L in the tower DT toward the left, thereby energizing the control relay ZW and ZE at the west and east end respectively of the single track section O to their left hand dotted position. Energization of the control relay ZW will not result in the clearing of signal 1 at this time, because this signal cannot clear until an approaching train has caused the switch points to be locked in their normal position. Energization of the relay ZE, however, causes the signal 7 to move to its clear position providing the switch points are not locked and the dual control selector is in its normal position. In response to clearing of the signals 7 the local passenger train will proceed in a westwardly direction into the single track section O, the train dispatcher being informed by the momentary sounding of the bell 92 and the illumination of the indicating lamp 7IW that the train has entered upon the detector track circuit containing relay 7DT. It may be pointed out here that the bell 92 is sounded only momentarily because the inertia contact 98 is made only momentarily this by reason of the fact that the weight 98^a will, due to its inertia, only swing past its normal position for a moment upon de-energization of the relay 7LR, during which time the energizing circuit for the bell 92 is completed and after which this weight will come to rest in the position shown. The dispatcher will then observe the indication lamp 7IW and as soon as this lamp is extinguished he will know that the first train has completely passed into the single track section O. He will then observe the condition of lamp 7IW, or listen for the bell 92, to see whether the high speed passenger train has yet accepted the signal 7. As soon as the indicating lamp 7IW is again illuminated the operator knows that the passenger train is entering the single track section O, and that he may now de-energize the relay ZE as far as movement of the two trains in question through the single track section O is concerned. The dispatcher will now move his lever L to the middle or neutral position thereby de-energizing both the control relay ZW and the control relay ZE. De-energization of the control relay ZW will prevent the clearing of the signal 1 because it cannot effect locking of the switch points of track switch 1S and further because the home relay 1H con-

trolling this signal is held de-energized at the neutral contact 65 of the control relay ZW. The engineer of this local passenger train will then go to the telephone and tell the dispatcher that the signal 1 is held at stop and whether there are any instructions. The dispatcher will inform the engineer that he is to take the left hand track at a slow speed, and that this may be done by operating the dual control selector to the abnormal position, and that after this has been done the switch points may be operated by the switch stand SS. The conductor or trainman will then operate the dual control selector to the abnormal position the operation of which will assure de-energization of the home relay 2H, and in turn assure that the signal 2 will remain at stop and the opening of contact 104 will cut energy off of the electric lock winding 87 so that the switch points may be manually operable by the switch stand SS. After the dual control selector has been operated to its abnormal position as just explained, the switch points may be operated to the abnormal position through the medium of the switch stand SS. The local passenger train will then slowly enter into the left hand track of the passing siding at the west end of single track section O. As soon as the rear end of the local passenger train has entered the left hand side of the passing siding, the trainman will return the switch points to their normal position by operating the switch stand SS and will then return the dual control selector DS to its normal position. In the meantime the train dispatcher has possibly returned his lever L to the left hand position, and in so doing has energized the control relay ZW, thus permitting clearing of the signal 1 as soon as the dual control selector has been returned to the normal spring switch position, and the switch points have been properly electrically locked. The approach of the high speed passenger train, also moving in a westwardly direction in the single track section O, will cause the lock relay LRE to be picked up in a manner as already described, thereby causing the switch points of the switch 1S to be properly locked and in turn causing the signal 1 to assume the clear position, so that the high speed or through passenger train may proceed to take the right hand track of the passing siding between the single track sections N and O. The operator will of course set up west bound direction of traffic in the single track section N and will allow the high speed passenger train to proceed on its west bound travel.

The local passenger train is assumed to be still occupying the left hand track for west bound traffic of the passing siding between single track sections N and O, and by reason of the dwarf signal 7D being a dark signal, or indicating danger in some other way, this train cannot proceed westwardly. By the first method of passing trains from the rear the dispatcher will move his control lever L to the right thereby setting up east bound traffic in the single track section O and he will request the train crew to back out their train in response to the clearing of signal 2. The train will of course trail the switch 1S in a manner as already described, and when the train has backed entirely into the single track section O the switch points are returned to their normal position by the spring 83 of the spring switch mechanism. The presence of this local passenger train on the track circuit of track relay 2T will cause the lock relay LRE to assume its energized position as soon as this train has

backed entirely off of the circuit containing detector track relay 2DT, this by reason of the closure of back contact 43 of the track relay 2T and closure of front contact 49 of the detector track relay 2DT, and with the lock relay LRE once picked up a stick circuit will be completed through its front contact 106 and the contact 107 of relay 2DT as soon as this local passenger train moves westward upon the detector track circuit. Energization of the lock relay LRE will of course apply electric current to the lock magnet winding 87 thus locking the switch points and permitting clearing of the signal 1 in a manner as already described, so that the local passenger train may continue its westward travel over the right hand track of the passing siding and then into the single track section N.

Second method.—Let us now consider the second method of allowing one train to pass another from the rear. In this case let us assume that west bound traffic has been set up in the single track section O and that a local or slow passenger train is moving westwardly in this single track section O. This train may of course continue its movement into the right hand track of the passing siding between the single track sections N and O and will be brought to a stop at the signal 7 at the west end of this passing siding. With the first of these two trains moving in a westwardly direction in the single track section O, and with the signal 7 on the west end of the passing siding ahead of such train at stop, this first or local passenger train on the right hand portion of the siding is brought to a stop. In this connection it should be noted that the signal 7 has remained at stop during the approach of the first passenger train, and that for this reason the approach relay 7AR is stuck up through the following stick circuit:—beginning at the terminal B of a suitable battery, front stick contact 116, the approach relay 7AR, the winding of this relay, wire 12W, signal contact 117 of the starting signal 7 only closed when this starting signal is in the stop position. This approach relay 7AR had been picked up previously by the following pick-up circuit:—beginning at the terminal B of the same or another battery, front contact 118 of the track relay 2T, front contact 119 of the detector track relay 2DT, front contact 120 of the track relay 1T, the winding of the relay 7AR, the contact 117 of the signal 7 to the common return wire C. In other words, the relay 7AR if energized manifests that there is either no train occupying a section extending one track circuit beyond the next signal in the rear, or if there is a train occupying this section this train has approached and accepted the next signal in the rear at caution. This is true, because if after the train has entered such section the signal 7 is cleared and even though normally the stick circuit for the approach relay 7AR is broken at the contact 117 thus de-energizing the relay 7AR and if the signal 7 is again returned to the stop position, the relay 7AR cannot pick up because, as has been assumed, the approaching train has already entered the approach section in question and has therefore opened the pick-up circuit for the relay 7AR at one or more of the contacts 118, 119 or 120. Let us assume that the dispatcher has allowed the high speed train to move into the single track section O in a westwardly direction and that he wishes to communicate with the engineer of this high speed passenger train and in order to do so he de-energizes the control relay ZW. In response to

movement of the lever L to the neutral position after this high speed passenger train has entered the single track section O, this train will of course be brought to a stop at the signal 1, and in accordance with the rules the engineer or his aid will immediately go to a telephone conveniently located and will communicate with the dispatcher. In this case the dispatcher will tell the engineer of the high speed passenger train, or his aid, that they are to operate the dual control selector DS and the switch stand SS of the switch 1S and that they are to take the left hand track, further that after the train has entered this left hand track they are to return the dual control selector and the switch stand SS back to their normal position. The high speed passenger train is now permitted to proceed until it reaches the dwarf signal 7D where the train will again be brought to a stop and the engineer, or his aid, will communicate with the train dispatcher. The train dispatcher will inform the engineer that he is to depress the push button contact 7PB located near the telephone and the dwarf signal, and that if conditions are safe the signal 7D will clear and the train may proceed in response thereto. If now, the engineer, or his aid, depresses the push button 7PB, and assuming that traffic conditions in advance are safe, the home relay 7DH will be energized through the following circuit:—beginning at the terminal B±(+ or -), front contact 30 of the home relay 5H, front contact 50 of the track relay 6T, front contact 51 of the track relay 7T, front contact 52, detector track relay 7DT, signal contact 57 of the signal 7, wire 13W, winding of the home relay 7DH, contact 58 of the push button 7PB to the common return wire C connected to the other side of said source of energy. With this home relay 7DH once picked up, it will be stuck up through the front contact 109. With the home relay 7DH in its energized condition and with the approach locking relay 7AR energized an energizing circuit for the dwarf signal 7D is completed as follows:—beginning at the terminal B of a suitable battery or other source of current, front contact 112 of the home relay 7DH, front contact 113 of the approach relay 7AR, wire 11W, switch box contact 114 associated with the switch 8S, dwarf signal 7D to the common return wire C connected to the other side of said battery. Since the approach relay 7AR is stuck up through its stick circuit and since the home relay 7DH is also energized through a stick circuit the engineer, or his aid, who has depressed the push button 7PB may retire to the engine cab and the train may proceed in response to the clear indication of the dwarf signal 7D.

The high speed passenger train now having proceeded into the single track section N in a westward direction, and the dispatcher having been informed of such train by illumination of the indicating lamp 7IW, as this first class passenger train moved over the detector track circuit containing detector track relay 7DT, the dispatcher will clear the signal 7 by moving his lever L toward the left, thereby permitting the local passenger train to follow the first class passenger train into the single track section N. It should be noted that the first class passenger train moved into the single track section N in response to clearing of the dwarf signal 7D and that the dispatcher did not set up a particular direction of traffic in the single track section N, but merely permitted the train to enter such section in response to the clearing of dwarf signal

7D. It should be noted that that is entirely safe because the dwarf signal 7D is in part controlled by the home relay 7DH, which home relay is controlled in accordance with traffic conditions ahead, and if another train had entered the west end of the single track section N the home relays 3H and 5H would be de-energized through the tumble-down arrangement present in the absolute permissive block system, as heretofore briefly described thus preventing the clearing of the dwarf signal 7D. On the other hand, as soon as the first class passenger train proceeded westwardly into the single track section N its entry upon the detector track circuit containing track relay 7DT effected de-energization of the home relay 6H because its energizing circuit was broken at the front contact 35 of the detector track relay 7DT, and de-energization of this home relay 6H caused the various east bound home relays to be tumbled down in successive order, so that in this instance the direction of traffic for the single track section N was not set up by the train dispatcher, but was set up by the entrance of the first class passenger train into the single track section N in response to a proceed indication by the dwarf signal 7D.

It should be noted that the approach locking relay 7AR by being in its energized condition gave an assurance that no west bound train would enter the single track section from the north bound track. This is because the approach locking relay cannot be energized unless the signal 7 is at stop and has been at stop since the last train which passed the next signal in the rear accepted such signal. In other words, the approach locking relay 7AR, if up, assures that the train to be stopped by the signal 7, if there is such a train, has received a caution indication at the next signal in the rear and is therefore moving slow enough so that it will come to stop before it reaches the signal 7.

Third method.—The third method of having one train pass another from the rear on the system shown and described may conveniently be called "making a run around move". By this is meant, that the first train of two trains following each other through a particular single track section will in response to a train order communicated in any suitable way take the right hand track of the passing siding, moves entirely through the passing siding and then makes a back up move taking the right hand track for the opposite direction of traffic, so as to stand on the left hand siding facing in the direction in which it proposes to continue its travel. The train in the rear which is to pass the first train may then take the right hand track of the passing siding for its direction of travel in the usual way and pass by the first or inferior train. After the superior train has proceeded to a point where the rear end thereof is entirely within the passing siding limits, the inferior train may back up entirely out of the left track of the passing siding in accordance with signal indications at the back end thereof, and after it has backed entirely out of the passing siding may again move forwardly, taking the right hand track of the passing siding and continuing on its travel in the direction in which it originally moved.

By train moves of this character the crew of neither of the two trains in question was required to operate any switch points by hand nor was train required to move against the normal direction of travel for which the tracks of the passing siding is signaled by wholly automatic signals. In

other words, the train that made the run around move always traveled in the normal direction of traffic. If this method of making a pass from the rear is used, the dwarf signals 2D and 7D may be entirely omitted, but if omitted are preferably replaced by markers which signify that trains must not pass such marker in the direction governed by such marker under any condition.

Fourth method.—Obviously, the first of two following trains which are to make a pass from the rear may take the left hand track in a manner as already described, the second train takes the right hand track and the first train then backs out and follows the second train through the right hand track, in which event the partially manually controlled dwarf signals may be omitted.

The system described is thus one in which the movement of trains in opposite directions may be supervised by a dispatcher located at a distant point entirely through the medium of wayside signal indications as far as holding trains and causing these trains to meet on said passing siding is concerned, and wherein if it is found necessary for one train to pass another train from the rear this may be done in response to oral instructions or written train orders given by the train dispatcher. It should also be borne in mind that if a train takes the left hand track of a passing siding in order to pass another train from the rear that the train in question may enter a single track section in response to the clearing of a special partially manually controlled signal, which can only clear if traffic conditions are safe. Further, the system described is one that is extremely flexible and at the same time extremely simple in that trains may be dispatched thereover in a very convenient way so long as these trains only are required to meet other trains, especially bearing in mind that all of this may be accomplished without the use of power operated switch machine and also without the manual operation of any track switches.

Approach lock release.—If for any reason the approach relay 7AR should be de-energized when there is a west bound train occupying the north track of a passing siding at a time when there is a west bound train on the south track of such passing siding the latter of which is to proceed into the single track section ahead of the trains on the north track in response to clearing of the dwarf signal 7D, it is of course noted that the dwarf signal 7D cannot clear because its energizing circuit includes the front contact 113 of the approach relay 7AR. This condition could come about in any one of several different ways, for instance, if the dispatcher should have failed to move a signal such as the signal 7 to the stop position until after an approaching train had accepted the next signal in the rear of this signal 7, the approach relay 7AR could not pick up and therefore the dwarf signal 7D could not clear.

In order to take care of this possible condition there has been provided another or supplemental home relay 7DH¹. This home relay 7DH¹ is a very slow-acting time controlled device, which cannot close its contacts until a definite period of time has elapsed after energization thereof. In practice, this relay 7DH¹ will not close its front contacts until say two or three minutes after it has been energized. This relay 7DH¹ may be constructed in any suitable way to obtain such delay in the closure of its contacts and for this reason has been shown conventionally as consti-

tuting a slow acting device. If the train crew depresses the push button 7PB with the approach relay 7AR de-energized, but with clear traffic conditions existing ahead the home relay 7DH is picked up and stuck up through its front contact 109 for reasons heretofore given. The home relay 7DH¹ is of course also energized through the same stick contact 109, so that the member of the train crew who has depressed the push button 7PB may return to the cab and after the time interval required for the contacts 122 and 123 of the slow acting home relay 7DH¹ to close has expired the home relay 7DH¹ will then also be stuck up through its front contact 123. The dwarf signal 7D will then be energized through the following circuit:—beginning at the terminal B, front contact 122 of the slow acting or auxiliary home relay 7DH¹, wire 11W, switch box contacts 114 of the switch 8S, through the dwarf signal 7D to the common return wire C connected to the other side of said source. In other words, if there were a west bound train on the left hand track of the passing siding between the single track sections N and O, which were to proceed into the single track section N in response to depression of the push button 7PB, and at the same time there were a train moving westwardly at high speed on the right hand track of this passing siding, the train on the left hand of this passing could not proceed until after an interval of time, say two or three minutes, required for the home relay 7DH¹ to pick up, and this interval of time is sufficient for the train on the right hand track moving at speed to have either come to stop before it passed the starting signal 7 or else would have passed the starting signal 7 and in so doing have prevented the clearing of the dwarf signal 7D.

It should especially be noted that although only a single lever is employed for operating the two control relays ZW and ZE of the single track section O, that two line wires 18W and 19W have been used. These two line wires both of which are energized by the same potential at the same time would at first hand seem unnecessary bearing in mind that the relay ZW is energized to the right when the relay ZE is energized to the right, the relay ZW is energized to the left hand dotted position when the relay ZE is energized to the left hand position, and if one of these relays is de-energized the other is also de-energized, the two line wires have however been provided in order to give distinctive indications at the tower DT when one or the other, or even both, of the detector track relays 2DT and 7DT are de-energized by reasons of the presence of a train on their respective detector track circuits.

Modified control for approach locking relay

In the arrangement shown in Figs. 1A, 1B and 1C of the drawings the lock relay LRW may be picked up by east bound traffic entering upon the detector track circuit including relay 7DT, but may not be picked up when a west bound train passes over this detector track circuit, by reason of the fact that the pick up circuit for this relay includes a front contact of the track relay 7DT and its stick circuit includes a back contact of this relay 7DT. In Fig. 2 of the drawings there has been shown a modified control circuit for controlling this approach locking relay LRW, which control circuit includes contacts of a stick relay 7S, which stick relay is the usual stick of the absolute permissive block signal system. In the arrangement shown it will be noted that a train moving from left to right

will pick up the relay LRW through any one of the contacts 184, 185 or 186 of the track relays 5T, 6T and 7T, because the stick relay 7S is de-energized during the movement of an east bound train through the single track section O. With the lock relay LRW once picked up it will stick up through its stick contact 187 and the back contact 188 of the detector track relay 7DT, so that the passage of an east bound train will effect energization of the lock relay LRW and locking of the spring switch mechanism associated with the track switch 8S. Let us now consider the passage of a west bound train over the detector track circuit including detector track relay 7DT, under which conditions the switch points should not be locked up and the lock relay LRW should not pick up. Let us assume that the west bound train to be considered is moving on the right hand track of the passing siding and passes by the signal 7 in its clear indicating condition. The passage of the train by the signal 7 effects de-energization of the detector track relay 7DT and effects dropping of the contacts 189 and 190 of this track relay 7DT. The dropping of the contact 190 completes a pick up circuit for the stick relay 7S which includes this contact 190 of relay 7DT and the contact 191 of the signal 7, so that the stick relay 7S assumes its energized position. The dropping of the contact 189 de-energizes the home relay 7H and the retraction of the contact 192 of the home relay 7H completes a stick circuit for the relay 7S, which circuit includes this contact 192 and the stick contact 193 of the stick relay 7S, so that the stick relay 7S remains energized so long as the home relay 7H is de-energized. It should be noted that the contact 195 of the stick relay 7S is up and that the lock relay LRW cannot be energized in spite of closure of the contacts 186, 185 or 184 of the various track relays de-energized as the train proceeds in a westward direction. In other words, the arrangement shown in Fig. 3 provides means whereby an east bound train will pick up the lock relay LRW and effect locking of the switch control mechanism, whereas the movement of west bound train will not pick up this lock relay LRW and will therefore not effect locking of the switch control mechanism.

Having thus shown and described several specific embodiments of the present invention it is desired to be understood that the particular arrangements shown and described have been illustrated for the purpose of conveying the underlying purpose of the present invention and the manner in which it may be applied to the particular type of single track absolute-permissive-block signal system shown, and that no attempt has been made to illustrate how the invention may be applied to other systems, and further that the particular embodiment of the invention illustrated has not been selected to show the preferred construction preferably employed in practicing the invention nor that the arrangement shown has been selected to show the scope of the invention, and that various changes, modifications and additions may be made to adapt the invention to other systems of single track or double track railway signalling and that certain features may be omitted if desired all without departing from the scope of the invention or the idea of means underlying the same except as demanded by the scope of the following claims.

What we claim as new is:—

1. In a railway system, a track switch, spring 75

means for holding the switch points of said track switch in the normal position, electrically operated locking means for locking the switch points in the normal position, and manually operable means controlled from a distant point for controlling said locking means.

2. In a railway system, the combination with a railway track including a track switch, spring means for holding the switch points of said track switch in a normal position, a signal associated with said track switch, means for locking said track switch in the normal position effective when there is a train facing the switch points approaching the switch, and means for permitting said signal to indicate proceed only in the event that the switch points are locked by said locking means.

3. In combination with a railway track, a track switch, spring means for holding the switch points of said track switch in the normal position, electrically operated locking means for locking the switch points, a signal associated with said track switch, and means permitting said signal to indicate proceed only in the event the switch points of said track switch are not locked by said locking means.

4. In combination with a railway track, a track switch, a spring operated means for retaining the switch points of said track switch in their main track position, locking means for locking said switch points in said main track position, a way-side signal governing the movement of traffic over said track switch when in the main track position and toward the points of said track switch, and contacts associated with said locking means for governing the clearing of said signal.

5. In combination with a railway track, a track switch, a spring operated means for retaining the switch points of said track switch in their main track position, locking means for locking said switch points in said main track position, a way-side signal governing the movement of traffic over said track switch when in the main track position and toward the points of said track switch, manually operable means for rendering said locking means effective, and contacts associated with said locking means for permitting clearing of said signal only when said locking means is effective.

6. In a traffic controlling system for single track railroads having passing sidings at intervals, starting and entering signals associated with each end of each siding and governing traffic away from and toward the corresponding siding respectively, a track switch at each end of each siding, spring means associated with each track switch and tending to move the switch points to and hold them in one extreme position, said switch points when moved from said extreme position by the wheels of a train trailing the switch being automatically returned by said spring means to that extreme position, the track switches at the ends of each siding being biased to opposite positions by said spring means to direct trains approaching the siding in opposite directions on to different tracks, means for controlling each of said signals by track circuits in advance thereof, means for selectively controlling said starting signal and said entering signal for each siding end in accordance with the position of the associated switch, and means including manually operable devices at a distant central control point for holding at stop either the starting signal or the entering signal or both at the several siding ends at the will of the operator.

7. In a traffic controlling system for single track railroads having passing sidings, starting and entering signals associated with each end of each siding; spring operating means associated with the track switches at the ends of each siding for positioning said track switches in opposite extreme positions, said spring means automatically returning the switch to its extreme position after it has been shifted by the wheels of a train trailing the switch; means for controlling the indications of said signals at each end of each siding jointly in accordance with traffic conditions in advance thereof, the position of the associated track switch, and an electro-responsive device; a detector track circuit at each siding end; line circuits extending from a central control office to the several siding ends; and means including said line circuits for controlling said electro-responsive devices and indicating in said control office the presence of a train on a corresponding detector track circuit.

8. In a railway system including a main track and a siding connected thereto by a track switch, a signal associated with said siding and governing the movement of traffic off of said siding into the main track, a signal on the main track located at least braking distance from said track switch, and means effective to clear the first mentioned signal if suitable manually operable means is operated and there is no train on the main track approaching said track switch or if there is a train approaching, such train has accepted at caution the signal located braking distance from the track switch.

9. In combination, a plurality of indicating relays each assuming a condition corresponding to the condition of occupancy of a distant track circuit, a signal for each of said relays controlled by such relay, an audible signal, and an inertia device associated with each of said relays constructed to only momentarily change the continuity of the energizing circuit for said audible signal upon deenergization of any one of said relays.

10. In combination, a plurality of indicating relays each assuming a condition corresponding to the condition of occupancy of a distant track circuit, a signal for each of said relays controlled by such relay, an audible signal, and inertia means associated with each of said relays for only momentarily closing the energizing circuit of the said audible signal upon a change in the energized condition of any one of such relays.

11. In an absolute-permissive-block system employing spring switches, the combination with the usual directional stick relay of such system, a lock relay of the stick type for locking the points of a spring switch of such system upon the approach of a train, a pick up circuit for said lock relay including a back contact of said stick relay and a back contact of a track relay, and a stick circuit for said lock relay including its own front contact and a back contact of another track relay.

12. In combination, a railway track switch, a switch stand, spring means tending to move the switch points of said track switch to and hold them in one extreme position, said spring means acting to return the switch points automatically to said extreme position after they have been shifted by the wheels of a train trailing the switch, manually operable selecting means for operatively connecting said track switch to said spring means or to said switch stand.

13. In combination, a railway track switch, a

switch stand, a spring operated track switch operator, and manually operable selecting means for operatively connecting said track switch to said track switch operator or to said switch stand, and a signal which may be caused to indicate proceed only when said track switch is operatively connected to said track switch operator.

14. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable selecting means for operatively connecting said track switch to said track switch operator or to said switch stand, said selecting means being constructed so that said track switch is at all times during manipulation of said selecting means connected to either said operator or said switch stand.

15. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal, and means for holding said wayside signal at stop if said dual control selector is in a position to connect said switch stand to said track switch.

16. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal having its control dependent on the position of said manually operable dual control selector, and locking means for locking said track switch in the main track position under predetermined traffic conditions.

17. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal controlled in accordance with the position of said dual control selector, locking means for locking said track switch in the main track position, and means for rendering said locking means ineffective so long as said dual control selector is in a condition to connect said switch stand to said track switch.

18. In a system for governing railroad traffic over track switches, the combination with spring means operable to move the switch points to one extreme position and automatically return them to that position after they have been shifted by the wheels of a train trailing the switch, locking means for holding said switch points in said extreme position, a signal governing traffic over the switch in the facing direction, a hand-throw device adapted to shift said switch points to either extreme position, and means for causing said signal to indicate stop if said locking means is unlocked or if said hand-throw device is effective.

19. In a system for governing railroad traffic over track switches, the combination with spring means operable to move the switch points to one extreme position and automatically return them to that position after they have been shifted by the wheels of a train trailing the switch, locking means effective only if the switch points are in said extreme position for positively holding the switch points in that position, a signal governing traffic over said switch in the trailing direction, a hand-throw device operable to shift said switch points to either extreme position, manually operable selecting means for connecting said switch points to said spring means or to said hand-throw

device, and means preventing the clearing of said signal if said locking means is locked to prevent trailing of the switch or if the switch points are connected to said hand-throw device.

20. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal controlled in accordance with the position of said dual control selector, locking means for locking said track switch, and means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator.

21. In a system for governing railroad traffic over track switches, the combination with spring means operable to move the switch points to one extreme position and automatically returning them to that position after they have been shifted by the wheels of a train trailing the switch, locking means effective to hold the switch points in said extreme position, a signal governing traffic over the switch in the facing direction, a switch stand adapted when connected to the switch points to operate them to either extreme position, manually operable means for operatively connecting said switch stand to the switch points, and means preventing the clearing of said signal if said locking means is unlocked or if said switch stand is connected to the switch points.

22. In a system for governing traffic over track switches, the combination with spring means tending to hold the switch points in one extreme position and acting to return them automatically to that position after they are shifted by the wheels of a train trailing the switch, a switch stand for operating the switch by hand, an electrically operable lock for positively holding the switch points in the spring operated position, track circuit controlled means for governing said lock, and manually operable means for rendering said lock ineffective to permit hand operation of the switch by said switch stand.

23. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal, locking means for locking said track switch, means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator, and means for permitting said signal to assume a proceed condition only if said locking means is active.

24. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal, locking means for locking said track switch, means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator, and means for permitting said signal to assume a proceed condition only if said locking means is inactive.

25. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track

switch to said switch stand or to said switch operator, a wayside signal, locking means for locking said track switch, means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator, and means for permitting said signal to assume a proceed condition only if said locking means is active and said dual control selector is in position to connect said track switch to said switch operator.

26. In combination; a railway track switch; a switch stand; a spring operated track switch operator; manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator; a wayside signal; locking means for locking said track switch; means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator; and means for permitting said signal to assume a proceed condition only if said locking means is active, said track switch is in the main track position and said dual control selector is in position to connect said track switch to said switch operator.

27. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal, locking means for locking said track switch, means for rendering said locking means active only if said dual control selector is in position to connect said track switch to said switch operator, and means for permitting said signal to assume a proceed condition only if said locking means is active and said track switch is in the main track position.

28. In combination, a railway track switch, a switch stand, a spring operated track switch operator, manually operable dual control selecting means for operatively connecting said track switch to said switch stand or to said switch operator, a wayside signal, locking means active only if said dual control selector is in position to connect said track switch to said switch operator, and means for permitting said signal to assume a proceed condition only if said locking means is inactive and said dual control selector is in position to connect said track switch to said switch operator.

29. In combination, a spring operated track switch, locking means for locking said track switch in the main track position upon the approach of a train facing the switch points, a signal located substantially braking distance from the track switch in the direction from which said train is approaching, and means for permitting said signal to indicate proceed only in the event said locking means is active.

30. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, a signal for governing the movement of trains on the main track in a direction trailing the switch points, and manually operable means located on the ground and near said track switch for causing said signal to indicate proceed effective only if a second signal governing the movement of traffic off of the diverging route is at stop.

31. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, a signal

for governing the movement of trains on the main track in a trailing direction, and manually operable means for causing said signal to indicate proceed effective if a signal governing the movement of traffic off of the diverging route is at stop and providing there is no train on the main track approaching said track switch unless such approaching train has accepted a distant signal at caution or stop.

32. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, a signal for governing the movement of trains off of the diverging route, locking means for locking the track switch in its spring pressed position, and means for preventing said signal assuming a proceed condition if said locking means is active.

33. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, means for temporarily holding said track switch in its trailed position if operated to the trailed position, a signal for governing the movement of trains on the main track in a direction trailing the switch points, and manually operable means located on the ground and near said track switch for causing said signal to indicate proceed effective only if a second signal governing the movement of traffic off of the diverging route is at stop and said switch points are held in the trailed position by said temporary holding means.

34. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, means for temporarily holding said track switch in its trailed position if operated to the trailed position, a signal for governing the movement of trains on the main track in a direction trailing the switch points which may be cleared only when said track switch is held in the trailed position by said temporary holding means, and manually operable means for causing said signal to indicate proceed effective if a signal governing the movement of traffic off of the diverging route is at stop and providing there is no train approaching said switch points unless such approaching train has accepted a distant signal at caution or stop.

35. In combination, a main track, a diverging route, a spring operated track switch in which the spring acts to allow a train facing the switch points to move on the main track only, means for temporarily holding said track switch in its trailed position when operated to the trailed position by the wheels of a train trailing the switch, a signal for governing the movement of trains off of the diverging route, locking means for positively locking the track switch in its spring pressed position, and means for preventing said signal assuming a proceed condition if said locking means is active.

36. In a system for governing railroad traffic on single track railroads, the combination with a stretch of single track having passing sidings at intervals and provided with track circuits, track switches at the ends of the passing sidings, spring means operatively connected to each switch and tending to move the switch points thereof to and hold them in one extreme position, said spring means acting automatically to return the switch points to said extreme position after they have been displaced by the wheels

of a train trailing the switch, starting signals at the ends of said sidings governing traffic toward the adjacent siding and controlled by the intervening track circuits, means interlocking the opposing starting signals for two adjacent sidings and preventing either signal being cleared unless the other signal indicates stop, locking means for holding each track switch in said extreme position to which it is biased by its associated spring means, means preventing the clearing of each starting signal if the locking means of the associated track switch is locked, a control relay for governing each starting signal, and means including manually operable devices at a distant central control point for governing said control relays at the will of the operator.

37. In a system for governing railroad traffic on single track railroads having passing sidings at intervals, the combination with spring switches at the ends of said sidings, locking means effective to positively hold each switch in its spring actuated position, a starting signal and an entering signal associated with each end of each siding and governing traffic away from and toward the siding respectively, means including manually operable devices at a distant central control point for tending to clear either the starting signal or the entering signal at each siding end at the will of the operator, means for governing said signals for each siding end in accordance with the position of the associated track switch and the locked or unlocked condition of its locking means, means interlocking the opposing starting signals of adjacent siding ends and preventing either signal being cleared unless the other indicates stop, and track circuits for governing said signals in accordance with the presence or absence of trains in advance thereof.

38. In a system for governing traffic on single track railroads having passing sidings at intervals, the combination with spring switches at the ends of said sidings, locking means for mechanically holding said switches in their spring actuated position, starting signals at the ends of said sidings governing traffic toward the adjacent siding and controlled by the intervening track circuits, entering signals at the ends of said sidings governing traffic over the corresponding switch toward the other end of the siding, means for governing the indications of said signals in accordance with the position of the corresponding switch, other means for governing the indications of said signals to prevent the clearing of the starting signal if the locking means is locked and the clearing of the entering signal if said locking means is unlocked, and means including manually operable control devices at a distant central control point for holding at stop either the starting signal or the entering signal or both for each siding end at the will of the operator.

39. In a system of traffic control for single track railroads having passing sidings at intervals and provided with track circuits, the combination with a track switch at each end of each siding, signals governing traffic in both directions over said switches and through the intervening stretches of single track, said signals being automatically controlled by track circuits in advance thereof, means associated with each switch for governing the indications of the signals associated therewith in accordance with the position of the switch, a lock for mechanically holding each switch in one extreme position only, means preventing the clearing of the signals governing traffic over the switches in the facing di-

rection unless the corresponding lock is effective, and means including line circuits extending from a central control office to the several siding ends for holding at stop said signals at the will of an operator.

40. In a traffic controlling system for single track railroads having passing sidings at intervals, a track switch for each siding end, spring means for actuating each track switch to one extreme position, power-operated locking means for restraining each switch in its spring actuated position against movement, signals governing traffic in both directions over said switches and through the intervening sections of single track, means controlling the indications of said signals in accordance with the position of the corresponding switch and locked or unlocked condition of its associated locking means, and means including manually operable devices located at a distant central control point for governing said signals and said locking means at the several siding ends at the will of the operator.

41. In a system for governing traffic over single track railroads having passing sidings at intervals, the combination with spring actuated track switches at the ends of said passing sidings, locking means for each track switch operable to hold the switch mechanically in its spring actuated position, power means for operating said locking means to its locking position, signals governing traffic in both directions over said switches and through the intervening portions of single track, track circuits for controlling said signals, means for controlling said signals and said power means at the respective siding ends from a distant central control point, and automatically track circuit controlled means responsive to the direction of train movement for also governing said power means.

42. In a traffic controlling system for railroads, the combination with a spring-actuated track switch, normally inactive power-operated means for locking said switch in its spring actuated position, track circuit controlled means responsive to the direction of train movement for controlling said power-operated means to lock the switch upon the approach of a train in the facing direction, and signaling means operated only if said locking means is effective.

43. In a traffic controlling system for railroads, the combination with a track switch, a power-operated lock for holding the switch in one extreme position only, signals governing traffic over the switch in opposite directions, and means controlled in accordance with the condition of said lock for preventing clearing of the signal governing traffic in the facing direction if said lock is unlocked, and the clearing of the signal governing traffic in the trailing direction if said lock is locked.

44. In a traffic controlling system for railroads, the combination with a spring actuated track switch, a locking plunger effective only if the switch is in its spring actuated position for mechanically locking the switch against movement, power means for actuating said locking plunger, manually controllable means for governing said power means from a distant control point, a signal governing traffic over the switch in its spring-actuated position, a control circuit for said signal, and contacts in said control circuit operated by said locking plunger and closed only if said plunger is in its locking position.

45. In a traffic controlling system for railroads, the combination with the movable switch points of a track switch, spring means operatively con-

nected to said switch points and tending to move them to one extreme position, said spring means permitting the switch points to be shifted to the other position by the wheels of a train trailing the switch and acting to restore the switch points automatically to said extreme position after passage of the train, a plunger lock effective only if the switch points are in said extreme position for locking said switch points against movement, a signal for governing train movements in the trailing direction over said switch, and means for preventing clearing of said signal if said lock is in its locking position.

46. In a traffic controlling system for railroads, the combination with the movable switch points of a track switch, spring means connected to said switch points and acting to shift them to one extreme position, after having been moved from that position by the wheels of a train trailing the switch, a plunger lock effective only if said switch points are in said extreme position for locking them against movement, electrically operable means for actuating said plunger to its locking position, a signal located braking distance from said switch and governing traffic in the facing direction toward the switch, track circuit controlled means rendered effective by a train approaching said signal in the facing direction only for governing said electrical operable means to cause actuation of said lock to its locking position, and means for preventing clearing of said signal if said lock is not locked.

47. In a traffic controlling system for railroads, the combination with the movable switch points of a track switch, a plunger lock effective only if said switch points are in the normal position for locking them against movement, a signal governing train movement over said switch in the trailing direction, a control circuit for said signal, and circuit controlling means included in said control circuit and actuated by said plunger, said circuit controlling means being closed to permit clearing of said signal only if said plunger is in its unlocked position.

48. In a traffic controlling system for railroads, the combination with the movable switch points of a track switch, a plunger lock effective only if said switch points are in the normal position for locking them against movement, electrically operable means for actuating said lock, means for manually controlling said electrically operable means from a distant central control point, a signal governing train movement over said switch in the trailing direction, track circuits for controlling said signal, and means for holding said signal at stop independently of said track circuits if said lock is in its locking position.

49. In a traffic controlling system for railroads, a track switch, spring means biasing said switch to its normal position, normally inactive locking means for locking said switch against movement in its spring-actuated normal position only, means responsive to a train movement toward the switch only for controlling the operation of said locking means to its locking condition, manually controllable means for also governing said locking means from a distant central control point, a signal governing traffic in the facing direction toward said switch, and means permitting clearing of said signal only if said locking means is effective.

50. In a system of the type described, the combination with a track switch, normally inactive power-operated locking means operable to lock said switch points in its normal position, means

operated in accordance with the direction of train movements for governing said locking means, a wayside signal governing traffic in the facing direction over said switch, and a control circuit for clearing said signal closed only if said switch points are in said normal position and if said locking means is also in its locking position.

51. In a system for controlling train movements on railroads, the combination with a plurality of 10 spring-actuated trailable track switches located at intervals along a railroad track, locking means for each switch effective only if its switch points are in the spring-actuated position for mechanically locking said switch points against movement, electrically operable means for actuating each of said locking means, means for manually controlling the operation of said electrically operable means associated with the several switches from a distant central control point, signals governing traffic in opposite directions over said switches, and means responsive to the position of said locking means of each switch for preventing clearing of the associated signal governing traffic in the facing direction if said locking means is unlocked and also preventing clearing of the associated signal governing traffic in the trailing direction if said locking means is locked.

52. In a system of traffic control for railroads, the combination with a plurality of trailable 30 spring-returned track switches at intervals along the railroad track, a power-operated plunger lock for mechanically locking each switch, signals governing traffic over said switches, means for governing said signals in accordance with the position of the switch points of the associated switch and the locked or unlocked condition of its associated lock, and means including manually movable control levers at a distant central control point for governing the power operation of said locks and also the indications of said signals at the will of an operator.

53. In combination, a railway track switch, manually operable means, means for at times connecting said manually operable means to said track switch for operating said track switch from one track position to the other track position, a signal for indicating the position of said track switch, and another signal for indicating by its aspect whether or not said manually operable means is operatively connected to said track switch.

54. In a railway traffic controlling system, the combination with a section of railway track, of a traffic controlling device for governing traffic over said section, a relay for controlling said traffic controlling device and having a pick-up circuit and a holding circuit, a self-restoring manually controllable normally open push button contact included in said pick-up circuit, a contact controlled in accordance with traffic conditions included in said holding circuit, and a normally closed contact associated with said push button and included in a circuit of a signal governing traffic over said section.

55. In a railway signal system, in combination, a railway track switch, a stick relay for controlling the locked condition of said track switch, a detector track circuit associated with said track switch, an approach section for said track switch, a pick-up circuit for said stick relay closed when there is a train in said approach section, and a stick circuit for said stick relay including a contact closed when said detector track circuit is occupied.

56. In combination, a track switch, a switch stand, shiftable means which if in one position mechanically connects said switch stand to said track switch by an operative connection and which if in another position disconnects said switch stand from said track switch, a lock for locking said track switch at a point in said operative connection between said shiftable means and the switch points of said track switch, and means for rendering said lock inoperative when said switch stand is operatively connected to said track switch.

57. In combination, a track switch, a switch stand, shiftable means which if in one position mechanically connects said switch stand to said track switch by an operative connection and which if in another position disconnects said switch stand from said track switch, a lock for locking said track switch at a point in said operative connection between said shiftable means and the switch points of said track switch, manually controllable means for controlling said lock, and means for rendering said lock inoperative when said switch stand is operatively connected to said track switch.

58. In combination, a track switch, a switch stand, shiftable means which if in one position mechanically connects said switch stand to said track switch by an operative connection and which if in another position disconnects said switch stand from said track switch, a lock for locking said track switch at a point in said operative connection between said shiftable means and the switch points of said track switch, automatically controlled means for controlling said lock, and means for rendering said lock inoperative when said switch stand is operatively connected to said track switch.

59. In combination, a track switch, a switch stand local to said switch for manually operating said track switch, electro-responsive locking means separate and independent of switch operating means for locking said track switch, means for manually controlling said electro-responsive means from a distant control point, and a signal which may be cleared only if said locking means is in its locked condition.

60. In combination, a track switch, a switch stand local to said switch for manually operating said track switch, electro-responsive locking means separate and independent of switch operating means for locking the switch points of said track switch, means for manually controlling said electro-responsive means from a distant control point and only by a person other than the man manually operating said switch stand, and a signal which may be cleared only if said locking means is in its unlocked condition.

61. In combination, a railway track switch, a signal for governing traffic movements over said switch, means set into operation by a train approaching said switch for locking said switch only if said signal is manually controlled to indicate "stop", and means for automatically unlocking said switch when said train has passed over said switch.

62. In combination, a railway track switch spring-biased to a given position, means manually controlled for locking or unlocking said switch in said given position, a signal controlled to permit traffic movements over said switch in said given position if and only if said switch is locked, and a second signal controlled to permit traffic movements over said switch in the op-

posite position if and only if said switch is unlocked.

63. In combination, a railway track switch spring-biased to a given position, means manually controlled for locking or unlocking said switch in said given position, a signal controlled to permit traffic movements in a given direction over said switch in said given position if and only if said switch is locked, and a second signal controlled to permit traffic movements in the opposite direction over said switch in its opposite position if and only if said switch is unlocked.

64. In combination, a railway track switch, means set into operation by a train approaching said switch from a given direction for locking said switch, a signal for governing traffic movements from said given direction over said switch, and means for clearing said signal only if said locking means has been operated to lock said switch.

65. In combination, a lock magnet for controlling the operation of railway traffic governing means, a polar relay for controlling the operation of said lock magnet, indication means located at a remote point, a circuit including two line wires for controlling said polar relay and said indication means, and means located at said remote point for controlling said circuit.

66. In combination, a local office, a track switch located at a distant point, an electrically operated lock for locking said track switch, a signal adjacent said track switch, means for rendering said signal active if said electrically operated lock assumes a predetermined condition only, and means including a single line circuit connecting said office and said distant point for controlling said electrically operated lock and for receiving an indication that a train has accepted said signal and is passing over said track switch in its locked condition.

67. In combination, a local office, a track switch located at a distant point, an electrically operated lock for locking said track switch, a single line circuit connecting said office and distant point, a lever in said office for controlling said electrically operated lock over said line circuit, and indicating means adjacent said track switch for indicating the condition of said electric lock.

68. In combination, a local office, a track switch located at a distant point, an electrically operated lock for locking said track switch, a single line circuit connecting said office and distant point, a lever in said office for controlling said electrically operated lock over said line circuit, and indicating means adjacent said track switch for distinctively indicating whether said track switch is locked or unlocked.

69. In combination, a local office, a track switch located at a distant point, an electrically operated lock for locking said track switch, a signal adjacent said track switch, means for rendering said signal active only if said electrically operated lock assumes a predetermined condition, a single line circuit connecting said office and said distant point, a lever in said office for controlling said lock over said line circuit, and an indicator in said office for indicating the passage of a train over said track switch which train passed in response to the active condition of said signal, whereby said indicator indirectly indicates said predetermined condition of said switch.

70. In combination, a track switch, two railway track routes over said track switch, each route being for a distinctive position of the track switch

and for a particular and distinctive direction of train travel over said switch, a signal for governing traffic over each of said routes, an approach section for each of said signals, a contact in the control circuit for each of said signals and closed when there is a train approaching on the associated approach section, and means responsive to the clearing of one of said signals in response to the closure of its associated contact to block the other of said signals against clearing in response to the subsequent entrance of another train into the other of said approach sections.

71. In combination, a railway system including two track switches, two routes having a portion of railway track and said two track switches in common, a signal for each of said routes, a switch lock for each of said track switches and automatically operated to lock such track switch when there is a train approaching such track switch in a facing point direction, a clearing circuit for each of said signals including a contact closed only if the switch lock of the associated track switch is in its locked condition, and means responsive to the clearing of one of said signals in response to the approach of a train to accept such signal to block the other of said signals against clearing in response to the subsequent entrance of another train into the other of said approach sections.

72. In combination, a railway track switch, a spring operated track switch operator which if connected to said track switch tends to hold the switch points of said track switch in one extreme

position, a switch stand which if connected to said track switch affords manual operation of said track switch to either extreme position, and manually operable selecting means to connect either said track switch operator or said switch stand to said track switch.

73. In combination, a railway track switch, a spring operated track switch operator which if connected to said track switch tends to hold the switch points of said track switch in one extreme position, a switch stand which if connected to said track switch affords manual operation of said track switch to either extreme position, manually operable selecting means to connect either said track switch operator or said switch stand to said track switch, a signal for governing movement of traffic over said track switch, and a clearing circuit for said signal including a contact closed only if said selecting means assumes one of its selecting positions.

74. In combination, a railway track switch, a signal for governing traffic movements over said switch in one direction, manually controlled means for controlling said signal, means set into operation by a train approaching said switch in the opposite direction for locking said switch only if said manually controlled means is manually controlled to cause said signal to indicate "stop", and means for automatically unlocking said switch when said train has passed over said switch.

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