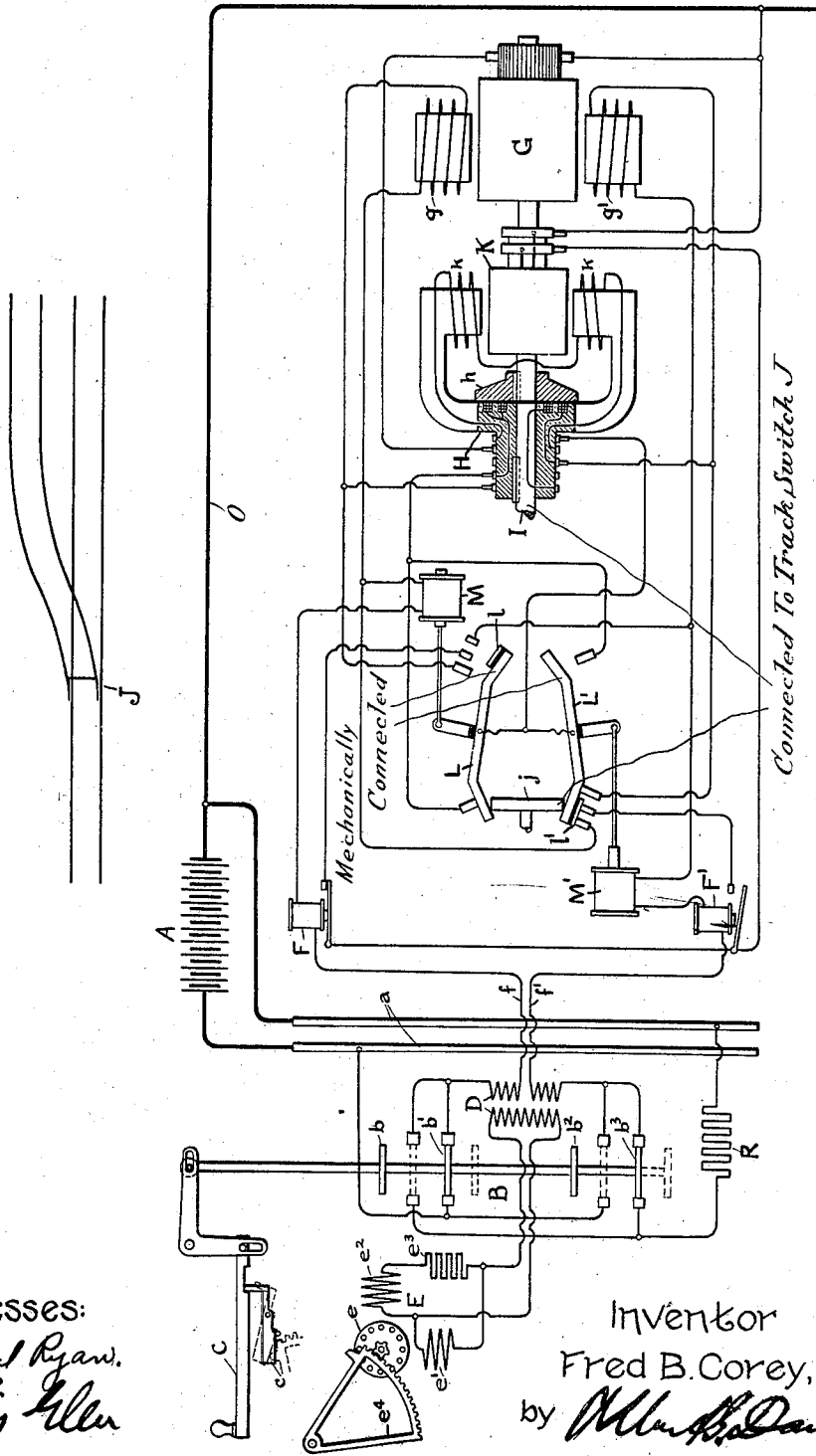


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 RETURN INDICATION DEVICE FOR ELECTRIC INTERLOCKING SYSTEMS.
 APPLICATION FILED SEPT. 24, 1908.

996,460.

Patented June 27, 1911.



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UNITED STATES PATENT OFFICE.

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RETURN-INDICATION DEVICE FOR ELECTRIC INTERLOCKING SYSTEMS.

996,460.

Specification of Letters Patent. Patented June 27, 1911.

Application filed September 24, 1908. Serial No. 454,644.

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Return-Indication Devices for Electric Interlocking Systems, of which the following is a specification.

My invention relates to the control of railway apparatus for controlling traffic such as track switches driven by electric motors, and its object is to provide a novel arrangement of the return indication device which shows that the movement of the track switch or other apparatus is completed. In systems of this character, commonly known as electric interlocking systems, the control levers are ordinarily so arranged that the first part of the movement of the control lever energizes the electric motor to drive the switch controlled by the lever. The control lever is arrested, before it has completed its movement, by a catch, which is released only by the return indication, showing that the movement of the track switch has been completed. The movement of the lever may then be completed so as to unlock other levers interlocked therewith. Since the safety of the system depends largely upon the certainty that the track switch has completed its movement when the return indication is received, it is desirable that the return indication device should be so arranged as to remain unaffected by any currents except the return indication current which is to operate it.

It has been proposed heretofore, in electric interlocking systems employing direct current for the driving motors, to use alternating current for the return indication and to arrange the return indication magnet so that it cannot be affected by direct current as for instance, by connecting it to the return indication circuit through a transformer. Even with such an arrangement there is a possibility of the magnet being actuated by a fluctuating direct current.

The object of my invention is effectively to guard against such a possibility.

My invention consists in employing a rotary motor arranged to be energized by the return indication current and so connected to the catch which stops the lever that the catch can be released only after the motor has

completed a predetermined plurality of revolutions. With such an arrangement, while a fluctuating current might cause the motor to start, it could not drive it a sufficient number of revolutions to release the lever.

My invention will best be understood by reference to the accompanying drawing which shows diagrammatically an electric interlocking system provided with a return indication device arranged in accordance with my invention.

In the drawing A represents a storage battery or other source of current for the driving motors of the system. The terminals of this battery are connected to the bus bars *a*.

B represents a switch member carrying four contacts *b* to *b*³ and actuated by the control lever C.

c represents a latch arranged to arrest the control lever C in mid position by engagement with a slot on the lower side of the control lever.

D represents a transformer having two primary windings connected to contacts of the switch member B and a secondary winding connected to the primary winding of a small rotary motor E. This motor is shown diagrammatically as of the well known induction type, comprising a short circuited rotor *e* and two primary windings or sets of coils *e*¹, *e*². These windings are connected in parallel, with a non-inductive resistance *e*³ in series with the winding *e*², so as to give a relative phase displacement to the currents in the two windings and thereby to give the motor a starting torque as is well understood in the art. The motor *e* carries a pinion which engages with a gear sector *e*⁴ which is normally in the position shown in the drawings and which, whenever the motor is energized, returns by gravity to that position. When the motor E is energized it rotates in such a direction as to raise the gear sector *e*⁴, and after the motor has completed a number of revolutions determined by the relative sizes of the pinion and the gear sector, the gear sector is brought into engagement with the latch *c* so as to move the latch out of engagement with the control lever C, as indicated in dotted lines, thereby permitting the control lever to complete its movement. The relative size of pinion and gear sector are preferably so chosen that a plu-

rality of revolutions of the motor are required to bring the gear sector into position to release the latch. It will be seen that such a return indication device not only is not affected by direct current but cannot be effectively actuated by a fluctuating current, which, while it might cause the motor to move slightly, could not drive it the necessary number of revolutions to release the latch, since each impulse could carry the motor only a part of a revolution and after each impulse the gear sector would return by gravity to the position shown in the drawings.

My return indication device is not limited to any particular arrangement of interlocking system, but for the sake of illustration I have shown it in connection with the system described in my earlier application, Serial No. 443,840, filed July 16, 1908, and in order that the operation of the system may be understood without reference to my earlier application I shall describe the system here. The two primary windings of the transformer D are connected in series with the control wires f and f^1 .

F and F^1 represent relays in the control-wires.

G represents the armature, and g, g^1 the field windings of an electric motor. This motor is reversible, the field windings being connected for this purpose in the well-known manner, so that one winding or the other is energized for the opposite directions of rotation of the motor.

H represents a magnetic clutch, the member carrying the energizing winding of the clutch being fast to a shaft I, which drives through suitable connections (not shown) a track-switch indicated diagrammatically at J. The armature h of the clutch is fast to the shaft of the motor armature G. The clutch is shown provided with two concentric windings, either of which may energize it, two windings being used merely to simplify the wiring.

K represents the armature of a small alternating-current generator, which armature is mounted on the shaft of the motor armature. This generator is provided with field windings k, k^1 , which are carried on a field magnet, which is in turn carried by the shaft I. When the clutch H is energized, the armature and field of the small generator are locked together, and no current can be induced in the generator armature. When the shaft I is stationary, the clutch H deenergized, and the motor-armature G running, an alternating voltage is induced in the generator-armature K, which voltage is employed for furnishing the return indication. Collector rings are provided for clutch H, armature K, and field k , as shown.

L L^1 represent switch-contact members, which are controlled by a member j connect-

ed to and moving with the track-switch. These contact members carry auxiliary contacts l and l^1 .

M and M^1 represent a pair of electromagnets connected to the control-wires f and f^1 , respectively, and jointly with the member j controlling the switch members L L^1 .

The diagram shows the conditions when the movement of the track-switch from one direction to the other has just been started. The control-lever has been moved to bring the switch member B from the initial dotted-line position to an intermediate position, shown in full lines. In this position of the switch member B, a circuit is closed from the left hand terminal of battery A, through contact b^1 , through one primary of transformer D, control-wire f , relay F, magnet M, motor field winding g , the inner winding of clutch H, contact member L, generator field winding k , and motor-armature G, to the common main O. Relay F, magnet M, clutch H, motor field winding g , generator field winding k , and motor-armature G are all energized. The motor consequently starts and drives the track-switch, since the clutch connects the two together. Although the generator field k is energized, no current is induced in the generator armature, since the two elements of the generator are locked together by the clutch. As the track switch moves from one position to the other, member j moves from left to right. When the track-switch completes its movement, member j throws the switch members L and L^1 to their other positions. This short circuits the inner winding of clutch H. This short circuit may be traced from the left-hand collector-ring on clutch H, through switch member L and through switch member L^1 to the second collector ring from the left on clutch H. Motor-armature G is, therefore, disconnected from the track-switch and runs free. The field of the alternating-current generator is, therefore, stationary, while its armature is driven by the motor. Furthermore, the generator-armature is now connected to line-wire f^1 . This circuit may be traced from the left-hand collector-ring of armature K through the contact of relay F, through auxiliary contacts l of switch member L, through magnet winding M^1 and relay F^1 , the lower primary of transformer D, contact b^3 , resistance R, right-hand bus-bar a and common main O, to the right-hand collector ring of generator-armature K. The alternating current generated in this armature consequently produces a voltage in the secondary of transformer D to which the primary windings of the motor E are connected. The motor is therefore energized and turns its rotor e in a clockwise direction so as to raise the gear sector e^4 and to release the control lever C. The movement of the control lever and switch member B may then be com-

pleted so as to break the circuit of the main motor at contact b^1 . To reverse the track switch, switch member B is thrown in the other direction.

5 It will be understood that the relays F and F¹ are arranged not to respond to the current from the alternating-current generator. They may be so arranged, either by adjusting them to respond only to a pre-
10 determined current-strength, since the current from the alternating generator is naturally less than the motor current, or they may be designed in any of the well known ways, to render them unresponsive to alter-
15 nating-current.

In the normal operation of the system, the magnets M and M¹ perform no useful function. If, however, the completion of the movement of the track-switch is pre-
20 vented, so that switch members L and L¹ are left in an intermediate position, then, by throwing switch member C to its other position, magnet M or M¹ is energized to draw the switch members back to their original
25 position. It should be understood that the switch members L and L¹ are mechanically connected to each other, so as to move together.

30 Since the motor E is of a type which will not respond to direct current the insertion of the transformer D between the motor winding and the return indication circuit is not necessary, but the use of this trans-
35 formed simplifies the motor connections and for this reason I prefer to employ it.

I do not desire to limit myself to the particular construction and arrangement of parts shown, but aim to cover in the appended claims all modifications which are
40 within the scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In combination with an electric motor, a traffic controlling device, operative connec-
45 tions between said motor and device, a return indication circuit, means for producing a current in said circuit when said device is driven by said motor to a predetermined position, a rotary motor arranged to be en-
50 ergized by said current, a member adapted to be operated by said rotary motor, and gearing between said rotary motor and said member whereby said member is actuated

only by a predetermined plurality of revolutions of said motor.

2. In combination with an electric motor, a traffic controlling device, operative connec-
55 tions between said motor and device, a return indication circuit, means for producing a current in said circuit when said device is driven by said motor to a predetermined position, a rotary motor arranged to be en-
60 ergized by said current, a pinion driven by said rotary motor, a member having gear teeth meshing with said pinion, and a second
65 member arranged to be operated by the first member after the first member has moved a distance corresponding to a predetermined plurality of revolutions of said motor.

3. In combination with an electric motor, a control lever therefor, a traffic controlling
70 device, operative connections between said motor and said device, a return indication circuit, means for producing a current in said circuit when said device is driven by
75 said motor to a predetermined position, a rotary motor arranged to be energized by said current, a latch for said control lever, and operative connections between said rotary-
80 motor and said latch comprising gearing arranged to release said latch only after said rotary motor has completed a predetermined plurality of revolutions.

4. In combination with an electric motor, a traffic controlling device, operative connec-
85 tions between said motor and said device, a return indication circuit, means for producing in said circuit a current of a character differing from that on which said motor
90 operates when said device is driven by said motor to a predetermined position, a rotary motor operatively related to said circuit adapted to be energized only by current of
95 said character, a member adapted to be actuated by said rotary motor, and gearing between said rotary motor and said member whereby said member is actuated only by a predetermined plurality of revolutions of said motor.

In witness whereof, I have hereunto set
100 my hand this 22nd day of September, 1908.

FRED B. COREY.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.