Nov. 8, 1932. O. L. VINCENT 1,886,435

SIGNAL

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Fig. 1

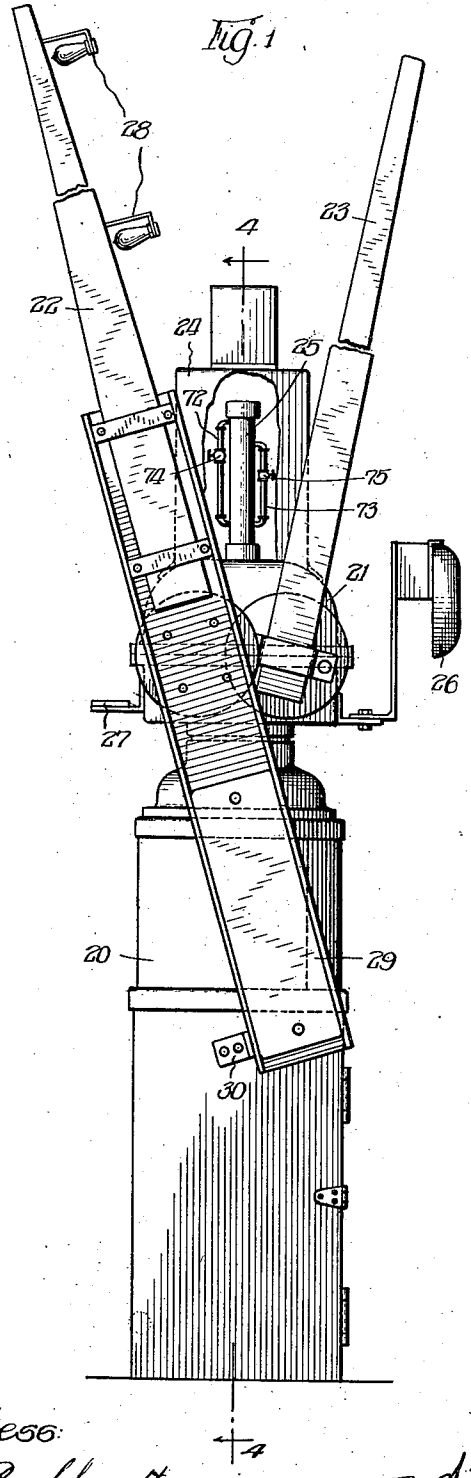
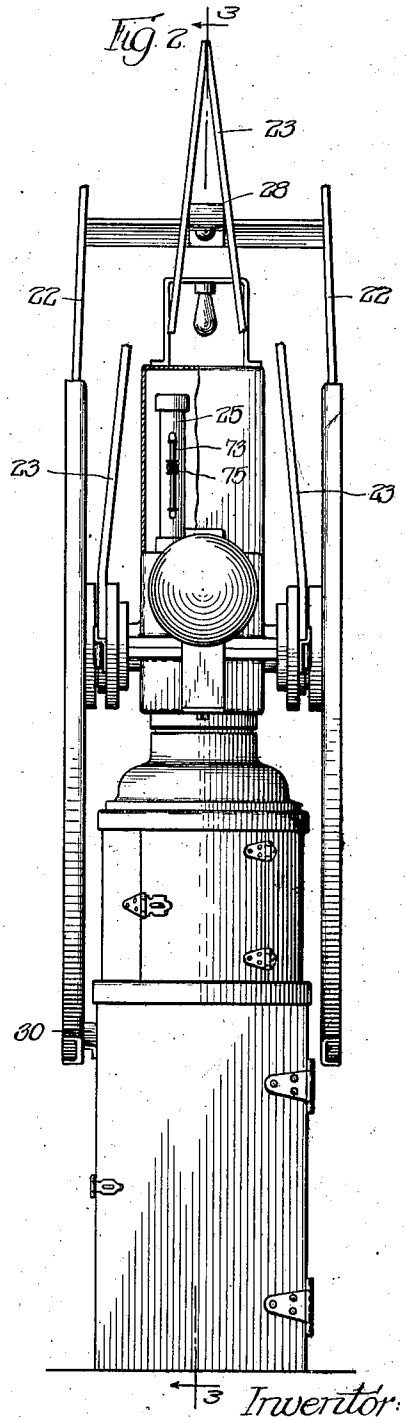


Fig. 2



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Nov. 8, 1932. O. L. VINCENT 1,886,435

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Fig. 3.

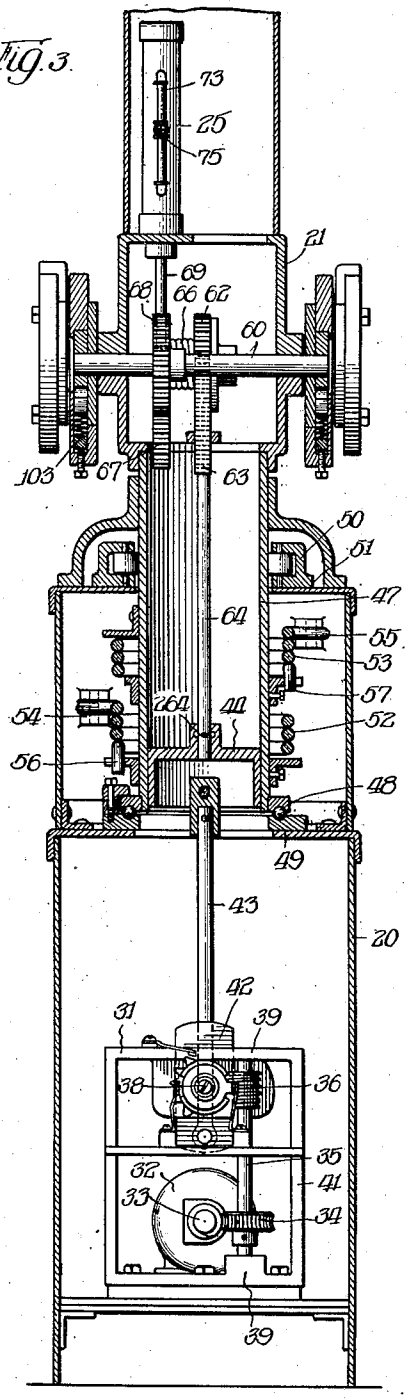
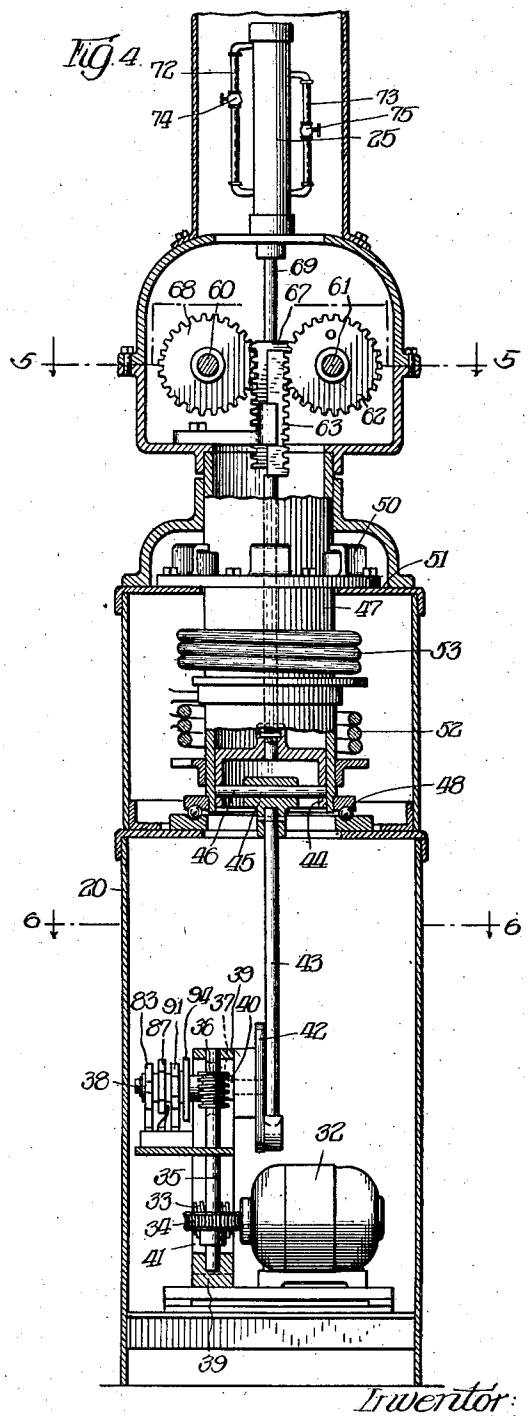


Fig. 4.



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Nov. 8, 1932. O. L. VINCENT 1,886,435

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Fig. 5.

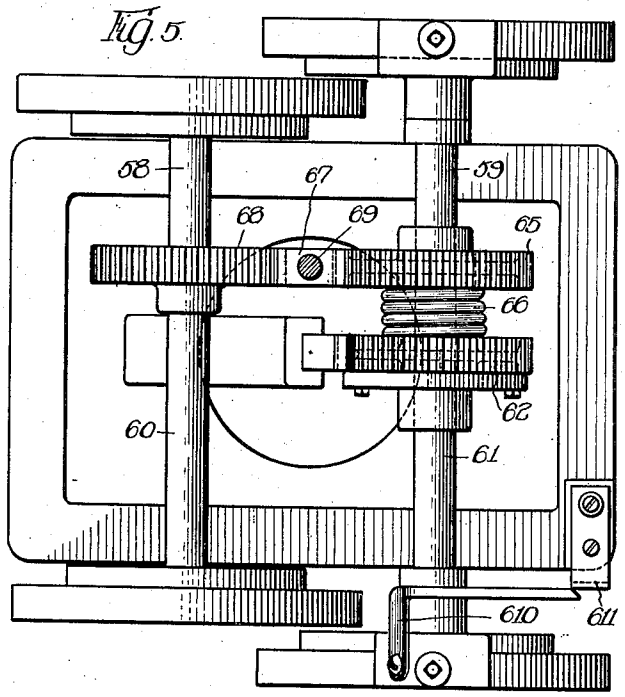


Fig. 6.

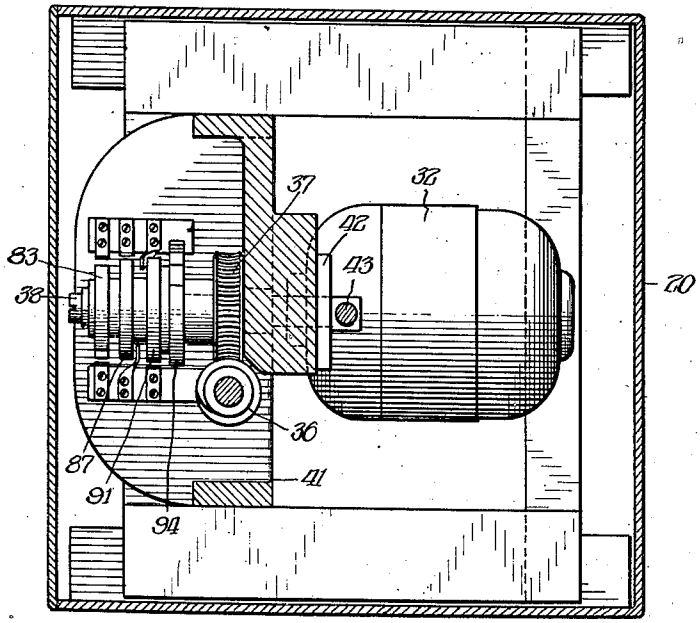


Fig. 7.

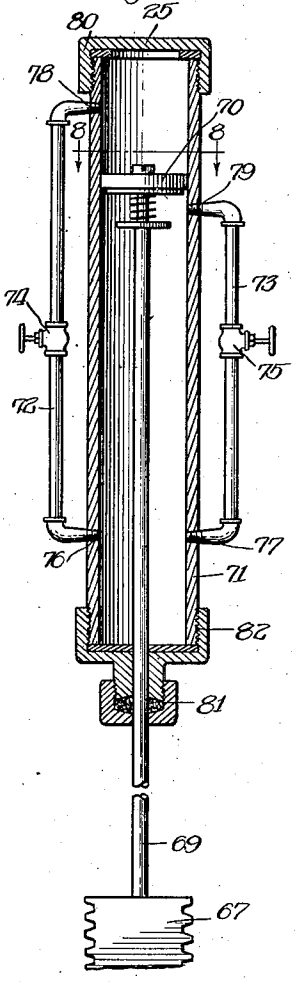
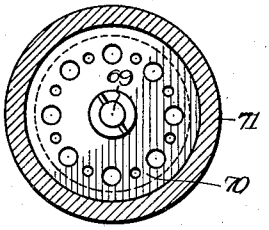


Fig. 8.



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Nov. 8, 1932. O. L. VINCENT 1,886,435

SIGNAL

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Fig. 12.

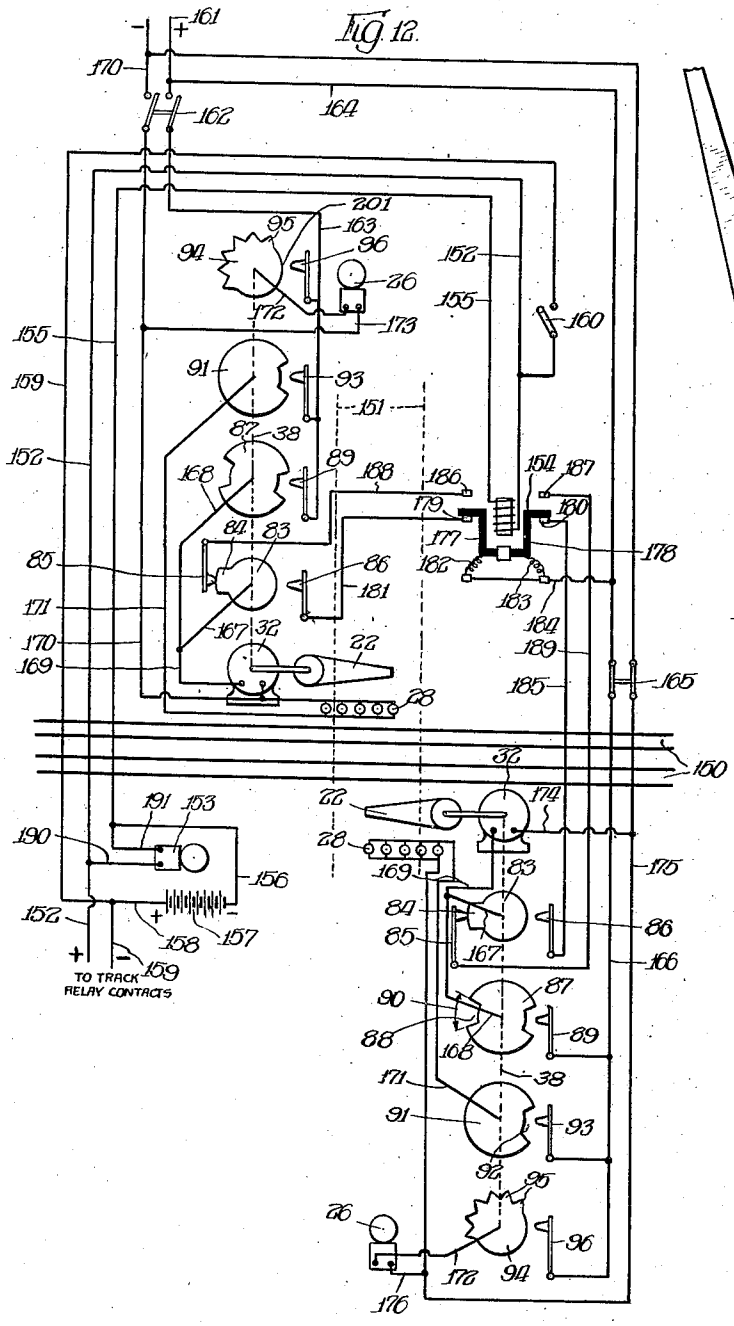


Fig. 9.

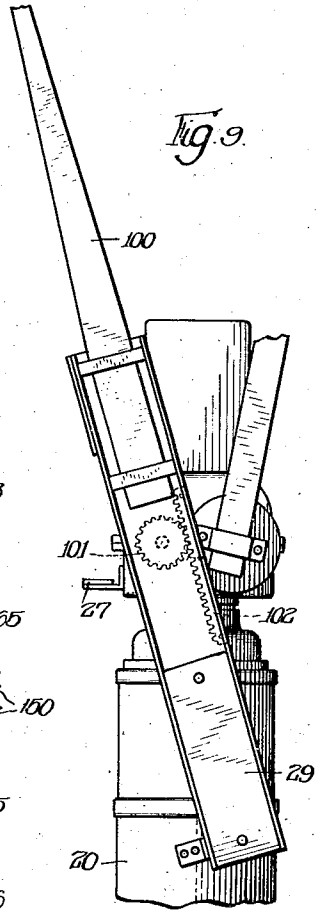
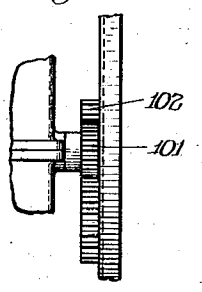


Fig. 10.



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Fig. 11.

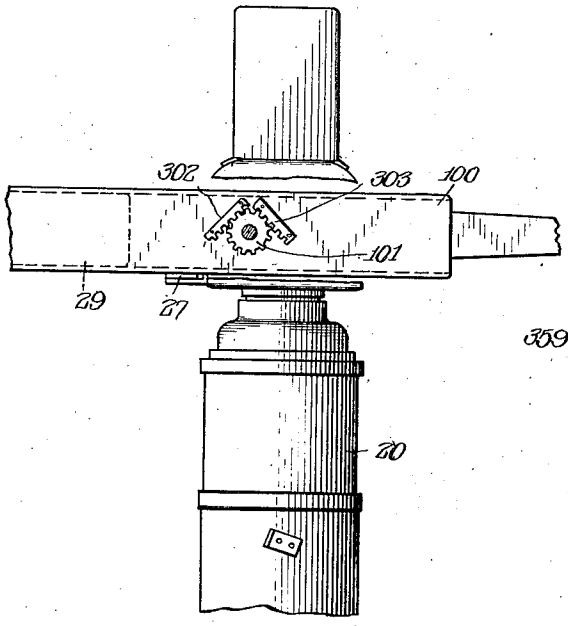


Fig. 14.

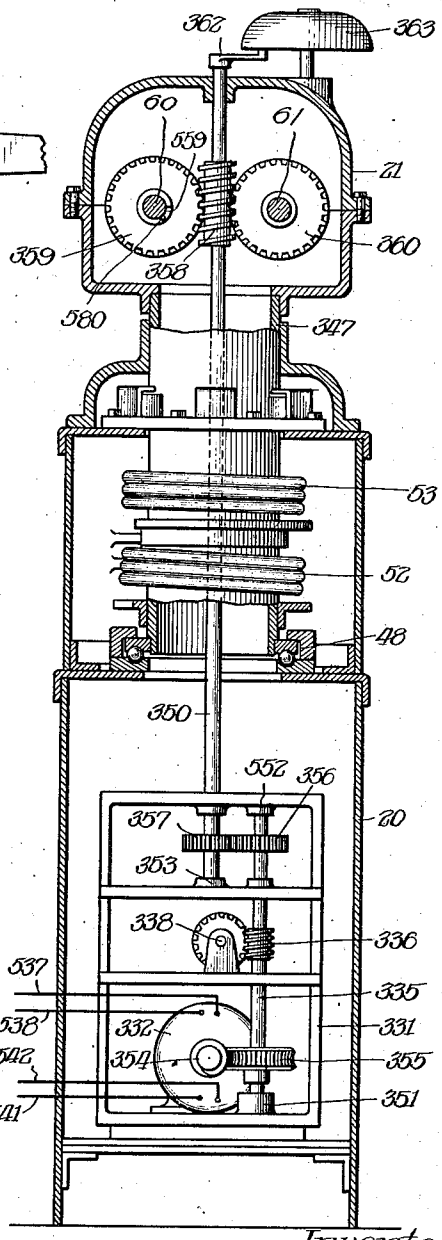
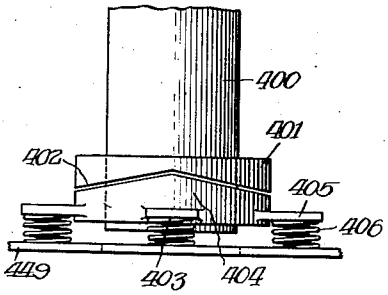


Fig. 15



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Nov. 8, 1932. O. L. VINCENT 1,886,435

SIGNAL

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Fig. 13

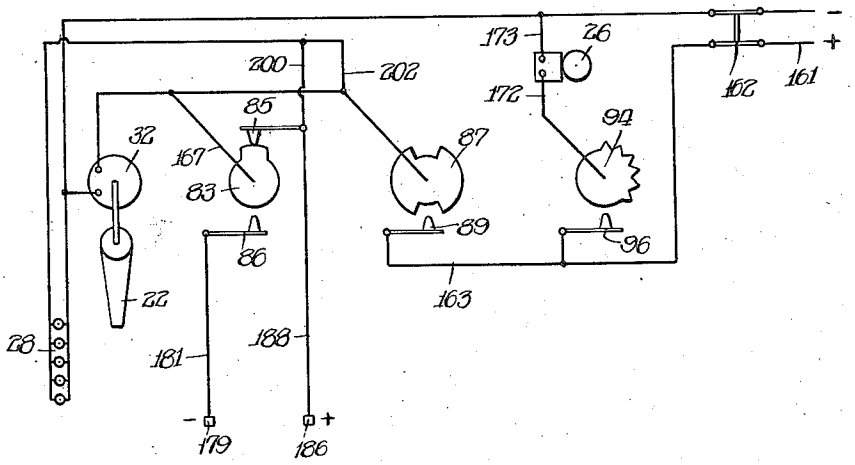
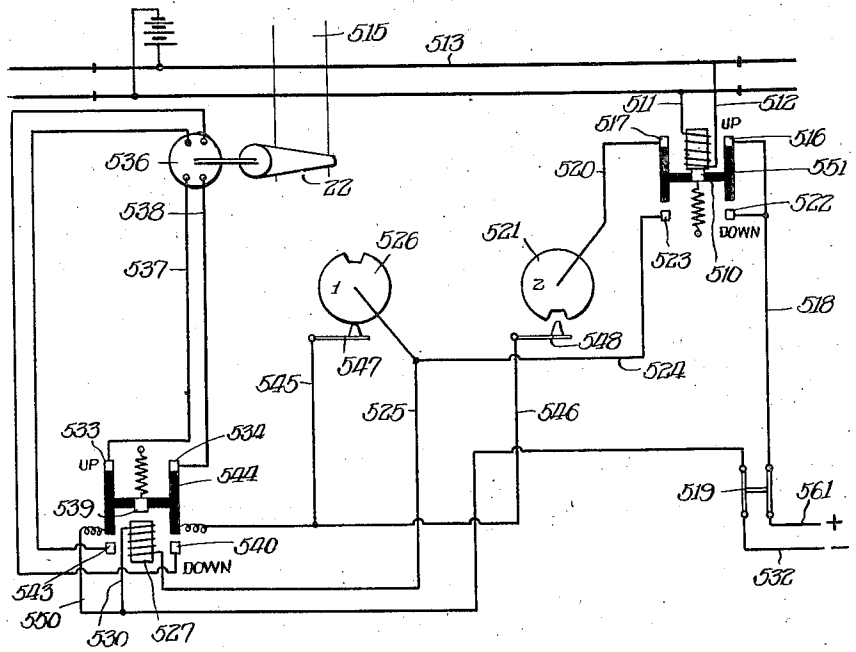


Fig. 10



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UNITED STATES PATENT OFFICE

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Application filed October 10, 1927. Serial No. 225,313.

This invention pertains to crossing gates, and more particularly to automatic and multiple safety gate and signal systems.

Much difficulty has been found in providing a satisfactory crossing barrier. Much of the difficulty has been in high cost of a satisfactory unit and its actuation. Many are automatic or semi-automatic, and to be practical from a commercial standpoint must be positive and not easily put out of order. Manual barriers are expensive in upkeep and are not always operated in time to be effective. Then too, when barriers are used, they are often run into, damaging or destroying them so that much expense is necessary for repair.

It is therefore an object of this invention to provide a crossing gate provided with signals operable in predetermined sequences with respect to said gate.

Another object is to provide barrier construction effective to provide safety means for a crossing or the like, yet one which is yieldable under impact and/or obstruction.

Still another object is to provide a crossing barrier having delayed return operation after the controlling mechanism has been actuated to return said barrier to inoperative position.

A further object is to provide crossing protection and warning signals operative either automatically or manually.

A still further object is to provide barrier construction having cushioning means for absorbing shocks incident to operation or use and one which fulfills all requirements of manufacture and service.

With these and various other objects in view, the invention consists of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, wherein like reference characters are used to designate like parts—

Figure 1 is a side elevation of a crossing gate unit with the gates in raised position;

Figure 2 is an end elevation of Figure 1;

Figure 3 is a sectional elevation of Figure 2 with the gates omitted, the same being taken substantially in the plane as indicated by the line 3—3 of Figure 2;

Figure 4 is a sectional elevation of Figure 1 with the gates omitted, the same being taken substantially in the plane as indicated by the line 4—4 of Figure 1;

Figure 5 is a plan view taken substantially in the plane as indicated by the line 5—5 of Figure 4;

Figure 6 is a sectional plan showing the operating motor unit together with the switch control elements, this figure being taken substantially in the plane as indicated by the line 6—6 of Figure 4;

Figure 7 is a side elevation of the gate brake unit;

Figure 8 is a sectional plan taken substantially in the plane as indicated by the line 8—8 of Figure 7;

Figure 9 is a fragmentary side elevation of a modified form of the gate actuating mechanism shown in Figure 1;

Figure 10 is a detail of Figure 9 taken at right angles thereto and showing the relation between the parts of a rack and pinion control unit for the gate;

Figure 11 is a fragmentary side elevation of a modified form of rack and pinion actuating mechanism;

Figure 12 is a diagrammatic representation of a pair of gate units for a railroad crossing and the electrical connections therefor;

Figure 13 is a diagrammatic representation of a modified form of wiring for a gate unit;

Figure 14 is a diagrammatic sectional side elevation of a modified form of barrier with the gate arms omitted;

Figure 15 is an enlarged elevation of a form of mechanical barrier return positioning mechanism; and

Figure 16 is a diagrammatic representation of a modified form of wiring for a gate unit employing a reversible motor.

Referring now more particularly to the first modification illustrated in Figures 1 to 8 inclusive, the unit consists of a standard or housing 20, upon which is rotatably mounted a gate carrying head 21 having pivoted thereto gate means 22 and 23, the head 21 serving also to carry a housing 24 in which is disposed a brake cylinder 25. Member 21 also may carry a signal, such as a bell 26,

and a stop 27 adapted to contact with gate 22 in its lowered position to maintain the same in its limited horizontal lowered position. Gate 22 being preferably longer than gate 23 is used as a barrier for the vehicle road while gate 23 is for the sidewalk or passenger road, and either or both of these gates may be provided with lights or signals 28. Gate 22 is of course provided with a counterweight 29, and the lower portion of this gate may well be adapted to have contact with the stop 30 disposed on the housing or standard 20 for limiting the raised position of the gates.

Within the housing 20 is mounted a motor and switch unit 31 adapted to control or operate the gates. This unit consists of a motor 32 connected through suitable gearing, such as the worm and wheel 33 and 34, to a jack shaft 35, which shaft is connected through suitable gearing such as the worm and wheel 36 and 37, to a shaft 38, it being understood of course that jack shafts 35 and 38 are carried in suitable bearings, such as 39 and 40, disposed in a frame 41. Shaft 38 has disposed at one end thereof a crank 42 or a disc to which a link 43 may be eccentrically pivotally connected, said link in turn being pivoted to a suitable cross head 44 through members 45 and 46. The cross head may be circular in section and adapted to reciprocate in a cylindrical track or sleeve 47 disposed in the upper part of the housing 20, said sleeve 47 being so mounted as to be capable of rotation on bearings 48 disposed between the sleeve and a part 49 of the housing 20.

In the upper part of the housing, bearings 50 may also be provided, suitably spaced and positioned with respect to the sleeve, on the upper part 51 of said housing. Spring segments 52 and 53 surrounding the sleeve may be anchored as at 54 and 55 to the housing 20 and as at 56 and 57 to the sleeve 47 in order to provide for means for allowing pivoting of the gate and returning the gate to initial or barrier position; that is, to such a position where it will be disposed across the roadway should said gate be moved out of barrier position by any object or obstruction.

It is understood of course that the sleeve 47 is fixedly connected to the head 21 which supports, by means of suitable bearings at 58 and 59, the gate shafts 60 and 61. Shaft 61 is provided with a pinion 62 adapted to be operated by a rack 63 which is attached to the cross-head 44 by means of a link or rod 64 so connected, as by the pin and slot connection 264, that it has rotatable movement with respect to said cross-head. Loosely mounted on the shaft 61, there is another pinion 65 connected to the pinion 62 by means of a coil spring 66. Pinion 65 is in engagement with one side of a double rack 67, the other side of which engages a pinion 68 secured to the shaft 60. Rack 67 is provided with an extension or link 69, one end of which is connected to a spring-pressed disc, piston or spider 70 of the brake 25. This brake consists of a cylinder 71 acting as a guide or track for the piston 70 and by-passes 72 and 73 controlled by valves 74 and 75. These by-passes communicate with the cylinder at their lower points 76 and 77 in substantially the same horizontal plane, but at their upper points 78 and 79, they communicate with the cylinder on opposite sides of the piston 70 when said piston is at the top of its travel, it being understood of course that the cylinder on both sides of the piston is provided with a fluid acting as a brake medium. The action of the liquid to effect braking operation is that found in an adjustable dashpot; assuming the piston 70 to be in the position shown in Figure 7, downward movement of the piston rod will cause movement of the piston downwardly, forcing the liquid through the by-pass 72 to a point above the piston, the flow being regulated by the valve 74. Continued downward movement of the piston after it has passed the point 79 causes the by-pass 73 to function to supplement the by-pass 72, the valve 75 controlling the flow through the by-pass 73. A quick reversal is prevented by the spring shown beneath the piston 70, which spring will act as a cushion should the movement of the piston rod 69 be reversed quickly. Upward movement of the piston 70, therefore, causes by-passing through the by-passes 72 and 73 until the time when the piston 70 passes the point 79, at which time the by-pass 73 is cut out and only the by-pass 72 functions, causing a retarding movement of the piston and piston rod.

It will of course be appreciated that the cylinder 71 is provided with a top or cap 80 threaded to the cylinder in oil-tight relation and the lower end of said cylinder is provided with a suitable stuffing box or gland 81 similarly screw-threaded as at 82 to said cylinder, through which gland the piston rod or link 69 passes.

The shaft 61 is provided at an outer end with a connection 610 adapted to have fixed or sliding contact with a switch element 611 for the purpose of controlling the lights 28.

The jack shaft 38 is provided with switch elements, one of said elements 83 being substantially circular and provided with a projection 84 normally in contact with the finger 85, this element 83 having constant electrical connection with one terminal of the motor 32. Another finger 86 is provided which is adapted to be contacted by lug or projection 84 upon predetermined rotation of the element 83. Another motor element 87 is provided having constant electrical contact with the same terminal of the motor 32 with which switch element 83 has contact. Member 87

is substantially circular and is provided with diametrically opposed notches 88, said notches being normally out of contact with a switch finger 89 and so proportioned that the peripheral length 90 of said notches is slightly less than the peripheral length of the lug 84 for the purpose of preventing break in the motor circuit during one cycle of operation of the assembly.

Another switch element 91 is provided on the shaft and is connected to one side of a circuit controlling the lights 28, said element being substantially circular and provided with a single notch 92 disposed, when the gates are in raised position, in way of a switch finger 93 so that there is no connection between said finger and the element 91. Though element 91 is shown with only one notch, it causing a continuing lighting of the lights for a period, it will be appreciated that said element may just as readily be provided with a plurality of notches forming a plurality of fingers to cause the lights to be lighted intermittently, or flashed, as in the winking form of signalling. An element 94 is provided having a plurality of lugs or fingers 95 adapted to be moved into successive contact with the finger 96 in order to operate the signal or bell 26, it being understood that element 94 is in constant connection to one side of the bell. If desired, the relay may be used to directly operate either or both lighting and audible signals thereby eliminating switch elements and connections.

It will then be seen that when the gate is in lowered position blocking a road, if it is run into or hit in any manner, due to the pivotal connection of the sleeve 47 with the standard 20, the gate may be rotated substantially 90°, it being returned to the original position by means of the spring elements 52 and 53. And as clutch means 103 may be provided for the shaft 61, should the gates be let down upon any object, they will have no tendency to crush the object but will remain in the position in which they have been stopped. It will also be seen that there is a flexible connection between the gates 22 and 23 through the spring 66 augmenting cushioning action, and in return position, of course, the speed of return of the gates may be readily regulated through the brake member 25, preventing slamming of said gates.

Referring now more particularly to Figure 9, it will be understood that the essential elements are substantially the same as already described, the only difference being that instead of gate 100 being connected directly to the shaft 61, said shaft carries a pinion 101 in contact with a rack 102 carried by the gate 100, this gate, it being understood, being provided with the usual counterweight 29. The gate then by means of its balanced relation through the rack and pinion readily operates to open and closed position. A slight overbalancing causes the raising or lowering of said gate and is advantageous in permitting overtravel, due to inertia, where there is a sudden reversal or stopping of the operating mechanism. Figure 11 illustrates a mounting between the gate 100 and the pinion 101, using a rack 302 and/or 303 angularly disposed with respect to the longitudinal direction of the gate for the purpose of permitting a different degree of delay in starting movement of the gate after the actuating mechanism is put in operation, as well as providing different time intervals in other operations between the gate and its actuating mechanisms.

Further, the modification shown in Figure 9 provides the rack and pinion connection in order that in operation to lower the gates, the pinion 101 will revolve in a counterclockwise direction, having the effect of extending the gate 100 so that should it be stopped in its downward path, after the path of movement of the gate is unblocked, said gate will assume a lowered position across the road.

Referring now to Figure 12, 150 represents railroad tracks having a crossing such as a road 151, gates 22 being disposed on either side of said crossing. Although only one gate is shown on either side of the crossing, it is to be understood that they may be provided in multiple, but as the wiring of such a system would be merely duplications of that shown and similarly numbered, the present showing is deemed sufficient for illustrative purposes. As already described, the units comprise the motor and switch elements for their operation connected in a manner as already described. The conductor 152 is connected to one side of the track relay, which in the system disclosed is normally open, said conductor being connected to one side of a signal 153 and also to one side of a double throw relay 154, the other side thereof being connected through conductor 155 to the other side of the signal 153 and also through conductor 156 to the negative terminal of a source of energy, such as battery 157, the other side of said battery being connected through conductor 158 to conductor 159 in turn connected to the other side of the track relay circuit. Conductor 159 is connected to a normally open hand switch 160 in turn connected to conductor 152 to establish contact with one side of the relay 154. The positive side of another source of energy is connected to the conductor 161 connected through the switch 162 with conductor 163 in turn connected to the switch elements 96, 93 and 89 of the motor switch unit, the conductor 161 being connected through the conductor 164, through switch 165 to conductor 166, in turn connected to the switch elements 89, 93 and 96 of the other gate unit. Elements 83 and 87 are connected by means of conductors 167 and 168 with con-

ductor 169 connected to one side of the motor 32, the other side of said motor being connected to conductor 170 connected through switch 162 to the negative side of the source of energy supplying current to conductor 161.

Conductor 170 is also connected to one side of the lights 28, the other side of said lights being connected through conductor 171 to the switch element 91. Switch element 94 is connected by means of conductor 172 to one side of the signal or bell 26, the other side of said bell being connected through conductor 173 to conductor 170. Similarly, the elements 83 and 87 of the other unit are connected through conductors 167 and 168 with conductor 169 connected to one side of the motor 32, the other side thereof being connected through conductor 174 with conductor 175, which conductor is connected through switch 165 with conductor 170, conductor 175 being also connected through conductor 176 to one side of the bell or signal 26, the other side of which bell is connected through conductor 172 with the switch element 92. Conductor 175 then is connected to one side of the lights 28, the other side being connected through conductor 171 with the switch element 91. Switch elements 96, 93 and 89 are connected through conductor 166 and switch 165 to conductor 164 and the positive source of current through conductor 161.

Relay 154 consists essentially of insulated arms or switch elements 177 and 178 normally in contact with contacts 179 and 180, the contact 179 being in connection with the finger 86 through conductor 181. Arms 177 and 178 are connected through conductors 182 and 183 with conductor 184 connected to conductor 164, and contact 180 is connected with the element 86 of the other unit through conductor 185. When the solenoid relay is energized, arms 177 and 178 are adapted to move in contact with contacts 186 and 187, said contacts being connected through conductors 188 and 189 with fingers 85 of the respective units. Multiple connections may be made from the motor circuit to the motor 32 and the lights 28 for lighting the lights when the motor circuit is completed. This may be done by inserting the conductor 200 between the conductor 188 and the conductor 171, and inserting a conductor 202 between the conductor 169 and the conductor 171. In this manner, as soon as the relay has been closed supplying current to the conductor 188, a part of said current is supplied to the switch element 83 and thence to the motor and another part of said current is supplied to the conductor 171 to the conductor 200 and thence to the lights 28. This does not affect the switch element 91 or the switch element 87 as these are open and the current is supplied to the switch element 83. The conductors 200 and 202 are really not necessary to an operative circuit as will readily be appreciated.

In operation, when a train enters a block, the normally open track relay is closed, completing the circuit and energizing the relay 154; that is, current will enter conductor 152, will pass through conductor 190 to the signal 153 actuating the same, passing through conductor 191 to conductor 156 through the battery 157 and through conductors 158 and 159 to complete the track relay circuit. Current will also pass along conductor 152 to energize the relay 154 and back through conductors 155 and 156 back to complete the circuit through the track relay circuit, as already described. It will of course be appreciated that when the relay 154 is energized, arms 177 and 178 are moved into contact with contacts 186 and 187 so that current will pass from conductor 161 through conductor 164, through conductors 184 and 182, through arm 177 to contact 186, through conductor 86 to switch element 85, through switch element 83 to conductors 167 and 169 to the motor 32 and from the motor through conductor 170 back to the negative side of the actuating circuit.

It will be understood that motor 32 is geared to the shaft 38 in such a manner that to lower the gates from raised position or to raise the gates from lowered position means that the shaft 38 revolves only 180°. When the motor revolves, of course, elements 83, 87, 91 and 94 are moved so that connection is broken between the finger 85 and the lug 84. However, contact is closed between the element 87 and the finger 89 so that current passes from the conductor 161 through conductor 163 and through elements 89 and 87 and wire 168 to wire 169 to complete the motor circuit, as already described.

Contact is also made between the finger 93 and the element 91 causing current to flow from conductor 163 through finger 93 and element 91 to conductor 171 through the lights 28 and back through the conductor 170 to the negative side of the source of energy. The projections 95 on the element 94 will of course make intermittent connection with the finger 96 so that the current will pass through conductor 163, through finger 96, successively through fingers 95, through element 94, through conductor 172 to one side of the signal 26, causing intermittent actuation of the same, the current passing from the other side of said signal through conductor 173 back to conductor 170 to complete the circuit. The current will also pass from conductor 184 through conductor 183, through switch arm 178 and contact 187 to conductor 189 connected to the finger 85 of the other unit, causing actuation of said other unit in a manner similar to that as already described. It will be appreciated that the apertures 88 in element 87

are so proportioned with respect to the lug 84 on the element 83 as to prevent feedback to the other gate and so to prevent actuation of one gate without the other.

It will be understood that after the train has passed out of the block, deenergizing the relay 154, arms 177 and 178 are moved into contact with the contacts 179 and 180. By this time, however, lug 84 has revolved to contact with the finger 86 so that current is passed from arm 177 to contact 179 through conductor 181 and through finger 86 through lug 84 and element 83 to complete the motor circuit through conductor 169, causing actuation of the same to move the gate, it being understood that the crank 42 is diametrically in opposed position as that illustrated in Figure 4.

In a similar manner, contact is made through finger 89 and element 87 as the opposite notch 88 has been moved in way of finger 89 so that the gate will be raised to its upright or "off-duty" position, the same actuation occurring in the other barrier unit as described above for initial actuation.

The gates may be operated manually through switch 160, if so desired, as current may be passed from source 157 through conductor 159 and through switch 160 to conductor 152 to energize the relay, causing actuation in a manner as already described.

As already pointed out, the track relay is of the normally open type but it is contemplated that the normally closed type of track circuit may be used. Also, it will be appreciated that the circuit as described was one for direct current though it is contemplated that alternating current may be just as readily used.

The system of construction and operation described may be somewhat varied to simplify the construction of the control circuit, one form of such variation being indicated in Figure 13. In this system, the switch elements 91 and 93 controlling the light circuit have been eliminated with a consequent reduction of parts and change in the motor circuit, though the circuit control for the relay 154 may remain as above described. In this form, assuming like parts to be in position described for Figure 11, the positive side of the source of energy supplied through conductor 161 is connected through switch 162 (shown open, but normally closed) to conductor 163 connected to switch fingers 96 and 89, out of contact with elements 94 and 87. Element 94 is connected to one side of signal 26 through conductor 172, the other side being connected through conductors 173 and 170 and switch 162 to the negative side of the source of energy of 161. Element 87 is connected to one side of the motor 32 through conductor 168, the other side of said motor being connected to conductor 170. Element 87 is also connected through conductor 202 through the battery of lights 28 to conductor 170. Contacts 186 and 179 of the relay are connected through conductors 188 and 181 to fingers 85 and 86, finger 85 being shown in contact with a portion of element 83 connected through conductor 167 and motor 32 to conductor 170. Finger 85 is also connected through conductor 200 and lights 28 with conductor 170. So that in operation, when the relay supplies current to contact 186, it passes to the motor through conductor 188, elements 85, 83, and conductors 167, 168 and from the motor to conductors 170, completing the circuit, it being understood that current is supplied through 161, 164, etc. as before. Current also passes through conductors 188, 200 to the lights 28. Starting the motor breaks contact between elements 85 and 83 as before, and makes contact between elements 89 and 87 and 96 and 94, actuating the signal 26 in the latter case. In the former case, current passes through conductors 161, 163, elements 89, 87, conductor 168 to complete the motor circuit, and also passes through conductor 202 to complete the light circuit. Exactly a similar operation occurs in operating the gates after movement of the element shaft 38, the relay then supplying current through contact 179, as previously described.

With the construction above described, the motor 32 is actuated in only one direction. However, if a reversible motor be used, the system and construction may be altered and simplified as shown in Figures 14 and 16. Referring first to the construction of the barrier unit, the essential parts of the gates, lights, standard, etc. are the same; that is, it is only necessary to change the motor unit and its connection to the transverse gate shafts 60 and 61 (Figure 5). This motor unit includes the frame 331 supporting the motor 332 and properly bearinged shafts 335 and 350, bearings therefor being indicated at 351 and 552 and 353. The motor is geared to shaft 335 through the worm and gear 354 and 355, and the shaft 335 is in turn geared to shaft 350 through gear wheels 356 and 357 so that a movement of rotation is imparted thereto which in turn is transferred to shafts 58 and 59 through reversible worm and gears 358, 359 and 360. Shaft 350 is preferably carried through a bearing in the head 21 for the reception of mechanical bell operating mechanism 362 cooperating with gong 363. It is further understood that jackshaft 338, actuated by worm 336 on shaft 335, carries the switch element in a manner similar to shaft 38.

In this construction, the turning sleeve and spring mechanism 347 and 52 and 53 may be varied somewhat to eliminate the coil springs and bearings. This may be accomplished as shown in Figure 15 by providing the head 21 with a depending tube 400, replacing sleeve 347, to which is fixedly attached a crown gear

401 preferably provided with teeth 402 at the quadrants. A reciprocating cooperating sleeve 403 has teeth 404 cooperating with the spaces between teeth 402 and may be provided with shoulders 405 between which and the shelf 449 of the standard, coil springs 406 are disposed. So that should the barriers be rotated, the springs will be depressed until the barriers are released. Then the collar 403 will be forced against collar 401 and camming action between the teeth will return the barrier to crossing protecting position. Of course the parts may be varied; for instance, the head may be adapted to be moved upwardly over crown gear teeth to return by gravity and/or spring action, in which case a sliding connection is provided in shaft 350.

The motor circuit may be varied as shown in Figure 16 wherein a four-wire motor is illustrated, it being contemplated however that any motor may be used, the above type being described as illustrative of one form of adaptation. In this circuit, a normally energized relay 510 is shown connected through conductors 511 and 512 with the rails of the block 513 of the track, the road 515 crossing through the block. The armature 551 of the relay 510 normally connects contacts 516 and 517 connected respectively through conductor and switch 519 with positive side 561 of a source of energy, and through conductor 520 with switch element 521 disposed on the motor jackshaft 338 shown in Figure 14. Other contacts 522 and 523 of the track relay are respectively connected to conductor 518, and through conductors 524 and 525 to switch element 526 and the solenoid 527 of a relay 529, the other side of the solenoid being connected through conductors 530 and 531 and through the switch 519 with the negative side 532 of a source of energy. Contacts 533 and 534 are connected to one side of the motor 536 through conductors 537 and 538, to say run the barrier to up position, and the contacts 543 and 540 are connected through conductors 541 and 542 to the other side of the motor, to say run the barrier to down position. The armature 539 of the relay is in separated insulated parts, side 544 oscillating between contacts 534 and 540, being connected through conductors 545 and 546 with switch fingers 547 and 548 cooperating with elements 526 and 521. The other part 549 oscillating between contacts 533 and 543 is connected through conductor 550 with conductor 531.

In operation then, a train entering block 513 deenergizes relay 510, causing the armature 551 to establish connections between contacts 522 and 523, termed down contacts, causing current to flow from 561 through conductors 518 and 524, elements 526 and 547 to armature part 544. The current also passes through conductor 525 to energize solenoid 527 of relay 529, the current passing through conductors 530 and 531 through switch 519 to the source through 532. Energizing the relay establishes connection through part 544 and contact 540, between conductors 546 and 542 passing current to the motor 536 to cause it to lower the barriers, current returning to the source through conductor 541, contact 543, part 549 and conductors 550 and 531. The motor turning establishes connection between elements 548 and 521 and when the gate is lowered, breaks connection between elements 547 and 526 stopping the motor. When the train leaves the block, relay 510 is energized, establishing connection between the up contacts 516 and 517, causing deenergization of relay 529 so that the armature moves into contact with the up contacts 533 and 534. Current then passes through conductor 520, elements 521 and 548 to conductor 546, through part 544 to contact 534 and to the motor 536 through conductor 538, reversing the motor to raise the barrier, the current returning through conductor 537, contact 533, part 549 and conductors 550 and 531 to the source. This actuation continues until circuit is broken between elements 521 and 548 due to rotation of the jack shaft. The audible and visible signals are actuated as before, and the signal is reset after the last described operation pending other actuation.

It will be seen from the above that a very desirable signal barrier is provided, and it is to be understood that I do not wish to be limited by the exact embodiments shown, which are by way of illustration and not limitation, as other and various forms will of course occur to those skilled in the art.

I claim:

1. In a system of the character described, the combination of a track circuit, a relay in said circuit and controlled by a train affecting said track circuit, a normally inoperative barrier motor, a source of energy, a relay between said source of energy and motor normally disconnecting said motor and source of energy, said first named relay being operative by the train affecting said track circuit to control said second named relay whereby said source of energy is connected to said barrier motor for operating said barrier motor, and means operated by said motor for operating the same in either of two directions.

2. In a system of the character described, the combination of a track circuit, a relay in said circuit and controlled by a train affecting said track circuit, a normally inoperative barrier motor, a source of energy, a relay between said source of energy and motor normally disconnecting said motor and source of energy, said first named relay being operative by the train affecting said track circuit to control said second named relay whereby said source of energy is connected to said barrier motor for operating said barrier motor in either direction, and means in the circuits of

said relays and operated by said motor for rendering said source of energy inoperative after a predetermined period.

3. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a normally energized and a normally deenergized relay, a circuit connecting said relays, said normally energized relay being connected to said block and being adapted to be deenergized upon entry of a vehicle into said block, said relay remaining deenergized so long as a vehicle is within said block, a source of current supply, a normally closed switch element in the circuit between said relays, said switch element being operated by said motor, said normally deenergized relay being adapted to control said motor whereby when said first named relay is deenergized said source of current supply is connected to said second named relay to energize the same, the closing of said second named relay connecting said source of current supply to said motor through said normally closed switch element to operate said gate to closed position and to operate said normally closed switch element to open position to thereby disconnect said source of current supply from said motor to render said motor inoperative.

4. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a normally energized and a normally deenergized relay, a circuit connecting said relays, said normally energized relay being connected to said block and adapted to be deenergized upon entry of a vehicle into said block, a source of current supply, a normally open and a normally closed switch element in the circuit between said relays, said switch elements being operated by said motor, said normally deenergized relay being adapted to control said motor whereby when said first named relay is deenergized said source of current supply is connected to said second named relay to energize the same, the closing of said second named relay connecting said source of current supply to said motor through said normally closed switch element to operate said gate to closed position and to cause said normally closed switch element to be moved to open position to thereby disconnect said source of current supply from said motor to render said motor inoperative, operation of said motor to close said gate operating said normally open switch element to closed position, said first named relay being energized when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said second named relay deenergizing said relay, said source of energy being connected through said first named relay and said normally open switch element to said motor through said second named relay to operate the gate to open position and to cause said normally open switch element to be moved to open position and said normally closed switch element to closed position to thereby disconnect said motor from said source of energy.

5. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a normally energized and a normally deenergized relay, a circuit connecting said relays, said normally energized relay being connected to said block and being adapted to be deenergized upon entry of a vehicle into said block, said relay remaining deenergized so long as a vehicle is within said block, said normally deenergized relay controlling the direction of rotation of the reversible motor and when deenergized contacting with connections to operate the motor to open the gate, a source of current supply, means operated by said motor for permitting actuation of said motor, said normally deenergized relay being adapted to control said motor whereby when said first named relay is deenergized said source of current supply is connected to said second named relay to energize the same, the closing of said second named relay connecting said source of current supply to said motor through said means to operate said gate to closed position and to operate said means to disconnect said source of current supply from said motor to render said motor inoperative.

6. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a normally energized and a normally deenergized relay, a circuit connecting said relays, said normally energized relay being connected to said block and being adapted to be deenergized upon entry of a vehicle into said block, said relay remaining deenergized so long as a vehicle is within said block, a source of current supply, means operated by said motor for permitting actuation of said motor, said normally deenergized relay being adapted to control said motor whereby when said first named relay is deenergized said source of current supply is connected to said second named relay to energize the same, the closing of said second named relay connecting said source of current supply to said motor through said means to operate said gate to closed position and to operate said means to disconnect said source of current supply from said motor to render said motor inoperative, said first named relay being energized when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said second named relay deenergizing said relay, said source of energy being connected through said first named relay and said means to said motor through said second

named relay to permit operation of the gate to open position and to operate said means to disconnect said motor from said source of energy.

7. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a normally energized and a normally deenergized relay, a circuit connecting said relays, said normally energized relay being connected to said block and being adapted to be deenergized upon entry of a vehicle into said block, said relay remaining deenergized so long as a vehicle is within said block, said normally deenergized relay controlling the direction of rotation of the reversible motor and when deenergized contacting with connections to operate the motor to open the gate, a source of current supply, means operated by said motor for permitting actuation of said motor, said normally deenergized relay being adapted to control said motor whereby when first named relay is deenergized said source of current supply is connected to said second named relay to energize the same, the closing of said second named relay connecting said source of current supply to said motor through said means to operate said gate to closed position and to permit operation of said means to disconnect said source of current supply from said motor to render said motor inoperative.

8. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor through said means to said source of supply to operate said gate to closed position and to permit operation of said means to disconnect said source of current supply from said motor to render said motor inoperative.

9. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, said normally deenergized relay controlling the direction of rotation of the reversible motor and when deenergized contacting with connections to operate the motor to open the gate, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor and said source of supply to operate said gate to closed position.

10. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being conneeted to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, said normally deenergized relay controlling the direction of rotation of the reversible motor and when deenergized contacting with connections to operate the motor to open the gate, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor and said source of supply to permit operation of said motor to move said gate to closed position and to operate said means to disconnect said source of current supply from said motor to render said motor inoperative.

11. In a railway gate operating system, the combination of a track block, a gate having a motor reversible controlling operation thereof, a relay, motor operating means, a circuit connecting said relay and motor operating means including a second relay, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, said second relay being operatively associated with said motor operated means, operation of said motor operating means connecting said motor through said motor operated means to said source of supply to permit operation of said gate to closed position and to operate said motor operated means to disconnect said source of current supply from said motor to render said motor inoperative, said second relay including means actuated by said motor operated means for reversing said motor to lift said gate.

12. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation

thereof, a relay, motor operating means including a second relay, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, said second relay being operatively associated with said motor operative means, operation of said motor operating means connecting said motor to said source of supply to operate said gate to closed position, said second relay including means actuated by said motor operated means for reversing said motor to lift said gate.

13. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a relay, motor operating means including a second relay, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, said second relay being operatively associated with said motor operative means, operation of said motor operating means connecting said motor to said source of supply to operate said gate to closed position and to permit operation of said motor operated means to disconnect said source of current supply from said motor to render said motor inoperative, said second relay including means actuated by said motor operated means for reversing said motor to lift said gate.

14. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor through said means to said source of supply to operate said gate to closed position and to operate said means to disconnect said source of current supply from said motor to render said motor inoperative, said first named relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said second named relay, said source of energy being connected through said first named relay and said means to said motor through said second named relay to operate the gate to open position and to operate said means to disconnect said motor from said source of energy.

15. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor and said source of supply to operate said gate to closed position, said first named relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said second named relay, said source of energy being connected through said first named relay and said means to said motor through said second named relay to operate the gate to open position and to permit operation of said means to disconnect said motor from said source of energy.

16. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, means operated by said motor for permitting actuation of said motor, the other of said relays being adapted to control said motor whereby operation of said first named relay causes operation of said second named relay, operation of said second named relay connecting said motor and said source of supply to permit operation of said gate to closed position and to operate said means to disconnect said source of current supply from said motor to render said motor inoperative, said first named relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said second named relay, said source of energy being connected through

said first named relay and said means to said motor through said second named relay to operate the gate to open position and to permit operation of said means to disconnect said motor from said source of energy.

17. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a relay, motor operating means, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, operation of said motor operating means connecting said motor through said motor operated means to said source of supply to operate said gate to closed position and to operate said motor operated means to disconnect said source of current supply from said motor to render said motor inoperative, said relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said motor operating means, said source of energy being connected through said relay and said motor operated means to said motor through said motor operating means to operate the gate to open position and to permit operation of said motor operated means to disconnect said motor from said source of energy.

18. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a relay, motor operating means, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, operation of said motor operating means connecting said motor and said source of supply to operate said gate to closed position, said relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said motor operating means, said source of energy being connected through said relay and said motor operated means to said motor through said motor operating means to operate the gate to open position and to permit operation of said motor operated means to disconnect said motor from said source of energy.

19. In a railway gate operating system, the combination of a track block, a gate having a motor controlling operation thereof, a relay, motor operating means, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, a source of current supply, motor operated means for permitting actuation of said motor, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, operation of said motor operating means connecting said motor and said source of supply to operate said gate to closed position and to permit operation of said motor operated means to disconnect said source of current supply from said motor to render said motor inoperative, said relay being operated when said block is cleared by exit of vehicles therefrom whereupon said source of energy is disconnected from said motor operating means, said source of energy being connected through said relay and said motor operated means to said motor through said motor operating means to permit operation of the gate to open position and to operate said motor operated means to disconnect said motor from said source of energy.

20. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated continually by a vehicle while in said block, a source of current, said one relay controlling the flow of current from said source, the second relay controlling the direction of rotation of the motor and means operated by said motor for permitting actuation of said motor until the gate is in closed position.

21. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a plurality of relays, a circuit therebetween, one of said relays being connected to said block and being adapted to be operated continually by a vehicle while in said block, a source of current, said one relay controlling the flow of current from said source, the second relay controlling the direction of rotation of the motor, means operated by said motor for permitting actuation of said motor until the gate is in closed position, and motor operated means effective when the train has left the block for permitting actuation of said motor until the gate is in open position.

22. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation

thereof, a relay, motor operating means, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated upon entry of a vehicle into said block, said relay remaining operated so long as a vehicle is within said block, means operated by said motor for controlling actuation of said motor, a source of current supply, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, said second relay associated with said motor operated means and controlled thereby, operation of said motor operating means connecting said motor to said source of supply to operate said gate to closed position, said second relay including means actuated by said motor operated means for reversing said motor to lift said gate.

23. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a relay, motor operating means including a second relay, a circuit connecting said relay and motor operating means, said relay being connected to said block and being adapted to be operated by entry and exit of a vehicle into and from said block, means operated by said motor for controlling actuation of said motor, a source of current supply, said motor operating means being adapted to control said motor whereby operation of said relay causes operation of said motor operating means, said second relay associated with said motor operated means and controlled thereby, operation of said motor operating means connecting said motor to said source of supply to operate said gate to closed position, said second relay including means actuated by said motor operated means for reversing said motor to lift said gate.

24. In a railway gate operating system, the combination of a track block, a gate having a reversible motor controlling operation thereof, a relay, motor operating means including a second relay, a circuit connecting said relay and motor operating means, said first named relay being connected to said block and being adapted to be operated by entry and exit of a vehicle into and from said block, means operated by said motor for controlling actuation of said motor, a source of current supply, said second named relay being actuated by said motor operated means for controlling said motor whereby operation of said second named relay causes operation of said motor in either of two directions by connecting said source of supply to said motor through said motor operating means.

Signed at Chicago, Illinois, this 7th day of October, 1927.

ORVILLE L. VINCENT.