

(No Model.)

F. MCBRIEN.
ELECTRICALLY CONTROLLED RAILWAY SIGNAL.
No. 579,929.

Patented Mar. 30, 1897.

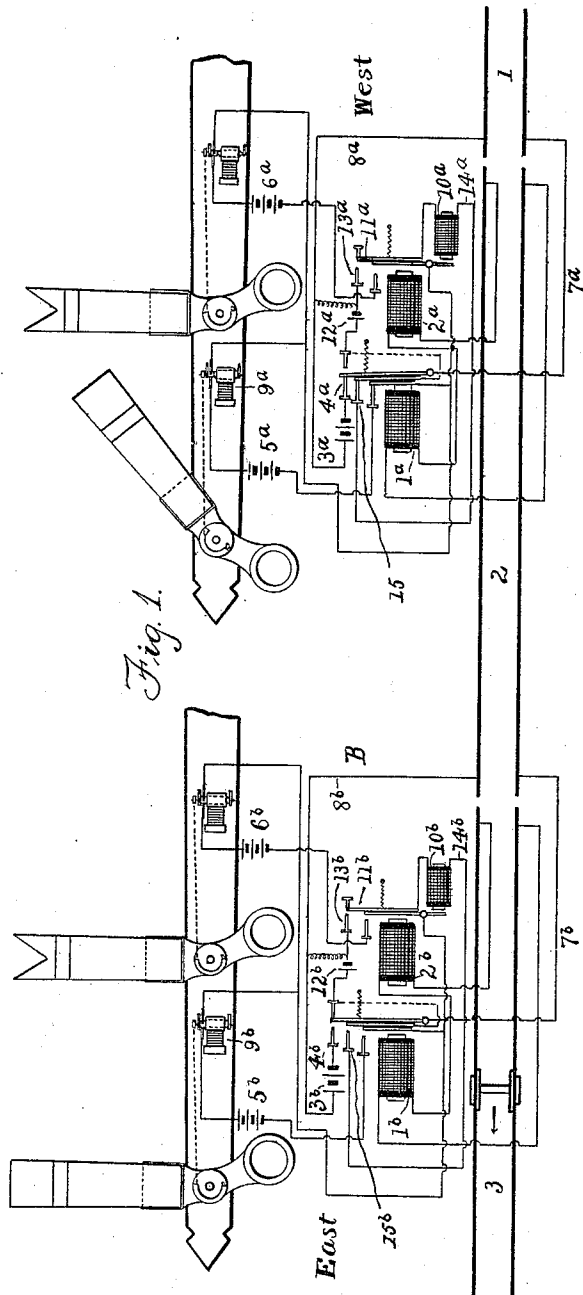


Fig. 1.

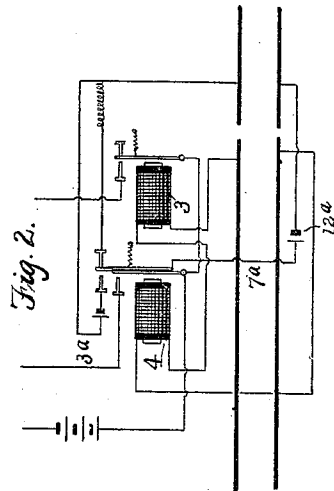


Fig. 2.

WITNESSES:

C. L. Belcher
L. B. Marks

INVENTOR

Frank McBrien

BY

Robert Read

his ATTORNEY

UNITED STATES PATENT OFFICE.

FRANK MCBRIEN, OF NEWARK, NEW JERSEY.

ELECTRICALLY-CONTROLLED RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 579,929, dated March 30, 1897.

Application filed September 3, 1896. Serial No. 604,691. (No model.)

To all whom it may concern:

Be it known that I, FRANK MCBRIEN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electrically-Controlled Railway-Signals, of which the following is a specification.

This invention relates to railway-signals, the object being to control the signals by track-circuits alone and to indicate the position of a train to one following it by giving a clear, caution, or danger signal.

In carrying out my invention I divide the track into a plurality of blocks or sections, the rails of each section being formed into a continuous conductor by electrically bonding the several joints. I provide two signals, which may be semaphores, distinguishable by their relative position and provided with lamps or other equivalent devices for night display. The signals are electrically controlled by circuits, including the track-rails, and may both be at "safety," both at "danger," or one at "safety" and the other at "danger," depending on the position of a train on the block or protected region of the track. This result is accomplished by operating relays for the signal-controlling circuits with different current strengths thrown upon the track automatically when the train passes determinate points. The relays are preferably normally charged by current from a track-battery, so that when a train enters a section they will both be deenergized and will set both signals at "danger." When the train reaches a determinate distance, the strength of the track-charging current is weakened, thus restoring one signal to "safety" by actuating its relay. The other signal is held at "danger" until the train leaves the protected region, when the normal condition of the track-circuit is restored.

The several features of novelty of the invention will be hereinafter more fully described, and will be definitely indicated in the claims.

The accompanying drawings diagrammatically illustrate the invention, Figure 1 showing the system, and Fig. 2 a modification of the circuits.

1 2 3 represent track-sections, the rails of

each section being electrically bonded together, so as to form of each side of the track throughout the length of each section a continuous electric conductor. At a suitable point in each section is placed a signal-station provided with semaphores or other suitable indicating devices and with the controlling-relays, track-batteries, and other apparatus necessary to control the system. Each station is provided with two relays, as 1^a 2^a, in series relation to the track-rails and preferably also in series with each other. One of the relays has a greater number of ampere-turns than the other, so as to render it sensitive to weaker currents. For example, 1^a may be wound to eight ohms resistance, and 2^a to but one ohm, thus providing the former with a much greater number of ampere-turns and enabling it to draw up its armature under a much weaker current. An equivalent mode of control would be to render the retractile power of the two relay-armatures different; but the first-described method is much the preferable one.

Each track-section is normally charged with current by a battery in the advance section. For example, the rails of section 2 are charged by battery 3^b of station B. Similarly the battery 3^a of station A charges its rear section 1. The circuit of this battery includes a circuit-closer 4^a, controlled by the high-resistance relay 1^a, so that so long as the relay is deenergized the track-battery 3^a is cut off the rear section. The back stop of the relay 3^a is connected with an auxiliary battery, so that during the periods when relay 1^a is deenergized the rear section is charged with a weaker current than normal. This current is sufficient to excite the high-resistance relay of the rear section, but not the low-resistance relay. It will thus be seen that the essential feature of my system of control is the differing current strengths and that the controlling devices might be made responsive in other ways than those I have just set forth, one of which has already been adverted to.

Relay 1^a controls one signal-operating circuit by calling into action a battery 5^a, and relay 2^a controls the other by cutting into action battery 6^a. The battery-power for the two signals may of course be shared in common, as shown, for example, in Fig. 2, the bat-

tery in this case being of sufficient capacity to operate both signals simultaneously. The signal-operating motors may be of any approved type, that shown being merely typical and representing an ordinary electric motor. The coöperative relation of the several parts of the system will better appear from a description of the mode of operation. Let us suppose a train to be moving east and entering section 2. In the normal status, when no train is present in the protected region, the track-rails of each section will be charged with current from the track-battery of the advance section. Thus section 1 in the drawings is charged by battery 3^a by way of wire 7^a, armature 4^a, front stop of relay, battery 3^a, and conductor 8^a. The armature of relay 1^a controls two other pairs of contacts, one pair in circuit with the signal-operating motor 9^a and its operating-battery 5^a and the other in circuit with the auxiliary magnet 10^a and a circuit-closer 11^a, controlled by the armature of relay 2^a. The normal current is sufficient to energize both relays, thus holding closed both signal-operating circuits. I prefer to use an organization in which it will be impossible to give a "clear" signal if the circuits are out of order. Thus, as shown, the signals are normally positively held at "safety" and will automatically go to "danger" if the circuit is impaired. When the wheels bridge the rails of section 2, relays 1^a 2^a are short-circuited and drop off their armatures, opening both signal-operating circuits and permitting both semaphores to go to "danger." Thus not only are the signals set for a train in the rear, but the engineer is advised, by the fact that both signals have changed from "safety" to "danger," that there is a clear track through the whole protected region and that his rear is properly guarded. On entering section 3 a similar action of the signals will occur, supposing no train to be within protective range of station B.

When the section is cleared, the entire train being in section 3, relay 1^a is energized by a weak current from battery 12^b, thrown upon the rails of section 2 by armature 4^b engaging its back stop and charging the track through conductors 7^b 8^b. I preferably interpose a resistance in this circuit to reduce current strength, as indicated. Thus one of the signals at station A is restored to "safety," but inasmuch as relay 2^a requires a stronger current to actuate it the other signal remains at "danger" until section 3 is cleared, when relay 1^b is energized and the normal current strength is thrown upon section 2. Relay 2^a is then energized and draws up its armature. A firm contact is obtained by cutting in the auxiliary relay 10^a when the armature 11^a engages its front stop. The auxiliary relay reinforces the action of relay 2^a by acting on the same armature, as shown. The auxiliary circuit includes battery 12^a, front stop 13^a, armature 11^a, coils of relay, conductor 14^a, front stop 15^a, and its coöperating insulated

contact carried by armature 8^a. In practice the reinforcing-coil may be wound on the same core as the coil of relay 2^a. It will be seen that the auxiliary coil 10^a permits a firm contact to be made by the armature of relay 2^a, the arrangement being such that a small initial movement of the armature of said relay cuts into circuit the auxiliary coil and produces a firm contact under current from local battery 12^a.

The auxiliary relay 10^a might in some cases be dispensed with, as shown in Fig. 2, and in such a case the auxiliary battery 12^a may be used to assist in maintaining the normal charge of the track-circuit, as shown.

The armature of each relay 1^a 2^a controls several independent circuits. The several contact-pieces should, therefore, be insulated from one another.

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

1. A railway signal system comprising a track divided into a plurality of insulated sections, independent magnetically-controlled signals at the same station operated by currents of different strengths in a controlling track-circuit common to both signals, circuit-controlling devices adapted to be actuated by a train for simultaneously actuating both signals when a train reaches the station if the track ahead be clear, and means for restoring them one at a time when the train reaches different determinate positions beyond the station by varying the current strength in the track-circuit.

2. A railway signal system comprising a plurality of insulated track-sections, signal-stations corresponding thereto, each provided with two independently-operated signal devices, controlling-relays for said devices responsive to currents of different strength, a track-circuit common to both relays, and means for varying current strength to actuate one relay when the train leaves the section, and to further change the circuit to actuate the other relay when the train reaches a determinate distance beyond the section.

3. A railway signal system comprising a plurality of insulated track-sections, signal-stations corresponding thereto each provided with two independently-operated signal devices, controlling-relays for said devices responsive to currents of different strength, a normally-charged track-circuit controlling the relays, and a generator of current located at the advance station and controlled by a relay in the track-circuit of the advance section for altering the current strength in the rear section.

4. A railway signal system comprising a plurality of insulated track-sections, signal-stations corresponding thereto each provided with two independently-operated signal devices responsive to currents of different strength, a normally-charged track-circuit controlling the relays, a generator of current

located at the advance station, and means for reducing current strength in the track-circuit to permit a weaker than normal current to flow in the track-circuit when a train reaches a determinate position.

5 A railway signal system comprising a plurality of insulated track-sections each normally charged with current, a plurality of signal-stations each containing two independently-operated signal devices controlled respectively by two relays in series relation to one another and charged by the track-circuit, one relay having a greater number of ampere-turns than the other, and means for varying the strength of current in the track-circuit when a train passes determinate points of the track.

6. A railway signal system comprising a plurality of insulated track-sections each normally charged with current, a plurality of

signal-stations each containing two independently-operated signal devices controlled respectively by two relays in series relation to one another and charged by the track-circuit, one relay having a greater number of ampere-turns than the other, means for changing current strength when a train reaches a determinate position, an auxiliary coil for increasing the pull of the low-resistance relay, the circuit of said coil being controlled by the initial movement of the armature of the low-resistance relay.

In testimony whereof I have hereunto subscribed my name this 2d day of September, A. D. 1896.

FRANK MCBRIEN.

Witnesses:

ROBT. H. READ,
JAS. WAYLAND.