C. M. HURST.

AUTOMATIC SWITCH AND SIGNAL MECHANISM.

APPLICATION FILED MAR. 5, 1906. RENEWED FEB. 20, 1911.

989,977. **Patented Apr. 18, 1911.**

5 SHEETS—SHEET 1.

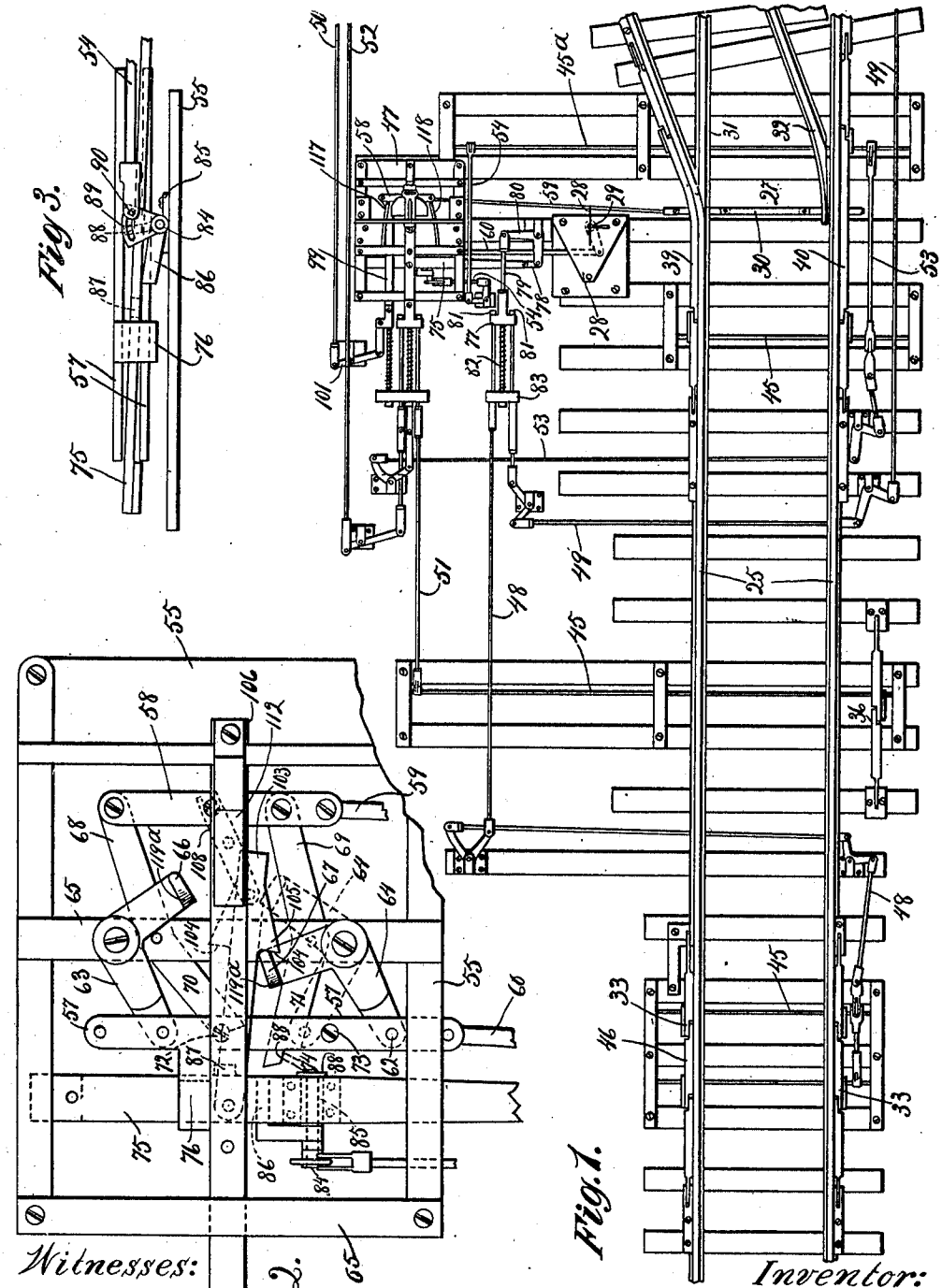

Fig. 1.

Fig. 2.

Fig. 3.

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5 SHEETS—SHEET 2.

Fig. 1a.

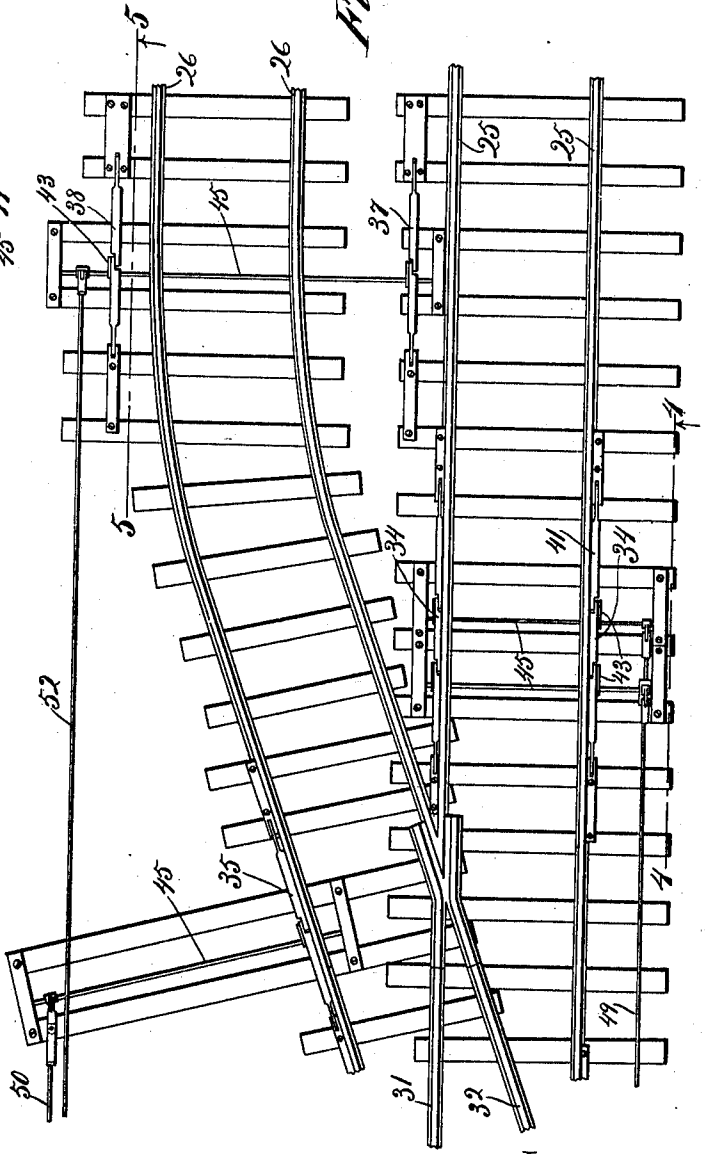


Fig. 5.

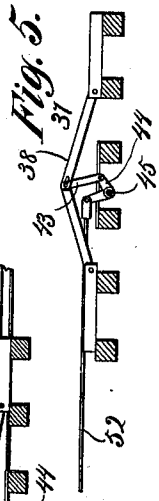
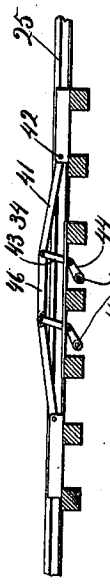


Fig. 4



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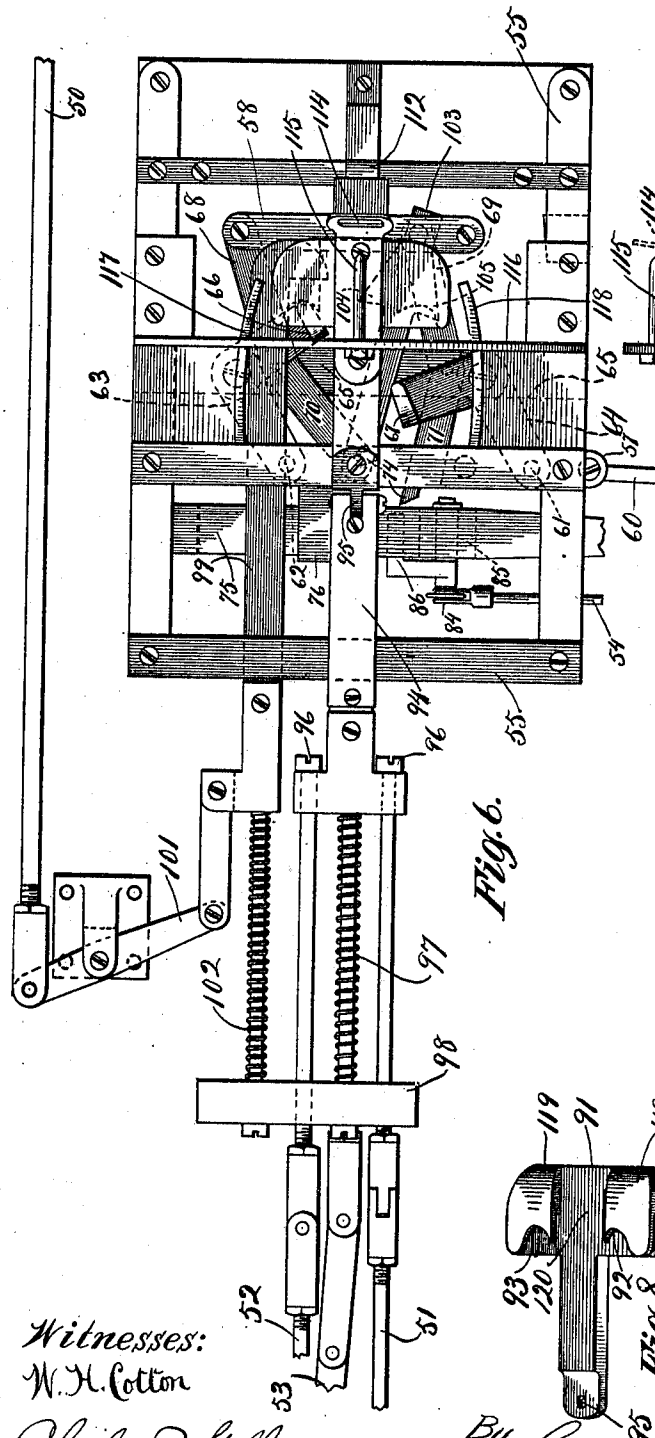

Fig. 6.

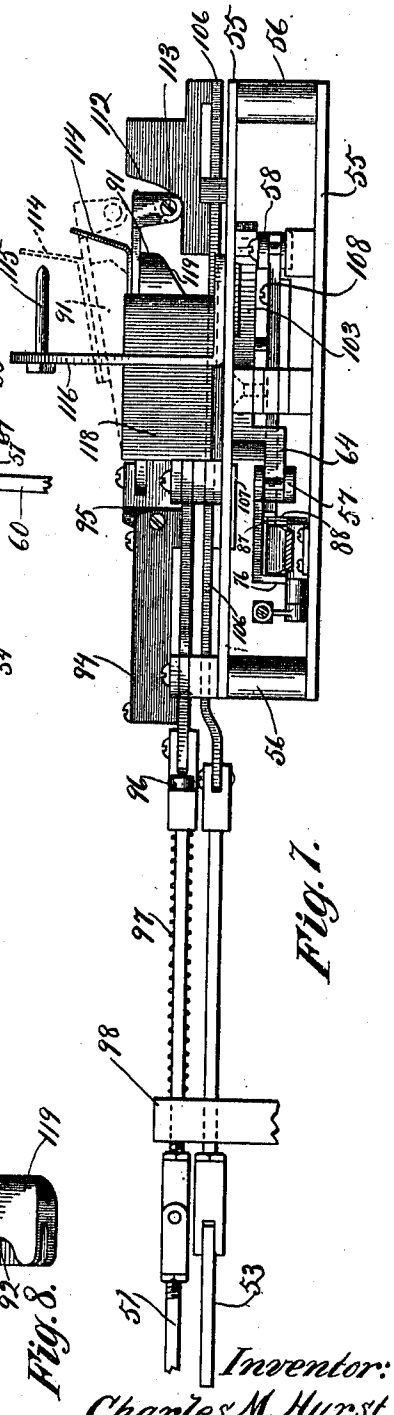

Fig. 7.

Fig. 8.

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5 SHEETS—SHEET 4.

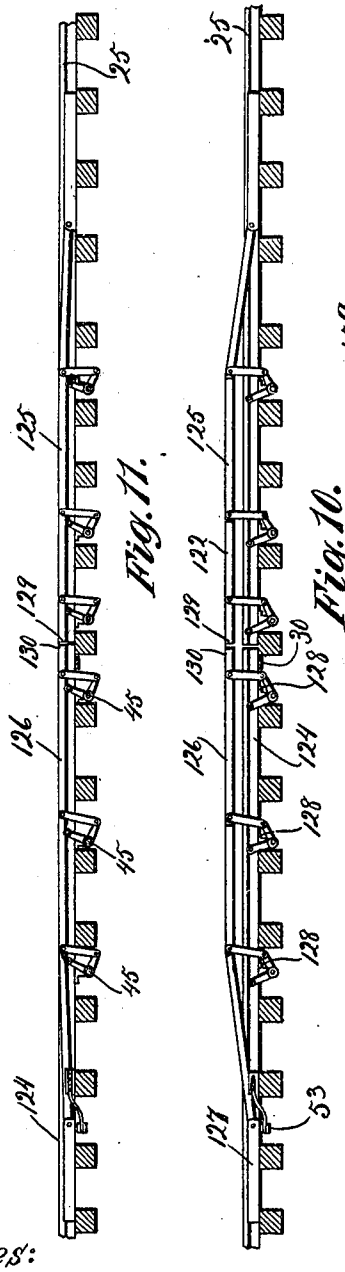

Fig. 11.

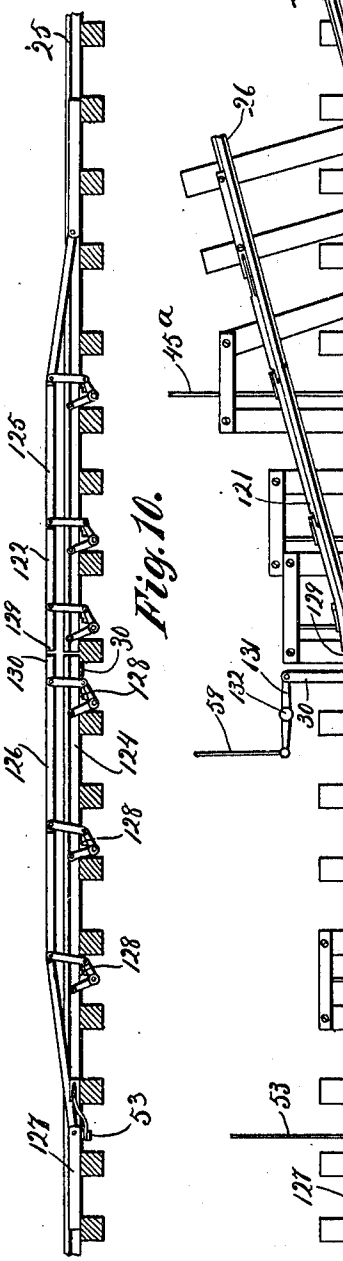

Fig. 10.

Fig. 9.

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5 SHEETS—SHEET 5.

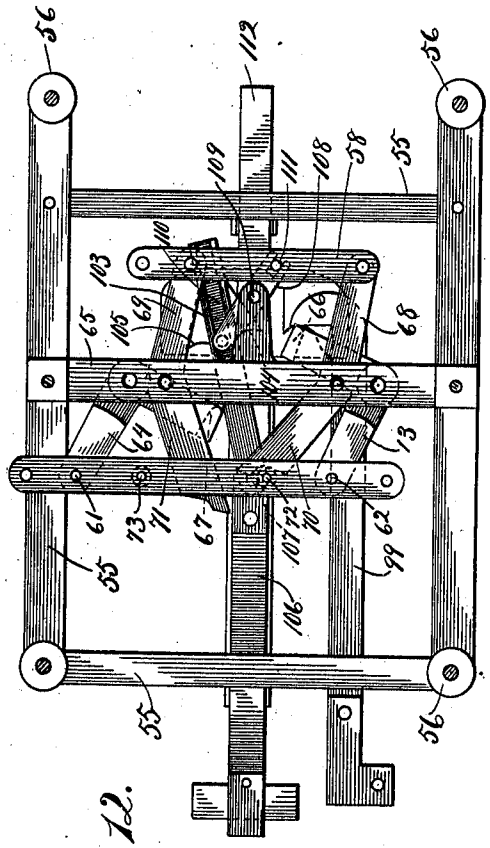

Fig. 12.

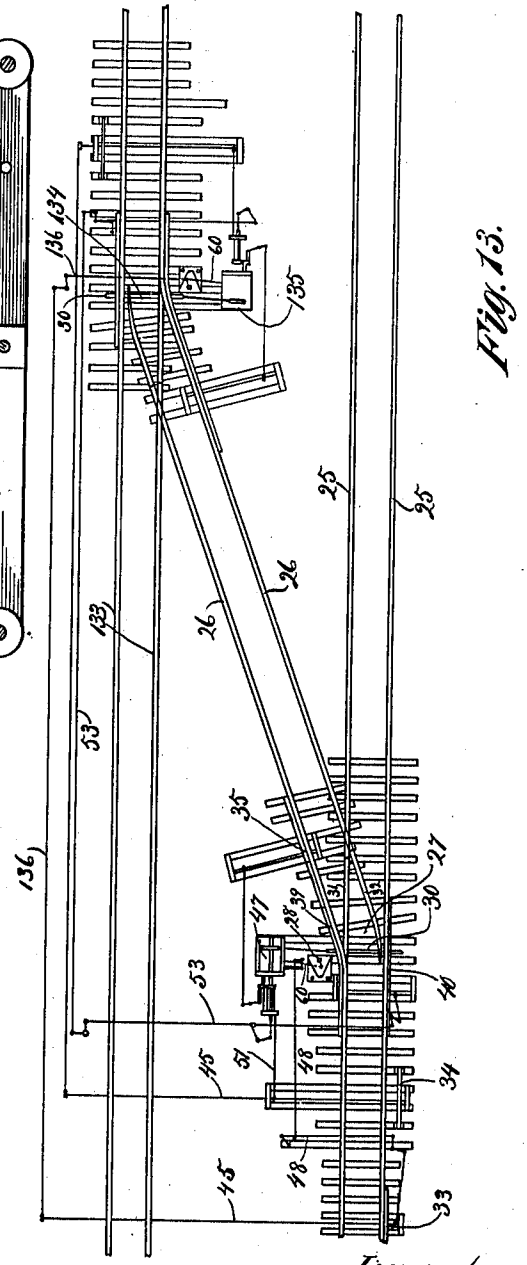

Fig. 13.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SWITCH AND SIGNAL MECHANISM.

989,977. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed March 5, 1906, Serial No. 304,314. Renewed February 20, 1911. Serial No. 609,787.

To all whom it may concern:

Be it known that I, CHARLES M. HURST, a citizen of the United States, and resident of Rawlins, county of Carbon, and State of Wyoming, have invented certain new and useful Improvements in Automatic Switch and Signal Mechanism, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to mechanism for operating and controlling railway switches and signals from moving trains; and has for its object to provide complete means for automatically effecting all of the required movements of a single switch and its signal, or a system of related switches and signals, and for locking a switch against movement while the switch itself, or a portion of the track to which it leads, is being used by a train.

The invention contemplates the use of trip aprons of ordinary construction and adapted to be engaged by an appurtenance of a moving train, and of improved mechanism actuated by these trip aprons for changing switches and signals, for locking a switch being used by a train, so that it cannot be changed, and for preventing the changing of switches leading to a track which is being used by one train so that another train cannot enter the same track.

An embodiment of the invention in its preferred form comprises both, trip aprons placed close to the track rails and adapted to be automatically engaged, by a portion of a wheel of a train approaching the switch which it is desired to operate, for changing the switch to the position usually required by trains moving in the direction of the train in question, and also trip aprons so placed upon the railway track as to be engaged, only at the will of the engineer of a train, by a suitable contact shoe, carried by the train, for effecting other changes of the switch or related switches. Preferably, also, the mechanism for locking switches against movement is controlled by trip aprons adapted to be automatically operated by a moving train.

A feature of the invention provides means for releasing the mechanism actuated by those trip aprons which are adapted to be automatically engaged by the wheels of a train for changing a switch after the intended movement of the switch and its signal have been effected, so that if desired a further change of the switch and signal may then be made by means of one of those trip aprons which are adapted to be engaged by a contact shoe only at the will of the engineer, although some of the wheels of the train may still be engaged with the first trip apron. Moreover, as it is desirable that it shall not be necessary to place any of the trip aprons as far from the switches which they are to operate as the length of many of the trains which will use these switches, it is important that those trip aprons which are automatically engaged by the wheels of a train to change a switch shall not operate when engaged by the forward wheels of a train coming off of the switch; and a further feature of the invention provides means operated by the wheels of a train using the switch for releasing the mechanism actuated by those automatic trip aprons intended to so change the switch.

The invention consists in a system of mechanisms for operating and controlling switches and signals, and in its various parts and combinations of parts, as exemplified in the structure to be hereinafter described and illustrated in the accompanying drawings, in which—

Figures 1 and 1ª are a plan view of a detail of a railway track showing the invention applied to a point switch uniting a siding and a main line track; Fig. 2 is a plan view of a detail of the mechanism shown in Fig. 1, drawn to a larger scale, some of the parts being omitted; Fig. 3 is a detail end elevation of the mechanism shown in Fig. 2; Figs. 4 and 5 are sectional views on the lines 4—4 and 5—5, respectively, of Fig. 1ª; Fig. 6 is a plan view, drawn to a larger scale, of some of the parts shown in Fig. 1; Fig. 7 is a detail side elevation of the part shown in Fig. 6; Fig. 8 is a perspective view of a detail of the mechanism separated from other parts; Fig. 9 is a plan view of a detail of a railway track showing the application of the invention to a stub rail switch; Fig. 10 is a sectional view on the line 10—10 of Fig. 9; Fig. 11 is similar to Fig. 10 but showing a different position of the parts; Fig. 12

is a bottom plan view of some of the parts shown in Fig. 2; and Fig. 13 is a plan view of a detail of a railway track illustrating the application of the invention to two or more related switches and signals, and shows two main line tracks united by a siding meeting each in a switch.

In Figs. 1 to 8 inclusive of the drawings the rails of a main line track are shown at 25, and those of a siding at 26, these two tracks meeting in a switch 27. The usual target signal is represented at 28, and the hand operating lever at 29, the latter being connected in the manner to be hereinafter described with the customary bridle bar 30, to which the movable rails 31, 32, of the switch are secured. A trip apron for closing the switch is provided on the main line track at each side of the switch and, as shown, is placed close to the rails of the track, as indicated at 33 and 34, so as to be automatically engaged by the wheels of a train approaching the switch from either direction, and a trip apron, preferably of similar form, for opening the switch is placed close to one of the rails of the siding and near the switch, as indicated at 35. These aprons provide means for automatically closing the switch to accommodate a train moving on the main line track in either direction and for opening the switch to accommodate a train coming out of the siding. Preferably, also, a trip apron adapted to be engaged by a suitable contact shoe of a passing train at the will of the engineer of the train is placed on the main line track at either side of the switch, as indicated at 36 and 37, for changing the switch, and a similar apron 38, for closing the switch, is placed on the siding, to enable the engineer of a train approaching the switch on the main line track to open it so that his train will enter the siding, and after his train has passed on to the siding to then close the switch in order that a following train will keep to the main line track, and to enable the engineer of a train passing the switch on the main line track to open the switch after him so that a following train will take the siding.

A pair of trip aprons 39, 40, preferably of the form designed to be automatically engaged by the wheels of a train using the switch, are placed close to the rails of the main line track and of the siding at the switch, and are adapted, as will hereinafter appear, to lock the movable rails of the switch against movement while it is being used by a train, and to release the mechanism actuated by those trip aprons for changing the switch, so that, if any one of them should be engaged while the movable rails of the switch are locked in position, no part of the mechanism will be injured. The trip aprons 33 to 40 may be of any of the forms heretofore employed in devices of this kind, but will preferably comprise an inclined operating bar 41, pivotally united, as at 42, to an appurtenance of the railway track so as to swing in a vertical plane and having its free end united by a link 43 to the crank arm 44 of a crank shaft 45 extending substantially transverse to the track and beneath its rails. As shown each of these trip aprons comprises two such inclined bars so disposed that the apron may be operated by a train moving in either direction, and in some instances the length of the apron is increased to provide for its being always in engagement with some of the wheels of a train passing over it, by the interposition of a link 46 between the bars 41 and uniting their free ends. For this form of trip apron there is preferably provided a plurality of crank shafts, as 45 and 45^a, and the construction of the apron is not herein more fully described, as it is made the subject of another application for patent filed concurrently herewith.

The mechanism actuated by the several trip aprons and by the hand lever 29 for controlling the switch 27 and signal 28 is generally designated 47. It is operatively connected to the trip aprons 33 to 40 by means of tension rods 48, 49, 50, 51, 52, 53, and 54, each of which leads from the crank shaft 45 or 45^a of one of the aprons to a movable part of the mechanism. This mechanism 47 is mounted in an oblong rectangular frame comprising upper and lower side and end rails 55, united by posts 56 and firmly secured, in a convenient position adjacent the switch, to the bed of the track. It includes a pair of oppositely movable reciprocable parallel bars 57, 58, one of which, as 58, is connected by a link 59 to the bridle bar 30 of the switch, and the other, 57, by a link 60 to the hand-operating lever 29, so that if desired the switch may be manually changed at any time by an attendant, in the manner heretofore universally employed. The bar 57 is pivotally attached at 61, 62, to the free end of one arm of each of two bell-crank levers 63, 64, mounted on a cross-piece 65 of the frame of the mechanism 47. The other arms of the bell-crank levers 63, 64, are oppositely directed and as shown extend toward each other, and each carries at its end an upwardly directed hook-engaging stud 66, 67. The bar 58 is carried by a pair of links 68, 69, mounted on the cross-piece 65, and each extending beyond its pivotal support, as indicated at 70, 71, into the path of a pin 72, 73, carried by the bar 57. These pins are adapted to engage the side edges of the extended portions of the links 68, 69, to shift the bar 58 when the bar 57 is operated, the projecting ends 70, 71, of the links being of such length that as the limit of movement in either direction is reached one of the pins

rides over the end of the corresponding link and engages a socket 74 formed in the end of such link, thereby serving as a stop to prevent the reverse movement of the bar 58 being affected by means of force applied to the bar or to either of the links.

That part of the mechanism 47 which may be actuated by either of the trip aprons 33, or 34, for closing the switch, includes a hook 75, slidably mounted in the frame of the mechanism 47 adjacent the bar 57, and a lug 76 extending from the bar 57 normally into the path of this hook. This hook, as shown, is reciprocated to shift the bar 57 and operate the switch by means of a cross-head 77, to which it is most conveniently connected by links 78 and 79 and a bell-crank lever 80, motion being imparted to the cross-head to advance the hook by means of the tension rods 48, 49, leading from the trip aprons 33, 34, respectively, and each being provided with a suitable head 81 bearing on the cross-head. A spring 82, reacting between the cross-head 77 and a stop 83 rigidly fixed to the bed of the track, serves to return the hook when the trip aprons 33, 34 have been released. In order, however, that the switch may be opened by means of the trip aprons 36 or 37 while the trip aprons 33 or 34 are still depressed by some of the wheels of a train, and in order that the apron 33 will not operate to close the switch when it is engaged by the forward wheels of a train coming out of the siding before the last wheels of the train have passed over the switch, means designed to be operated when the hook 75 reaches the limit of its advance movement, or when the wheels of a train are engaged with the trip aprons 39, 40, at the switch, are provided for raising the hook 75 out of engagement with the lug 76 of the bar 57. As shown this mechanism takes the form of a rock shaft 84 journaled, as indicated at 85, in the frame of the mechanism 47 and having an arm 86 bearing against the under face of the hook 75 (Fig. 3). For turning this rock shaft to raise the hook when it has reached the limit of its advance movement, there are provided a stud 87, carried by the hook, and a contact-piece 88 rising from the rock shaft into the path of the stud. For turning the rock shaft to raise the hook out of engagement with the stud 76, to prevent the trip apron 33 from operating to close the switch when the wheels of a train are passing over it, the tension rod 54 leading from the crank-shaft 45^a of the trip aprons 39, 40, which, as shown, are depressed by the wheels of a train using the switch, is connected to a crank arm 89 of the rock shaft 84, as indicated at 90. This connection preferably takes the pin and slot form shown, so that while it serves to turn the rock shaft to raise the hook 75 whenever the tension rod 54 is strained, it will not interfere with the turning of the rock shaft effected by means of the engagement of the stud 87 with the contact-piece 88 when the hook reaches the limit of its advance movement and the tension rod is unstrained.

That part of the mechanism 47 adapted to be actuated by means of the trip aprons 36, 37 or 38, which, as previously described, are preferably so placed upon the track as to be engaged by a passing train, for changing the switch, only at the will of the engineer of the train, includes a cross-head or shipper arm 91, having hooks 92, 93 (Fig. 8) for engaging the studs 66, 67, which rise from the bell-crank levers 63, 64, provided for shifting the bar 57. A shank 94, having a universal joint 95, so as to be flexible in both horizontal and vertical planes, leads from the cross-head 91 and is slidably mounted in the frame of the mechanism 47, motion being imparted to the shank to advance the cross-head whenever one of the trip aprons 36, 37, 38 is engaged by a passing train, by means of one of the tension rods 51, 52, which lead from the crank shafts 45 of these trip aprons, and each of which is provided with a suitable head 96 for engaging a shoulder of the shank. A spring 97 reacting between the end of the shank 94 and a stop 98, fixed in position on the bed of the track, is provided for returning the cross-head 91 when the trip apron 36, 37 or 38, which effected its advance, has been released.

That part of the mechanism 47 provided for opening the switch when a train approaching it from the siding engages the trip apron 35, includes a hook 99, slidably mounted in the frame of the mechanism 47 and movable in the path of the stud 66 (Fig. 12) projecting from the inner end of the bell-crank lever 63 provided for shifting the operating bar 57, the tension rod 50 leading from the crank shaft 45 of the trip apron 35 being positively connected by means of a lever 101 with the rear end of the hook 99. A spring 102, reacting between the end of the shank of the hook 99 and the stop 98, is provided for returning the hook when the trip apron 35 has been released.

For locking the switch in position so that it cannot be changed while it is being used by a train, there is provided a hooked member 103, most clearly shown in Fig. 12, having hooks 104, 105, and adapted to be moved, when either of the trip aprons 39, 40, is depressed, into the path of movement of one of the studs 66, 67, projecting from the bell-crank levers 63, 64. This hooked member is pivotally united at 107 to a shank 106, slidably mounted in the frame of the mechanism 47 and which is in turn connected to the tension rod 53 which leads from the crank shaft 45 of the trip aprons

39, 40. This device is adapted to lock the switch in either the open or closed position, and to this end the hooked member 103 is moved from side to side, turning about the pivot 107, in order to be in position to engage one of the studs 66, 67 for this purpose when it is advanced by the straining of the tension rod 53 as the bars 57 and 58 are reciprocated, by means of a lever 108, pivoted at 109 to the frame of the mechanism 47, and having a pin and slot engagement 110 and 111 (Fig. 12) with the cross-head and the bar 58, respectively.

For moving the cross-head 91 to prevent its hooks 92, 93, from engaging with the studs 66, 67, of the bell-crank levers 63, 64, when the switch is locked in position, as just described, so that, if any one of the trip aprons 36, 37 or 38 should then be operated, no part of the mechanism would be injured, there is provided a cam 112, Fig. 7, mounted on an extended portion of the shank 106 of the hooked member 103, which raises the cross-head 91 to the dotted lines position of Fig. 7 whenever the parts for locking the switch in position have been advanced by the depression of the trip aprons 39, 40. Preferably, for engaging this cam there is provided a roller 113, mounted on the forward end of the cross-head 91, and to support the cross-head in its elevated position, should it be accidentally advanced from any cause, there is provided a slideway, comprising, as shown, a pin 115, carried by a yoke 116, rising from the frame of the mechanism 47 and adapted to engage an apertured lug 114 rising from the cross-head.

In use the operation of the device embodying the invention and illustrated in Figs. 1 to 8, inclusive, and in Fig. 12 of the drawings, is as follows:—A train approaching the switch 27 on the rails 25 of the main line track, from the left as viewed in Figs. 1 and 1ª, will automatically engage the trip apron 33 to close the switch so that the train will keep to the main line track. As shown, this is effected by the rims of the wheels of the train riding onto the inclined members 41 of the trip apron 33, depressing it and turning its rock shaft 45 so as to draw on the tension rod 48 which in turn, through the medium of the cross-head 77, the links 78 and 79 and the bell-crank lever 80, draws upon the hook 75, shifting the reciprocable bars 57 and 58, to the latter of which the bridle bar 30 of the switch is joined by means of the link 59. If, however, the switch had already been closed, the hook 75 would move without engaging the lug 76 of the reciprocable bar 57, as most clearly shown in Fig. 3, and would not therefore change the switch. When the trip apron is completely depressed and the switch closed thereby, the hook 75 will be raised out of engagement with the lug 76 to permit the switch to be immediately opened, if desired, by means of the rock shaft 84 which is turned by the engagement of the lug 87 (Fig. 2), carried by the hook, with the contact-piece 88. Preferably the trip apron 33 is made of such length, by the interposition of a link 46 between the inclined bars 41, that it will always be engaged by a wheel of the train and will remain depressed so long as a train is passing over it. If then, the engineer wishes his train to take the siding he will adjust the trip shoe (not shown) of the train to engage and depress the trip apron 36, turning its rock shaft 45 and drawing on the tension rod 51 and advancing the cross-head 91. The advance of the cross-head 91 will, by the engagement of its hook 93 (Fig. 8) with the stud 67 of the bell-crank lever 64 (which will then be in the dotted lines position of Fig. 2), shift the reciprocable bars 57, 58, and open the switch, and as soon as the trip apron 36 is released the cross-head will be returned by means of the spring 97. In view of the connection between the bell-crank levers 63, 64, and the reciprocable bar 57, as the cross-head 91 advances one of the studs 66, 67, the other is moved back into positions to be advanced by the next forward movement of the cross-head and therefore the switch may be either opened or closed by the advance of this cross-head, depending entirely on which position it occupies just before the cross-head is moved. But, whenever the cross-head 91 is advanced by the operation of the trip apron 36 from a train moving toward the switch, the switch will just previously have been closed by the operation of the automatic trip apron 33, and its movement then will be to open the switch. The return movement of the cross-head 91 is guided to cause it to occupy a central position when returned and engage at its next advance that one of the studs 66, 67, which is then in a retracted position, by means of curved plates 117, 118, mounted in the frame of the mechanism 47, and the cross-head, when it is returned by the spring 97, after advancing one of the studs 66, 67, rides over the other stud by reason of the inclined rearward face 119 (Fig. 7) of the cross-head which engages the stud by a cam action to raise the cross-head, flexing the universal joint 95. Preferably this action is facilitated by providing each of the studs 66, 67, with an inclined cam-engaging face, as indicated at 119ª. The studs 66, 67, move through an arc, the cross-head accommodating itself to the path of the stud with which it is engaged by reason of the universal joint 95, and the parts are so proportioned that as the cross-head advances with one of the studs the other stud, in its return movement, traverses a channel 120 (Fig. 8) formed in the under face of the

cross-head between the hooks 92, 93. When, however, the train crosses the switch, whether it takes the siding or keeps to the main line track, its wheels will engage and depress, in the manner previously described, the trip aprons 39, 40, turning the crank shafts (of which two, 45 and 45ª, are shown, each being operated by both of these aprons), drawing on the tension rod 53 and advancing the hooked member 103 (Fig. 12). This member is moved from side to side, whenever the switch is changed, by means of the lever 108, operatively connecting the hooked member with the reciprocable bar 58, and at each change of the switch is moved to the proper position to engage, when it is advanced, that one of the studs 66, 67, of the bell-crank levers 63, 64, which is in an advanced position. The advance of the hooked members 103 will not, therefore, change the switch, but locks one of the bell crank levers 63, 64, in position and prevents the shifting of the bar 57 and the changing of the switch. The trip aprons 39, 40, are of such length that they are always engaged by some of the wheels of a train passing over them and the switch is therefore always locked in position whenever it is being crossed by a train. Moreover, when the trip aprons 39, 40, are depressed, the cross-head 91 is raised to an inoperative position, shown by dotted lines in Fig. 7, by means of the cam 112, carried by the bar 106, to which the hooked member 103 is attached, so that if it should be advanced for any reason while the switch is locked in position none of the parts of the device would be broken.

After the train has passed the switch, the engineer may, if he desires, change the switch to the opposite position, by adjusting a trip shoe (not shown) carried by the train and preferably at its rear, so as to avoid placing the trip aprons, which it is to engage, as great a distance from the switch as the length of the train, to engage the trip apron 37 if he has kept to the main line track, or the trip apron 38 if he has taken the siding. As shown, a single crank shaft 45 is provided for both of these trip aprons, and it operates the switch through the tension rod 52 and the reciprocable cross-head 91, thus changing the switch, as previously described, to the opposite position from that which it had just previously occupied.

When a train approaches the switch, on the main line track, from the right as viewed in Figs. 1 and 1ª, the switch will be automatically closed, if it had been open, to prevent the wheels of the train running through the switch the "wrong way", by the engagement of the wheels of the train with the trip apron 34, which operates the mechanism 47, through the tension rod 49, in the same manner as the automatic trip apron 33 located at the other side of the switch.

The switch will be automatically opened to accommodate a train coming out of the siding, by the engagement of the wheels of the train with the trip apron 35, which, when depressed, draws upon the tension rod 50 and the hook 99 (Fig. 6). This hook, if the switch is closed, operates the mechanism 47 to open it by engaging the stud 66 of the bell crank lever 63 to swing it, but if the switch is already open the hook merely advances and returns, as the trip apron 35 is depressed and released, without producing any effect upon the mechanism. As the train moves out of the siding the switch is automatically locked in position by the operation of the trip aprons 39, 40, upon the hook member 103 (Fig. 12), and in order that the trip apron 33 may not operate to close the switch or to cause injury to the mechanism, if it is engaged by the forward wheels of the train before its last cars have crossed the switch, the hook 75, controlled by the trip apron 33, is raised out of engagement with the stud 76, reaching into its path from the reciprocable bar 57, by means of the rock shaft 84 (Fig. 3) which is turned for this purpose when the trip aprons 39, 40, are depressed by the tension rod 54, leading from the crank shaft 45ª. As shown, if the trip apron 33 is completely depressed before the last wheels of a train coming out of the siding have passed over the trip aprons 39, 40, the switch will not be automatically closed by such a train, as the trip apron 33 will remain depressed for as long as a train is passing over it, being of sufficient length to be always engaged by some of its wheels. The engineer of a train coming out of the siding may, however, close the switch after him, by adjusting a trip shoe (not shown) carried at the rear of his train, to engage the trip apron 36, which, operating the mechanism 47 by means of the cross-head 91, will close the switch when it has been open.

Various modifications of the structure illustrated may be made without departing from the invention. In Figs. 9, 10 and 11 such a modification is shown, illustrating the application of the invention to the stub rail form of switch. In this instance trip aprons 121, 122, are placed close to the rails of the track adjacent the switch, and in order to permit the required movement of the movable rails 123, 124, of the switch, they are formed in sections, as 125, 126, (Fig. 10) one of the sections, 125, being disposed adjacent a fixed rail of the switch in the usual manner. The remaining section 126 is, however, preferably applied to the side of a movable rail 123 or 124, of the switch, so as to move with it, the connection, as shown, being by means of the pivot block 127 firmly secured to the side of the rail for receiving the end of the apron and the crank hangers 128 depending from the under face of the

rail, in which the several crank shafts 45 of the trip apron are journaled. For each position of the switch the adjacent ends 129, 130, of the two sections 125, 126, of one of the trip aprons 121, 122, are adapted to contact (Fig. 11), when either section is depressed, to cause the other section to operate at the same time, and for each position of the switch the section 125 of one of the trip aprons is therefore inoperative. This, however, is of no importance, as both of these trip aprons are designed to effect the same movements of the switch-controlling mechanism. A reversing lever 131, pivotally secured to the bed of the track at 132, is introduced between the bridle bar 30 of the switch and the link 59, and with these exceptions the mechanism for controlling and operating the stub rail form of switch may be identical with that employed for the point switch, and is not, therefore, further shown or described.

If desired, the devices herein shown may be adapted for controlling other switches than that which is to be used immediately by the train from which it is operated. In Fig. 13 of the drawings the rails 26 of the siding are shown as being extended to lead to a second main line track, the rails of which are designated 133, and with which the siding unites at a switch 134. A duplicate of the mechanism 47 and its appurtenances may be provided at this switch, as indicated at 135, and as shown the crank shaft 45 of the trip apron 33 of the first main line track is extended to cross the second main line track and is connected by a tension rod 136 to the switch 134, preferably through the mechanism 135, so that when the switch 27 is automatically closed by a train approaching it from the left as viewed in Fig. 13, the switch 134 will also be automatically closed and a train cannot, therefore, then enter the siding from the rails 133 of the second main line track nor a collision of trains occur at the switch 27. Moreover, if desired, the tension rod 53, actuated by the trip aprons 39 and 40 for locking the movable rails of the switch 27 in position while the switch is being used by a train, may be extended to the mechanism 135, as shown, to produce simultaneously a similar effect upon the switch 134. It will be understood, therefore, that by duplicating or extending the mechanisms herein shown, a complete controlling and interlocking system may be provided for any form of switch or system of related switches.

I claim as my invention—

1. In a railway switch mechanism, in combination, a fixed rail, a second rail movable into and out of register with the first-named rail, a bridle bar secured to the movable rail, shifting mechanism including a crank arm engaging the bar, a stop movable into and out of the path of the crank arm, a trip, and operative connection between the trip and the stop.

2. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar attached to the movable rail of the switch, shifting mechanism connected with the bar, a stop movable into and out of the path of a movable part of such mechanism, a crank apron adjacent a rail of the switch, a crank shaft the wrist pin of which is pivotally attached to the crank apron, and a rod or cable leading from a crank arm of the shaft to the stop.

3. In a railway switch mechanism, in combination, a switch, mechanism for changing the switch, and means adapted to be controlled by a train while using the switch for moving a part of such mechanism to an inoperative position.

4. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a shipper arm having a hook, means for reciprocating the shipper arm, mechanism including a stud adapted to be engaged by the hook of the shipper arm operatively connected to the bridle bar, and means adapted to be controlled by a train using the switch for moving the shipper arm free from the stud.

5. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a jointed shipper arm having a hook, means for reciprocating the shipper arm, mechanism including a pair of studs adapted to be engaged alternately by the hook of the shipper arm, operatively connected to the bridle bar, and a lifting cam for engaging the shipper arm beyond its joint adapted to be operated by a train using the switch.

6. In a railway switch mechanism, in combination, two rails meeting to form a switch, one thereof being movable, a bridle bar secured to the movable rail, a shipper arm having a hook, a trip adjacent one of the rails and remote from the switch, operative connection between the trip and the shipper arm, mechanism including studs adapted to be engaged by the hook of the shipper arm operatively connected to the bridle bar, and means adapted to be controlled by a train using the switch for moving the shipper arm free from the stud.

7. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a jointed shipper arm having a hook, means for reciprocating the shipper arm, mechanism, including a pair of studs adapted to be engaged alternately by the hook of the shipper arm, operatively connected to the bridle bar, a lifting cam adapted to engage the shipper arm

beyond its joint, a trip adjacent a rail of the switch, and operative connection between the trip and the lifting cam.

8. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a jointed shipper arm having a hook, means for reciprocating the shipper arm, mechanism including a stud adapted normally to be engaged by the hook of the shipper arm operatively connected to the bridle bar, an oscillatable lifting cam adapted to engage the shipper arm beyond its joint, means for oscillating the cam, and ways for guiding the movement of the hooked end of the shipper arm as it reciprocates when its joint is flexed by the cam.

9. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a jointed shipper arm having a hook, means for reciprocating the shipper arm, mechanism including a stud adapted normally to be engaged by the hook of the shipper arm operatively connected to the bridle bar, an oscillatable lifting cam adapted to engage the shipper arm beyond its joint, means for oscillating the cam, an apertured ear rising from the hooked end of the shipper arm, and a pin forming a slideway for the apertured ear as the shipper arm reciprocates when its joint is flexed by the cam.

10. In a railway switch mechanism, in combination, a reciprocable bar, two bell crank levers each having one arm pivotally united to the bar and having their free arms oppositely directed and substantially parallel to the bar when in its mid position, a stud rising from the free end of each of such levers, each of the studs having an inclined rearward cam face, a flexible shipper arm having a rearwardly directed hook and an inclined forward cam face, means for applying a pulling strain to the shipper arm, a spring opposing such strain, a curved guide limiting the lateral movement of the shipper arm, a switch comprising a fixed rail and a movable rail, and operative connection between the movable rail of the switch and the reciprocable bar.

11. In a railway switch mechanism, in combination, a reciprocable bar, two bell crank levers each having one arm pivotally united to the bar and having their free arms directed toward each other and substantially parallel to the bar when in its mid position, a stud rising from the free end of each of such levers, each of the studs having an inclined rearward cam face, a flexible shipper arm having a pair of rearwardly directed hooks and an inclined forward cam face, means for applying a pulling strain to the shipper arm, a spring opposing such strain, a curved guide limiting the lateral movement of the shipper arm, a switch comprising a fixed rail and a movable rail, and operative connection between the movable rail of the switch and the reciprocable bar.

12. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, two parallel reciprocable bars, operative connection between one of the bars and the movable rail of the switch, a shipper lever connected to the other bar, a link pivotally supported between the bars and having one end pivotally attached to the first designated bar, and a pin on the other bar in sliding engagement with an edge of the link and movable beyond the end of the link when the bar is in an extreme position.

13. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, two parallel reciprocable bars, operative connection between one of the bars and the movable rail of the switch, a shipper lever connected to the other bar, a link pivotally supported between the bars and having one end pivotally attached to the first designated bar, a pin on the other bar in sliding engagement with an edge of the link and movable beyond the end of the link when the bar is in an extreme position, and a socket on the end of the link to receive the pin.

14. In a railway switch mechanism, in combination, two rails meeting to form a switch one thereof being movable, a reciprocable bar, operative connection between the bar and the movable rail, a bell-crank lever having one of its arms pivotally attached to the bar, a stud rising from the free arm of the lever, a shipper arm having a hook adapted to engage the stud, a slide, a stop carried by the slide and movable into and out of the path of the stud, a trip adjacent one of the rails and remote from the switch, operative connection between such trip and the shipper arm, a second trip adjacent the switch, and operative connection between the last-named trip and the slide.

15. In a railway switch mechanism, in combination, two rails meeting to form a switch one thereof being movable, a reciprocable bar, operative connection between the bar and the movable rail, a bell-crank lever having one of its arms pivotally attached to the bar, a stud rising from the free arm of the lever, a jointed shipper arm having a hook adapted to engage the stud, a slide, a stop carried by the slide and movable into and out of the path of the stud, a lifting cam carried by the slide, a cam roller on the shipper arm bearing on the cam, a trip adjacent one of the rails and remote from the switch, operative connection between such trip and the shipper arm, a second trip adjacent the switch, and operative connection between the last-named trip and the slide.

16. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a jointed shipper arm having a hook, means for reciprocating the shipper arm, mechanism including a stud adapted normally to be engaged by the hook of the shipper arm operatively connected to the bridle bar, a slide, a stop carried by the slide and movable into and out of the path of the stud, a lifting cam carried by the slide and adapted to engage the shipper arm beyond its joint, a trip adapted to be engaged by a train using the switch, and operative connection between the trip and the slide.

17. In a railway switch mechanism, in combination, a switch comprising a fixed and a movable rail, a bridle bar secured to the movable rail of the switch, a shipper arm having a hook, a trip, operative connection between the trip and the shipper arm, mechanism for shifting the bridle bar including a stud adapted to be engaged by the hook of the shipper arm, a slide, a stop pivotally attached to the slide and movable into and out of the path of the stud, a link having a fixed pivotal support, one end of the link being pivotally united to the bridle bar and the other end of the link having a sliding engagement with the stop, a second trip, and operative connection between such trip and the slide.

18. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch, an automatic trip for closing the switch, located on the main line track in front of the switch, and a non-automatic trip for opening the switch located on the main line track between the first-mentioned trip and the switch.

19. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch, mechanism for closing the switch controlled by an automatic trip located on the main line track in front of the switch, and comprising a reciprocable bar having a stud, a shipper arm having a hook normally engaging the stud, and means acting at the end of the stroke of the shipper arm for disengaging the hook from the stud, and a non-automatic trip for opening the switch located on the main line track between the automatic trip and the switch.

20. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch having a movable rail, an automatic trip located on the main line track in front of the switch, a reciprocable bar having a stud, operative connection between the bar and the movable rail of the switch, a jointed shipper arm having a hook normally engaging the stud, operative connection between the shipper arm and the trip, a lug on the shipper arm, a rocker arm bearing on the shipper arm beyond its joint and having a shoulder in the path of the lug, and a non-automatic trip for changing the switch located on the main line track between the automatic trip and the switch.

21. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch, an automatic trip for closing the switch located on the main line track behind the switch, and a non-automatic trip for closing the switch located on the main line track behind the switch and beyond the first-mentioned trip.

22. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch, mechanism for closing the switch, controlled by an automatic trip located on the main line track behind the switch, and comprising a reciprocable bar having a stud, a shipper arm having a hook normally engaging the stud, and means acting at the end of the stroke of the shipper arm for disengaging the hook from the stud, and a non-automatic trip for opening the switch located on the main line track behind the switch and beyond the automatic trip.

23. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch, an automatic trip for closing the switch located on the main line track at each side of the switch, an automatic trip on the siding for opening the switch, a non-automatic trip for opening the switch located on the main line track in front of the switch and between one of the automatic trips and the switch, a non-automatic trip for opening the switch located on the main line track beyond the switch and beyond the automatic trips for closing the switch, and a non-automatic trip for closing the switch located on the siding beyond the automatic trip for opening the switch.

24. In a railway switch mechanism, in combination, two main line tracks, a siding meeting each of such tracks in a switch, means for locking each of the switches in a definite position, and a trip engageable by a passing train for simultaneously controlling both of the locking means.

25. In a railway switch mechanism, in combination, two main line tracks, a siding meeting each of such tracks in a switch, an automatic trip located on one of the main line tracks in front of the switch on that track for simultaneously closing both of the switches, and a non-automatic trip located on the same main line track between the automatic trip and the switch for simultaneously opening both of the switches.

26. In a railway switch mechanism in combination, a main line track and a siding meeting in a switch, mechanism for closing the switch, an automatic trip located on the main line track in front of the switch, operative connection between the trip and the

switch-closing mechanism, and a second trip adapted to be automatically engaged by a train coming out of the switch for releasing the connection.

27. In a railway switch mechanism, in combination, a main line track and a siding meeting in a switch having a movable rail, an automatic trip located on the main line track in front of the switch, a reciprocable bar having a stud, operative connection between the bar and the movable rail of the switch, a jointed shipper arm having a hook normally engaging the stud, operative connection between the shipper arm and the trip, a rocker arm bearing on the shipper arm beyond its joint, and a second trip adapted to be automatically engaged by a train coming out of the switch for swinging the rocker arm.

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