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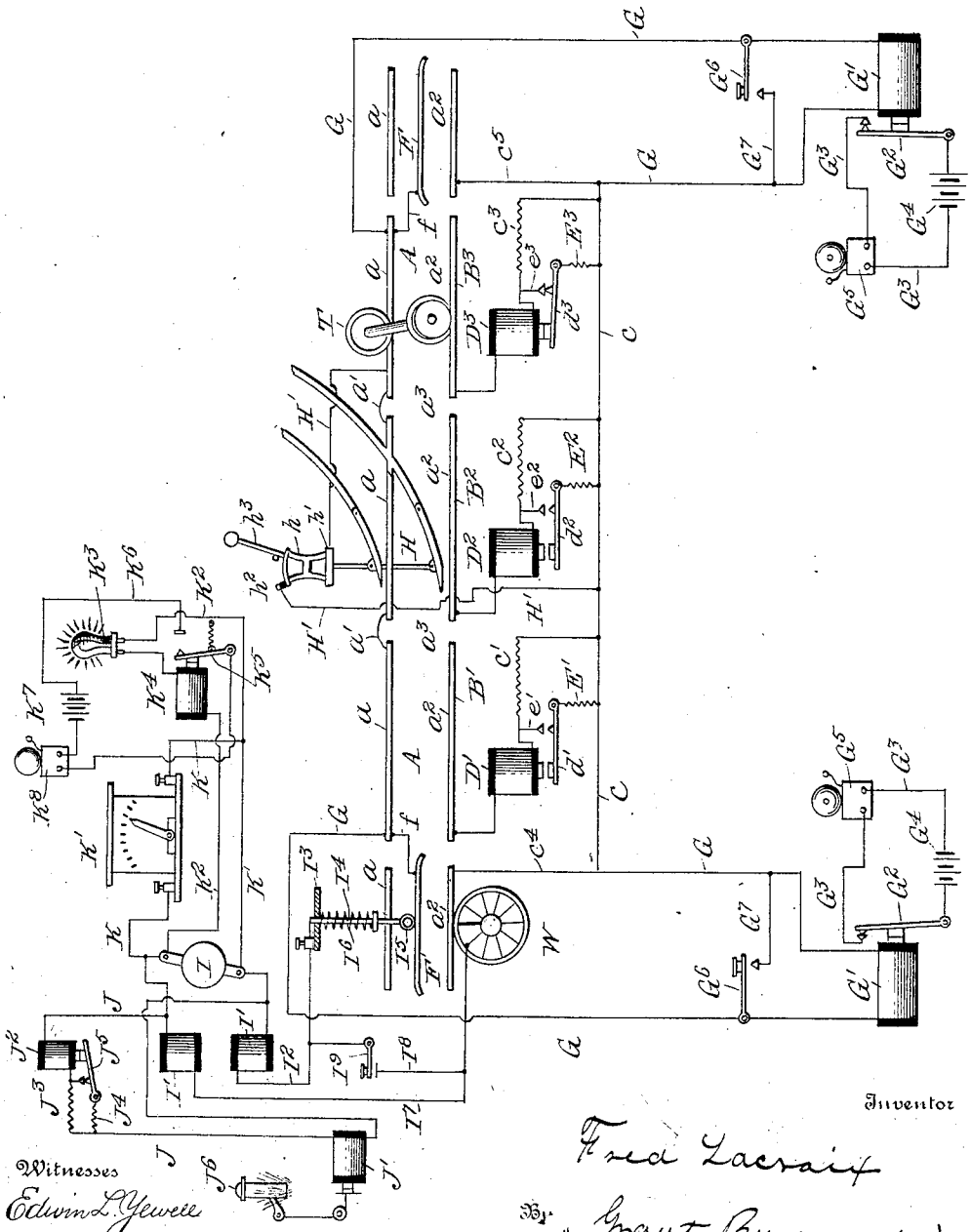
F. LACROIX.

ELECTRICAL SIGNAL SYSTEM.

APPLICATION FILED JAN. 31, 1905.



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ELECTRICAL SIGNAL SYSTEM.

No. 814,303. Specification of Letters Patent. Patented March 6, 1906.

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To all whom it may concern:

Be it known that I, FRED LACROIX, a citizen of the United States, and a resident of San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Electrical Signal Systems, of which the following is a full, clear, and exact description, such as will enable those skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, forming a part of this specification.

The invention relates to electrical signal systems whereby the position of a train or other obstruction on a railway-track can be ascertained at either terminal.

It more particularly relates to the system disclosed in the application for patent filed by me August 29, 1904, and which bears Serial No. 222,597. The system disclosed in the said application consists, primarily, of a circuit connected with a source of electricity extending along the track and divided into blocks of different electrical resistance and of an indicating mechanism to show the closing of the circuit through any one of the blocks. In that system the source of electricity and the indicating mechanism are placed at the stations at the terminals of the track, and no particular means are employed to notify the engineer in his cab of the condition of the track in front of him.

The present invention consists in employing the principle set forth in the foregoing application, so that an engineer in his cab can ascertain the condition of the track in front of him and also receive and transmit signals from and to the agents at the terminals or stations of the track. It consists in the novel construction, combination, and arrangement of parts, such as will be hereinafter fully described, pointed out in the appended claims, and illustrated in the accompanying drawing.

In the drawing is shown a diagrammatical view of an electrical signal system embodying the invention.

The railway-track A has one of its rails a electrically continuous from one end of the line to the other, the ends of the rail-sections being bonded in any suitable manner, as at a'. The other rail a^2 is divided by the insulating breaks a^3 into sections or blocks B' B^2 B^3, the number and length of which depend on the frequency of the trains and other determining conditions of the road. Extending along the track is the electrical conductor C, connected at intervals with the blocks or sections B' B^2 B^3 by the resistance-coils C' C^2 C^3, respectively. The ends of the conductor are connected with the end rail-sections of the rail a^2 by the wires C^4 and C^5, respectively. In the resistance-coils are interposed the magnets D' D^2 D^3, respectively, which control the switches d' d^2 d^3. These switches are respectively connected with the wires E' E^2 E^3, leading to the conductor C, and operate to connect said wires with the wires e' e^2 e^3, leading from the resistance-coils C' C^2 C^3.

At intervals along the track mid-rails F are placed. These mid-rails are generally placed at stations, although they may be placed at intermediate points. They are comparatively short and are electrically connected by the wires f with the ends of the electrically-continuous rail a. At each station where there is a mid-rail a conductor G leads from the end of the electrically-continuous rail a to the adjacent end of the conductor C. Interposed in this conductor is the magnet G' for operating the switch G^2, controlling the circuit G^3, passing from the battery G^4 through the bell G^5. The switch G^2 is normally in position to break the circuit G^3. When it is moved to close the circuit, the bell G^5 rings. The circuit passing through the magnet G' is controlled by the switch G^6 and the branch wire G^7.

At the track-switch H an electrical conductor H' leads from the electrically-continuous rail a to the conductor C. The conductor H' is broken, and one end is secured to the metal frame h of the switch-stand, as at h', and the other end is connected with the insulated contact h^2 on the switch-stand. When the operating-lever h^3 is thrown to close the main track to the siding, as shown in the drawing, the circuit through the conductor H' will be broken, and when said lever is thrown in the opposite direction, to open the main track to the siding the lever engages with the contact h^2 and establishes the circuit through the metal frame of the switch-stand, the operating-lever, and the conductor H' from the rail a to the conductor C.

Mounted on the locomotive is the shunt-

wound dynamo I, the field-coils I′ of which are connected by the wire I^2 with the support I^3, of insulating material, secured to the under side of the locomotive. Movably mounted in the insulated support is the rod I^4, having the trolley-wheel I^5 journaled on its lower end. The trolley-wheel is electrically connected with the wire I^2, leading from the field-coils of the dynamo. The trolley-wheel is normally pressed downward by the spring I^6 and is in position to engage with the mid-rails F as the locomotive moves along the track. The field-coils of the dynamo are also electrically connected with the traction-wheel W of the locomotive by the wire I^7. This connection can be made by securing an end of the wire I^7 to any part of the metal frame of the locomotive. The wire I^2 and the wire I^7 are connected by the branch wire I^8, controlled by the electrical switch I^9.

In multiple with the main circuit of the dynamo is the circuit J. Interposed in the latter are the magnets J′ J^2, and between the two is the coil J^3 of comparatively high resistance. Connected with this circuit J at a point intermediate of the resistance-coil J^3 and the magnet J′ is the coil J^4 of comparatively low resistance. This low-resistance coil is connected with the electrical switch J^5, operating to connect said low-resistance coil with the circuit J between the magnet J^2 and the high-resistance coil J^3. A current passing through the circuit J of sufficient voltage will energize the magnet J^8 to cause the whistle J^6 to blow.

Interposed in the main circuit K of the dynamo is the voltmeter K′. In multiple connection with the main circuit is the branch circuit K^2, passing through the electrical lamp K^3, and interposed in this lamp-circuit is the magnet K^4 for operating the switch K^5, controlling the circuit K^6, passing through the battery K^7 and the bell K^8. The switch K^5 is spring-pressed to normally close the circuit K^6 to continuously ring the bell K^8.

The operation of the device is as follows: In the system there are two incomplete circuits. One of them is on the locomotive and the other extends along the track. The locomotive-circuit has its terminals at the trolley-wheel I^5 and the traction-wheel W. The track-circuit has its terminals at the mid-rail F and the rail-section a^2 adjacent to the mid-rail. When the system is in operative condition, these two circuits are complements of each other, and this occurs when the trolley-wheel passes onto a mid-rail F and the traction-wheel passes onto the rail-rection a^2 opposite to the mid-rail.

When the two incomplete circuits come together and form a complete circuit throughout the entire system, there being no obstruction on the track, the current passing through the field-coils of the dynamo on the locomotive will pass to the extreme limit of the electrically-continuous rail a, through the branch circuit G to the main conductor C, back to the traction-wheel W, and thence to the field-coils of the generator. Part of the current entering the rail-section a from the mid-rail F will pass into the branch circuit G, connected with said rail-section. The current in passing through the branch circuits G will energize the magnets G′ to operate the switches G^2 to close the circuits G^3 to ring the bells G^5. The ringing of the bells would notify the agents at the stations at the ends of the track that a train had passed onto the same and warn them to be on the lookout. By means of the switch I^9 in his cab the engineer could break and make the circuit through the magnets G′, controlling the switches of the bell-circuits G^3, and through the ringing of the bells could signal to the station agents.

When the circuit throughout the system is closed and there is no obstruction on the track, the resistance in the circuit will be such as to cause the lamp K^3 in the circuit K^2 in multiple with the main circuit of the dynamo to glow with a dim light. Also under such conditions the current passing through the magnet K^4 would not be sufficiently strong to energize said magnet to move the switch K^5 against the action of its spring to open the circuit K^6 through the bell K^8 to stop the ringing of the latter. Furthermore, the current passing into the circuit J would not be sufficiently strong to pass by the resistance J^3 to energize the magnet J′ to blow the whistle J^6. Consequently by the dim glow of the lamp, the constant ringing of the bell, and the non-blowing of the whistle the engineer would know that the track was clear. The agent at either end of the track by closing the circuit G through the switch G^6 and the branch wire G^7, thereby cutting out part of the resistance of the track-circuit, could cause the lamp to glow brighter and by a system of flashes could signal to the engineer.

Should there be an obstruction on the track—a train T on the block B^3, for an instance—then the circuit would be closed through such block. The current would pass from the electrically continuous rail-section a in said block through the wheels and axle of the train to the opposite insulated rail-section a^2. The current would then pass from the insulated rail-section through the high-resistance coil C^3 to the conductor C. In doing so it would energize the magnet D^3 in said coil, and the switch d^3 would be moved to close the circuit through the low-resistance coil E^3, and the high-resistance coil would be cut out of the circuit. The resistance of this particular block being known—say thirty ohms—the indicator K′ registering such a resistance would inform the engineer that there was an obstruction on that particular block.

The same way with the other blocks, should the circuit be connected through them the particular one would be indicated, as their resistance differs from each other and from the block B^3. To illustrate, the resistance of the block B′ may be ten ohms and of the block B^2 twenty ohms. Should the indicator show either of these resistances, the engineer could locate the obstruction.

The purpose of the magnets D′ D^2 D^3 is to prevent the accidental short-circuiting of the system through the blocks by weather conditions, such as water, snow, and ice. Suppose that the dynamo is generating a current of about one hundred volts when it enters the electrically-continuous rail of the track. Could there be a leakage of, say, ninety volts across the tracks through the presence of water, snow, or ice at any one of the blocks, to operate the signals through this particular block the current would have to pass from the insulated rail-section to the conductor C, which is so placed as not to be affected by weather conditions. The passage of this ninety volts to the conductor C would be prevented by the high-resistance coil in that particular block connecting the insulated rail-section and the conductor C. To pass this high-resistance coil C^1, C^2, or C^3, as the case may be, the current would have to have a strength of at least one hundred volts to overcome the resistance of one hundred ohms in such coil. As soon as the remaining ten volts are permitted to pass through the intervention of a train, the circuit through the high-resistance coil would be established and the indicator would designate the particular block through which the circuit has been completed. The ninety-volts leakage is a very high maximum and one that would not likely happen even under the most severe antagonistic weather conditions.

Should any considerable part of the resistance be cut out of the main circuit of the system, which includes the shunt-circuit of the dynamo, by a train moving onto the block B^3, for an instance, the voltage in the main circuit of the dynamo would be correspondingly increased. This increased voltage passing over the branch circuit K would cause a brighter glow of the lamp K^3. Also the increased current would energize the magnet K^4 to move the switch K^5 to break the circuit through the bell K^6, and thereby would stop the ringing of the said bell. The increased glow of the lamp, which would burn with a dull glow under ordinary conditions, and the cessation of the ringing of the bell would notify the engineer of an obstruction on the track, and by looking at the indicator K′ he could ascertain the particular block where the obstruction was located.

The increased voltage in the main circuit of the dynamo, caused by the obstruction on the track cutting out a large part of the resistance in the shunt-circuit, will overcome the resistance of the coil J^3 in the circuit J in multiple with the main circuit of the dynamo. The current passing through the circuit J energizes the magnet J^2 to move the switch J^5 to cut out the high-resistance coil J^3 and complete the circuit through the low-resistance coil J^4. The strength of the current passing through the circuit after the high resistance has been cut out and the low resistance introduced will be sufficient to energize the magnet J′ to blow the whistle J^6, which would also attract the attention of the engineer to the obstruction on the track.

Should the track-switch H be thrown to open the main track to the siding, the track-circuit would be completed through the conductor H′. This would eliminate a very large proportion of the resistance from the shunt-circuit of the dynamo, and there would be a proportional increase in the voltage of the current in the main circuit of the dynamo. This increase in voltage would cause an increased brightness of the lamp K^3, and the pointer of the indicator would move to the extreme limit of the low-resistance measurement. The whistle would also be blown with an excessively shrill sound, owing to the high voltage passing through the branch circuit J. All these would call the attention of the engineer to the fact that the siding was open to the main track.

The herein-described system illustrates one application of the invention. It is obvious, however, that the principle involved can be applied in many different ways and still be within the scope of the invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electrical signal system, a main electrical circuit, means for connecting said circuit with a source of electricity, bridging-coils of comparatively low resistance with the circuit through the same normally broken interposed at intervals in said main circuit to form multiple connections in the same, coils of comparatively high resistance with the circuit through the same complete forming connections in said main circuit parallel with said low-resistance coils, means operated by the current passing through a high-resistance coil for completing the circuit through the adjacent low-resistance coil, and indicating mechanism operated by the current passing through said main circuit.

2. In an electrical signal system, a main electrical circuit, means for connecting said circuit with a source of electricity, bridging-coils of comparatively low resistance with the circuit through the same normally broken interposed at intervals in said main circuit to form multiple connections across said main circuit and forming blocks of different electrical resistances therein, coils of compara-

tively high resistance with the circuit through the same complete forming connections in said main circuit parallel with said low-resistance coils, means operated by the current passing through the high-resistance coil in a block for completing the circuit through the parallel low-resistance coil in the same block, and indicating mechanism operated by the current passing through the main circuit.

3. In an electrical signal system, a railway-track with one of its rails electrically continuous and the other one divided by insulating-breaks into blocks, an electrical conductor extending along said track, comparatively low resistance coils with their circuits interrupted respectively connecting the insulated rail-sections with said conductor, comparatively high resistance coils forming parallel connections with said low-resistance coils between the insulated rail-sections and the conductor, means operated by the current passing through the high-resistance coil in a block for closing the circuit through the parallel low-resistance coil in the same block, means for connecting said conductor and said electrically-continuous rail with a source of electricity, and indicating mechanism operated by the current passing through said conductor and said electrically-continuous rail.

4. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, means for dividing said circuit into blocks of different electrical resistances, a carrier movable on said track, a normally incomplete circuit on said carrier, means for connecting said circuits to form a complete circuit, a source of electricity interposed in the completed circuit, and resistance-indicating mechanism operated by a current passing through the completed circuit.

5. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, means for dividing said circuit into blocks of different electrical resistances, a carrier movable on said track, a normally incomplete circuit on said carrier, means for connecting said circuits to form a complete circuit, a source of electricity on said carrier and connected with the incomplete circuit on said carrier, and resistance-indicating mechanism on said carrier and operated by a current passing through the completed circuit.

6. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, bridging-coils interposed at intervals in said circuit to divide the same into blocks of different electrical resistances, a carrier movable on said track, a normally incomplete circuit on said carrier, means for connecting said circuits to form a complete circuit, a source of electricity interposed in the completed circuit, and resistance-indicating mechanism operated by a current passing through the completed circuit.

7. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, bridging-coils interposed at intervals in said circuit to divide the same into blocks of different electrical resistances, a carrier movable on said track, a normally incomplete circuit on said carrier, means for connecting said circuits to form a complete circuit, a source of electricity on said carrier and connected with the incomplete circuit on said carrier, and resistance-indicating mechanism on said carrier and operated by a current passing through the completed circuit.

8. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, means for varying the resistance of said circuit, a carrier movable on said track, a normally incomplete circuit on said carrier, indicating mechanism operated by a current passing through said circuit on the carrier, means for connecting said circuits to form a complete circuit, and a source of electricity interposed in the completed circuit.

9. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, means for varying the resistance of said circuit, a carrier movable on said track, a shunt-wound dynamo on said carrier having its shunt-circuit normally incomplete, indicating mechanism operated by the current passing through the main circuit of said dynamo, and means for completing the circuit through the shunt-circuit of the dynamo and the normally incomplete circuit extending along the track.

10. In an electrical signal system, a railway-track, a normally incomplete circuit extending along said track, a branch circuit in multiple connection across said normally incomplete circuit, signal mechanism operated by a current passing through said branch circuit, a switch controlling said branch circuit, a carrier movable on said track, a normally incomplete circuit on said carrier, signal mechanism on said carrier and operated by a current passing through said incomplete circuit on the carrier, a switch controlling the incomplete circuit on the carrier, and means for connecting said incomplete circuits to form a complete circuit.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

FRED LACROIX.

Witnesses:
GRANT BURROUGHS,
FRANCIS S. MAGUIRE.