(No Model.) 4 Sheets—Sheet 1.

J. G. SCHREUDER.

SWITCH AND SIGNAL APPARATUS.

No. 479,225. Patented July 19, 1892.

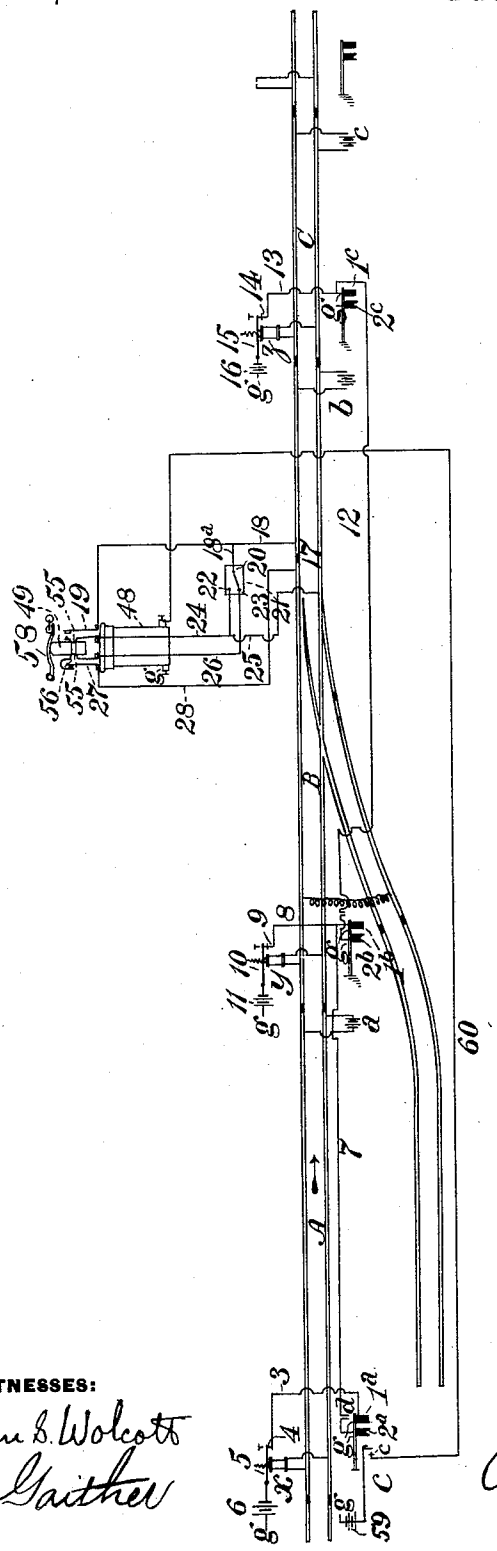


FIG. 1.

WITNESSES:

Damon S. Wolcott

F. E. Gaither

INVENTOR,

Jons G. Schreuder

by George H. Christy

Att'y.

(No Model.) 4 Sheets—Sheet 2.

J. G. SCHREUDER.

SWITCH AND SIGNAL APPARATUS.

No. 479,225. Patented July 19, 1892.

FIG. 2.

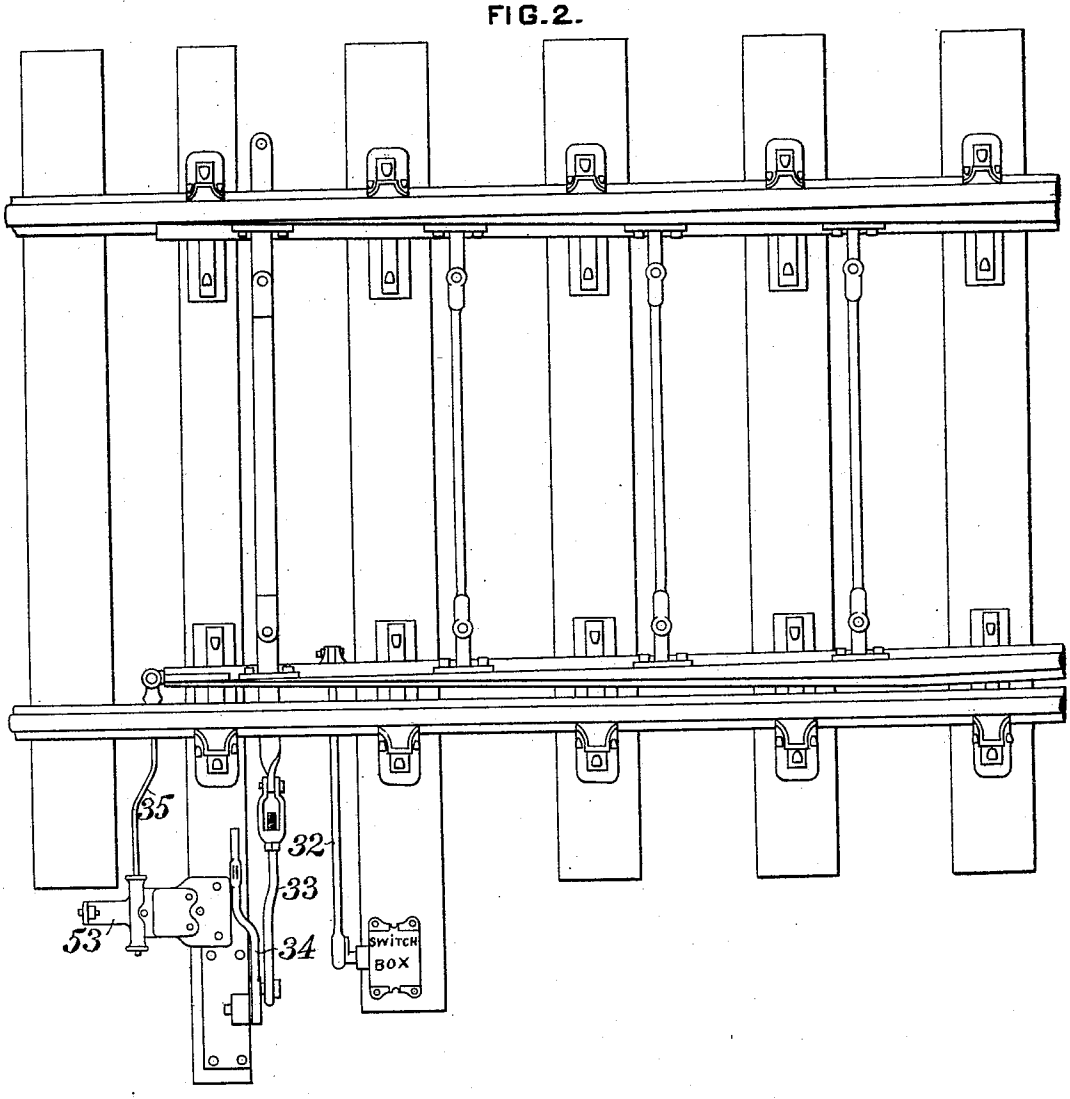
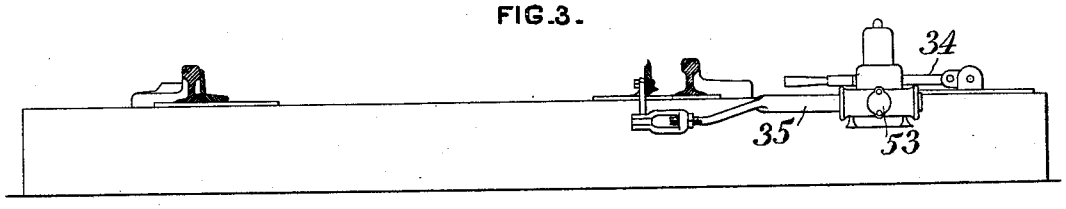


FIG. 3.



WITNESSES:

Dawin S. Wolcott

F. E. Gaither

INVENTOR,

Jens G. Schreuder

by George H. Christy Att'y.

(No Model.) 4 Sheets—Sheet 3.

J. G. SCHREUDER.

SWITCH AND SIGNAL APPARATUS.

No. 479,225. Patented July 19, 1892.

FIG 4.

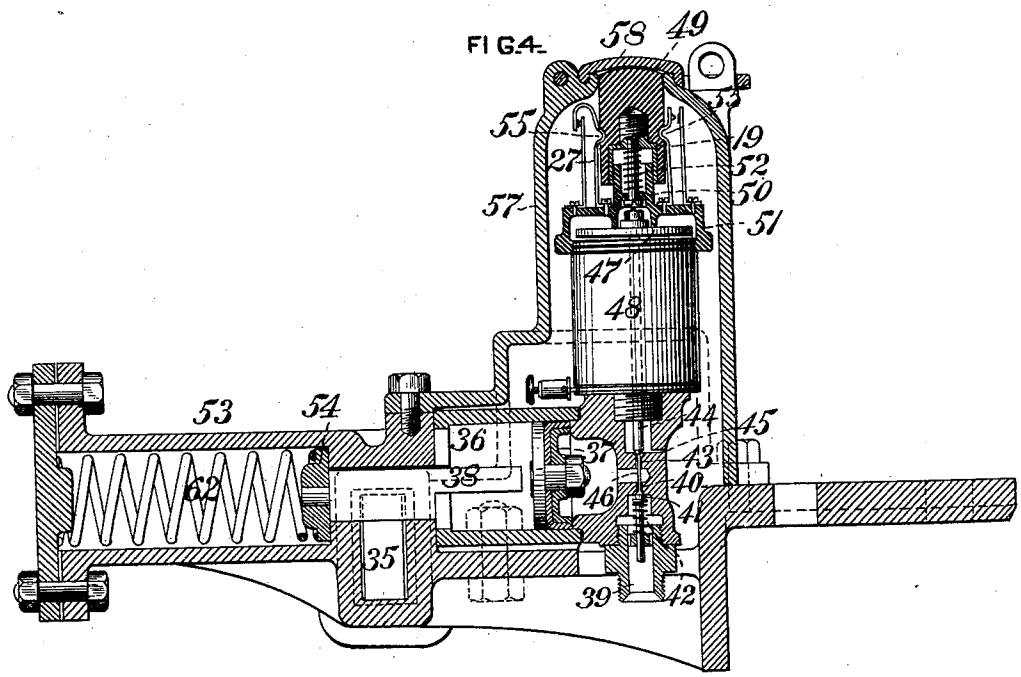
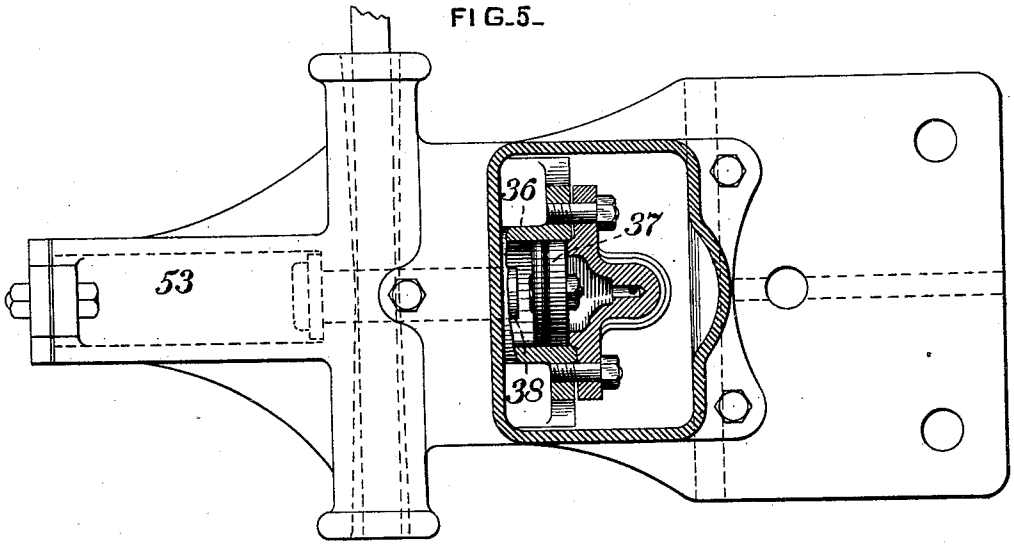


FIG 5.



WITNESSES:

Dawson B. Wolcott

F. E. Gaither

INVENTOR,

Jens G. Schreuder

by George H. Christy Att'y

(No Model.) 4 Sheets—Sheet 4.

J. G. SCHREUDER.

SWITCH AND SIGNAL APPARATUS.

No. 479,225. Patented July 19, 1892.

FIG. 6.

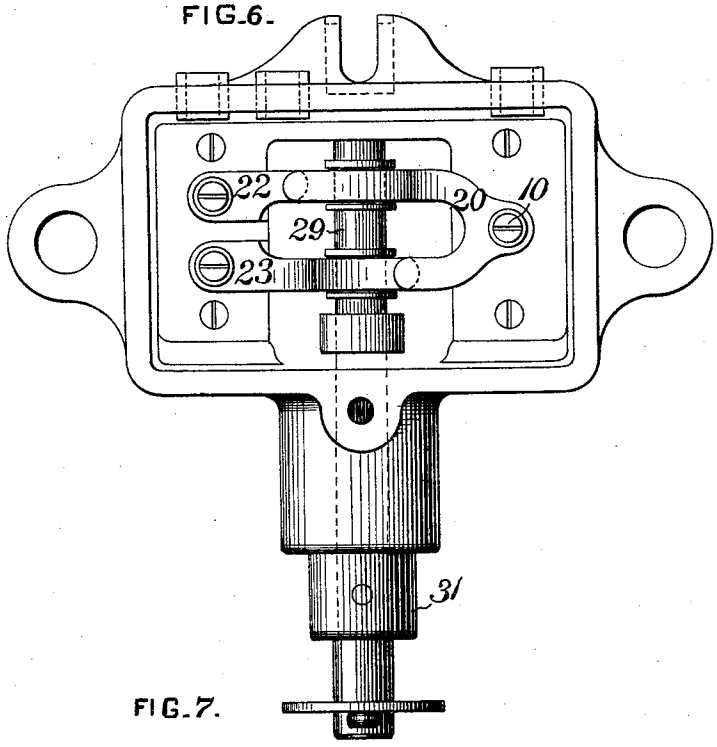


FIG. 7.

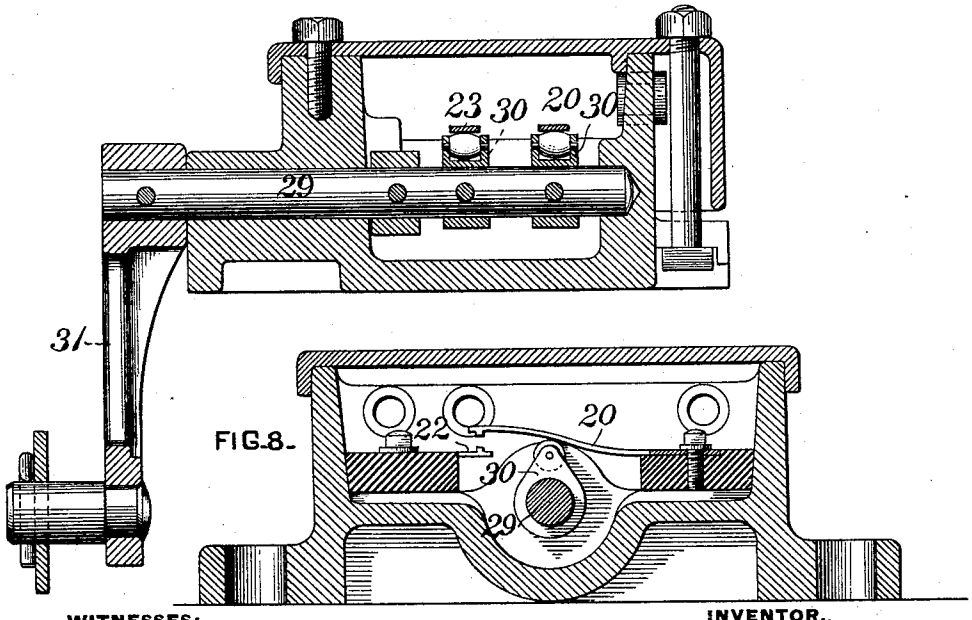


FIG. 8.

WITNESSES:

Damon B. Wolcott

F. E. Gaither

INVENTOR,

Jens G. Schreuder

by George H. Christy

Att'y.

UNITED STATES PATENT OFFICE.

JENS G. SCHREUDER, OF EDGEWOOD, PENNSYLVANIA.

SWITCH AND SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 479,225, dated July 19, 1892.

Application filed January 20, 1892. Serial No. 418,690. (No model.)

To all whom it may concern:

Be it known that I, JENS G. SCHREUDER, a subject of the King of Sweden and Norway, residing at Edgewood, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Switch and Signal Apparatus, of which improvements the following is a specification.

The invention described herein relates to certain improvements in switch-operating mechanism and in electric signaling devices controlling the movements of trains along the section of track from which the switch leads off.

The invention has for its object the unlocking of the switch mechanism by hand when locked by the train standing on the section from which the switch extends and one or more preceding sections, thereby preventing the entrance of trains on such section when the switch is open.

In general terms the invention consists in the construction and arrangement substantially as hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a diagrammatic view showing a portion of a railway-track with a switch or siding and the several signals with their circuits controlling the movement of trains along the sections of track. Figs. 2 and 3 are plan and transverse sections of the portions of track adjacent to the switch and showing the general arrangement of the switch operating and locking mechanism. Figs. 4 and 5 are sectional elevation and plan views of the switch-locking mechanism; and Figs. 6, 7, and 8 are plan and sectional elevations of the electric-switch box, the planes of section coinciding with the axis of the operating-shaft and at right angles thereto.

As is customary, the track is divided into sections, only three A, B, and C being shown, and these sections are electrically insulated from each other, as shown. At one end of each section the two rails or lines of rail are connected to opposite poles of the batteries *a b c*, and the opposite ends of the rails or lines of rail are connected to opposite poles of the relays *x y z*, which control the signal-circuits, as hereinafter described. At the entrance of each section is placed a post, on which the home-signal 1^a 1^b 1^c, controlling such section, and the distant signal 2^a, 2^b, and 2^c, controlling the next succeeding section, are mounted. The home-signal 1^a is controlled by a circuit composed of the wire 3, contact-point 4, armature 5 of relay *x*, and battery 6, and the distant signal 2^a and home-signal 1^b are controlled by a circuit formed by the wires 7 and 8, contact-point 9, armature 10 of relay *y*, and battery 11. The distant signal 2^b and home-signal 3^a are controlled by a circuit formed by wires 12 and 13, contact-point 14, armature 15 of relay *z*, and battery 16.

In sections A and C the rails are electrically connected and form uninterrupted circuits between the batteries and relays of such sections. One of the lines of rails in section B is divided into two sub-sections insulated from each other, the point of division being a little in front of the switch-points, as shown. From the rail on one side of the break or insulation 17 the wire 18 extends to one of the spring contact-plates 19 and is provided with a branch 18^a to the common pole 20 of the switch 21. One branch pole 22 of the switch is connected to the other member of the contact-plates 19 by a wire 24, which is provided with a branch 25 to the continuous rail of section B. The other branch pole 23 of the switch is connected by a wire 26 to one of the spring contact-plates 27, while the other contact-plate 27 is connected by a wire 28 to the divided rail of section B, but on the opposite side of the break or insulation 17 from that to which the wire 18 is connected. Hence the track-circuit of section B, the switch being set to clear main line, is from battery *b* by rail-section to break 17, thence by wire 18, branch 18^a, pole 20, movable arm of switch, pole 23, wire 26, plates 27, which are in contact when switch is normal, wire 28 to other portion of divided rail, thence through relay *y* to continuous rail, thence to battery *b*.

While any suitable electrical switch mechanism whereby the pole 20 can be connected to one or the other of the poles 22 23 on a shift of the switch-rails may be employed, the construction shown in Figs. 6, 7, and 8 is

preferred. The common or main pole 20 is formed by a spring-plate having a long and a short arm, the former projecting over the end of a plate, forming the branch pole 22. The branch pole 23 is formed by a spring-plate, whose outer end projects under the short arm of the pole-plate 20, as shown in Fig. 6. The long arm of the pole or plate 20 and the pole or plate 23 are so arranged that when free to move the former will bear upon and have electrical contact with the pole or plate 22 and the plate 23 will have electrical contact with the short arm of plate or pole 20. A shaft 29 is arranged transversely of these plates and has arms 30, preferably provided with friction-rolls, secured thereon. As this shaft is rotated in one direction these rollers bear upon the under side of the plate 23 and the long arm of the plate or pole 20, thereby moving the plate 23 into contact with the short arm of the pole 20 and lifting the long arm of the pole 20 away from the plate 22. When the shaft is turned to move the friction-rolls out of contact with the plates, the resilience of the plate 23 will cause it to spring away from the short arm of the plate or pole 20, and the long arm of said plate or pole will by reason of its resilience spring down into contact with the plate 22. The shaft 29 is provided at one end with a crank-arm 31, which is connected by a rod 32 with the movable rails of the switch, as shown in Fig. 2.

As shown in Figs. 2 and 3, the movable rails of the switch are connected by a rod 33 to an operating-lever 34, or, in lieu thereof, any other suitable form of switch-operating mechanism known in the art may be employed. A locking-bar 35 is also connected to the movable rails and extends out through a slot in the locking mechanism, which is secured in convenient proximity to the switch, as shown. On one side of the casting containing the slot for the locking-bar is secured a cylinder 36, having a piston 37 arranged therein. The stem 38 of the piston reciprocates transversely of the locking-bar 35 and is provided with a lateral enlargement near its outer end adapted to engage when the piston is at the right-hand limit of its movement a transverse notch in the locking-bar, thereby preventing a longitudinal movement of the bar. When the piston with its stem is shifted to the left, the lateral enlargement of the stem passes out of the notch in the locking-bar, permitting of the shifting of the switch-rails to siding. The head of the cylinder 36 is provided with a passage 39, connected with a suitable source of fluid-pressure supply, and from said passage extends the inlet-port 40, the flow of fluid-pressure through said port being controlled by a valve 41, normally held to its seat at the outer end of the port by a spring 42, as shown in Fig. 4. Fluid-pressure escapes from the cylinder by the port 43 and passage 44, its escape being controlled by a valve 45, which is normally held away from its seat at the outer end of the port 43 by the spring 42, a pin 46 being interposed between the valves 41 and 45 of such a length that when the former is seated the latter will be held away from its seat, and vice versa. The valve 45 is connected to the armature 47 of the electro-magnet 48. When the armature is attracted to its magnet, the valve 45 is forced against its seat and the valve 41 unseated, thereby permitting fluid-pressure to flow into the cylinder 36. When the magnet is demagnetized, the spring 42 seats the valve 41 and raises the valve 45 and the armature of the magnet, thereby permitting of the escape of fluid-pressure from the cylinder. The armature may be depressed, thereby shifting the valves 41 and 45, as described, by pressing down on the plug 49, which is provided with a pin 50, adapted to bear upon the armature 48. This plug is provided with a central recess fitting over a hollow projection on the cap 51, covering the armature, and is normally held in a raised position by the spring 52, as shown in Fig. 4. On the admission of fluid-pressure into the cylinder 36 the piston 37 and stem 38 are shifted to the left, thereby unlocking the bar 35 and compressing the spring 62, which is arranged in a shell 53, a follower 54 being arranged between the spring and the end of the stem 38. As soon as the exhaust-port 43 is opened the spring 52 will force the stem 38 and piston 37 to the right, thereby shifting the lateral enlargement on the stem into the notch in the locking-bar.

The two pairs of contact-plates 19 and 27 are attached to the cap 51, which is formed of insulating material, on opposite sides of the plug 49, and the inner member of each pair is provided with a projection 55, adapted to fit in a groove or recess 56 in the plug when the latter is in normal position, as shown in Fig. 4. The ends of the plates 19 are so constructed as to be out of contact with each other when the projection on the inner member of said plates enters the groove or recess in the plug, but will be forced into contact with each other when the plug is moved up or down, thereby effecting an outward movement of the inner member of the plates 19. The plates 27 are so constructed that their ends will be in contact when the plug is in normal position, but will be forced apart by a movement of the plug from normal position.

The electro-magnet and the mechanism arranged above it are surrounded by a case 57, provided with a hinged cover 58, adapted to be held in closed position by a padlock or suitable locking device. The case with its cover and the plug are so constructed that when the cover is closed the plug will be pressed down until the projections 55 on the contact-plates will enter the groove or recess in the plug. This inward movement of the plug when the cover is closed is sufficient to slightly compress the spring 52, but not sufficient to cause the pin 50 to bear upon the armature 48. When the parts are in this position, the circuit of which the plates 27 form

a part is closed, while the circuit of which the plates 19 form a part is open.

In describing the operation of the apparatus it will be supposed that the normal direction of traffic is in the direction of the arrow in Fig. 1.

As a train enters the section A the battery *a* will be short-circuited through the wheels of the train, thereby cutting out the relay *x* and permitting the armature of said relay to be shifed away from the contact 4, breaking the circuit of the home-signal 1^a and setting such signal to "danger." The movement of the home-signal 1^a to "danger" breaks the circuit controlling the distant signal 2^a at the circuit-breaker indicated at *d*, thereby setting said signal to "danger." These signals will remain at "danger" as long as the train remains on the section A. As the train passes off the section A the track-circuit will be restored to normal, magnetizing the relay *x*, which will then attract the armature 5 against the contact 4, thereby closing the circuit of signal 1^a and restoring it to "safety." The movement of the signal 1^a to "safety" will close the circuit-breaker *d*, whereupon the distant signal 2^a would go to "safety" were it not that the circuit controlling this distant and the home signal 1^b is broken by the demagnetization of the relay *y* consequent upon the entrance of the train into section B and the short-circuiting of the battery *b*. The movement of the distant signal 2^a to "danger" opens the switch *c* of the circuit formed by the battery 59, switch *c*, wire 60, magnet 48, and ground, thereby demagnetizing said magnet, which will thereupon release its armature. This movement of the armature 47 so shifts the valves hereinbefore described as to permit the escape of fluid-pressure from the cylinder 36, thereby locking the switch. If the point of entrance to the section A should not be visible from the switch, the presence of a train on said section would lock the switch, as described, which can be unlocked only by depressing the plug. This must not be done unless the train on sections A or B, and therefore protected by the signals of said sections, is to enter the siding, in which case the plug is depressed to unlock the switch which is locked by the trains. After a train has passed out of section B, thereby restoring the signals 2^a and 1^b to "safety" and closing the circuit of the magnet 48 through the switch *c*, the armature will be drawn down, the inlet-valve 41 opened, and the outlet-valve 45 closed, admitting fluid-pressure to the cylinder and the shifting of the piston 37 to the left and the consequent unlocking of the switch-rails. If it be desired to let a train out of the siding or to run cars into the siding, the train standing on sections A or B, the brakeman will unlock and raise the cover 58, whereupon the plug 49 will be so raised by the spring 52 as to separate the ends of the contact-plates 27 and force the ends of the contact-plates 19 together, thereby making an additional break in the track-circuit of section B, of which the contact-plates 27 form a part, as hereinbefore stated, and also forming a shunt-circuit for battery *b*, said circuit being formed by a part of rail of section B, wire 18, contact-plates 19, wire 24, continuous rail of section B to battery. This shunt-circuit being of less resistance than the track-circuit, which contains the relay *y*, will insure the cutting out of the said relay even if the contact-plates 27 should not be separated by the movement of the plug. By the cutting out of the relay *y* the circuit of the home-signal 1^b and distant signal 2^a is broken and said signals shifted to "danger," thereby protecting section B. It will be observed that the act of raising the cover 58 permits of such a movement of the plug as to set the protecting-signals to "danger." The cover being raised, the brakeman presses down on the plug, thereby shifting the valves 41 and 45, so as to admit fluid-pressure to the cylinder 36 and unlock the switch. A movement of the plug sufficient to shift the valves will bring the groove or recess in the plug below the projections on the inner contact-plates, so that the track-circuit will remain broken and the shunt-circuit closed. The switch being unlocked, the rails are shifted to siding, thereby so shifting the movable parts of the electric switch 21 that another break is formed in the track-circuit at said switch and the shunt-circuit is formed by the wire 18, branch 18^a, poles 20 and 22, wire 24, branch 25, and rails to the battery. It will be observed that the relay *y* may be cut out from the battery *b* by the presence of a train on section B by breaking the contact of the plates 27 by forming a shunt-circuit through contact-plates 19 or through the poles 20 and 22 of switch 21. It will also be observed that when the relay *y* of track-section B is cut out in any of the ways stated the signals 1^b and 2^a go to "danger," and that the movement of the distant signal 2^a breaks the circuit-breaker or switch *c* of the circuit of the magnet 48, thereby releasing the armature 47, and when the armature is in this position the valves 41 and 45 are closed and opened, respectively, and the switch-rails will be locked. After the switch-rails have been shifted to siding, thereby so shifting the movable part of the electric switch 21 that a shunt-circuit is formed through the poles 20 and 22 thereof, the cover 58 may be closed and locked, the plug 49 returning to normal position, as shown in Figs. 1 and 4, the relay *y* being still cut by the shunt-circuit through the switch 21, so that after the train has passed out of the siding and thereinto beyond the fouling-point the switch-rails may be shifted to clear main line, and as such movement will restore the electric switch to normal position, as shown in Fig. 1, the track-circuit of section B will be restored, magnetizing the relay *y*, and thereby shifting the signals 1^b and 2^a to "safety." The movement of the distant signal 2^a to "safety" will close the circuit of magnet 48, thereby

attracting the armature 47, which with the valves 41 and 45 are depressed by the fluid-pressure to the cylinder 36, thereby unlocking the switch-rails. It will be observed that it is necessary for the plug to be in proper position—*i. e.*, that in which it is held by the cover 58—when closed and locked to restore the track-circuit of section B to normal position and set the signals 1^b and 2^a to "safety." Hence if a brakeman should leave the cover 58 open or unlocked (the spring 52 being of sufficient strength to raise the cover, if unlocked) or should place a block between the plug and cover, so as to avoid the necessity of opening the cover to unlock the switch, the signals controlling the section B will remain at "danger," preventing traffic until the device has been properly adjusted.

I claim herein as my invention—

1. In a switch and signal apparatus, the combination of movable switch-rails, a fluid-pressure mechanism for locking such rails in position for clear main line, electrically-operated valves controlling the flow of fluid-pressure to and from such mechanism, a normally-closed circuit controlling said valves and provided with a circuit-breaker, and a signal controlling a track-section adjacent to the switch and adapted when shifted to "danger" to open the valve-controlling circuit, and thereby so shifting the valves as to effect a locking of the switch-rails to clear main line, substantially as set forth.

2. In a switch and signal apparatus, the combination of movable switch-rails, electrically-controlled mechanism for locking the rails in position for clear main line, a normally-closed circuit controlling the lock mechanism and provided with a circuit-breaker, a signal controlling a track-section adjacent to the switch, means operated by said signal when shifted to "danger" to open the circuit controlling the switch-lock, thereby locking the switch-rails to clear main line, and a hand-operated device for unlocking the switch-rails and simultaneously breaking the normally-closed circuit, whereby the signal controlling the adjacent section is shifted to "danger," substantially as set forth.

3. In a switch and signal apparatus, the combination of movable switch-rails, electrically-controlled mechanism for locking such rails in position for clear main line, a normally-closed circuit controlling such mechanism and provided with a circuit-breaker, a home-signal controlling a track-section adjacent to said switch, and a distant signal controlling the track-section containing the switch and controlled by the home-signal and adapted when shifted to "danger" to open the circuit controlling the switch-locking mechanism, and thereby lock the switch-rails to clear main line, substantially as set forth.

4. In a switch and signal apparatus, the combination of movable switch-rails, electrically-controlled mechanism for locking such rails in position for clear main line, a normally-closed circuit controlling such mechanism and provided with a circuit-breaker, a home-signal controlling a track-section adjacent to said switch, a distant signal controlling the track-section containing the switch and controlled by said home-signal and adapted when shifted to "danger" to open the circuit controlling the switch-locking mechanism, and thereby lock the switch-rails to clear main line, and a home-signal controlling the track-section containing the switch and adapted when at "danger" to hold the distant signal at "danger," substantially as set forth.

5. In a switch and signal apparatus, the combination of a track-circuit formed in part by the rails of a section of track and in part by contact-plates, a movable plug or other suitable hand device for holding said spring-plates in contact, thereby completing the track-circuit, a switch extending from said track-section, fluid-pressure mechanism for locking the switch to clear main line and controlled by the movable plug, and a normally-closed circuit controlling the signals protecting the track-section and controlled by the track-circuit, whereby a movement of the plug to unlock the switch will break the track-circuit, thereby causing the protecting-signals to go to "danger," substantially as set forth.

6. In a switch and signal apparatus, the combination of a track-section forming a part of a circuit, contact-plates, also forming a part of said circuit, a movable plug or other suitable hand device normally holding the contact-plates together, thereby completing the track-circuit, a switch extending from the track-section, fluid-pressure mechanism for locking the switch to clear main line and controlled by the movable plug, a normally-closed circuit controlling the signals protecting the track-section and controlled by the track-circuit, and a normally-open shunt-circuit from the track-circuit adapted to be closed by the movement of the plug to open the track-circuit and operate the switch-locking mechanism, substantially as set forth.

7. In a switch and signal apparatus, the combination of a track-section forming part of a track-circuit, contact-plates, also forming a part of said circuit, a movable plug or other suitable hand device normally holding the plates together, thereby completing the track-circuit, a switch extending from said track-section, fluid-pressure mechanism for locking the switch to clear main line and controlled by the movable plug, a normally-closed circuit controlling the signals protecting the track-section and controlled by the track-section, and an electric switch included in the track-circuit and operated by the movable rails of the track-switch to break the track-circuit when the movable rails are shifted to siding, substantially as set forth.

8. In a switch apparatus, the combination of a locking-bar provided with a notch and connected to the movable switch-rails, a movable bar adapted to engage the notch in said

locking-bar, a spring for pressing said movable bar in one direction, and a fluid-pressure cylinder provided with a piston for shifting the bar in the opposite direction, substantially as set forth.

9. In a switch and signal apparatus, the combination of movable rails, a locking mechanism therefor, a fluid-pressure mechanism for operating the locking mechanism, a spring-actuated plug for shifting the valves of the fluid-pressure mechanism, spring-plates adapted to form parts of a track-circuit and normally held in contact by the plug in certain position thereof, and a locking device for holding the plug in such position as to keep the spring-plates in contact, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JENS G. SCHREUDER.

Witnesses:
DARWIN S. WOLCOTT,
W. B. CORWIN.