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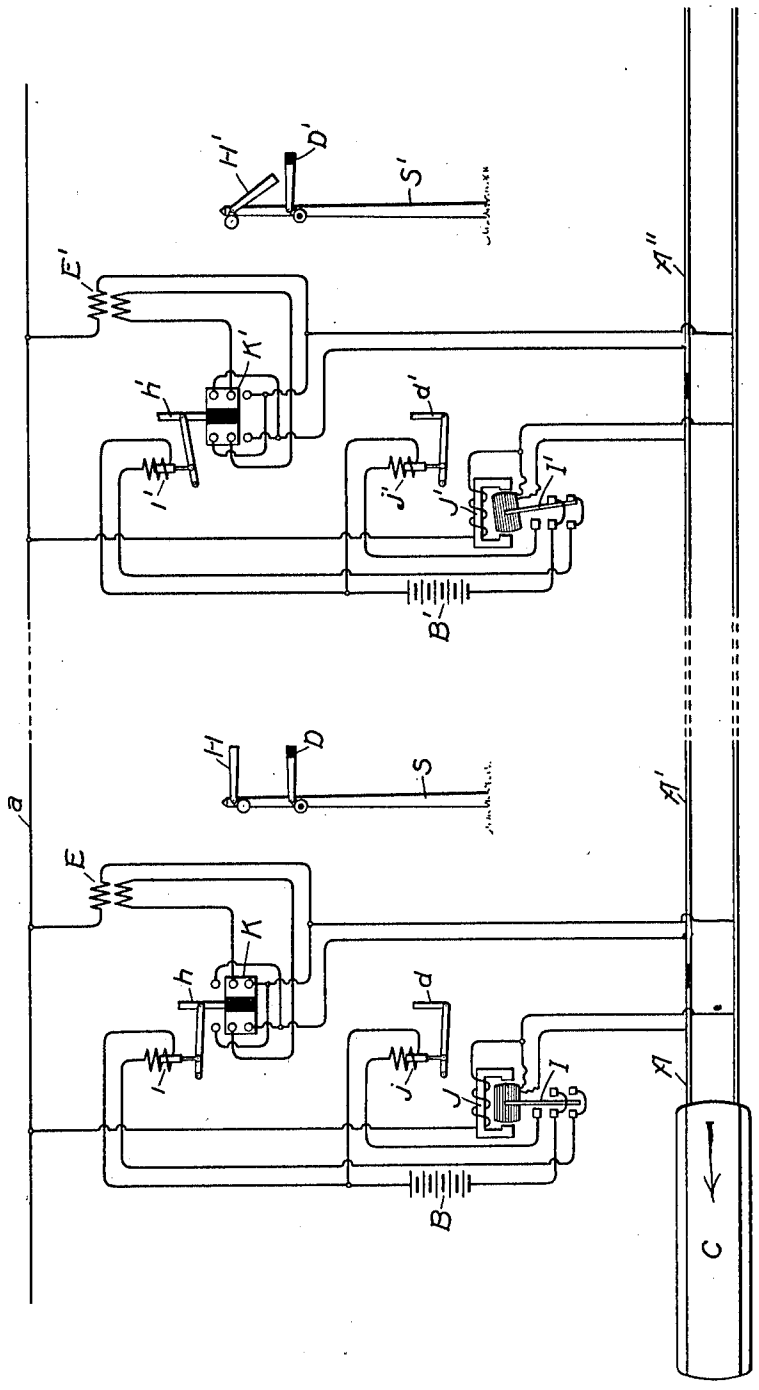
BLOCK SIGNAL SYSTEM.

APPLICATION FILED JULY 19, 1904.

949,322. Patented Feb. 15, 1910.



Witnesses.

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BLOCK-SIGNAL SYSTEM.

949,322. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed July 19, 1904. Serial No. 217,212.

To all whom it may concern:

Be it known that I, LAURENCE A. HAWKINS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Block-Signal Systems, of which the following is a specification.

My invention relates to block signal systems, and its object is to provide a novel system particularly adapted for operation by alternating current.

In block signal systems in which home and distant signals are used, the operating mechanism for the signals, as is well understood, should be so arranged that when a train is in a block, the home signal at the entrance to that block and the distant signal at the entrance to the preceding block should be at danger. These two signals are on different semaphore posts, and the length of a block apart.

When direct current is employed as the source for the track circuits and signal-controlling relays, two methods are in common use for securing the proper operation of the home and distant signals. In one of these systems a relay at the entrance to a block controls the circuit of the operating mechanism for the home signal at that point and also the circuit for the operating mechanism of the distant signal at the entrance to the preceding block. With this arrangement it is necessary that the circuit of the operating mechanism for the distant signal should extend the length of the block. In another arrangement the necessity for these circuits, each one extending the length of a block, is done away with by the use of a polarized relay for controlling the circuit of the operating mechanism of the distant signal. By the use of the polarized relay, the relays for the operating mechanisms for all the signals may be placed at the same points at which the signals themselves are placed. It is evident that this latter system possesses a number of advantages over the former, both as regards cost of installation and maintenance.

When alternating current is employed as the source for operating the signal mechanisms, it is evident that a polarized relay cannot be used, such relays being suited to direct current only. In certain cases alternating current has several advantages over direct current for use in such systems. In the case of an electric railway where the rails act as return conductor for the trolley current, the current in the rails interferes with the proper operation of the signal relays when direct current is used in the track circuit. When alternating current is used, it is possible to employ relays for the signals, which are not affected by direct current. In a Patent No. 845,220, issued to F. B. Corey, February 26, 1907, is disclosed a system in which alternating current may be used with its attendant advantages, and in which all the advantages of the direct current system without wires may be obtained. This system consists in the employment of two relays, one for operating the home signals, responsive to a flow of current, and the other being responsive to a reversal of current in the block, relative to the source. The first of these relays, controlling the home signals, is of the usual type, but is screened from direct currents by being connected to the rails through a transformer. The second relay, which operates the distant signals, is of the wattmeter type, having one member excited by alternating current taken directly from the source and the other member excited by alternating current taken from the block, which is connected to the source through a reversing switch controlled by the home signal one block in advance. When this home signal operates, the direction of current in the block is reversed relative to that in the source, and the direction of torque of the wattmeter relay, controlling the distant signal at the entrance of the block, is reversed. Thus, by using a transformer with one relay, and a relay of the wattmeter type corresponding to the usual polarized relay, a system similar to the direct current is obtained.

My invention in one aspect consists in an improvement in the above described system, and comprises a novel arrangement of a relay and its circuit, such that a single relay takes the place of both relays used in the above system. I accomplish this by providing a single relay of the wattmeter type arranged when moved in one direction to close the circuit for one signal, and when moved in the other direction to close the circuit of both signals; while when deënergized, the circuits of both signals are open. With this arrangement, one relay and its transformer

may be omitted, thereby simplifying the system and reducing the expense. Furthermore, not only is the relay unaffected by direct current in the rails, but it is also unaffected by an alternating current of different frequency, a result that cannot be obtained with a simple relay connected to the track through a transformer.

In its broader aspect my invention is not limited to a system employing alternating-current in the track circuit, but consists in the combination with home and distant signals and their operating mechanisms, of a relay movable in either direction and controlling the operating mechanisms; the relay being so arranged that when it is moved in one direction it energizes the operating mechanisms for both signals, and in the other direction the mechanism for the home signal only, together with means operatively connected to the home signal of the following block for reversing the connections from the rails of the block to the source of current.

My invention will best be understood by reference to the accompanying drawing, which shows diagrammatically the relay and its circuits arranged in accordance with my invention.

In the drawing, A A′ A″ represent three blocks of a railway. It will be seen that only one of the rails is divided into blocks, the other rail being continuous throughout all the blocks so as to serve as return conductor for the power current.

a represents a line-wire connected to a source of alternating current and connected to the continuous rail through the primaries of the transformers E, E′. With this arrangement, the continuous rail acts as return conductor for the alternating current also, but a separate return conductor may be employed if preferred.

S and S′ represent two semaphore posts at the entrance to blocks A and A′ respectively. Each post carries a home signal H and a distant signal D, the signals for the block A being the home signal H on semaphore post S, and the distant signal D′ on semaphore post S′. Thus, when a car is in block A, as indicated by C, signals H and D′ should be at danger, as shown; while signal H′ is at safety position, since no car is in block A′.

The secondaries of transformers E and E′ are connected to the blocks A′ and A″ through reversing switches K and K′. By means of these switches the phase of the currents in the rail circuits relative to the current in line-wire *a* may be reversed. To the other ends of the blocks are connected one winding of the relays J J′, which are shown as of the wattmeter type with their movable windings connected to the block circuits. The other, or stationary, windings of the relays are connected directly between the line-wire *a* and the return rail.

The movable member of the relay carries a contact member I, which controls the circuits of the two magnet coils *i* and *j*, which, when contact member I is moved toward the left, are both energized from the battery B, or other suitable source, while when the contact member I is moved toward the right, only the winding *i* is energized. When member I is in the position shown, the circuits of both magnet windings are open. This is the position which the contact member assumes either by gravity or a spring when the relay is deënergized. The magnet windings *i* and *j* control the rods *h* and *d*, respectively, which are the operating rods for the home signal H and distant signal D, respectively. The connections between these rods and the signals are omitted for the sake of simplicity. The rod *h* also controls the phase-changing or reversing switch K. The phase-changing switch K controls the phase of the current in the block A′, relative to the phase of the current in line-wire *a*, as will be readily seen from tracing out the circuits of this switch. In other words, the switch K controls the relative phases of the currents in the two members of the relay J′. The operation is then as follows: with a car C in the block A the armature of relay J is short-circuited, the relay is consequently deënergized and assumes the position shown in the drawing, thereby opening the circuits of both magnet windings *i* and *j*. Both signals H and D go to danger by gravity, indicating the presence of the car in the block. As signal H goes to danger rod *h* is moved downward to move switch K to the position shown. The relay J′ has its movable winding energized with current in a direction, relative to that in line-wire *a*, determined by the position of switch K. The direction of current is such as to move contact member I′ to the right, thereby closing the circuit of magnet coil *i*′, while leaving the circuit of magnet coil *j*′ open. Home signal H′ is consequently drawn to safety position by magnet winding *i*′, while the distant signal D′ remains at danger. When car C leaves block A and enters the following block, relay J will be energized in the same manner as relay J′, thereby closing the circuit of magnet winding *i*, and drawing home signal H to safety. This will move reversing switch K to its upper position, and reverse the direction of current through the block A′, relative to the direction of current in line-wire *a*, thereby reversing the direction of torque in relay J′. Contact member I′ will be moved toward the left, closing the circuits of both windings *i*′ and *j*′, and signals H′ and D′ will consequently be drawn to safety, indicating that both blocks A and A′ are clear.

Evidently, direct current in the track circuit cannot affect the operation of the signals, since direct current in the movable winding and alternating current in the stationary winding would produce a torque alternating in direction. The same would be the case with alternating current in the track circuit of a different frequency from that of the current in the signal circuit.

Although I have shown my invention as applied to a signal system employing alternating-current in the track circuit, it will be understood that in some of its aspects my invention is equally applicable to direct-current systems.

It will be understood that I have shown the operating mechanisms for the signals diagrammatically, and that any well known form of operating mechanism may be used in the arrangement that I have shown and described.

Accordingly, I do not desire to limit myself to the particular construction and arrangement of parts here shown, but I 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 a block signal system, home and distant signals at the entrance to a block, operating mechanisms therefor, a relay movable in either direction and controlling said operating mechanism, said relay being arranged when moved in one direction to energize the operating mechanism for both signals and in the other direction the mechanism for the home signal only, and means operatively connected to the home signal of the following block for reversing the direction of movement of said relay.

2. In a block signal system, home and distant signals at the entrance to a block, electro-responsive operating mechanisms therefor, a relay movable in either direction, switch contacts controlled by said relay and arranged to close the circuits of both mechanisms when said relay is moved in one direction and of the mechanism for the home signal only when said relay is moved in the other direction, and means operatively connected to the home signal of the following block for reversing the direction of movement of said relay.

3. In a block signal system, a source of current connected to one end of a block, a relay connected to the other end of the block comprising an armature having an off position and movable in either direction from said off position upon a reversal of current in the block relative to the source, means for reversing the current in the block relative to the source, and signal mechanism for the block controlled by the relay and adapted to give three distinct indications corresponding to the three positions of the relay armature.

4. In a block signal system having home and distant signals, a source of current connected to one end of a block, means controlled by the home signal of the following block for reversing the connections of said source to said block, a relay connected to the other end of the block and movable in opposite directions upon a reversal of current in the block relative to the source, and home and distant signals controlled by said relay.

5. In a block signal system, a source of alternating current connected to a block, means for reversing the connections of said source to the block, a relay having two windings relatively movable in either direction, one of said windings being connected to said source and the other to said block, a signal arranged and connected to be operated by the movement of said relay in either direction, and a second signal arranged and connected to be operated by the movement of said relay in one direction only.

6. In a block signal system, a source of current connected to one end of a block, a relay connected to the other end of the block comprising an armature having an off position and movable in either direction from said off position upon a reversal of current in the block relative to the source, means controlled by a train in the following block for reversing the current in the block relative to the source, a signal for the block adapted to give three distinct indications corresponding to the three positions of the relay armature, and electric operating means for the signal controlled by the relay armature.

7. In a block signal system having electrically-operated home and distant signals, a source of alternating current connected to one end of a block, means controlled by the home signal of the following block for reversing the connections of said source to said block, a relay having two relatively movable windings, one connected to the other end of said block and the other to said source, and means operatively connected to said relay for closing the circuit of the operating mechanism of the home signal for said block upon a movement of said relay in either direction and for closing the circuit of the operating mechanism of a distant signal upon a movement of said relay in one direction only.

8. In a block signal system, home and distant signals at the entrance to a block, operating mechanisms therefor, a selective relay movable in either direction and controlling said operating mechanism, said relay being arranged when moved in one direction to energize the operating mechanism for both signals and in the other direction the mechan-

ism for the home signal only, and means operatively connected to the home signal of the following block for reversing the direction of movement of said relay.

9. In a block signal system, home and distant signals at the entrance to a block, electro-responsive operating mechanisms therefor, a selective relay movable in either direction, switch contacts controlled by said relay and arranged to close the circuits of both mechanisms when said relay is moved in one direction and of the mechanism for the home signal only when said relay is moved in the other direction, and means operatively connected to the home signal of the following block for reversing the direction of movement of said relay.

10. In a block signal system, signals for the several blocks, operating mechanisms therefor adapted to cause the signals to give three distinct indications, a source of alternating current connected to the rails of each block, a relay for each block having two cooperating windings, one supplied from the track rails and the other supplied with alternating current independently of the rail circuit, said relay being movable in either direction from off position according to the relative phases of the currents in its windings and being provided with contacts controlling the operating mechanism for causing the signal for that block to give different indications according to the direction of movement of the relay, and means controlled by a train in the block ahead for controlling the relative phases of the currents in the two windings of the relay.

11. In a block signal system, signals for the several blocks, operating mechanisms therefor adapted to cause the signals to give three distinct indications, a source of alternating current connected to the rails of each block, a relay for each block having two coöperating windings, one supplied from the track rails and the other supplied with alternating current independently of the rail circuit, said relay being movable in either direction from off position according to the relative phases of the currents in its windings and being provided with contacts controlling the operating mechanism for causing the signal for that block to give different indications according to the direction of movement of the relay, and means controlled by a train in the block ahead for controlling the relative phases of the currents in the two windings of the relay reversing the phase of the current supplied by said source to the track rails.

12. In a railway block signaling system, having a closed alternating-current track circuit for controlling the signals, a plurality of block sections, distant and home signals for each block, a single relay controlling said distant and home signals, controlled partly by said track circuit and partly by an external circuit, and means whereby one of the signal mechanisms of a distant block may affect the track circuit so as to reversely actuate said relay.

In witness whereof I have hereunto set my hand this 18th day of July, 1904.

LAURENCE A. HAWKINS.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.