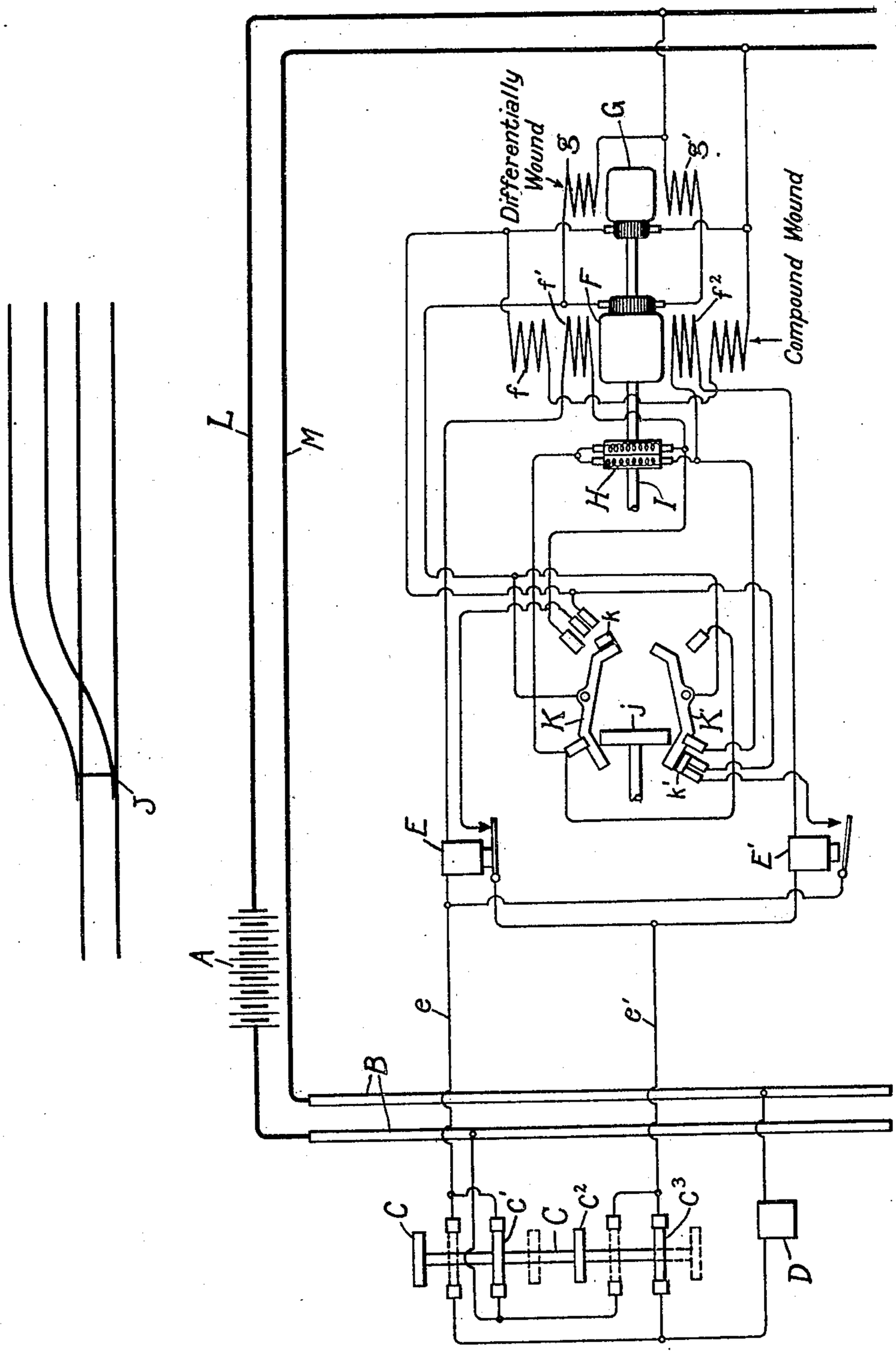
L. A. HAWKINS.

CONTROL OF RAILWAY APPARATUS.

APPLICATION FILED JULY 16, 1908.

919,573. Patented Apr. 27, 1909.



Witnesses:
Lloyd C. Bush
J. Ellis Glen.

Inventor:
Laurence A. Hawkins
By Allen & Dann
Atty.

UNITED STATES PATENT OFFICE.

LAURENCE A. HAWKINS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROL OF RAILWAY APPARATUS.

No. 919,573. Specification of Letters Patent. Patented April 27, 1909.

Application filed July 16, 1908. Serial No. 443,841.

To all whom it may concern:

Be it known that I, LAURENCE A. HAWKINS, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Control of Railway Apparatus, 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 for giving the return indication to show 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 switch has been completed. The movement of the lever may then be completed, so as to unlock other levers interlocked therewith. The safety of the systems depends largely on the certainty that the track-switch has completed its movement when the return indication is received. It is the usual practice to place a magnetic clutch between the electric motor and the track-switch; the clutch being de-energized by contacts controlled by the track-switch when the track-switch has completed its movement.

My invention consists in providing a small generator driven by the motor, and adapted, when the motor is unclutched from the track-switch, to generate a voltage higher than that supplied to the motor, and providing a return indication device responsive only to the higher voltage of the generator. For instance, if the motor is operated at 110 volts, the small generator may be wound to deliver 250 volts when the motor is running free, and the return-indication device may be arranged to respond to not less than 200 volts. By such an arrangement, all possibility of the return-indication device being actuated by an accidental cross on the motor control-wires is eliminated.

My invention further comprises certain connections of the field windings of motor and generator, whereby the motor speed is limited, so that it will not reach an excessive speed, if allowed to run free for any length of time, and whereby the voltage of the generator is increased rapidly when the motor is unclutched from the track-switch and its speed increases.

My invention will best be understood by reference to the accompanying drawing, which shows diagrammatically a control system for a track-switch arranged in accordance with my invention.

In the drawing A represents a battery, or other source of current for supplying the motor for driving the switch. This battery may be of any suitable voltage, as, for instance, 110 volts.

B represents bus-bars, and C a switch member actuated by the control lever (not shown) for the switch motor and having contacts c to c^3.

D represents diagrammatically the return indication magnet, which may be arranged in any well-known manner, and which is designed to respond only to a voltage substantially higher than that furnished by the battery A.

e e^1 represent control-wires for the motor.

E E^1 represent relays in the control-wires.

F represents the armature of the driving motor for the track-switch. This motor has a main winding arranged in two parts f^1 and f^2, to which parts respectively current is supplied for operating the motor in opposite directions of rotation in the well-known manner. This motor is provided with an auxiliary winding f, which assists the main winding, as indicated by the legend "Compound-wound" placed below the motor. The auxiliary winding f is connected in shunt to the armature G of a small auxiliary generator driven by the motor. This generator has a main winding g connected in shunt to the motor-armature F, and an auxiliary winding g^1 connected in series with the motor and opposing the main winding g. The opposition of the two windings of the small generator is indicated by the legend "Differentially-wound" placed above the generator. The purpose of these particular connections of the windings of the two machines will be explained later.

The motor F is connected through a magnetic clutch H to a shaft I, which drives

through any suitable connection (not shown) a track switch indicated diagrammatically at J. The clutch H is shown diagrammatically, and may be of any well-known construction. The drawing indicates that this clutch has two windings. Either of these windings may energize the clutch, the two windings being employed merely for the sake of simplifying the wiring.

K and K¹ represent contact members which are arranged to be operated by a member *j* connected to and moving with the track-switch J. These contact members carry auxiliary contacts *k* *k*¹.

L represents the common return-wire for the motor circuits, and M the common return-wire for the indication circuits.

The parts are shown in the positions occupied when the movement of the switch in one direction has just begun. The control-lever has been moved to an intermediate position, bringing the switch member C from its dotted-line position to the position shown in full lines. A circuit is closed from the left-hand terminal of battery A, through the left-hand bus bar B, contact *c*¹ of switch member C, control-wire *e*, relay E, motor field *f*¹, right-hand winding of clutch H, contact member K, motor-armature F, generator winding *g*¹, common return-wire L, to battery. Relay E and clutch H are consequently energized, and motor F starts to rotate in the direction in which it is driven when field-winding *f*¹ is energized. The motor consequently begins to drive the track-switch. Generator G has both its field windings energized, but its circuit is open at contact *k*, and contact of relay E, and furthermore its voltage is low because the current through the differential winding *g*¹ is comparatively large, since the motor is operating under load, so that the two windings *g* and *g*¹ nearly balance each other. Furthermore, the speed of motor and generator is comparatively low. When the switch completes its movement, reaching its other position, member *j* rocks switch-contacts K and K¹, and short-circuits the right-hand winding of clutch H. This short-circuit may be traced from the upper terminal of this winding through switch member K¹ and through switch member K to the lower terminal of the clutch winding. The clutch is, therefore, deënergized, unclutching the motor from the track-switch. The motor is thus left to run free, so that the speed rapidly rises, and the current as rapidly falls. This produces a double effect on the voltage of generator G, since the differential winding *g*¹ has its current rapidly decreased, while the speed at which the generator-armature is driven rapidly increases. The motor is prevented from running away, no matter how long its circuit may remain closed, by the auxiliary winding *f* in shunt to the generator-armature. As the generator voltage rises, the current in this winding on the motor grows rapidly stronger, and serves to limit the motor speed. At the same time that the motor is unclutched from the switch, thereby causing the rapid increase in generator voltage, the generator is connected to the control-lead *e*¹. This circuit may be traced from the upper brush of generator G, through auxiliary contacts *k*, contact of relay E, control-wire *e*¹, contact *c*³ on switch member C, return-indication magnet D, right-hand bus bar B, and common return-wire M, to the lower brush of the generator. The comparatively high voltage of generator G is thus impressed on the return-indication magnet, causing this magnet to respond, releasing the control-lever, permitting the movement of the lever to be completed, and thereby opening the motor-circuit at contact *c*¹. For rotation in the opposite direction, the direction of movement of the switch member C is reversed, thereby supplying current to the motor through line-wire *e*¹, and energizing relay E¹, motor field *f*² and left-hand coil of clutch H, so that the motor drives the switch in the opposite direction. Otherwise the operation is the same.

The field connections of motor and generator may be made permanently, since they require no reversal when the direction of rotation of the motor is reversed. This will be seen from the following considerations. The current through the motor-armature F is never reversed, but flows always in the same direction, so that the current in the windings *g* and *g*¹ of the generator are never reversed. Since the direction of rotation of the generator reverses, however, the polarity of its brushes is reversed every other movement of the track-switch, so that the direction of current-flow in the auxiliary motor winding *f* is reversed every other movement. This reversal, however, is precisely what is required in order that the winding *f* may always assist the main motor winding, since the main field of the motor is reversed every other movement.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are 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, means for supplying current thereto, a traffic controlling device, a magnetic clutch for connecting the motor to said device to drive it, means controlled by the movement of said device for deënergizing the clutch, means driven by said motor for generating a voltage higher than that supplied to the motor when the motor is unclutched from said de-

vice, and an electromagnetic device responsive only to the higher voltage.

2. In combination with an electric motor, control-wires therefor, a traffic controlling device, a magnetic clutch for connecting the motor to said device to drive it, means controlled by the movement of said device to a predetermined position for deënergizing said clutch, means driven by said motor for generating a voltage higher than that supplied to the motor through said control-wires when the motor is unclutched from said device, and an electromagnetic device connected to the control-wires and responsive to the higher voltage.

3. In combination with a reversible electric motor, a pair of control-wires through which current is supplied to the motor for opposite directions of rotation respectively, a traffic controlling device, a magnetic clutch for connecting the motor to said device to drive it, a small electric generator driven by the motor and when the motor is unclutched from said device adapted to generate a voltage higher than that supplied to the motor, means controlled by the movement of said device for deënergizing said clutch and for connecting the generator to the control-wire other than that through which current is then being supplied to the motor, and an electro-responsive device responsive only to the voltage impressed by said generator on said control wire.

4. In combination with an electric motor, means for supplying current thereto, a traffic controlling device, a magnetic clutch for connecting the motor to said device, means controlled by the movement of said device for deënergizing said clutch, a small generator driven by said motor and adapted when the motor is unclutched from said device to generate a higher voltage than that supplied to the motor, said motor having a main field winding in series with its armature and an auxiliary field winding in shunt to the armature of the generator, and an electromagnetic device responsive to the voltage produced by the generator.

5. In combination with an electric motor, means for supplying current thereto, a traffic controlling device, a magnetic clutch for connecting the motor to said device to drive it, means controlled by the movement of said device for deënergizing said clutch, a small generator driven by said motor and adapted when the motor is unclutched from said device to generate a higher voltage than that supplied to the motor, said generator having a main field winding in shunt to the motor-armature and an auxiliary differential field winding in series with the motor, and an electromagnetic device responsive only to the voltage produced by the generator.

In witness whereof, I have hereunto set my hand this 15th day of July, 1908.

LAURENCE A. HAWKINS.

Witnesses:
HELEN ORFORD,
THOMAS W. NOONAN.