(No Model.) 4 Sheets—Sheet 1.

J. G. SCHREUDER.

SWITCH AND SIGNAL MECHANISM FOR RAILROAD CROSSINGS.

No. 559,613. Patented May 5, 1896.

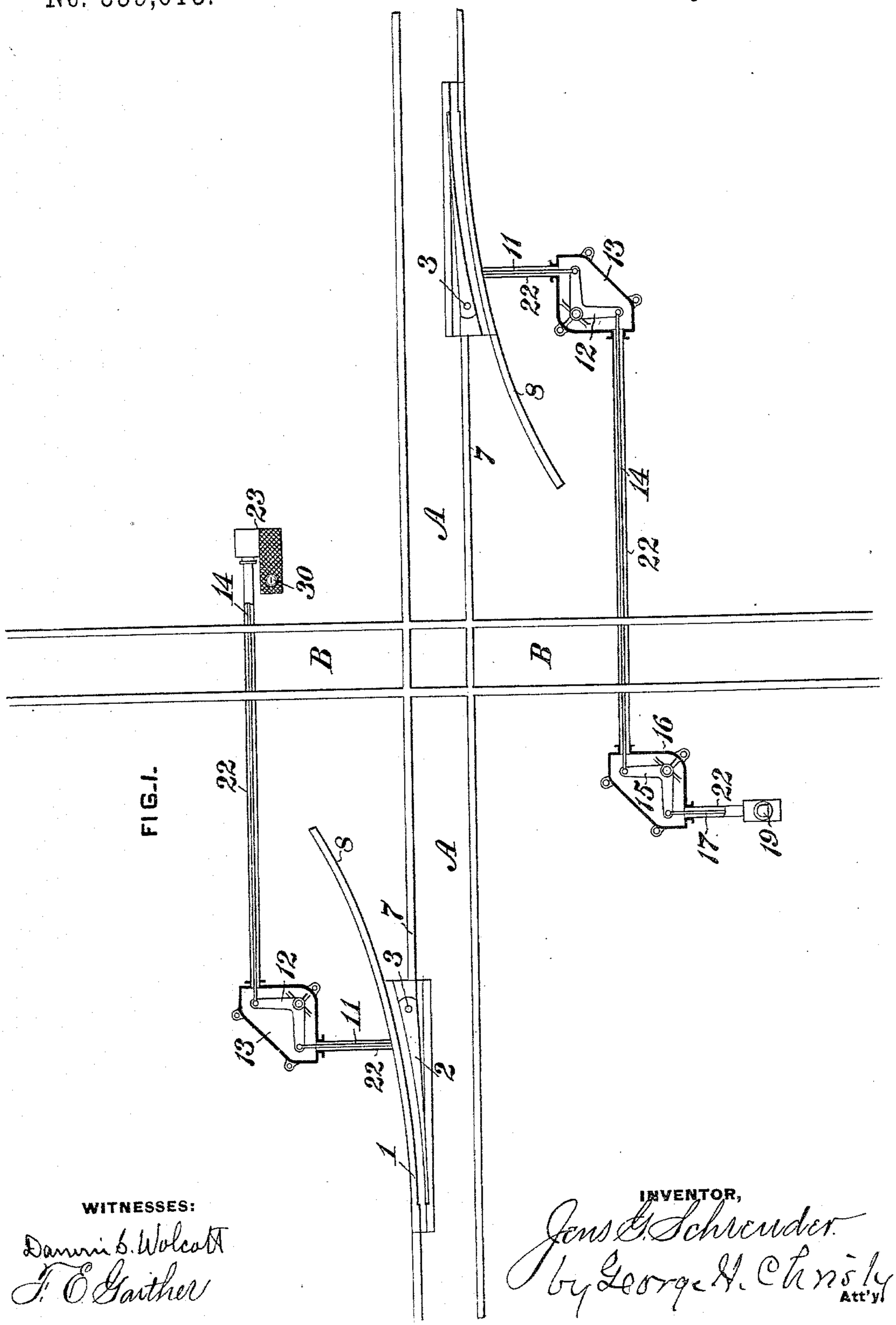

FIG. 1.

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(No Model.) 4 Sheets—Sheet 2.

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FIG. 2.

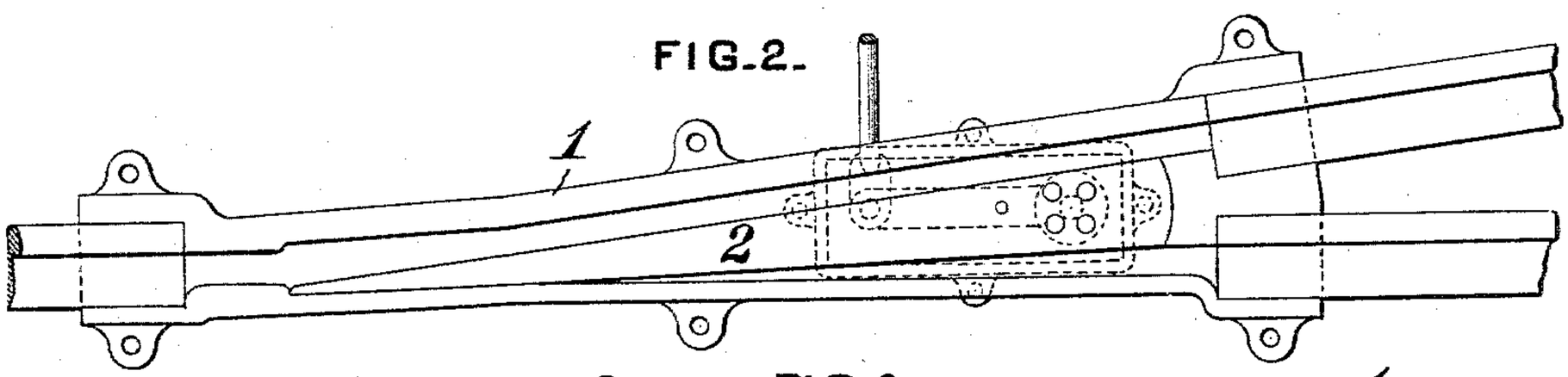


FIG. 3.

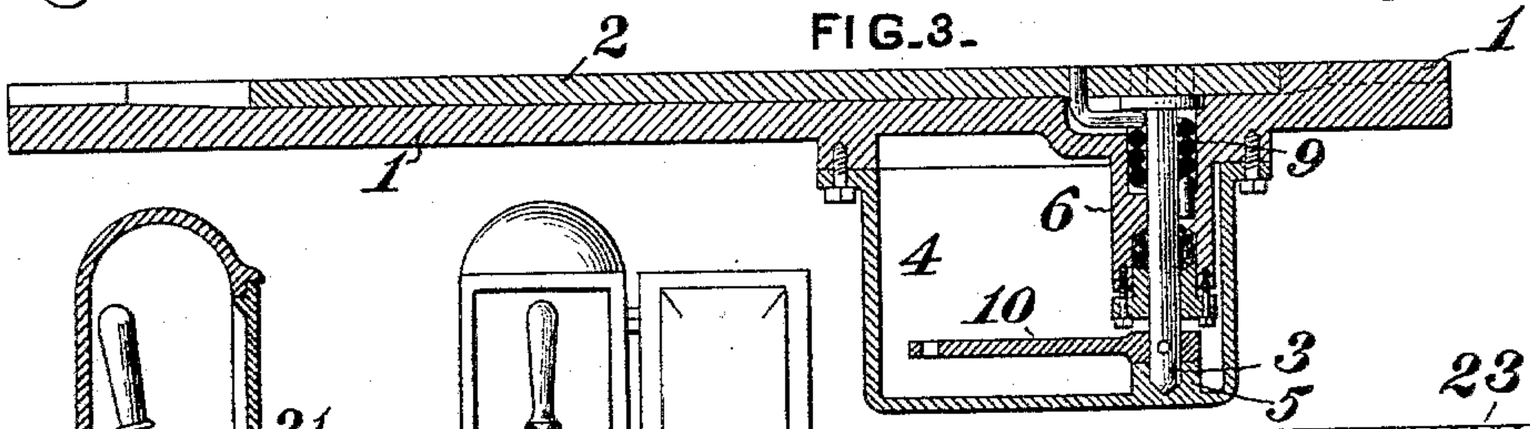


FIG. 4.

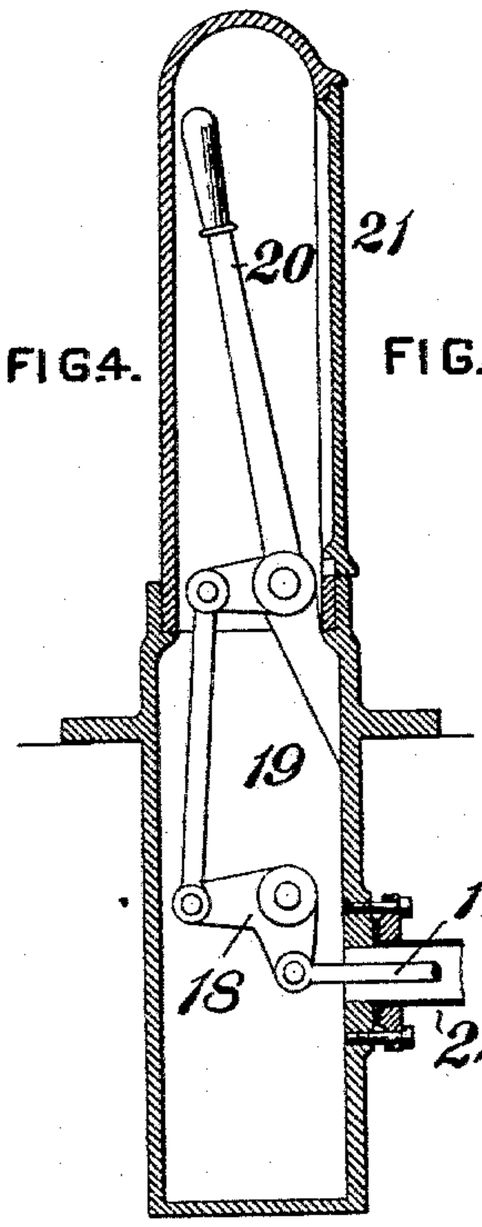


FIG. 5.

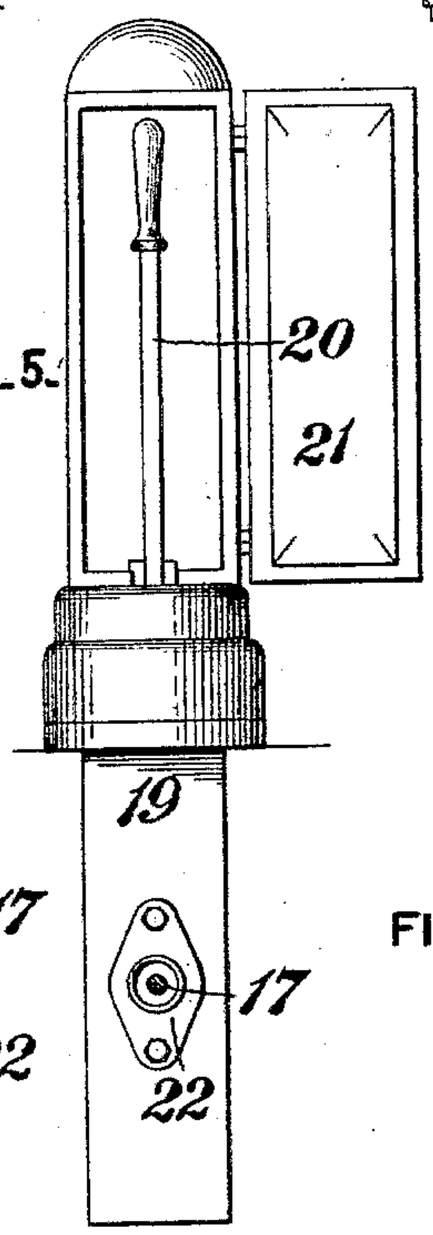


FIG. 6.

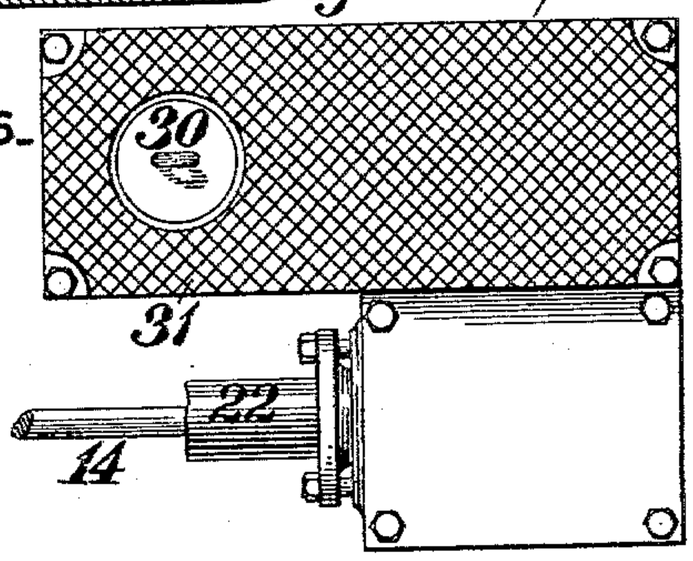


FIG. 7.

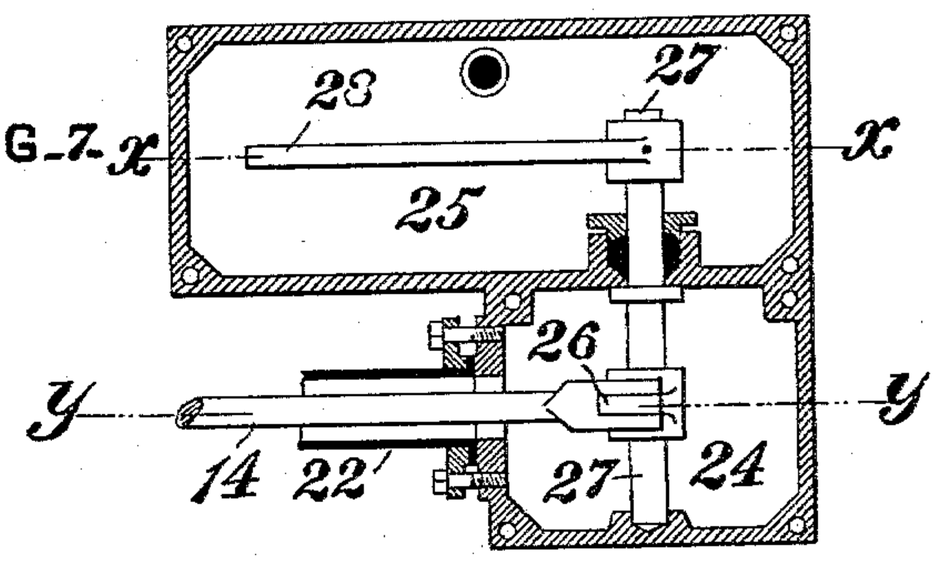


FIG. 8.

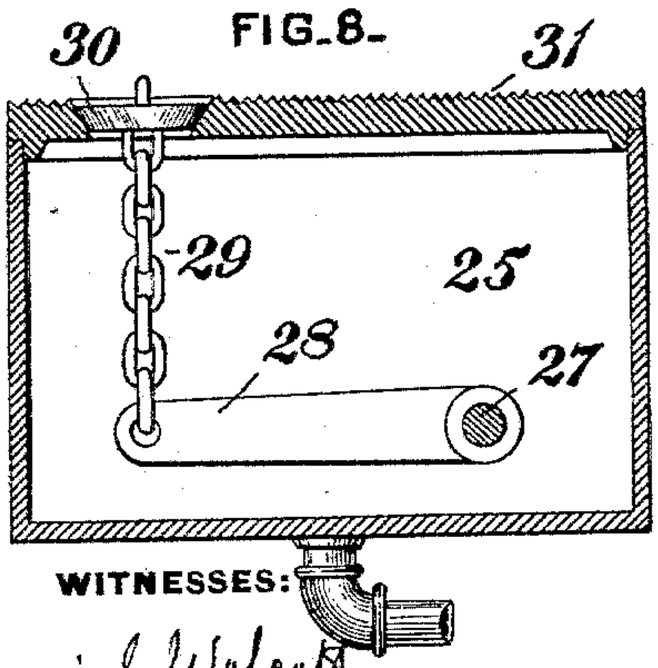
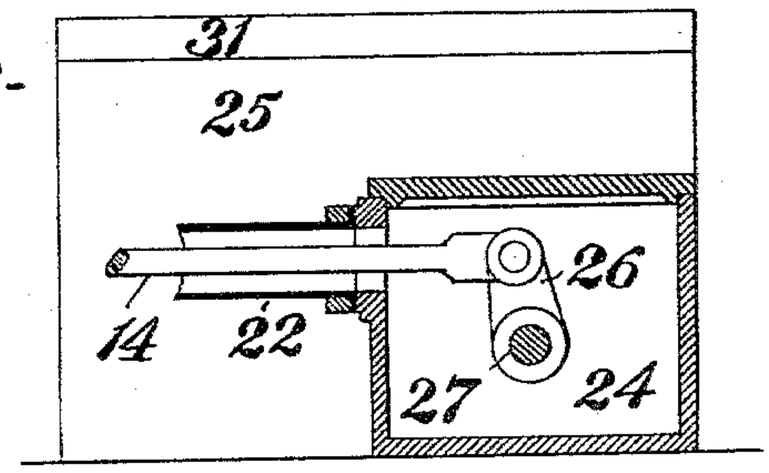


FIG. 9.



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SWITCH AND SIGNAL MECHANISM FOR RAILROAD CROSSINGS.

No. 559,613. Patented May 5, 1896.

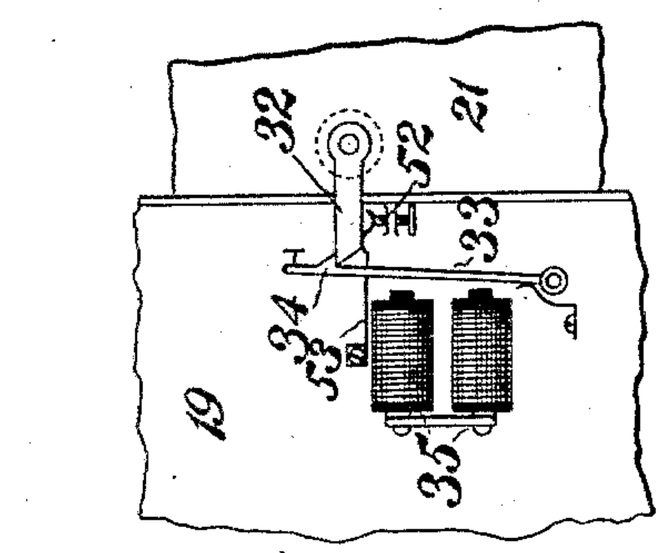

FIG. 12.

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SWITCH AND SIGNAL MECHANISM FOR RAILROAD CROSSINGS.

No. 559,613. Patented May 5, 1896.

FIG. 13.

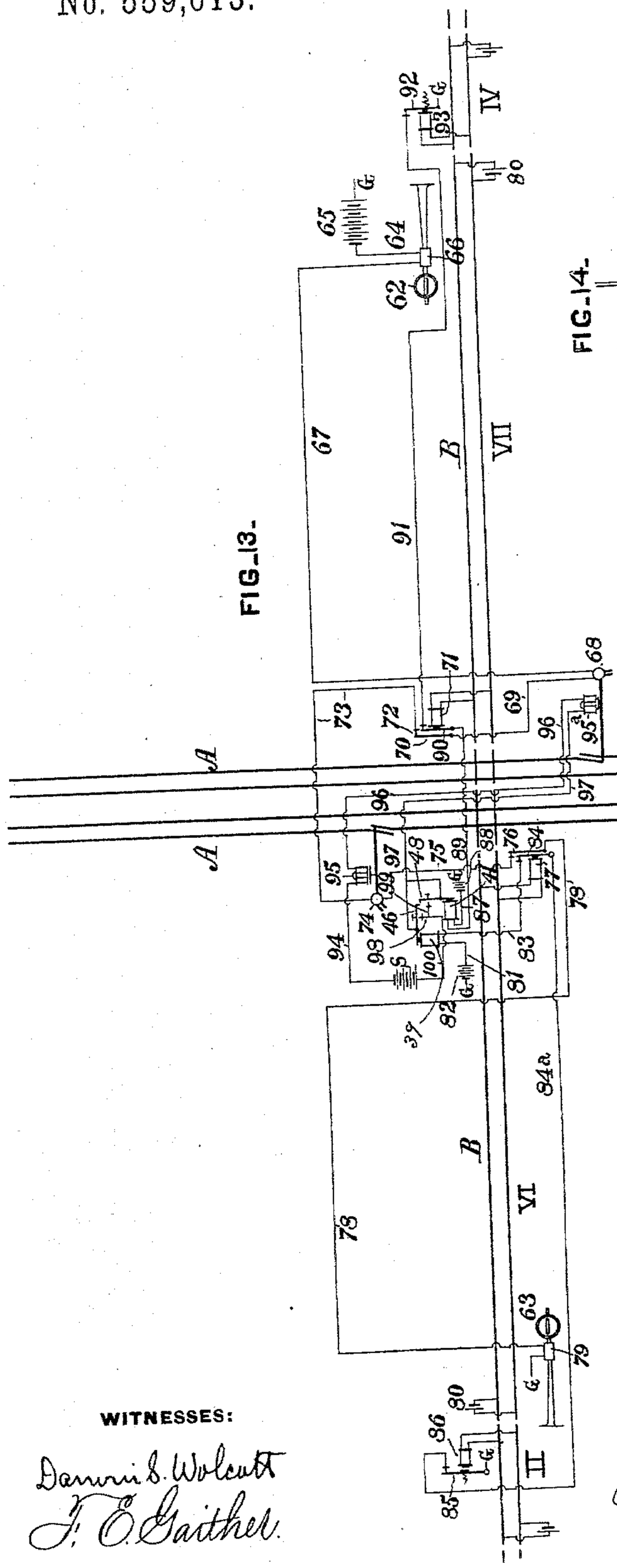


FIG. 14.

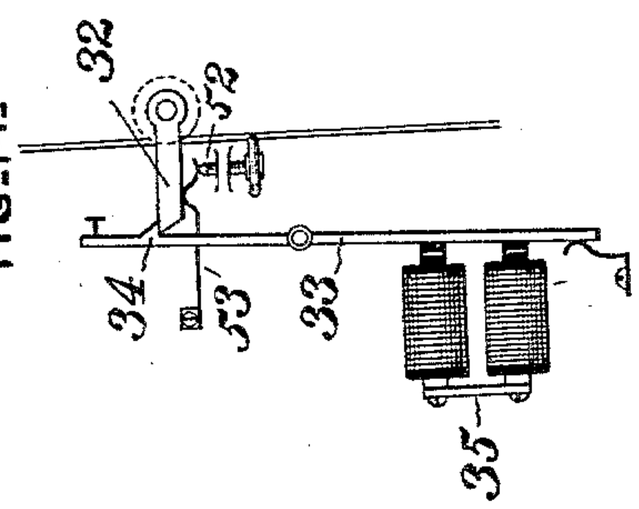
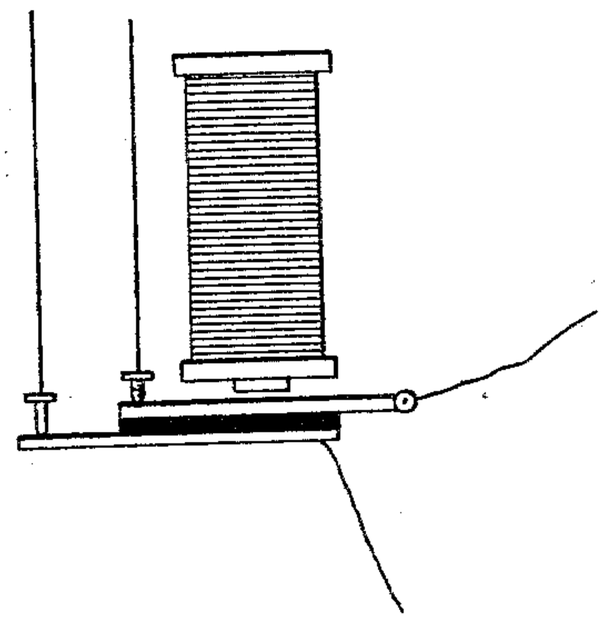


FIG. 15.



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Atty.

UNITED STATES PATENT OFFICE.

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SWITCH AND SIGNAL MECHANISM FOR RAILROAD-CROSSINGS.

SPECIFICATION forming part of Letters Patent No. 559,613, dated May 5, 1896.

Application filed March 31, 1893. Serial No. 468,557. (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 Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Switch and Signal Mechanism for Railroad-Crossings, of which improvements the following is a specification.

The invention described herein relates to certain improvements in switch and signal mechanism for the protection of grade crossings, and has for its object the provision of a normally open switch in a line of track arranged on one side of a crossing line of track and mechanism for closing said switch arranged on the opposite side of the crossing; and it is a further object of said invention to provide a locking mechanism controlled by trains on the crossing line of track for locking the switch in normal or open position when trains shall have approached within a certain predetermined distance of the point of crossing of the two lines of track.

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

In the accompanying drawings, forming a part of this specification, Figure 1 is a plan view of two tracks crossing at grade and mechanism for operating the movable rails in one of the lines of track. Figs. 2 and 3 are plan and sectional views of the movable rails and connections. Figs. 4 and 5 are sectional and front elevations of the curb box or case for the operating-lever. Figs. 6 and 7 are plan and horizontal sections of the street box or case. Figs. 8 and 9 are sectional views, the planes of section being indicated by the lines $x\ x$ and $y\ y$, Fig. 7, respectively. Fig. 10 is a diagrammatic view of the track and locking circuit for locking the movable rail at derailing position. Figs. 11^a, 11^b, 11^c, 11^d, and 11^e are views illustrating the different positions of the armatures of the relays in the track-circuits. Fig. 12 is a detail view illustrating a form of lock for the door for the curb-box. Fig. 13 is a diagrammatic view showing the track, signal, and signal-circuits. Fig. 14 is a detail view of a modification of the construction shown in Fig. 12, and Fig. 15 is a detail view of a relay having a double armature.

In the practice of my invention a frog 1, having a movable rail 2, is the line of one of the rails of the track A on each side of the track B, crossing the track A. The movable rail 2 is provided at or near one end with a pivot-pin 3, which passes down into a box 4, secured to the under side of the frog, and is supported in a vertical position by bearings 5 and 6. When shifted into one position by mechanism hereinafter described, the movable rail will guide the wheels of a car onto the rail 7, forming a part of the main track, but when shifted into the other position the movable rail will guide the wheels of a car onto the derail 8. The movable rail is normally held in position to guide the wheels of a car onto the derail by a spring 9, surrounding the pin 3 and having one end connected to the movable rail 2 and its other end to the bearing 6 or other stationary portion of the frog or box, as shown in Fig. 3. An arm 10 is attached to the pin 3 with the box 4, and to the free end of said arm is connected a rod or wire 11, having its opposite end connected to one arm of a bell-crank lever 12, pivotally mounted in a box 13, arranged below the level of the street a point at one side of and a short distance from the frog. The other arm of the bell-crank lever is connected, by a wire or rod 14, to one arm of a similar lever 15, mounted in a box 16, arranged below the level of the street on the opposite side of the track B. The other arm of lever 15 is connected by a wire or rod 17 to a similar bell-crank lever 18, mounted in the lower portion of a box or case 19, arranged vertically at or near the curb of the street. The lever 18 is shifted by a hand-lever 20, mounted in the upper portion of the box or case 19, which is provided with a door 21, permitting access to the lever 20. The several boxes 4, 13, 16, and 19 are connected by pipes 22, through which pass the wires connecting the levers arranged in said boxes.

As the movable rail 2 is normally held by the spring 9 in a position to guide the wheels of a car onto the derail, and as the mechanism for shifting the movable rail is inaccessible except at the box 19, it is necessary for the conductor of a car passing along the track

A, in order to get beyond the frogs 1, to leave his car, cross over the track B, open the box 19, shift the movable rail by the lever 20, and hold it in its shifted position until the car has passed beyond the frog. As soon as the conductor releases the lever 20 the spring 9 will force the movable rail to open or normal position.

In lieu of locating the operating-lever at one side of the street or roadway, as hereinbefore described, it may be located in the street or roadway below the surface thereof, as shown in Figs. 1, 6, 7, 8, and 9. In such, a box or case 23, having two compartments 24 and 25, is substituted for the box 16. The rod 14 is connected to an arm 26, secured on the shaft 27, mounted in the compartment 24 and projecting into compartment 25. On the portion of the shaft 27, within the compartment 25, is secured an arm 28 at right angles, or approximately so, with the arm 26, and the free end of the arm 28 is connected by a chain or rod 29 with a disk 30, fitting in an opening in the lid or cover 31 of the compartment 25. The box 23 is so placed in the street or roadway that its cover 31, which is roughened in any suitable manner, is level with the surface of the street. The disk or plug is provided with an eye or other suitable device whereby it may be lifted, thereby raising the arm 28 and through the connections heretofore described shifting the movable rail of the frog.

In order to prevent the movable rail from being shifted when a train on track B has approached within a certain predetermined distance of the crossing, a suitable locking device is placed on the door 21 and the unlocking movement of said device is controlled by a train passing along the track B. To this end a latch 32 is applied to the door 21 of each box or case 19, said latch being adapted, as hereinafter described, to be shifted by a key in the possession of the conductor to unlock the door, Figs. 10, 12, 13, and 14. On the case 19, in suitable proximity to the latch when turned to a locked position, is pivoted a bar 33, provided with a projection 34, adapted to engage the latch and hold the same in a locked position. This bar 33 forms the armature of electromagnet 35, which, when excited, draws the bar out from engagement with the latch, the bar being shifted into engagement with the latch by a spring 36.

On each side of the crossing are sections II and IV, which are insulated from the remaining portions of the track. (See Fig. 10.) At one end each insulated section is provided with a battery 37, whose poles are connected with the rails of the sections. From the inner end of section IV extend wires 38, leading to the poles of an electromagnet 39, and from the ends of the rails of section II extend wires 40, which are connected to the poles of electromagnet 41. The electromagnet 35 is included in the circuit of the battery 42. This circuit consists of a wire 43, contact 44, spring 45 on the armature 46 of the electromagnet 39, a wire 47, connecting the armature 46 with the armature 48 of the electromagnet 41, a spring 49 on the armature 48, contact-point 50, wire 51, contact springs or points 52^a and 53^a of the door-locking mechanism of the box or casing 19 on one side of the crossing, wire 54^a, electromagnet 35^a, wire 51^a, contact springs or points of the door-locking mechanism of the door or case 19 on the opposite side of the crossing, wire 54, electromagnet 35 and wire 55, connected to battery 42.

The operation of this locking device will be readily understood by reference to the diagrammatic views which are numbered in accordance with the number of sections shown in the track B. As a train moving in the direction of the arrow *x* enters on section II it will short-circuit battery 37, thereby demagnetizing the magnet 41 and permitting the armature 48, with its spring 49, to be drawn out of contact with the contact-point 50. The positions of the parts are shown in diagrammatic view, 11^b. As the spring 49 and contact-point 50 form part of the circuit in which relays 35 and 35^a are included, the separation of the contact point and spring breaks the circuit and permits the bars 33 to be forced away from their electromagnets and their projection 34 to pass over the latches 32, thereby locking said latches. At the same time the bars 33 are forced against the contact-points 56, thereby closing circuit consisting of the contact-point 56, wire 57, relay 58 of an electric-bell mechanism, wires 59 and 55, battery 42, wires 43 and 60, and bar 33. From the foregoing it will be seen that the short-circuiting of battery 37 by the entrance of a train onto section II not only locks the latches 32, but also effects the closing of a bell-ringing circuit, giving the conductor on a car passing along track A an audible signal of the approach of a train on track B. As the train passes along over the crossing and enters section IV the battery 37 of said section will be short-circuited, thereby demagnetizing magnet 39 and permitting its armature 46 to be shifted by its actuating-spring. The armatures 46 and 48 are arranged in such relation to each other that when the magnet 41 is demagnetized the outer end of the armature 48 drops below the end of the armature 46, so that when the magnet 39 is demagnetized the armature 46 will strike against the armature 48, thereby preventing such a movement of the armature 46 as to draw its spring out of contact with the point 44. The position of the armatures 46 and 48 while a train is passing along section II is shown in diagrammatic view, Fig. 11^b, and the position of said armatures after the forward end of the train has entered upon section IV is shown in diagrammatic view III, Fig. 11^c.

As the rear end of the train passes off at section II the magnet 41 will be excited and draw its armature 48 sufficiently far toward

it to bring the spring 49 and contact-point 50 together, thereby completing the circuit, of which electromagnets 35 and 35ª form parts, and drawing the bars 33 out of engagement with the latches 32 and away from contact-point 56, thus unlocking the latches and breaking the circuit of the electric bell. The armature 48 cannot, however, return to normal position until after a train has passed off section IV, thus permitting its battery 37 to excite magnet 39 and draw armature 46 out of contact with armature 48.

If the track B formed a part of a double-track system and the trains passed in one direction only, it would be necessary to employ only one insulated section in each track, but as trains pass in both directions along track B it is necessary to provide an insulated section on each side of the track A and to provide for breaking the locking-circuit while trains are passing in both directions. In order to permit the completion of the locking-circuit and the shifting of the movable rail in the track A immediately after a train has passed over the latter without waiting until the train has passed off of the insulated section, the armatures of electromagnets 39 and 41 are arranged in such relation to each other that when an armature, as 48, has been shifted by its spring on the short-circuiting of magnet 41 by the passage of a train over section II the other armature 46, when shifted by its spring on the short-circuiting of magnet 39 by the subsequent passage of the train over section IV, will be checked by the armature 48 before contact between the spring 45 and the point 44 is broken, (see Figs. 11ᶜ and 11ᵈ;) and in order to prevent the armature 48 from being shifted from behind the armature 46 after a train moving in the direction of the arrow *x* has passed off of section II and is passing along section IV the armature 46 is provided with a hook or shoulder adapted to prevent such a movement of the armature 48 on the excitation of magnet 41 as will remove it from engagement with armature 46, but at the same time permitting of sufficient movement of the armature 48 to bring its spring 49 into contact with the point 50. (See Fig. 11ᵈ.)

From the foregoing it will be readily understood that a train passing along the track B in the direction of the arrow *x* will produce a break in the locking-circuit only while passing over section II, so that as soon as the train has passed the crossing the track A can be put in condition for the passage of cars along it.

During the passage of a train along track B in the direction of the arrow *y*, the operation of the parts or elements of the apparatus is similar to that hereinbefore described, except that the locking-circuit is broken by the armature 46, which in turn prevents such a movement of the armature 48 as would effect a separation of its spring 49 and contact-point 50. The armature 48 is also provided with a hook to prevent a complete movement of the armature 46, while permitting a sufficient movement thereof to close the locking-circuit when the magnet 39 is excited.

The contact-pieces 52 52ª and 53 53ª in the locking-circuit are arranged in such relation to the latches 32 as to be held in contact only when the latch has been fully turned or shifted to a locked position, so that when the latch is turned and the door opened the locking-circuit will be broken and the bell-circuit completed, as already described. As the door cannot be closed and locked until the lever operating the movable rail in track A has been shifted to normal position and as the bell-circuit cannot be broken until the door is closed and locked the contact-pieces 52 52ª and 53 53ª and the circuits controlled thereby will prevent the conductor or other operator from leaving the apparatus in an unsafe condition.

In order to prevent a train from proceeding along the track B to the crossing while the track A is cleared for the passage of cars over the crossing, electric signals 62 and 63 are placed at a distance from the crossing on both sides thereof proportional to the speed at which the trains are usually run in approaching the crossing. (See Fig. 13.) The circuit for the signals consists of the wire 64, connected to one pole of the battery 65, the other pole thereof being grounded, the mechanism 66 of the signal 62, wire 67, an electric switch 68, wire 69, the armature 70 of the relay 71 of the track-circuit, to be hereinafter described, contact-point 72, wire 73, electric switch 74, wire 75, armature 76 of the relay 77 of another track-circuit, wire 78, the operating mechanism 79 of signal 63, and a ground. The switches 68 and 74 may be formed by the contact plates or springs 52 and 53, as shown in Figs. 10 and 12, which, as already stated, are controlled by the latch 32 or any other suitable construction of switch adapted to break the signal-circuit when the latch is shifted to open the door 21. The foregoing signal-circuit is a normally closed circuit, so that by unlocking either one of the doors 21, in order to obtain access to the operating mechanism of one of the movable rails in the track A, one of the electric-switch mechanisms 68 or 74 will be so shifted as to break the signal-circuit, thereby setting both signals to "danger" and protecting the crossover on both sides thereof.

The signals 62 and 63 are made a part of the signal system of the track B and are controlled by track-circuits formed by insulated sections VI and VII, as shown in Fig. 13. At one end the rails of each of the sections VI and VII are connected to a battery 80, and the rails of the ends of the sections adjacent to the crossing are connected to the electromagnets of relays 71 and 77, so that by the entrance of a train onto one section, as VI, the relay 77 is cut out, permitting the armature 76 to be shifted, thereby breaking the circuit of the signals 62 and 63, hereinbefore described. As the train proceeds and enters

upon section VII relay 71 will be cut out, permitting armature 70 to be shifted, thereby effecting another break in the signal-circuit. This latter break will be continued until the train has passed off of section VII. From the foregoing it will be seen that, as regards the movement of trains along track B and the protection of trains on said track, the sections VI and VII are practically one, the signals being set to "danger" by the entrance of a train onto one section and held at "danger" until the train has passed off of the other section.

The magnets 39 and 41 controlling the locking-circuit heretofore described, in lieu of being included in the track-circuits of sections II and IV, as shown in Fig. 10, form parts of circuits controlled by the track-circuits of sections II and IV, and also by track-circuits of sections VI and VII. The circuit of magnet 39 consists of wire 81, connected to one pole of battery 82, (the other pole of the battery being grounded,) magnet 39, wire 83, armature 84 of relay 77, wire 84ª, armature 85 of relay 86, and ground. The circuit of magnet 41 consists of wire 87, connected to one pole of battery 88, (the other pole of said battery being grounded,) magnet 41, wire 89, armature 90 of relay 71, wire 91, armature 92 of relay 93, and ground. The relays 86 and 93 form parts of the track-circuits of sections II and IV. It may sometimes happen that the conductor of cars on tracks A would unlock the door 21, thereby setting signal 62 or 63 at "danger" just as a train is about to enter one of the sections VI or VII, so that the engineer on the train would, thinking that the signal 62 or 63 had been shifted to "danger" by reason of the entrance of his train upon section VI or VII, proceed. At the same time the conductor having unlocked the door 21, believing that the signal 62 or 63 had been thereby set to "danger," would shift the movable rail in the track and signal his car to come on. In order to prevent the liability to collision which such coincidence would permit, sections II and IV are placed beyond the sections VI and VII, so as to lock the doors 21 before the train enters upon said sections. Hence if the engineer sees the signal 62 or 63 at "danger" while his train is passing over sections II and IV he will know that the crossover is blocked and must not proceed.

As the armatures 84 and 90 are controlled by magnets of relays 77 and 71 the circuits of the magnets 39 and 41 will remain open, said circuits having been opened by the entrance of a train on section II or IV, as described, until the train has passed off of sections VI or VII.

In lieu of employing a normally closed locking-circuit, as shown in Fig. 10, a normally open locking-circuit may be employed. This circuit consists of wire 94, connected to one pole of battery *s*, magnet 95 of the locking mechanism of the box or case 19 on one side of track B, wire 96, magnet 95ª of mechanism for locking door of box or case 19 on opposite side of track B, wire 97, armatures 46 and 48 of electromagnets 39 and 41, contact-points 98 and 99, and wire 100, connected to opposite pole of battery *s*. Both armatures 46 and 48 are connected to wire 97 and both contact-points 98 and 99 are connected to wire 100. In using a normally open locking-circuit the magnets 95 and 95ª are arranged to draw, when excited, the bars 33 into engagement with the latches 32, the unlocking movement of the bars being effected by springs, as shown in Fig. 14. As hereinbefore stated, the relays 71 and 77 are provided with two armatures, or with an armature and a conducting-strip attached to but insulated from the armature proper, as clearly shown in Fig. 15. This construction of relay is well known in the art as a double-armature relay. The operation of this normally open locking-circuit is as follows: As the train enters upon section II the relay 86 will be cut out, thereby breaking the circuit of magnet 39 and permitting its armature 46 to be shifted by its spring against contact-point 98, completing the locking-circuit heretofore described. By the closing of the locking-circuit the bars 33 are so shifted as to lock the latches 32. As the train enters section VI the relay 77 will be cut out, thereby permitting both armatures 76 and 84 to be shifted, thus forming a second break in the circuit of magnet 39, and also breaking the signal-circuit, as described. As the entrance of the train onto section VI formed a second break in the circuit of magnet 39 the locking-circuit will remain closed even after the train has passed off of section II. As the train enters upon section VII relay 71 will be cut out, thereby, through the shifting of armature 90, breaking the circuit of magnet 41. If the armature 48 were permitted to strike against the contact-point 99, the locking-circuit would be held closed until the train had passed off of sections VII and IV, but the position of the armature 46 prevents the armature 48 from contact with the point 99, in the manner shown in Fig. 11. After the train has passed off of section VI the magnet 39 would tend to draw its armature 46 from in front of the armature 48, but such movement of the armature 46 is prevented by the hook on the end of the armature 48. Sufficient movement is permitted the armature 46 to break the locking-circuit, thereby affording opportunity for unlocking the doors 21 after the train has passed the crossing, in lieu of waiting until the train has passed off of sections VII and IV. The relative positions assumed by the armatures 46 and 48 while a train is approaching and passing over the crossing are clearly illustrated in the several views in Fig. 11.

I claim herein as my invention—

1. The combination of two lines of track crossing each other at grade, movable rails arranged in one line of track on opposite sides of the crossing, and normally held at derail-

ing position, mechanism for shifting the movable rails into line with the main rails and a lock operated by cars on the other line of track for holding the movable rails in derailing position, substantially as set forth.

2. The combination of two lines of track crossing each other at grade, movable rails arranged in one line of track on opposite sides of the crossing and normally held at derailing position, mechanisms for shifting the movable rails into line with the main rail arranged on opposite sides of the crossing, the movable rail on one side of the crossing being connected to the operating mechanism on the opposite side of the crossing, and locks operated by cars on the other line of track for holding the movable rails at derailing position, substantially as set forth.

3. The combination of two lines of track crossing each other at grade, movable rails arranged in one line of track on opposite sides of the crossing, and normally held at derailing position, mechanisms for shifting the movable rails into line with the main rails, arranged on opposite sides of the crossing, the movable rail on one side of the crossing being connected with the operating mechanism on the opposite side of the crossing, track-circuits arranged in the other line of track, and mechanism controlled by the track-circuits for locking the movable rails at derailing position, substantially as set forth.

4. The combination of two lines of track crossing each other at grade, movable rails arranged in one line of track on opposite sides of the intersecting line of track and normally held at derailing position, mechanism for shifting the movable rails, arranged on opposite sides of the intersecting line of track, the movable rail on each side of the intersecting line of track being connected to and adapted to be operated by the operating mechanism on the opposite side of the intersecting line of track, signals arranged on the intersecting line of track and on opposite sides of the line of track having the derailing-switches, and means operated by the mechanism for shifting the movable rails for setting said signals to "danger," substantially as set forth.

In testimony whereof I have hereunto set my hand.

JENS G. SCHREUDER.

Witnesses:
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DARWIN S. WOLCOTT.