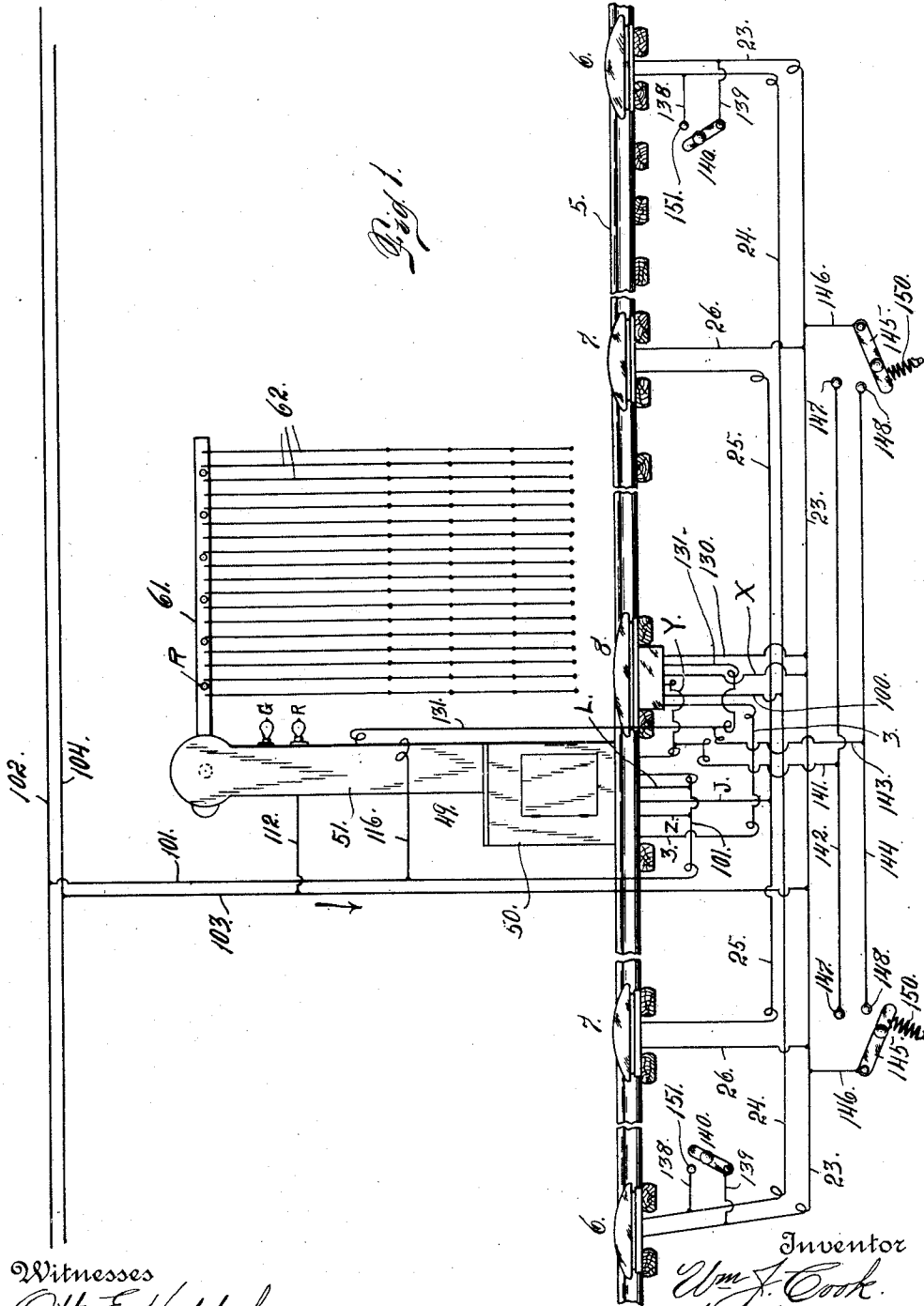


W. J. COOK.
 AUTOMATIC ELECTRIC RAILWAY GATE.
 APPLICATION FILED NOV. 5, 1909.

985,977.

Patented Mar. 7, 1911.

7 SHEETS-SHEET 1.



Witnesses

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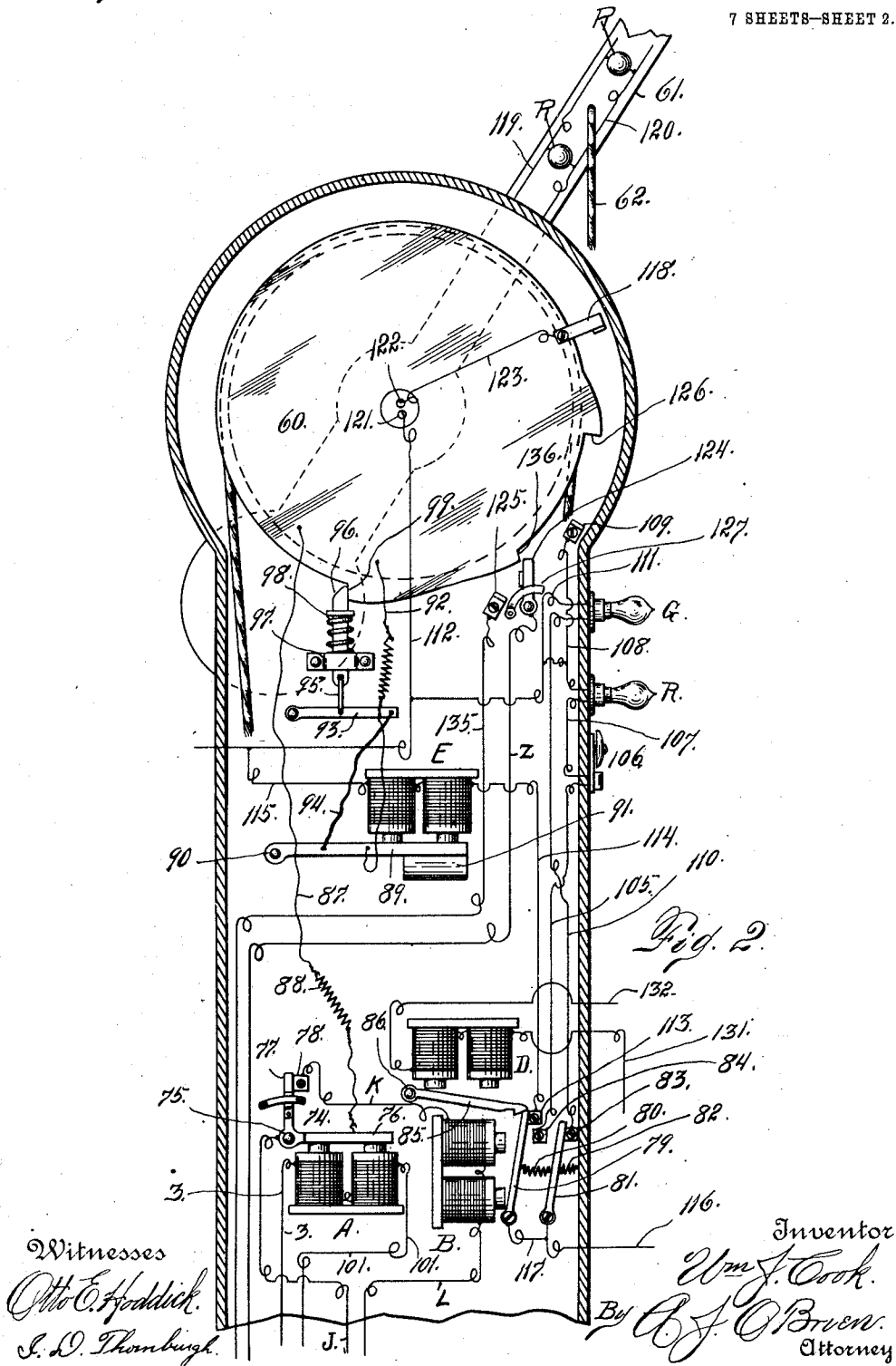
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7 SHEETS—SHEET 2.



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7 SHEETS—SHEET 3.

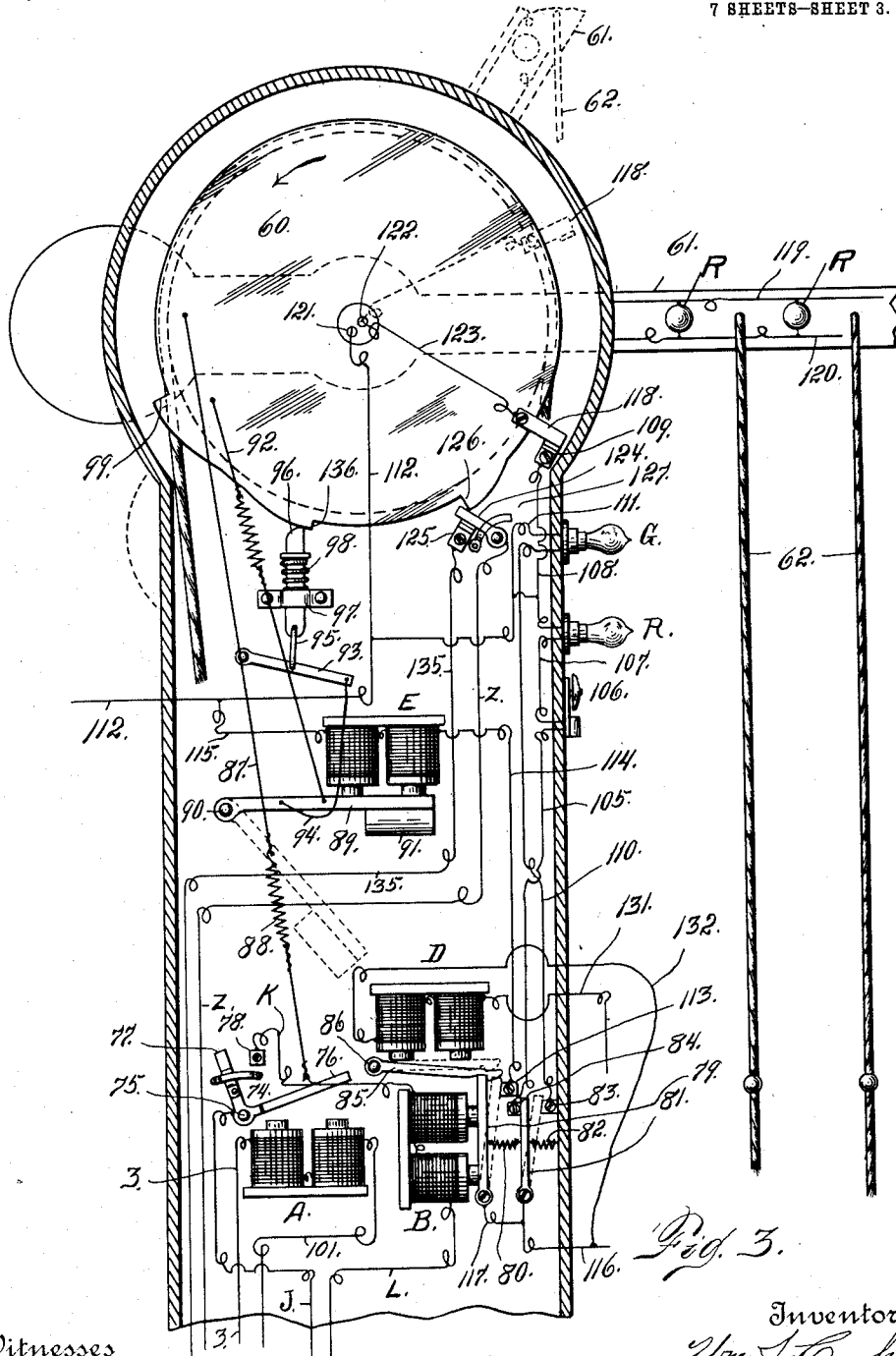


Fig. 3.

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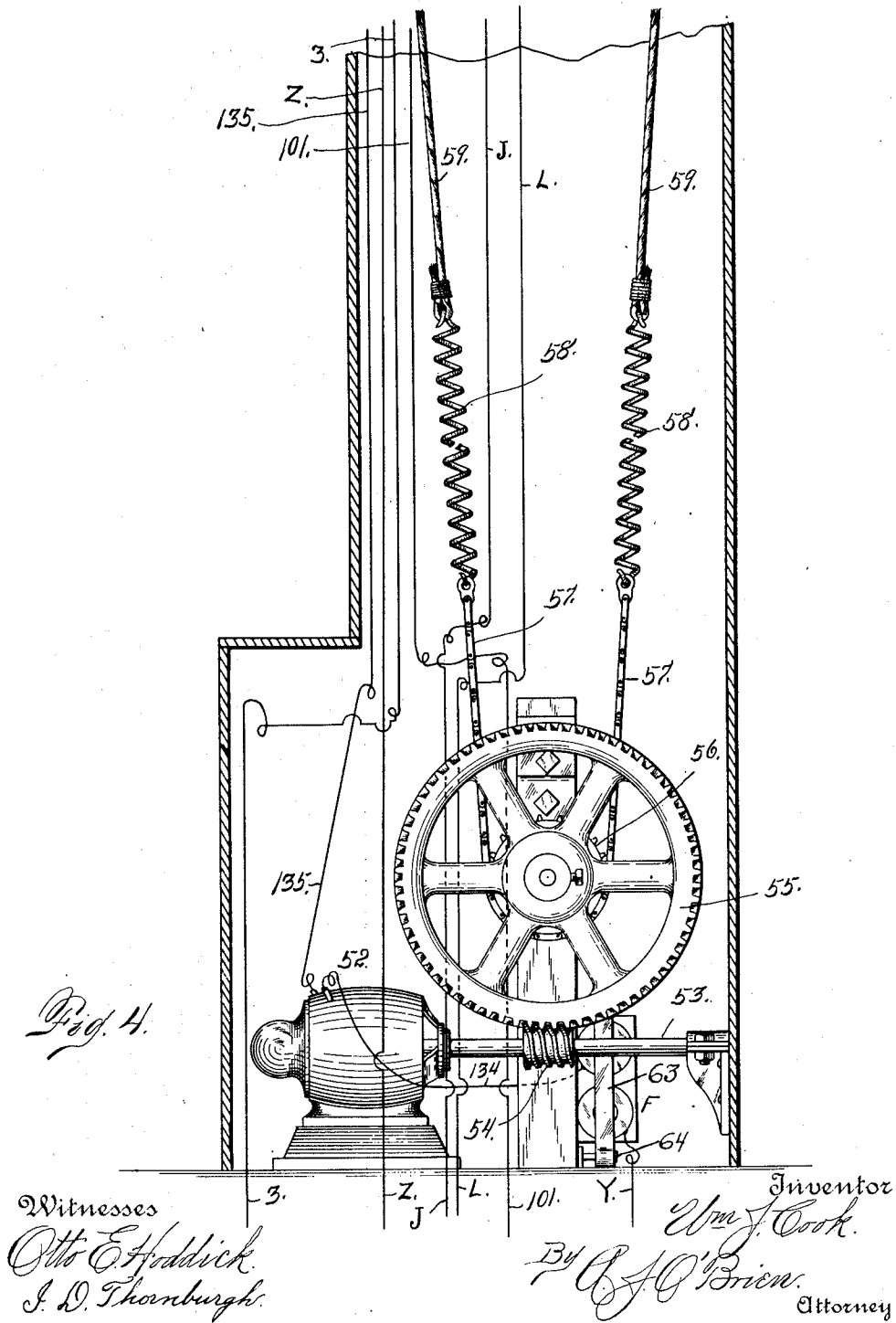
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7 SHEETS—SHEET 4.



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7 SHEETS—SHEET 5.

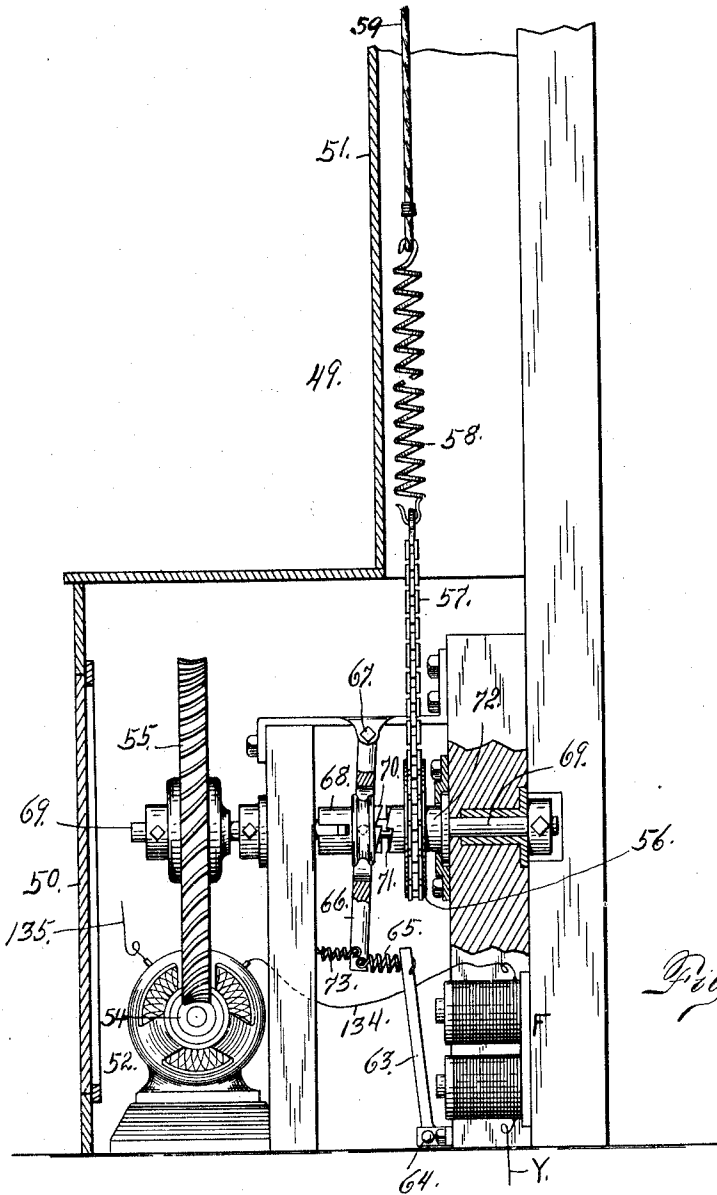


Fig. 5.

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7 SHEETS—SHEET 6.

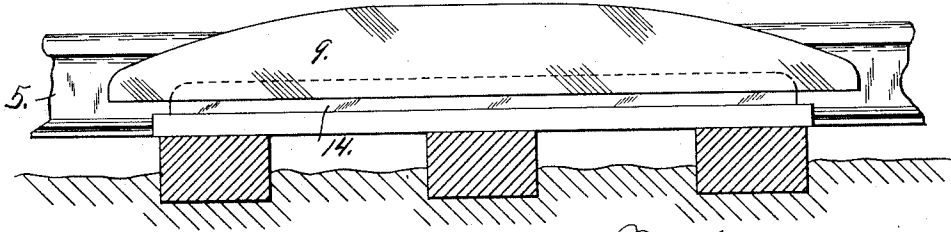


Fig. 6.

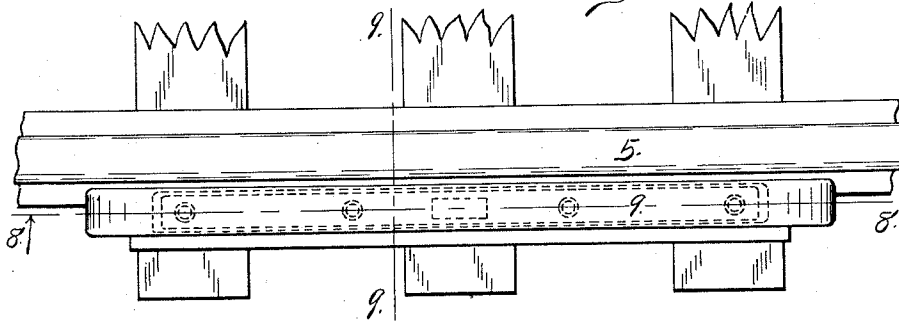


Fig. 7.

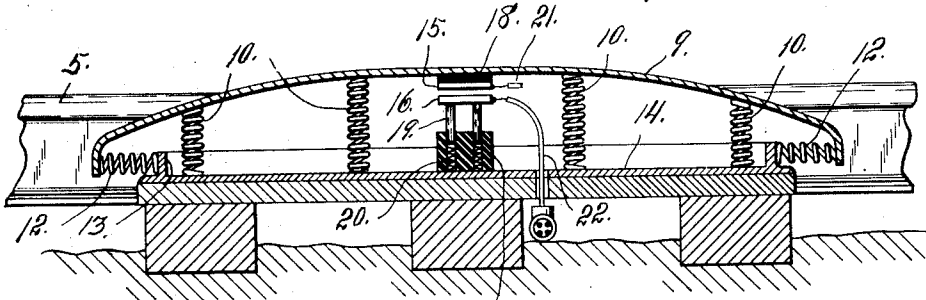


Fig. 8.

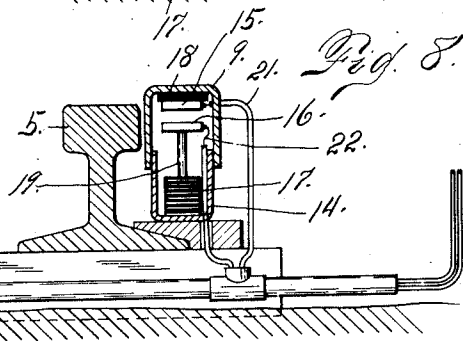


Fig. 9.

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7 SHEETS—SHEET 7.

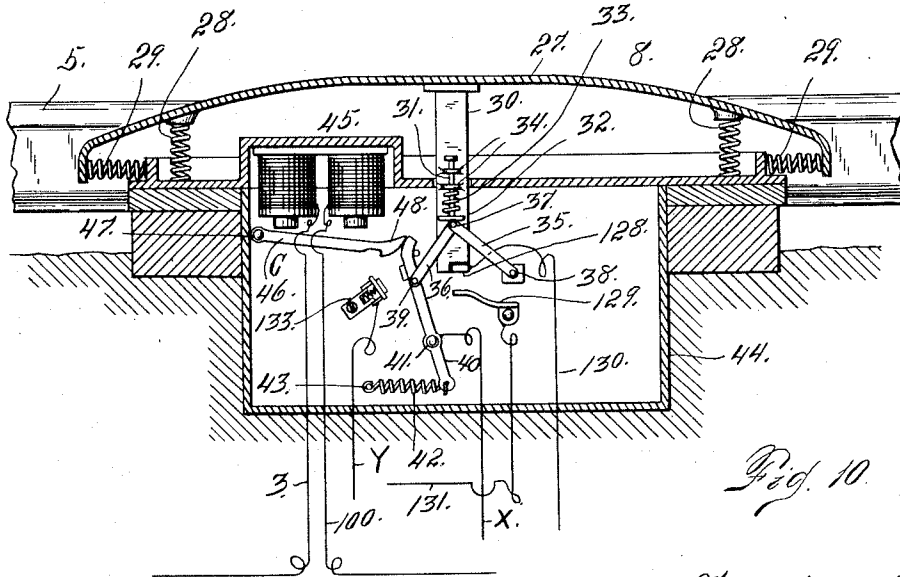


Fig. 10.

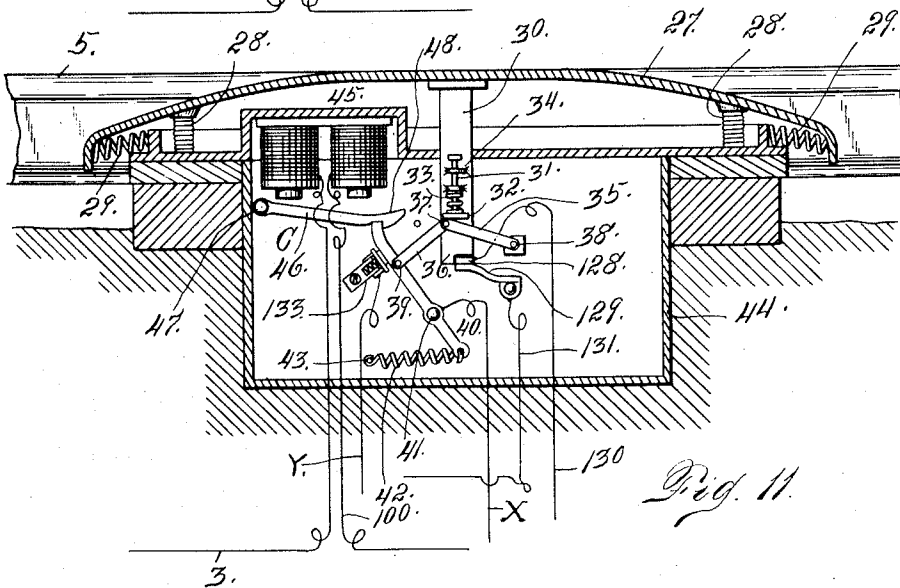


Fig. 11.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRIC RAILWAY-GATE.

985,977.

Specification of Letters Patent.

Patented Mar. 7, 1911.

Application filed November 5, 1909. Serial No. 526,351.

To all whom it may concern:

Be it known that I, WILLIAM J. COOK, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Automatic Electric Railway-Gates; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in automatically-operated signals for railway crossings, but as these signaling devices are generally of considerable length, they are usually termed gates, hence the significance of the title.

The object of my present invention is substantially the same as that of my Patent No. 940,786, dated Nov. 23, 1909. However, in my present construction, the device, viz. an electro-magnet which directly controls the gate, is always energized when the gate and other signals are in the condition indicating safety, hence if the circuit is broken or the apparatus is out of repair, the signaling devices will indicate danger and will remain in this position until the apparatus is repaired; while in my previous construction the circuit of the magnet directly controlling the gate was normally broken when the signal was in the position indicating safety, while its magnet had to be energized in order that the gate might drop to the danger position.

The invention will now be described in detail; reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a side elevation of a section of track equipped with my improvements, the gate being shown in the lowered or danger position. Fig. 2 is a sectional view taken through the upper part of the upright casing inclosing the gate-operating mechanism, the gate being shown in the raised, or safe position indicating no danger. Fig. 3 is a similar view showing the gate in the danger position, the other

parts of the mechanism being in position to harmonize therewith. Fig. 4 is a section similar to Figs. 1 and 2, and taken through the lower part of the same casing, or the portion thereof inclosing the electric motor for raising the gate to the safe position. Fig. 5 is a section also taken through the lower part of the casing, the view being taken at right angles to Fig. 4. Fig. 6 is an enlarged side elevation of one of the track make-and-break devices. Fig. 7 is a top plan view of the same. Fig. 8 is a vertical section taken on the line 8—8, Fig. 7. Fig. 9 is a cross section taken on the line 9—9, Fig. 7, the parts being shown on a larger scale. Fig. 10 is a section taken through the centrally-located track make-and-break device, also cutting the casing inclosing mechanism employed in connection therewith. Fig. 11 is a similar view, but showing the mechanism in a different position, viz. that which it occupies when a train is passing.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate one of the track rails, and 6, 7 and 8 make-and-break devices arranged along the track and adapted to be operated by a passing train. The make-and-break device 8 is centrally-located at any station or crossing where it is desired to lower the gate, while the make-and-break devices 6 and 7 are located on each side thereof, and arranged to coöperate therewith when a train is traveling in either direction.

It must be understood that the two make-and-break devices 6 and 7 on opposite sides of the make-and-break devices 8, are substantially identical in construction. The construction of these devices is illustrated in Figs. 6 to 9, inclusive; while the construction of the make-and-break device 8 and the adjacent mechanism is illustrated in Figs. 10 and 11.

The mechanism of the make-and-break devices 6 and 7 will now be described: Each of these devices is provided with an upwardly-bowed shoe 9, supported intermediate its extremities by coil springs 10; while its extremities are engaged by horizontally-arranged springs 12, whose inner extremities bear against projections 13 formed on a base plate 14, the said base plate also form-

ing a support for the springs 10. The highest part of this shoe normally projects above the tread of the rail and is in position to be depressed by the wheels of a passing train. 5 The downward movement of the shoe brings a contact 15 carried by the shoe into engagement with a contact 16, mounted on the plate 14 but insulated therefrom, as shown at 17. The contact 15 is also separated from 10 the shoe by a layer of insulating material 18. As shown in the drawing, the contact 16 is supported upon two pins 19 whose lower extremities are engaged by coil springs 20, thus giving the contact 16 a yielding support. 15 Connected with the contact 15 is an electrical conductor 21, while a similar conductor 22 is connected with the contact 16. The two contacts 15 of the two make-and-break devices 6, are connected by a circuit 20 wire or conductor 23; while the two contacts 16 of the two make-and-break devices (see Fig. 1), are connected by a circuit wire or conductor 24. Referring to the same figure, the two contacts 16 of the two make-and-break devices 7, are connected by an 25 electrical conductor 25, while the conductors 26 lead from the contacts 15 of the two make-and-break devices 7 to the conductor 23.

The make-and-break device 8 at each station or crossing consists of an upwardly-bowed shoe 27, supported intermediate its extremities by springs 28, while other springs 29 are connected with its extremities in a manner similar to the springs 12 of the 30 shoes 9 of the contacts 6 and 7. Extending downwardly from the central part of the shoe 27 is a bar 30, upon which is slidably mounted a pin 31, having a small plate 32 at its lower extremity, the said plate being 40 normally held at its lowest limit of movement by a spring 33. This pin is slidably mounted in apertured lugs 34, formed on the bar 30. Located below the spring-actuated pin 31, are two links 35 and 36 pivotally 45 connected at 37 to form a sort of toggle. One extremity of the link 35 is pivoted to a stationary support, as shown at 38, while one extremity of the link 36 is pivotally connected, as shown at 39, to one arm of a lever 40, fulcrumed at 41, while its opposite 50 arm is connected with one extremity of a coil spring 42, whose opposite extremity is fixed, as shown at 43. This mechanism is inclosed by a housing 44, within which is 55 also contained an electro-magnet 45, together with an armature 46, pivoted at 47, and having a hook-shaped extremity 48, adapted to engage the upper extremity of the lever 40 when the latter is drawn to the 60 position shown in Fig. 11 by the depression of the shoe 27.

It must be understood that the normal position of the mechanism of the contact 8, and also of that contained in the housing 44, is 65 illustrated in Fig. 10.

Located adjacent the track make-and-break device 8 and in suitable proximity to the station or crossing, is an upwardly-projecting casing 49, composed of a lower member 50 and an upper member 51. Located 70 in the lower part of this casing, is a motor 52, whose armature shaft 53 is equipped with a worm 54 engaging a worm wheel 55, carrying a sprocket wheel 56, loosely mounted on the shaft of the worm wheel 55 engaged by a chain 57, whose opposite extremities are connected by means of coil 75 springs 58 with a cable 59 passing upwardly through the casing member 51 and engaging a pulley 60, upon which is rigidly mounted the gate, or signal arm 61, which is 80 equipped with the usual depending ropes 62. Also inclosed within the lower part of this upright casing is an electro-magnet F, while arranged in suitable proximity thereto, is an armature bar 63, pivoted at 64, and 85 connected by means of a spring 65, with one extremity of an arm 66, whose upper extremity is pivoted, as shown at 67, to a stationary support. The central portion of 90 this arm is connected with a clutch sleeve 68, slidably mounted on a shaft 69, the teeth 70 of this face being adapted to interlock with teeth 71 of a clutch member 72 loose on the shaft 69. A coil spring 73 connected 95 with the lower extremity of the arm 66, normally holds the teeth of the clutch sleeve 68 out of engagement with the teeth of the clutch member 69, while the movement of 100 the armature bar 63 toward the pole pieces of the magnet F when the magnet is energized, actuates the arm 66 to throw the two clutch members into engagement, for the purpose of rotating the sprocket wheel 56 to operate the pulley 60 for raising the gate 105 arm. Attention is also called to the fact that within the upper part 51 of the casing are located electro-magnets A, B, D and E. Located adjacent the magnet A is an armature lever 74 of bell-crank shape and fulcrumed at 75. When the magnet A is energized, an arm 76 of this lever is adapted to engage the pole pieces of the magnet, while the other arm 77 is adapted to engage 110 a contact 78, to close the electrical circuit through the magnet B.

Pivoted adjacent the last named magnet is an armature bar 79, connected by means of a coil spring 80 with a pivoted contact arm 81, connected with a spring 82 which 120 normally holds the arm 81 in engagement with a contact 83. The bar 81 is adapted to be drawn into engagement with a contact 84 when the armature bar 79 is moved into engagement with the cores of the magnet B 125 by the energizing of the magnet. When the bar 79 is in the last named position, it is adapted to be locked in said position by an arm 85 pivoted at 86, adjacent the magnet D and arranged to be actuated by the last 13

named magnet when the same is energized and to disconnect the arm 85 from the bar 81. The armature lever 74 is connected by means of a wire 87 with the pulley 60. The wire 87 is provided with a yielding member 88.

Arranged adjacent the magnet E is an armature bar 89 pivoted at 90 and equipped at its extremity remote from the pivot with a weight 91. This bar is connected with the pulley 60 by a wire or cable 92; and with a pivoted arm 93 by a cable or wire 94. The wire 92 serves to raise the arm 89, when the pulley is turned by the downward movement of the gate, to such proximity to the magnet E that when the latter is energized, the magnetic influence can act upon the arm to maintain the latter in engagement with the magnet cores. When the arm 89 drops, due to the breaking of the magnet circuit, the said arm acts through its flexible connection 94, to pull the arm 93 downwardly. This last named arm is connected by means of a link 95 with a locking pin 96 vertically slidable in a guide 97, and normally held in its upward position of movement by a coil spring 98. When the gate arm 61 is in the raised position, indicating no danger, an offset shoulder 99 on the pulley 60 is engaged by the pin 96, whereby the gate arm is supported in the raised position until the pin 96 is disengaged from the offset 99.

Assuming now that the gate is in the raised or safe position, and that a train is approaching the crossing in either direction, as, for instance traveling toward the left, referring to Fig. 1: In this event, as soon as the train reaches the make-and-break device 6, the two contacts 15 and 16 are brought into engagement and the electric current may be said to pass from the contact 16 of the make-and-break device 6, through the conductor 24 and thence through the branch conductor 100, to one terminal of the magnet C, thence from the other terminal of the magnet C, through a conductor 3, to one terminal of the magnet A and thence from the opposite terminal of the said magnet through a conductor 101 to a feed wire 102, and thence back through a conductor 103 to the conductor 23, and thence to the contact 15, and to the cooperating contact 16 of the make-and-break device 6, or to the point of beginning, completing the circuit.

As soon as the train reaches the track make-and-break device 7, the current may be said to pass from the contact 16 through the conductor 25 and thence through a branch conductor J to the lever 74, thence through the contact 78, a conductor K to one terminal of the coils of the magnet B and thence from the other terminal through a conductor L, to the conductor 101 and thence to the feed wire 102, the circuit being completed through the conductor 103, leading from the feed wire 104, to the conductor 23,

and the branch conductor 26 to the contact 15 of the track make-and-break device 7 or to the point of beginning.

The energizing of the magnet B, results in the movement of the armature bar 81 into contact with the cores of the magnet, and at the same time moves the contact bar 81 from the contact 83 into engagement with the contact 84. The magnet bar 85 then engages the bar 79 and locks the latter in the last named position, as shown by the full lines in Fig. 3. This locking of the bar 79 in the said position is necessary, since the closing of the circuit through the magnet B, through the instrumentality of the make-and-break device 7, is only momentary, and it is necessary that the bar 79 and its connections shall remain for a short time in their adjusted position.

From the contact 84, a conductor 105 leads to a bell 106, from which a conductor 107 leads to a red lamp R and from this lamp a conductor 108 leads to a stationary contact 109. From the contact 83, a conductor 110 leads to a green lamp G, from which a conductor 111 leads to a conductor 112, the latter in turn leading to the conductor 103 connected with the feed wire 104.

When the armature bar 79 is in the position shown in Fig. 2, its upper extremity engages a contact 113 from which a conductor 114 leads to one terminal of the magnet E. From the opposite terminal of this magnet a conductor 115, leads to the conductor 112, which, as heretofore stated, is connected with the conductor 103, leading to the feed wire 104. From the movable bar 81, a conductor 116 leads to the conductor 101 connected with the feed wire 102; while from the armature bar 79 a conductor 117 leads to the conductor 116.

From the foregoing, it will be understood that when the bar 81 is in engagement with the contact 83, the circuit is closed through the green or safety light; while when the armature bar is in engagement with the contact 113, the circuit is completed through the magnet E, the weighted armature bar 89 being held against the cores of the magnet. In this event, the gate arm 61 is in the raised or safety position. When, however, the magnet B is energized in the manner heretofore explained; that is to say, by the bringing of the two contacts 15 and 16 together of the make-and-break device 7, resulting in the movement of the bar 75 away from the contact 113, and the bar 81 away from the contact 83, the circuit is broken through the green light G and also through the electro-magnet E. In this event, the weighted armature bar 89 will drop downwardly to the dotted line position in Fig. 3 and disconnect the locking pin 96 from the pulley 60 by virtue of the connections heretofore explained. As soon as this occurs,

the gate bar 61 will move downwardly, turning the pulley 60 until the bar 61 occupies a horizontal position. (See Figs. 1 and 3.) As soon as this occurs a contact 118 carried by the pulley 60, is brought into engagement with the stationary contact 109, closing the circuit through the red or danger light R and also through red lights R carried by the gate arm 61, the circuit being closed through the red lights on the gate arm by virtue of conductors 119 and 120 which are respectively connected with contacts 121 and 122 carried by the pulley 60. From the contact 122, a conductor 123 leads to the contact 118; while the conductor 112 is connected at one extremity with the contact 121. The movement of the pulley 60 incident to the dropping of the gate arm 61 to the horizontal position, throws a contact 124 into engagement with a stationary contact 125, by virtue of the engagement of an offset 126 on the pulley 60, with the movable contact 124, this last named contact being in engagement with a spring-guide 127, which normally retains it in the desired position of adjustment or in any position in which it is placed, by virtue of the friction between the contact and the spring guide 127. After the green light has been extinguished, the red lamps lighted and the gate arm 61 is in the horizontal position, the mechanism will be in the position to indicate danger, and this condition exists from the time the train is passing from the track make-and-break device 7 to the track make-and-break device 8. It is evident that these two last named make-and-break devices may be any desired distance apart, so that the mechanism may be thrown into the position indicating danger when the train is at any desired distance from the crossing. As soon, however, as the train reaches the crossing, the shoe 27 is depressed, whereby the spring-actuated pin 33 is brought into engagement with the toggle members 35 and 36, the latter being actuated to throw the pivoted lever 40 into the position shown in Fig. 11, the said lever being held in its position by virtue of the hook-shaped armature bar 46, whose hooked extremity engages the free end of the said lever. At the same time a contact 128 carried by the depending bar 30, is brought into engagement with the spring contact 129.

From the contact 128, a conductor 130 leads to the conductor 23, the latter being connected with the feed wire 104 by the conductor 103, as aforesaid. A conductor 131 leads from the spring contact 129 to one terminal of the magnet D, while a conductor 132 leads from the other terminal of the magnet D to the conductor 116. Hence the downward movement of the shoe 27 incident to the passing of the train, closes the circuit through the magnet D and the energiz-

ing of this magnet causes the armature bar 85 to move into engagement with the cores of the magnet D which movement results in releasing the armature bar 79 of the magnet B. At the same time the movable bar 81 and the armature bar 79 move into engagement with their respective contacts 83 and 113, with the result that the circuit is broken through the red lights R and closed through the green light G and the magnet E.

Simultaneously with the foregoing results, the circuit is closed through the motor 52, in which event the current may be said to pass from a contact 133, through the conductor Y, to one terminal of the magnet F, thence from the opposite terminal of the magnet through a conductor 134 to one pole of the motor, thence from the opposite pole of the motor through a conductor 135 to the stationary contact 125, thence through the movable contact 124, thence through the conductor Z, to the conductor 101 connected with the feed wire 102, the circuit being completed through the conductor 103 connected with the feed wire 104, through the conductor 23 and the branch conductor X to the lever 40 and thence to the contact 133, or the place of beginning.

The closing of the circuit through the magnet F energizes the same causing the armature bar 63 to move into contact with the cores of the said magnet and this movement actuates the yoke arm 66 to throw the clutch members 70 and 71 into engagement, simultaneously with the starting of the motor, whereby the shaft 53 is rotated transmitting motion through the worm 54 to the worm wheel 55, which rotates the shaft 69, whereby motion is transmitted through the sprocket wheel 56, the chain 57 and the cable 59, to the pulley 60 whereby the same is rotated in the direction indicated by the arrows in Figs. 2 and 3, the movement being sufficient to raise the gate arm 61 to the safe position or that indicated by full lines in Fig. 2 and the dotted lines in Fig. 3. Simultaneously with this movement of the gate, the circuit is broken through the red lights R by the movement of the contact 118 from the contact 109, while the motor circuit is broken by the engagement of an offset 136 on the pulley 60 with the movable contact 124 (see Fig. 2), thus stopping the operation of the motor as soon as the gate arm is raised to the safe position. At the same time the offset 99 of the pulley 60 is engaged by the spring-actuated locking pin 96, thus locking the pulley 60 in the adjusted position, whereby the gate arm is held in the position indicating safety. Then as the train continues toward the left, it engages the track make-and-break device 7 on the left hand side of the central make-and-break device 8, which, however, has no effect on the circuit, since the cir-

circuit is broken through the magnet B by the separation of the contacts 77 and 78. Then as the train continues, it engages the track make-and-break device 6 on the left, and closes the circuit through the magnet A, whereby the armature lever 74 is thrown to the position shown in Fig. 2, and bringing the arm 77 of the said armature lever into contact with the contact 78 preparatory to the closing of the circuit through the magnet B, which, however, is only accomplished when the track make-and-break device 7 is reached, going in either direction. Hence the next train traveling toward the right, when it reaches the first make-and-break device 6 on the left, will perform no function since the circuit is already closed through the magnet A, but as soon as the track make-and-break device 7 is reached, the operation heretofore described will be repeated while describing the travel of the train in the opposite direction or toward the left.

A brief connected description of the operation of the apparatus will now be given. In this description I will, for convenience, assume that the train is traveling toward the left. As soon as it reaches the track make-and-break device 6, the two magnets C and A will be energized. The result of energizing the magnet C, is to release the contact lever 40, if it should be locked in the position in engagement with the contact 33; while the result of energizing the magnet A, is to throw the armature lever 74 into position to close one of the breaks in the circuit through the magnet B. It is assumed that the gate arm is in the raised position, indicating safety and also that the red or danger lights are extinguished. As the train continues and reaches the track make-and-break device 7, the circuit is closed through the magnet B, which being energized, acts to throw the armature arm 82 into position to disengage it from the contact 113, thus breaking the circuit through the magnet E, the armature bar 81 being locked in the said position by the bar 85. At the same time the bar 81 is shifted to break the circuit through the green light G. The result of breaking the circuit through the magnet E, is to release the weighted armature bar 89, whereby the latter is allowed to drop to disengage the locking pin 96 from the offset 99 of the pulley 60, whereby the gate arm is allowed to drop to the danger position. The further result of this drop is to bring the two contacts 118 and 109 into engagement, thus closing the circuit through the red lights. At the same time the offset 126 of the pulley acts to throw the movable contact 124 into engagement with the stationary contact 125, closing one of the breaks in the motor circuit. The apparatus is now in the condition indicating danger, and this condition may be brought about when the

train is at any desired distance from the crossing. As the train continues its progress in the same direction, it finally reaches the track make-and-break device 8 and the downward pressure upon the shoe 27, closes the circuit through the magnet D, whereby the armature bar 79 is released to close the circuit through the electro-magnet E, while the bar 81 is released to close the circuit through the green or safety lights G. At the same time the circuit is closed through the magnet F, and the motor 52, with the result that the armature bar 63 is actuated to close the clutch members 70 and 71, whereby the shaft 69 is rotated and the cable 59 actuated to move the pulley 60 into position to raise the gate arm to the safe position, the circuit being at the same time broken through the red or danger lights.

In the event that a train approaching the crossing in either direction should after passing over the make-and-break devices 6 and 7, pass to a side track before reaching the make-and-break device 8, provision should be made for performing the function accomplished by the operation of the make-and-break device 8 by hand; and for this purpose I employ two parallel conductors designated (see Fig. 1) 142 and 144 respectively. A branch conductor 141 leads from the conductor Y to the conductor 142; while a branch conductor 143 leads from the conductor 131 to the conductor 144. The extremities of the conductors 142 and 144 are respectively equipped with contacts 147 and 148. Adjacent each pair of contacts 147 and 148, is located a switch arm 145 normally retained in the position shown in Fig. 1 by a spring 150. Each switch arm is connected with the conductor 23 by a branch conductor 146.

Now if it is desired to perform by hand the result that is accomplished by the passing of the train over the make-and-break device 8 the switch arm 145 is first moved into engagement with contact 148, after which it is moved into engagement with the contact 147. The momentary engagement of the switch arm with contact 148, results in energizing the electro-magnet D. When the switch arm engages the contact 147, the circuit is closed through the motor whereby the gate arm is raised, the switch arm being held in engagement with the contact 147 a sufficient length of time to accomplish this purpose, after which the said switch arm is released and the spring returns it to its normal position.

In the event that a train after having passed over the make-and-break devices 6, 7 and 8 passes to a side track without passing over the make-and-break device 6 on the leaving side of the crossing, the same function that is performed by operating the make-and-break device 6, may be accom-

plished by hand by moving a switch arm 140 into engagement with a contact 151 which is connected with the conductor 24 by a conductor 138, the pivotal extremity of the switch arm being connected with the conductor 23 by the branch conductor 139.

Having thus described my invention what I claim is:

1. In means for operating gates at railway crossings, the combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position, when the magnet is energized, a make-and-break device normally held in position to close the magnet circuit, a second electro-magnet which when energized serves to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, and a track make-and-break device adapted to be actuated by a passing train for momentarily closing the circuit of the second magnet.

2. The combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the lock-releasing device in the inactive position when the magnet is energized, a make-and-break device normally held in position to close the magnet circuit, a second electro-magnet which when energized acts on said device to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, a track make-and-break device for momentarily closing the circuit of the second magnet, means for locking the circuit-make-and-break device beyond the track, in the position to break the circuit of the first magnet, a third electro-magnet for releasing the last named locking means, and a second track make-and-break device located forward of the first named track make-and-break device and adapted to be actuated by a passing train for closing the circuit of the third magnet, whereby the circuit of the first magnet is restored.

3. The combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position when the magnet is energized, a movable circuit-make-and-break device located beyond the track and forming a part of the first magnet circuit, a second electro-magnet which when energized acts on the said device to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, a track make-and-break device for momentarily closing the circuit of the second magnet, means for locking the circuit-make-and-break device beyond the track, in the position to break the circuit of

the first magnet, a third electro-magnet for releasing the last named locking means, a second track make-and-break device located forward of the first named track make-and-break device and adapted to be actuated by a passing train for closing the circuit of the third magnet, whereby the circuit of the first magnet is restored, a movable element for breaking the circuit of the second magnet beyond the track, a fourth electro-magnet for acting on said element to close the second magnet circuit beyond the track, and a track make-and-break device located in the rear of the first named track make-and-break device and adapted to be actuated by a passing train for closing the circuit of the fourth magnet, preparatory to the energizing of the second magnet.

4. The combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position when the magnet is energized, a make-and-break device normally held in position to close the magnet circuit, a second electro-magnet which when energized serves to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, a track make-and-break device adapted to be actuated by a passing train for momentarily closing the circuit of the second magnet, danger and safe signal lights, a movable element located beyond the track for normally closing the circuit through the safe signal light, a second magnet which when energized actuates the said element to break the safe light circuit and to close the danger light circuit, and a track circuit-make-and-break device adapted to be operated by a passing train for closing the second magnet circuit.

5. The combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position when the magnet is energized, a make-and-break device normally held in position to close the magnet circuit, a second electro-magnet which when energized serves to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, danger and safe signal lights, a movable element located beyond the track for normally closing the circuit through the safe signal light, the second magnet when energized serving to actuate the said element to break the safe light signal and close the danger light signal, means for locking the movable element in the last named position, a track circuit-make-and-break device adapted to be actuated by a passing train for momentarily closing the second magnet circuit, a third magnet for releasing the last named

locking means, and a second track circuit-make-and-break device located forward of the first named track circuit-make-and-break device for closing the circuit of the third magnet.

6. In means for operating gates at railway crossings, the combination with a gate arm counterbalanced to fall, of an electric motor connected in operative relation with the gate to raise the same, a track circuit-make-and-break device adapted to be actuated by a passing train to close the motor circuit, means for locking the track make-and-break device in the motor-circuit-closing position, an electro-magnet for releasing the locking means, a second track make-and-break device for closing the circuit through the electro-magnet, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its forward limit of movement, means for locking the gate in a raised position, a lock releasing device, an electro-magnet for holding the releasing device in the inactive position, and a second electro-magnet which when energized serves to break the circuit of the first-named magnet, whereby the lock releasing device serves to unlock the gate arm.

7. The combination with a gate arm counterbalanced to fall, of an electric motor connected in operative relation to raise the same, a track circuit-make-and-break device adapted to be actuated by a passing train to close the motor-circuit, means for locking the track circuit-make-and-break device in the motor-circuit-closing position, an electro-magnet for releasing the locking means, a second track make-and-break device located at the end of either approach to the crossing for closing the circuit through the electro-magnet, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement, and a device for automatically locking the gate in the raised position, a lock releasing device, an electro-magnet for holding the releasing device in the inactive position, and a second electro-magnet for breaking the circuit through the first-named magnet, for releasing the locking device from its inactive position.

8. The combination with a gate arm counterbalanced to fall, of an electric motor connected in operative relation with the gate to raise the same, a track circuit-make-and-break device adapted to be acted on by a passing train for closing the motor circuit, means for locking the track make-and-break device in the motor-circuit-closing position, an electro-magnet for releasing the locking means, and a second track make-and-break device located at the end of either approach to the crossing for closing the circuit through

the electro-magnet, means for locking the gate arm in a raised position, a lock releasing device, an electro-magnet for holding the lock releasing device in the inactive position, and a second electro-magnet for releasing the locking device by breaking the circuit through the first-named electro-magnet, whereby the gate is caused to fall.

9. The combination with a gate arm counterbalanced to fall, of an electric motor connected in operative relation with the gate to raise the same, a track circuit-make-and-break device adapted to be actuated by a passing train to close the motor circuit, means for locking the track make-and-break device in the motor-circuit-closing position, an electro-magnet for releasing the locking means, a second track make-and-break device located at the end of either approach to the crossing, whereby it is acted on by the gate to break the motor circuit, when the gate has reached its upward limit of movement, a device for automatically locking the gate in the raised position, a lock-releasing device, an electro-magnet which when energized holds the said releasing device in the inactive position, when the gate arm is raised, and a second electro-magnet which when energized, serves to break the circuit through the first-named magnet, whereby the locking device is released to cause the gate arm to fall.

10. The combination with a gate arm counterbalanced to fall, of an electric motor connected in operative relation with the gate to raise the same, a track circuit-make-and-break device adapted to be actuated by a passing train to close the motor circuit, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement, a device for automatically locking the gate in the raised position, a weighted armature bar for releasing the locking device and an electro-magnet which when energized holds the weighted armature bar in the inactive position when the gate arm is raised.

11. The combination with a gate arm counterbalanced to fall, of an electric motor, an operative connection between the motor and the gate including a clutch, and a spring actuated arm for holding the clutch normally open, an electro-magnet located in the motor circuit and having an armature bar connected with the clutch arm for closing the clutch when the circuit is closed through the motor, a track make-and-break device adapted to be actuated by a passing train to close the motor circuit, and a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement.

12. The combination with a gate arm

counterbalanced to fall, of an electric motor, an operative connection between the gate and the motor for raising the gate, a track make-and-break device adapted to be actuated by a passing train to close the motor circuit, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement, means for automatically locking the gate in the raised position, a lock-releasing device, and an electro-magnet for holding the releasing device in the inactive position when the magnet is energized, and a second electro-magnet, which when energized, serves to break the circuit of the first-named magnet, whereby the lock releasing device serves to unlock the gate arm.

13. The combination with a gate arm counterbalanced to fall, of an electric motor; an operative connection between the motor and the gate for raising the latter, a track make-and-break device adapted to be actuated by a passing train to close the motor circuit, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement, means for automatically locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position, when the magnet is energized, a make-and-break device located beyond the track and normally held in position to close the magnet circuit, a second electro-magnet which when energized serves to break the circuit of the first magnet, whereby the lock-releasing device is actuated to unlock the gate arm, and a second track make-and-break device adapted to be actuated by a passing train for momentarily closing the circuit of the second magnet.

14. The combination with a gate arm counterbalanced to fall, of an electric motor, an operative connection between the motor and the gate for raising the latter when the motor circuit is closed, a track make-and-break device adapted to be actuated by a passing train to close the motor circuit, a movable element located beyond the track and acted on by the gate to break the motor circuit when the gate has reached its upward limit of movement, means for automatically locking the gate in the raised position, a gravity-acting lock-releasing device, electro-magnetic means for holding the releasing device in the inactive position, a movable circuit make-and-break device located beyond the track and forming a part of the first magnet circuit, a second electro-magnet which when energized acts on the

said device to break the circuit of the first magnet, whereby the lock-releasing device serves to unlock the gate arm, a second track make-and-break device for momentarily closing the circuit of the second magnet, means for locking the circuit-make-and-break device beyond the track in the position to break the circuit of the first magnet, a third electro-magnet for releasing the last named locking means and a third track make-and-break device adapted to be actuated by a passing train at the same time that the first track make-and-break device is actuated for closing the circuit of the third magnet, whereby the circuit of the first magnet is restored simultaneously with the raising of the gate by the action of the motor.

15. In means for operating gates at railway crossings, the combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device and an electro-magnet for holding the releasing device in the inactive position when the magnet is energized, a second electro-magnet, which when energized breaks the circuit of the first-named magnet, whereby the lock-releasing device acts upon the means for locking the gate in the raised position for releasing the same.

16. In means for operating gates at railway crossings, the combination with a gate arm counterbalanced to fall, of means for locking the gate in the raised position, a lock-releasing device, an electro-magnet for holding the releasing device in the inactive position, when the magnet is energized, a make-and-break device normally held in position to close the magnet circuit and a second electro-magnet, which when energized serves to break the circuit of the first magnet, whereby the lock releasing device serves to unlock the gate arm.

17. In apparatus of the class described, the combination with a gate arm counterbalanced to fall, of means for locking the said arm in the raised position, a lock-releasing device, and electro-magnetic means for holding the releasing device in the inactive position when the magnet is energized, a second electro-magnet, which when energized breaks the circuit of the first-named magnet, whereby the lock-releasing device acts upon the locking means to unlock the gate arm.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM J. COOK.

Witnesses:

JESSIE F. HOBART,
A. EBERT O'BRIEN.