(No Model.) 3 Sheets—Sheet 1.

F. McBRIEN.

ELECTRICALLY CONTROLLED RAILWAY SIGNAL.

No. 512,050. Patented Jan. 2, 1894.

Fig. 1.

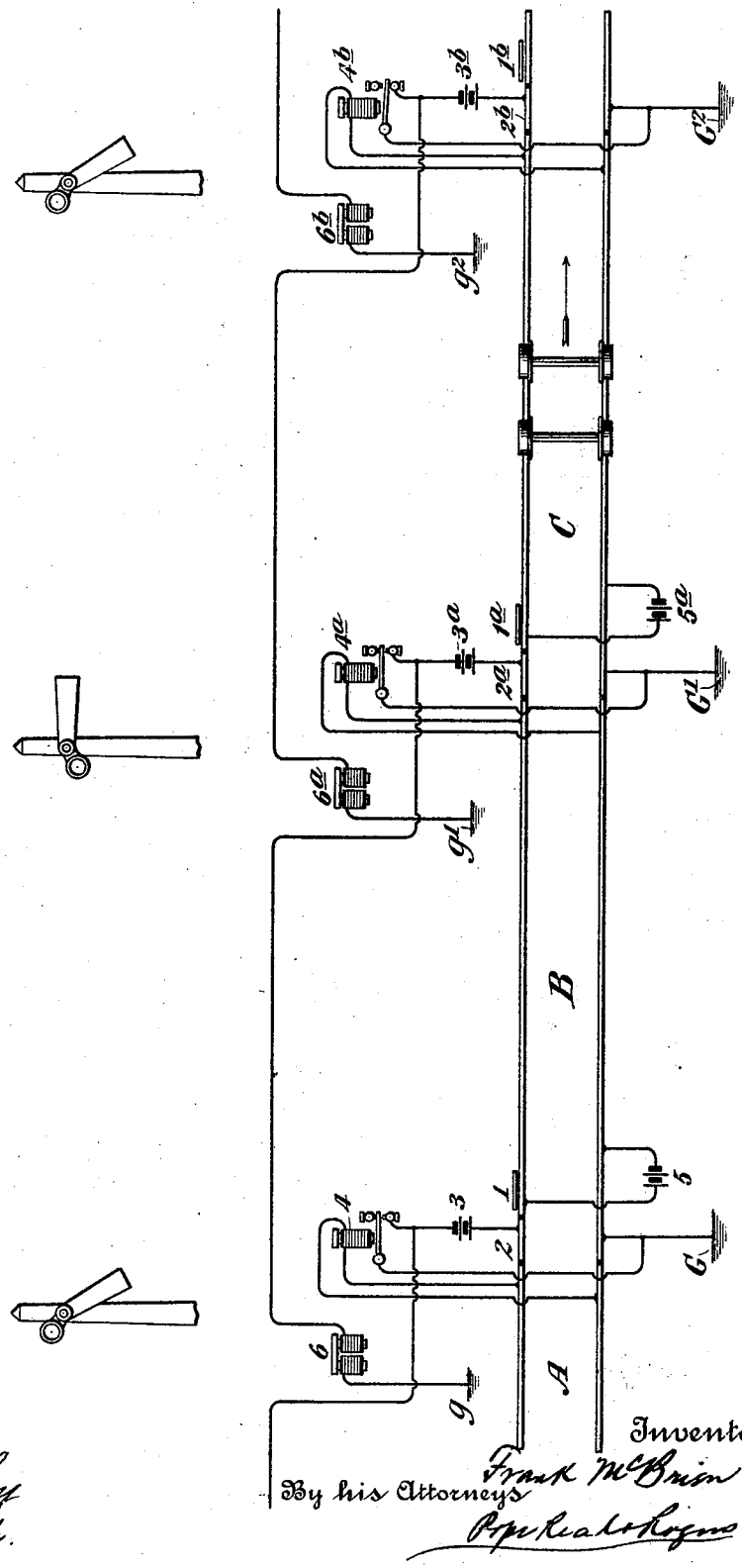

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Fig. 2,

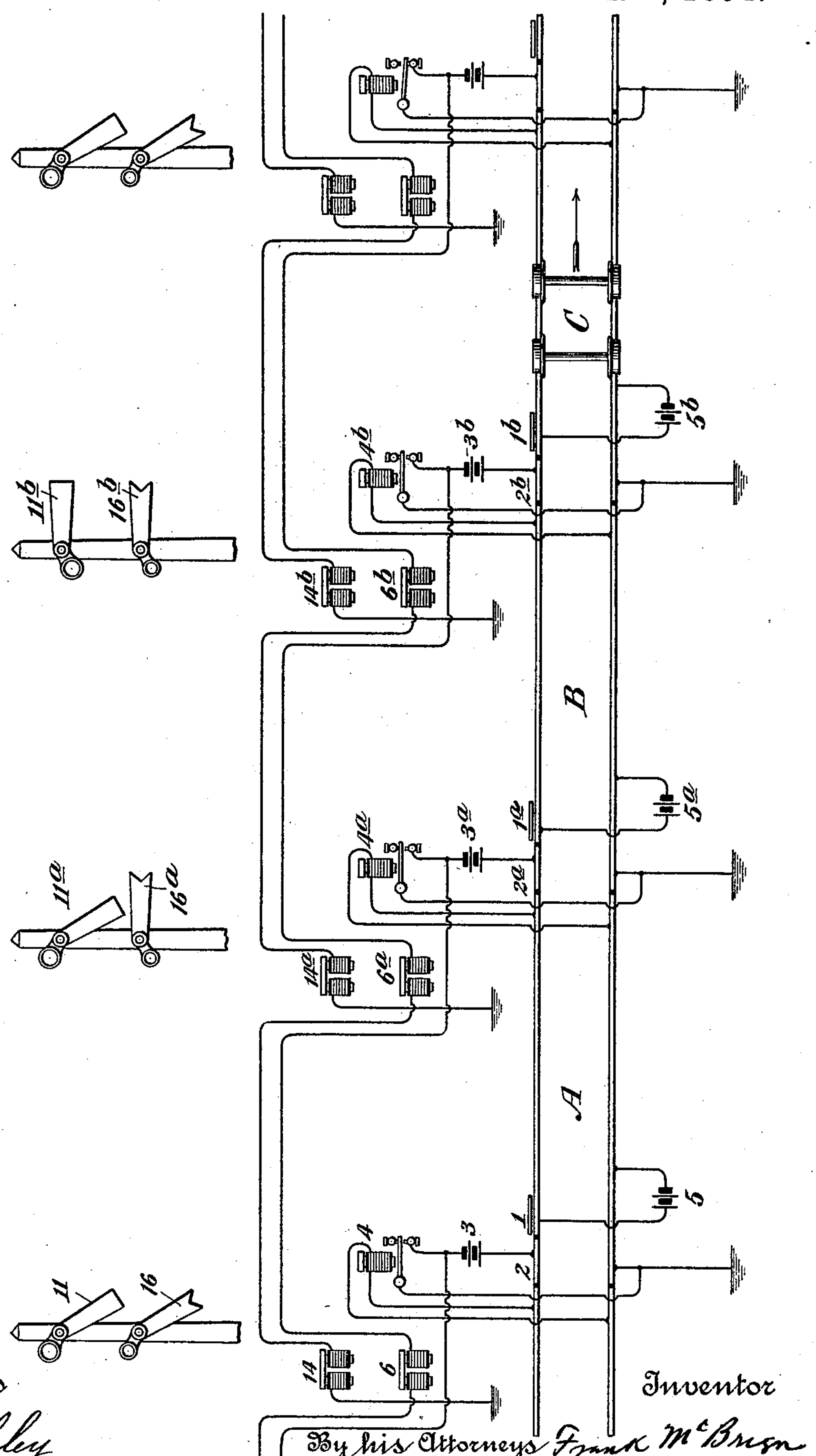

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Fig. 3,

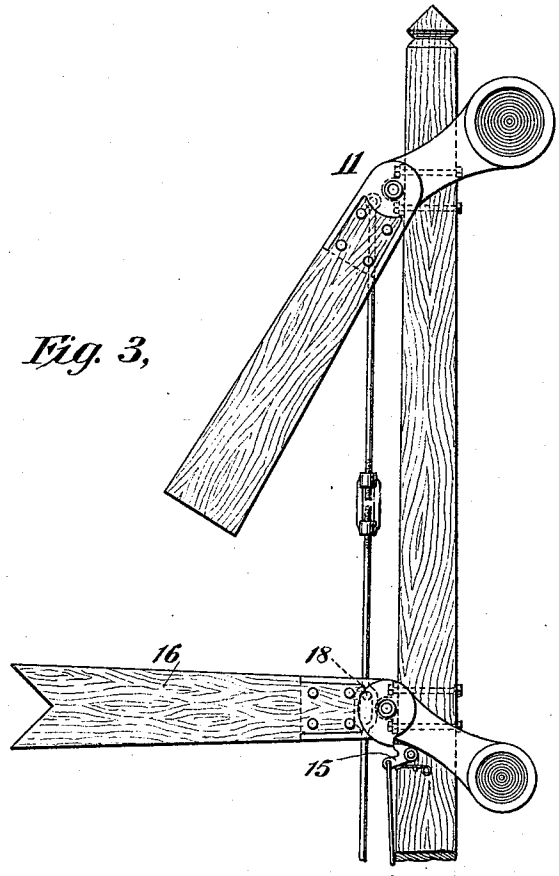


Fig. 4,

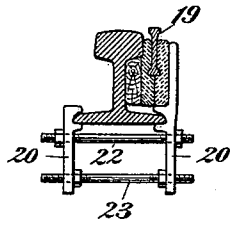
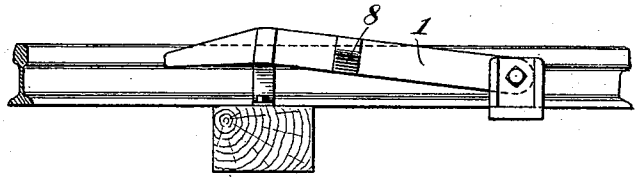


Fig. 5.



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ELECTRICALLY-CONTROLLED RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 512,050, dated January 2, 1894.

Application filed July 27, 1893. Serial No. 481,599. (No model.)

To all whom it may concern:

Be it known that I, FRANK McBRIEN, a citizen of the United States, residing in 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 electrically controlled railway signals of that type in which the line of way is divided into a number of blocks or sections, and the condition of the track, whether clear or occupied for one or more blocks or sections in advance of a moving train, is automatically indicated.

My improvements relate more particularly to means for restoring to a position of safety signals or semaphores which may be automatically set by a passing train in any suitable manner, but preferably by mechanism similar to that described in a patent of J. Wayland, No. 492,598, dated February 28, 1893.

The particular object of my invention is to prevent a return of a semaphore or semaphores to safety position until the last wheel of the advance train shall have passed out of the protected section. As electrically controlled railway signals are commonly organized the first wheel of the advance train upon reaching the circuit-closer operates upon a semaphore so as to indicate a clear track for the section.

The several features of novelty of my invention will be more particularly hereinafter described and will be definitely indicated in the claims appended to this specification.

In the accompanying drawings which illustrate my invention, Figure 1 is a diagrammatic view of a system embodying my improvements, containing a single signal device or semphore for each track section. Fig. 2 is a similar view of an organization comprising two signals for each section and adapted by their position to indicate the condition of the track for a distance of two sections, so that if the section immediately in advance is clear and the one beyond contains a train, an approaching engineer will be notified that caution must be exercised. Fig. 3 is a part sectional view and part elevation of the operative mechanism of two semaphores adapted for use with the organization shown in Fig. 2. Fig. 4 is a sectional view showing a track circuit-closer suitable for the end of a section or protected district; and Fig. 5 illustrates a controlling lever used at the side of the track for mechanically setting a signal on the passage of a train into a section.

Referring first to Fig. 1, A, B, C, indicate sections of a railway track, at the entrance to each of which is placed a tread lever, as 1, 1^a, 1^b, pivotally mounted at the side of rail, as indicated in Fig. 5, and having its free end projecting slightly above the plane of the rail-head so that the first wheel of an approaching train will depress the lever and operate the mechanism hereinafter to be described, by which the signal or signals corresponding to the entered section will be automatically set to the danger position. At the rear of the tread lever is placed an insulated section of rail 2, 2^a, 2^b, at the side of which is an insulated metallic strip 19, Fig. 4, electrically connected with one pole of a local battery 3, 3^a, 3^b, the other pole of which is connected to the back stop of a relay 4, 4^a, 4^b. The two terminals of the relay coil are connected with the rails of the rear track-section, with which are also connected the poles of an auxiliary battery 5, 5^a. The armature of the relay is electrically connected with the rail section, preferably at a point opposite the insulated rail section 2, 2^a, &c., and is also provided with a ground connection G, G′, G^2. The back-stop of the relay is electrically connected with a releasing magnet 6, 6^a, 6^b at the entrance of the section to which the relay corresponds, said releasing magnet being grounded as indicated at g, g', g^2. At the entrance of each section in co-operative relation to the tread-lever 1 is placed a pivoted lever 7, see Fig. 3, provided with a hooked projection at its free end engaging a co-operating projection 8 mounted on the tread-lever. Bearing against the lever 7 is a spring-pressed plunger moving in suitable fixed bearings and controlled by a stout spring tending to hold the plunger in the position indicated in Fig. 3. Connected with the plunger is a headed rod 9 over which the plunger can freely slide when thrown to the right by a passing train. Connected with the rod 9 is a bell-crank lever 10 mounted at the base of

the signal post and mechanically connected with a semaphore 11 provided with a weight sufficient to raise the semaphore blade and shift the bell-crank lever 10 and rod 9 after the tread-lever 8 has been depressed by a passing train. Upon a bar rigidly connected to the rod 9 is a stud bolt or pin 12 with which co-operates a hooked extension of a weighted arm provided at its free end with a latch 13 adapted to engage a co-operating detent connected to the armature of the releasing electro-magnet 6 hereinbefore referred to in describing Fig. 1. An auxiliary electro-magnet 14, the purpose of which will more particularly hereinafter appear in describing Fig. 2, is provided, its armature being mechanically connected with a latch 15 engaging a detent on a second signal or semaphore 16, the blade of which is made sufficiently heavy to over-balance the weight of the opposite arm, as indicated by the relatively smaller size of the weight compared to that of semaphore 11. A stud 18 projecting from the semaphore plays in a slot formed in the rod 17 so that when the upper semaphore 11 is set by a passing train and the walls of the slot raised, the lower wall of the slot if semaphore 16 is at "safety" and the stud 18 at its lowest position, will engage stud 18 and also set to a danger position the semaphore 16. From the construction hereinbefore described it will be seen that upon the passage of a train the plunger is forced suddenly to the right by the lever 7 and held in such position by the hook-shaped projection 8. The weight of the semaphore 11 is thus free to lift rod 17 and shift rod 9. The stud 18 engages the lower wall of the slotted rod, thus setting semaphore 16 to "danger" position, permitting the latch 15 to lock it in such position. After the last wheel of the train has passed the distant end of the section electro-magnet 6 is energized, releasing catch 13 and permitting the weighted arm to drop, and after it has accumulated great momentum by its fall its hooked extension strikes stud bolt 12 and releases projection 8 from the hooked extremity of lever 7, permitting a light spring under tread-lever 1 to restore it to normal position; the spring on the plunger instantly reacts and forces the lever 9 to the left, lifting the weight and permitting the catch 13 to engage the armature of electro-magnet 6, restoring the apparatus to its normal condition; but it will be evident that although the semaphore 11 has been restored to safety position the semaphore 16 is prevented from dropping by the latch 15 and will not drop to safety position until the electro-magnet 14 is energized and the latch 15 withdrawn, which does not occur until the train has passed over the end of the second section.

At the side of the insulated section 2, 2^a, 2^b referred to in Fig. 1 is placed a circuit-closing bar 19, see Fig. 4, which is mounted between two blocks of soft rubber at the side of the rail, and provided with means for tightly compressing the blocks of rubber so as to prevent the entrance of moisture and a possible electrical connection with ground.

Any convenient method of clamping the circuit-closing bar in position may be employed, that shown comprising side plates 20, provided with a bolt 22 for clamping them to the base of the rail, and a spreading bolt 23 for compressing the blocks of rubber upon the circuit-closing bar. It will of course be understood that where as in Fig. 1 a single semaphore is used for each section, the auxiliary magnet 14 and the auxiliary semaphore 16 and their operative connections may be dispensed with.

From the construction hereinbefore described it will be seen, referring to Fig. 1, that when the forward end of a train, as indicated for example by the truck in section C, enters a section the tread-lever 1^a is depressed and the signal mechanically raised to a danger position. Simultaneously therewith the battery 3^a is short-circuited by the wheels and axles, and the relay 4^b is demagnetized, permitting its armature to drop off and remain in such position so long as any pair of wheels and axles is on the section. When the front wheel strikes the circuit-closer at 2^b the battery 3^b will have two closed paths, one of which passes through the releasing magnet at the entrance of the section, but such path is short-circuited by a path through the relay armature, circuit-closer and axle to ground G^2, so that the releasing magnet is not energized; but when the last axle of the train leaves the section and bears upon the circuit-closer at 2^b the relay is immediately energized by reason of the opening of the short circuit, the armature is instantly lifted from its back-stop, and current forced to traverse the releasing magnet at the entrance of the section. It will thus be seen that while any train is upon a guarded section the relay armature is in a position ready to immediately set the signal to safety when the last axle of the train shall have passed, and if a coupling should break and any portion of the train be left in the section the signal will not be restored because the relay will still be short-circuited by the axles of the disconnected car or cars.

In order to protect more than a single section and adapt the invention to what is known as "permissive systems," the double semaphores described in connection with Fig. 3 are employed, both of which are set automatically upon the entrance of a section, but which are restored to a safety position independently and at different times. This is effected in a simple manner by leading the circuit of a home magnet 6^b, for example, see Fig. 2, through a distant magnet 14^a before grounding the circuit. When any relay is energized by the passage of the final car of a train current will be forced from the local battery, say 3^b, through the home magnet 6^a and also through the distant magnet 14, thus dropping

to safety the semaphore 16 of the distant signal and 11^a of the home signal, but leaving the semaphore 16^a of the home signal set for "caution." So long as a train is in section C therefore the home signals will be both set at "danger" and the distant signal will be set at "caution," whereas the signals out of range of the protected district, as indicated, will be both set at "safety."

The means for mechanically controlling the semaphores herein described and the mechanical devices for operating the two semaphores of any section independently are not of my invention.

What I claim as my invention is—

1. A railway signaling system comprising a plurality of track blocks or sections, track instruments at the entrance of the several blocks, signals automatically set by said instruments on the passage of a train into the several blocks, an insulated contact at the end of each block or section, an electro-magnet for restoring each signal, an electric generator in closed relation to said electro-magnet when the contact is engaged by a wheel, and a short circuit around the magnet completed during the passage of the train through the section, whereby the magnet will be energized only when the last wheel has passed out of the section and engages the contact.

2. A railway signaling system comprising one or more track blocks or sections, means at the entrance of each block for automatically setting a signal upon the entrance of a train, an electro-magnet controlling the release of the signal, a contact at the end of the block for closing a circuit through said electro-magnet upon passage of the train, a short-circuit for diverting current from the releasing magnet while the block is occupied, and a relay in circuit with the rails for opening the short-circuit when the block is cleared, whereby the signal is released when the last wheel of the train passes the contact.

3. A railway signaling system comprising one or more track blocks or sections, means at the entrance of each block for automatically setting a signal upon the entrance of a train, a magnet in each block circuit open at the end of its block adapted to be closed by the passage of the wheels through the end of the block, a short-circuit around the magnet controlled by a relay, and a track circuit governing the relay, whereby the short-circuit remains closed while any portion of a train is in the block.

4. A railway signaling system comprising a plurality of track blocks or sections, track instruments at the entrance of the several blocks, "danger" and "caution" signals automatically set by said instruments on the passage of a train into a block, independent electro-magnets for restoring the "danger" and "caution" signals to safety, a contact at the end of each block for closing the circuit of an electric generator through the controlling magnets of the "danger" and "caution" signals of the home and distant sections respectively when engaged by a wheel, and means for diverting current from said magnets while any portion of the train is in the block.

In testimony whereof I have hereunto subscribed my name this 25th day of July, A. D. 1893.

FRANK MCBRIEN.

Witnesses:
JAMES WAYLAND,
ROBT. H. READ.