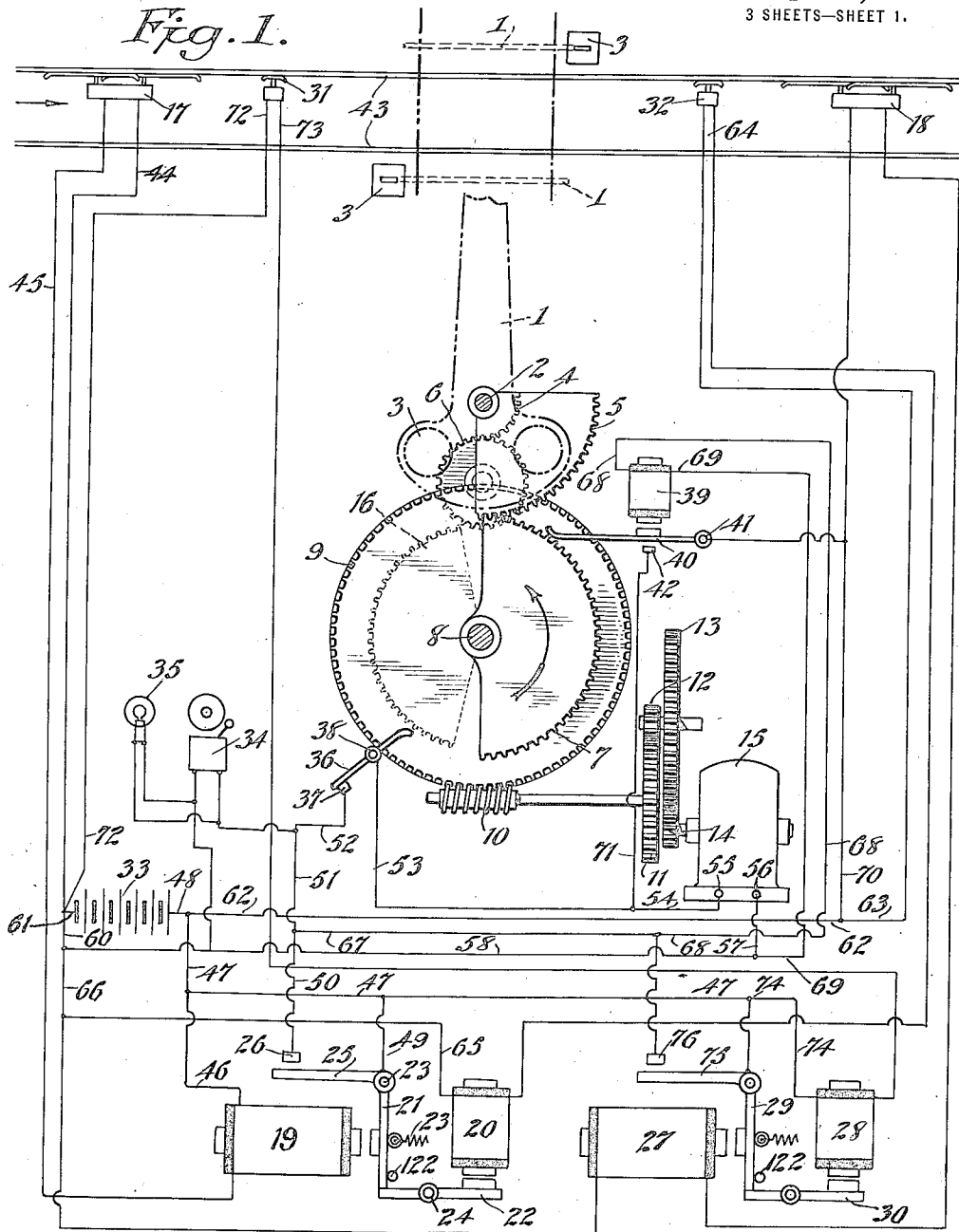


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RAILWAY GATE CONTROL MECHANISM.  
APPLICATION FILED FEB. 27, 1919.

1,353,038.

Patented Sept. 14, 1920.

3 SHEETS—SHEET 1.



WITNESSES

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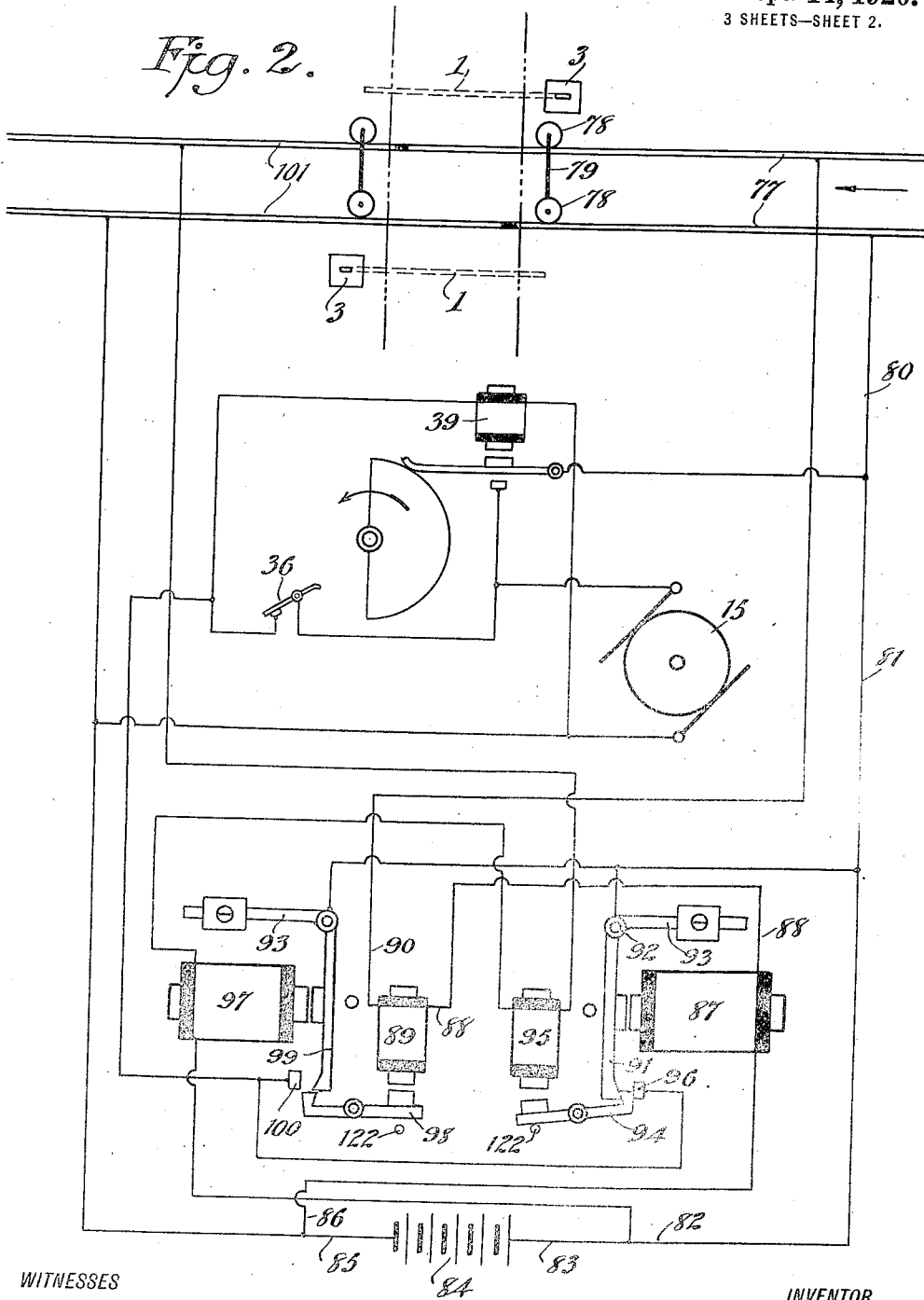
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Fig. 2.



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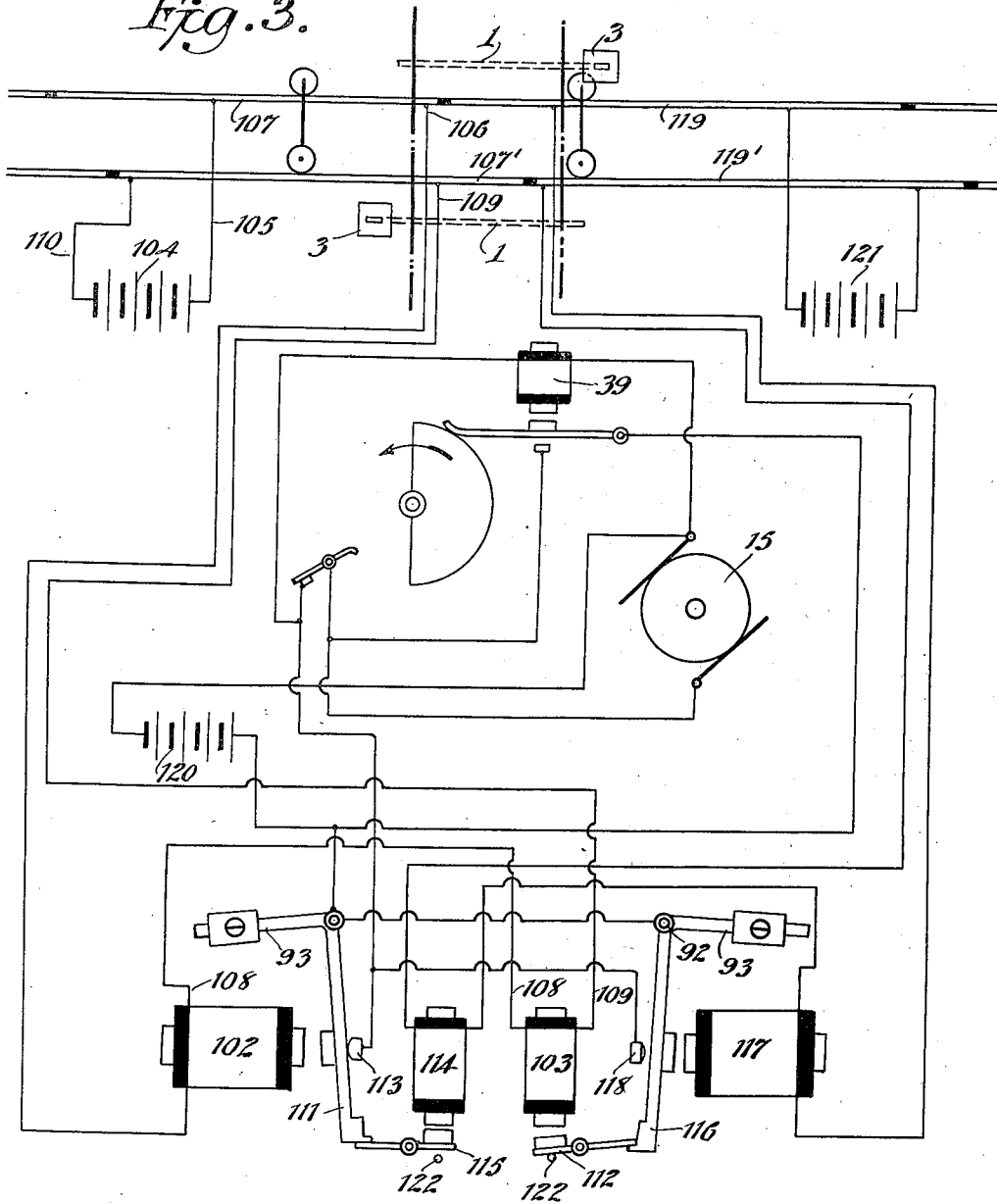
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*Fig. 3.*



WITNESSES

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# UNITED STATES PATENT OFFICE.

FRANK A. GRANT, OF CORTLAND, NEW YORK.

RAILWAY-GATE-CONTROL MECHANISM.

1,353,038.

Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed February 27, 1919. Serial No. 279,559.

*To all whom it may concern:*

Be it known that I, FRANK A. GRANT, a citizen of the United States, and a resident of Cortland, county of Cortland, and State of New York, have invented a new and Improved Railway-Gate-Control Mechanism, of which the following is a full, clear, and exact description.

My invention relates to the protection of street crossing railways by gates which are automatically positively closed by the approach of a train from either direction, and which is automatically positively opened after the train has passed said crossing. One of the objects is to provide a positively actuated gate operating mechanism and a system of control therefor, wherein, upon the approach of a train from either direction the gates will be automatically closed, and when the train has passed, the gates will be positively actuated and automatically opened.

A further object is to provide a method of control which is readily adapted for use on railroads employing, either switches actuated by the moving train for establishing an operating circuit, or on railroads employing insulated rails and depending upon the completion of an operating circuit by a portion of the passing train, or upon what is known as the closed circuit system wherein a portion of the passing car forms a low resistance shunt circuit which causes magnets to be weakened sufficiently to permit contact members to establish operating circuits for the gate actuating mechanism.

A further object is to provide means for accomplishing the above without the use of a complicated construction. In this invention there is provided a gate which is substantially balanced, a motor and a reversible driving mechanism positively connecting the motor with said gate and a system of control for said motor wherein upon the approach of a train the motor circuit is automatically established and the gate is closed, at which time the motor circuit is interrupted. After the train has passed the crossing the motor circuit is again automatically established to raise the gate when its circuit is again interrupted.

From the following description other objects and advantages will be apparent.

In the accompanying drawings, the same

reference characters will designate corresponding parts in the several views:

Figure 1 is a diagrammatic view showing the application of the invention to a single track railroad system at a crossing, showing also a wiring diagram of the arrangement of the circuits and a mechanism for actuating the gate.

Fig. 2 is a diagram showing the application of the control mechanism to a track having an insulated section therefor, wherein a part of the train completes an operating circuit.

Fig. 3 is a diagram showing the application of the invention to a system having insulated rail sections and having the magnets on a normally closed circuit.

In Fig. 1, showing one of the preferred forms of the invention, there is provided a gate 1, mounted on the shaft 2, and being substantially balanced by weights 3. There is also mounted on shaft 2 two gear segments 4 and 5 which engage respectively with an idler gear 6 and gear segment 7, the latter being mounted upon a shaft 8, which is driven through a worm wheel 9 by a worm 10, which is in turn driven through a train of gears 11, 12, 13 and 14, by a motor 15. Mounted on shaft 8 is a gear segment 16 which engages idler gear 6 for part of the revolution in raising the gate. Gear segments 5 and 7 are engaged only for part of a revolution when the gate is lowered. To lower the gate the motor 15 through the gears 11, 12, 13 and 14, drives the worm 10 which turns the worm wheel 9 rotating the gear segment 7 in the direction indicated by the arrow, which engages the gear segment 5, mounted on the shaft of the gate. Through this period the gear segment 4 is merely turning the idler gear 6 freely, the latter not being engaged with the gear segment 16. To raise the gate the gear segment 16, also turns in the direction of the arrow, and drives the idler gear 6, which engages the gear segment 4 and moves the gate to the open position. From this arrangement it is noted that the gate is positively driven in each direction by the motor 15, which rotates in one direction only, the reverse direction of the gate being obtained by the gear mechanism.

In Fig. 1 there is provided control devices for the motor, which include trip rail

switches 17 and 18 located at a sufficient distance on either side of the crossing so that a train approaching the crossing actuates one of said switches in time to permit the gates to be lowered before the train reaches the crossing.

The trip rail switches 17 and 18 are preferably of the type shown in Patent No. 1,203,536, Oct. 31, 1916, issued to applicant. A particular feature of these switches are that they will first establish and subsequently open a circuit if approached from one direction, but if approached from the opposite direction no circuit will be established. This, taken in connection with the method of control, is an essential feature in the resetting of the control mechanism for subsequent operation upon the approach of a train from either direction. There is further included in the control device magnets 19 and 20 having respectively interlocking armatures 21 and 22 pivoted at 23 and 24. Coöperating with the armature 21 is an arm 25 arranged to close a circuit through contact 26 when the armature 21 is in an attracted or closed position. When said armature 21 is thus attracted the armature member 22 drops and holds the armature member 21 and keeps the arm 25 and contact 26 in a closed position until the armature 22 has been attracted by the magnet 20 when energized, and the magnet 19 has been deenergized. It is thus seen that the normal position of the respective armatures will be as shown in the drawings, that is, the armature 21 holds the armature 22 in an attracted position with respect to magnet 20.

There are further provided magnets 27 and 28 with their respective armatures 29 and 30 arranged similarly to the above described. Other make and break trip rail switches 31 and 32 are arranged one on each side of the crossing so that when actuated a control circuit establishes the motor circuit to supply the energy for raising the gates, after the car reaches the crossing.

In the drawing, a battery 33 is shown as furnishing a means of electrical energy, but any other suitable means may herein be used. There is also shown a bell 34 as a means of furnishing an audible signal and a light 35 as a means of supplying a visible signal, which may be arranged if desired to indicate the direction from which train is approaching. As a means of interrupting the motor circuit when the gate is lowered there is provided a switch comprising an arm 36 engaging contacts 37 and pivoted at 38 arranged so that when the gate has reached the lowered position the gear segment 7 will engage one end of the arm 36 and open said switch thus stopping the motor. There is further provided a magnet 39 which, when energized, attracts the

armature 40 pivoted at 41, and prevents said armature from touching the contact 42 when the gear segment 7 moves around so that the end of armature 40 no longer contacts therewith. The above condition will exist when the gate is in the closed position. This prevents the immediate re-establishing of the motor circuit until after train reaches crossing.

In order to better understand the coöperation of the various parts we will assume that a train is approaching from the left of Fig. 1, or is traveling in the direction indicated by the arrow between rails 43. When the trip rail switch 17 is actuated by a portion of the train, a circuit is established through the magnet 19 which circuit is traced from battery 33, wire 44, switch 17, wire 45, magnet 19, wires 46, 47 and 48 to battery 33 again. The armature 21 is attracted by the magnet and closes the motor circuit through arm 25 and contact 26, said motor circuit being traced from the battery 33, conductors 48, 47, 49, arm 25, contact 26, wires 50, 51, 52, contact 37, arm 36, conductors 53, 54, motor terminals 55, 56, wires 57, 58, 60 and 61, to battery 33 again. The circuit to magnet 19 is established for only a short period, it being interrupted by the contactor of trip-rail switch 17 nearer the crossing. However, the armature member 21, the arm 25, and the contact 26 will be held in a closed position by the armature member 22, and will so remain until the said armature 22 has been moved by the magnet 20 when energized. The latter will occur when the train has passed the crossing a sufficient distance to actuate the trip rail switch 32, which momentarily completes the circuit for said magnet 20. From the battery 33 this circuit is traced through wires 48, 62, 63, trip-rail switch 32, conductor 64, magnet 20, conductors 65, 66, 60, 61, again to battery 33. When the armature 22 has been attracted by said magnet 20 this permits the armature 21 to return to normal position, and also permits the circuit through arm 25 and contact 26 to be broken. When this is done the circuit to magnet 39 is interrupted and as the gate is in a lowered position the gear segment 8 will be in a position shown opposite to that in Fig. 1, so that the armature 40 will drop and establish a circuit to the motor 15 through the contact 42 and so move the gate to a raised position when the motor circuit will be again interrupted by breaking the motor circuit at contact 42 when the gear segment 7 hits the armature 40. The circuit to magnet 39 is traced from the battery 33, conductors 48, 47, 49, arm 25, contact 26, conductors 50, 67, 68, 69, magnets 39, conductors 69, 58, 60, 61 and again to battery 33. The motor circuit as established through contact 42 is traced from the bat-

tery 33, conductors 48, 62, 70, armature 40, contact 42, conductors 71, 54, to motor terminals 55, 56, conductors 57, 58, 60, 61, again to battery 33.

5 As the train continues in the direction of the arrow and actuates the trip-rail switch 18 nothing happens because by reason of the switch construction no circuit is established to the magnet 27. It is to be further noted  
10 that when the trip-rail switch 31 was actuated although a circuit was established for magnet 28 from the battery 33 to conductor 72, switch 31, conductor 73, magnet 28, conductors 74, 47, 48, back to battery 33, there  
15 was no operation, because the armature 30 was already held in position by the armature 29 of magnet 27. Thus it is seen that the magnets 20 and 28 function as control magnets which cause the motor circuit to  
20 be automatically established for the raising of the gate at the proper time and to re-set the respective armatures and magnets in the proper position for subsequent operation by the approach of a train from either direc-  
25 tion.

If the train were to approach from the opposite direction the trip-rail switch 18 would establish a circuit through magnet 27 for a sufficient length of time to permit the  
30 armature 29 to be attracted and held in such position by the armature 30 at which time the circuit would be completed through the arm 75 and contact 76, to the magnet 39 and to the motor 15, through the switch 36,  
35 at which time the gate will be again lowered. As before, the motor circuit would be interrupted by the switch 36 when the gate had reached the lowered position, and the energized magnet 39 would prevent the  
40 armature 40 from completing the motor circuit at this time through contact 42. As the train passed on and actuated trip-rail switch 32, although the magnet 20 would be energized as before stated, nothing further  
45 happens until the trip-rail switch 31 on opposite side of the crossing has been actuated by the train, at which time the magnet 28 will be energized, thus permitting the armature 29 to drop back and interrupt through  
50 the contact 75 and arm 76, the circuit of magnet 39 permitting the armature 40 to establish the motor circuit through contact 42 for again moving the gates to a raised position. It is apparent that a number of gates  
55 may be controlled by the method here shown. This method of control may also be used on a plurality of tracks.

Fig. 2 shows the application of the method of control to a system having insulated rail  
60 sections in which the trip-rail switches are eliminated, the circuits for the controlling magnets being completed between the rails by the car traveling thereover. In this figure if it is assumed that a train is approach-  
65 ing in the direction of the arrow, the circuit

will be completed through the rails 77 by the wheels 78 and axle 79 of the car to conductors 80, 81, 82, 83, battery or other source of power 84, conductors 85, 86, magnet 87, conductor 88, magnet 89, conductor  
70 90, back to rail 77. This will energize magnet 87 attracting its armature 91 pivoted at 92 and having a weighted arm 93 for holding the armature normally in open position. When the armature 91 is attracted  
75 contact is made with one end of armature 94 of a magnet 95 and a contact 96, when a circuit is completed to the magnet 39 and to the motor 15 through the switch 36 as described in the previous operation in Fig. 80  
1. The main difference being that in Fig. 2 magnets 89 and 87 are connected in series and have their circuits completed through the rails by a portion of the train. Magnets  
85 95 and 97 are also connected in a similar manner, but connected to another insulated rail portion, the respective pair of magnets being used to control the operation of the gates upon the approach of a train from  
90 different directions. There is a further difference in interlocking the armatures of the respective magnets. For example, as above stated, when the armature 91 is attracted one end of the armature 94 is held between  
95 the contact 96 and said armature 91. When the magnet 89 is energized its armature 98 will be attracted and the opposite end will be withdrawn from between the end of  
100 armature 99 and contact 100. After the front wheels of the train have passed the insulated sections the circuits having magnets 95 and 97 connected in series will now be completed between the rails 101 through  
105 a portion of the car. Although the magnets 95 and 97 are energized no operation results therefrom because the armature 94 of magnet 95 is held against movement between the armature 91 and contact 96, the  
110 said magnet 95 not being sufficiently strong to withdraw the armature 94 from engagement with the said armature and contact. When the magnet 97 is energized the armature 99 will be attracted, but no operation will result therefrom because the end of the  
115 armature 98 has been withdrawn so that a circuit will not be completed between the armature 99 and contact 100. However, after the rear wheels of the train have passed from the insulated sections of the  
120 track on the right, the circuits to the magnets 87 and 89 will again be interrupted permitting the armature 91 to drop back, thus interrupting the circuit to the magnet 39 and permitting the motor circuit to be established for raising the gates as described in  
125 connection with Fig. 1. After the train has passed from the insulated rail sections the armatures will again resume their normal position which would be with end of the  
130 armature 94 located between the contact 96

and the end of the armature 91, but not contacted therewith because in this normal position the magnets would be deenergized and the armature 91 would be thrown to an open  
5 position by the weighted arm 93. The normal position of the armature members 98 and 99 with respect to the contact 100 would be the same.

In Fig. 3 is shown an arrangement of the  
10 control system in which two magnets 102 and 103 are in series on a normally closed circuit, which, starting from the battery 104 or other source of electrical energy, passes through conductor 105, insulated rail section  
15 107, conductor 106, magnet 102, conductor 108, magnet 103, conductor 109, to another insulated rail section 107' to conductor 110 and return to the battery 104. When the wheels of the train contact with the insu-  
20 lated rail sections a low resistance shunt path will be furnished which will weaken the magnets 102 and 103 sufficiently to permit their respective armature members 111 and 112 to drop. When this is done, the  
25 armature 111 will engage with contacts 113 and perform a similar function to that of the corresponding armature members in the above described arrangement, namely: establishing a circuit to the motor 15 and mag-  
30 net 39 and holding the armature member 115 of the adjacent magnet 114 in position. The armature member 112 when permitted to drop also assumes a position which prevents the armature 116 of the magnet 117 engag-  
35 ing contacts 118 until there has been a complete cycle of operations. When the wheels first pass from the insulated rail sections 107 and 107' to another pair of insulated rail sections 119 and 119' a low resistance shunt  
40 path is furnished for the magnets 117 and 114, connected in series across said rail sections tending to permit their armature members 116 and 115 to drop, but due to the holding positions of the armatures 112 and  
45 111 the armature member 116 is not permitted to engage the contact 118 nor is the armature member 115 permitted to drop its full distance whereby it would tend to hold the armature member 111 in an attracted  
50 position.

When the car wheels have passed completely from the insulated rail sections 107 and 107' the circuit for the magnets 102 and 103 will again be established, and the arma-  
55 ture member 111 of magnet 102 will accordingly be attracted and open the circuit at contact member 113. As in the operation of the previous systems the magnet 39 will thereby be deenergized and permit the motor circuit to be made, thereby furnishing  
60 power to move the gates to raised position. Of course, this would only happen after the car had reached the crossing. The train having left the insulated track sections 119 and 119' the magnets would again assume

their normal closed circuit position, and be in a position to be again operated by an approaching train from either direction. It is to be noted in this system that there are independent sources of electrical energy 104  
70 and 121 connected across the different insulated rail sections, these being in turn independent of the source of electrical supply 120 furnished to the motor 15.

In the drawings there are stationary stops  
75 122 which limit movement of the respective armature members. In Fig. 1 a spring 123 is shown connected to the armature members 21 and 29, whereby the circuit is broken at contacts 26 and 76, but a weighted arm may  
80 be used.

It is understood that various changes and modifications may be made without departing from the spirit and scope of my inven-  
85 tion.

Having shown and described my invention, what I claim is:

1. In an apparatus of the class described, a gate, a motor, mechanical reversing mechanism comprising a worm driven by said  
90 motor, a worm wheel engaging said worm, a plurality of gear segments arranged to turn with said worm wheel, a gear segment on said gate arranged to mesh for a part of the revolution with one of the above mentioned  
95 worm wheel gear segments to move the gate to a lowered position, another gear segment on said gate and an idler gear meshing therewith, said idler gear being arranged to mesh with the second worm wheel gear segment  
100 for a part of the revolution of the worm wheel to move the gate to a raised position.

2. In an apparatus of the class described, a gate, a motor, mechanical reversing mechanism comprising a worm driven by said  
105 motor, a worm wheel engaging said worm, a plurality of gear segments arranged to turn with said worm wheel, a gear segment on said gate arranged to mesh for a part of the revolution with one of the above mentioned  
110 worm wheel gear segments to move the gate to a lowered position, another gear segment on said gate and an idler gear meshing therewith, said idler gear being arranged to mesh with the second worm wheel gear segment  
115 for a part of the revolution of the worm wheel to move the gate to a raised position, a circuit for said motor, including therein a normally closed switch arranged to be automatically opened when the gate reaches a  
120 lowered position.

3. In an apparatus of the class described, a gate, a motor, mechanical reversing mechanism comprising a worm driven by said  
125 motor, a worm wheel engaging said worm, a plurality of gear segments arranged to turn with said worm wheel, a gear segment on said gate arranged to mesh for a part of the revolution with one of the above mentioned  
worm wheel gear segments to move the gate  
130

to a lowered position, another gear segment on said gate and an idler gear meshing therewith, said idler gear being arranged to mesh with the second worm wheel gear segment for a part of the revolution of the worm wheel to move the gate to a raised position, a circuit for said motor, including therein a normally closed switch arranged to be automatically opened when the gate reaches a lowered position, and a supplemental switch and a magnet therefor holding said switch open when energized and with the gate in a lowered position, means for deenergizing said supplemental magnet to permit the contacts to close, which contacts shunt said first mentioned normally closed contacts and again complete the motor circuit to furnish power for raising the gate.

4. In an apparatus of the class described, a gate, a motor, mechanical reversing mechanism comprising a worm driven by said motor, a worm wheel engaging said worm, a plurality of gear segments arranged to turn with said worm wheel, a gear segment on said gate arranged to mesh for a part of the revolution with one of the above mentioned worm wheel gear segments to move the gate to a lowered position, another gear segment on said gate and an idler gear meshing therewith, said idler gear being arranged to mesh with the second worm wheel gear segment for a part of the revolution of the worm wheel to move the gate to a raised position, a circuit for said motor, including therein a normally closed switch arranged to be automatically opened when the gate reaches a lowered position, and a supplemental switch normally opened when the gate is in a raised position, and a magnet for said supplemental switch to hold said switch in an open position when energized with the said gate in a lowered position.

5. In an apparatus of the class described, a gate, a motor, a reversing mechanism connecting said motor with said gate, including a worm driven by said motor, a worm wheel engaging said worm and having a plurality of gear segments connected therewith and set diametrically opposite each other, two gear segments mounted on said gate and arranged to move therewith, one of said gate gear segments engaging one of said gear segments on said worm wheel when the gate is moved to a lowered position, and an idler gear arranged to engage the other gate gear segment and the remaining oppositely disposed gear segment on the worm wheel to move the gate to a raised position.

6. In an apparatus of the class described, a gate, a shaft therefor, a plurality of gear segments mounted on said shaft, an idler gear engaging one of said gear segments, a motor, a worm driven thereby, a worm

wheel for said worm and means for alternately lowering and raising said gate without reversing said motor, said means including a plurality of gear segments arranged to move with said gear wheel, one of said gear segments engaging with one of the gear segments on said gate for a part of the revolution to lower the gate, and the other gear segment engaging the idler gear for another part of the revolution to raise the gate.

7. In an apparatus of the class described, a gate located at a crossing, a shaft therefor, a plurality of gear segments mounted on said shaft, an idler gear engaging one of said gear segments, a motor, a worm driven thereby, a worm wheel for said worm and means for alternately lowering and raising said gate without reversing said motor, said means including a plurality of gear segments arranged to move with said gear wheel one of said gear segments engaging with one of the gear segments on said gate for a part of the revolution to lower the gate, and the other gear segment engaging the idler gear for another part of the revolution to raise the gate, a circuit for said motor, means to automatically close said motor circuit upon the approach to said crossing of a train to move the gate to a lowered position, said means including a magnet and contacts actuated thereby, means to automatically open said motor circuit, including a normally closed switch opened by said reversing mechanism after the gate has reached a lowered position, means including an independent shunt switch for again automatically closing said motor circuit after the train has reached the crossing, to move the gate to a raised position, and means for automatically opening said last named shunt switch when the gate has been moved to a raised position, said means including an arm cooperating with one of the members of the shunt switch to contact with a portion of the reversing mechanism when the gate has been moved to a raised position.

8. In an apparatus of the class described, a gate located at the crossing, a nonreversing motor, mechanical reversing mechanism connecting or interposed between said motor and said gate, a circuit for said motor including a plurality of circuit closers arranged in series with said motor, one of said circuit closers being normally opened and controlled by an electromagnetic means arranged to be energized to close the normally opened circuit closer upon the approach to said crossing of a train at which time the motor circuit will be completed through said circuit closer, and through the reversing mechanism will move the gate to a lowered position, means cooperating with said reversing mechanism to open the nor-

mally closed circuit closer when said gate has reached a lowered position, another electroresponsive device arranged to be energized upon the approach of a train to a crossing, a circuit closer controlled thereby and connected in shunt with said first mentioned series circuit closers, the said last 5 named electroresponsive device will be de-energized after the train has passed the crossing permitting the said shunt circuit 10 closer to establish the motor circuit to move the gate to a raised position.

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