(No Model.)

4 Sheets—Sheet 1.

F. E. KINSMAN.

RAILWAY CIRCUIT FOR SIGNALING AND CONTROLLING TRAINS.

No. 448,751. Patented Mar. 24, 1891.

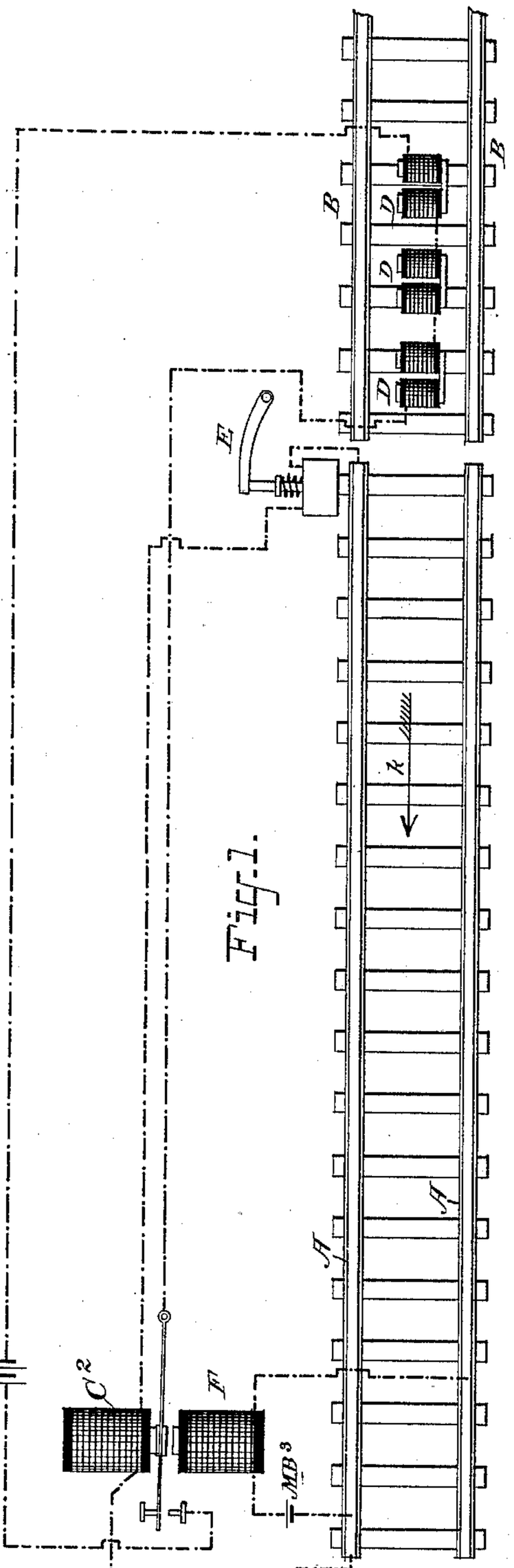

Fig. 1.

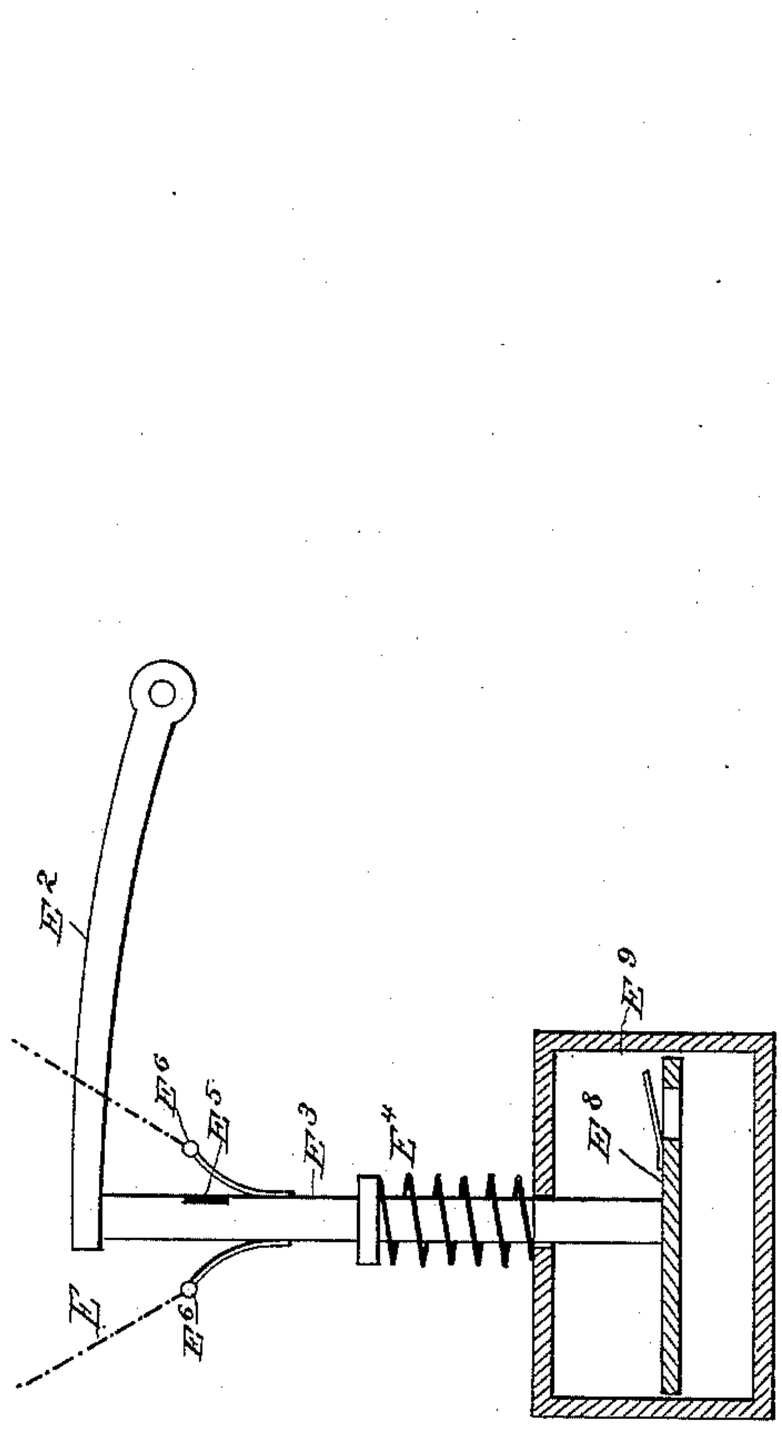

Fig. 2.

ATTEST:
J. A. Hurdle
Wm. A. Bagley

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(No Model.) 4 Sheets—Sheet 2.

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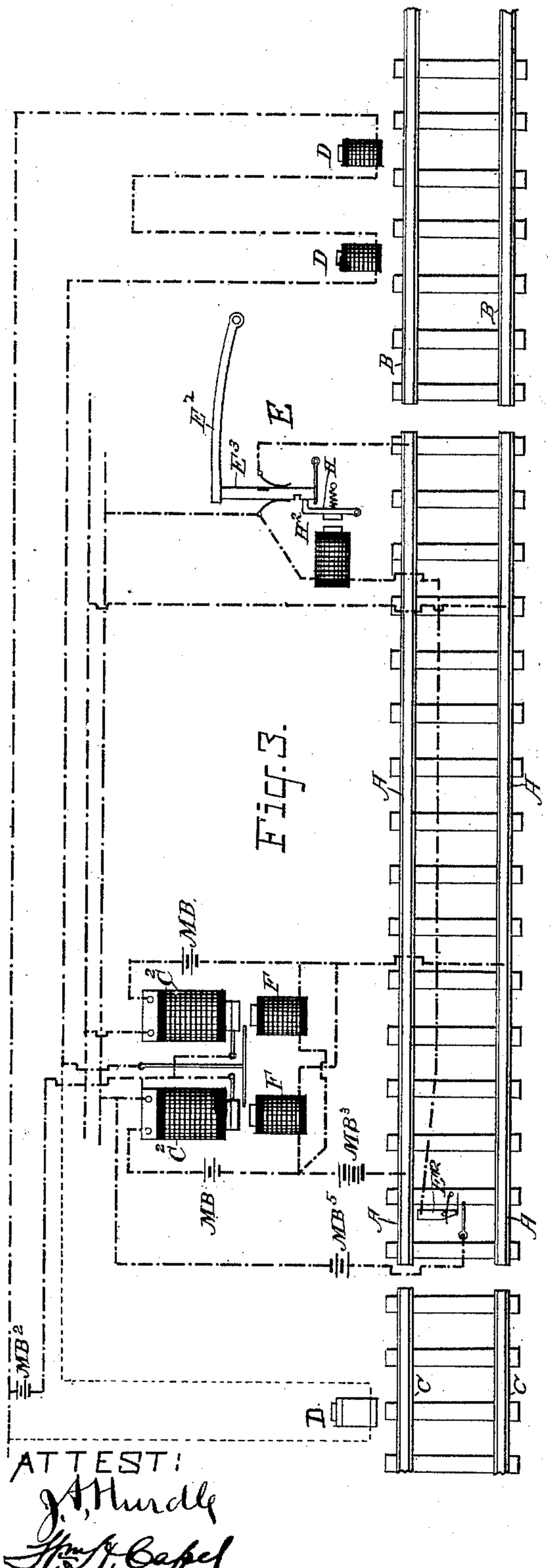

Fig. 3.

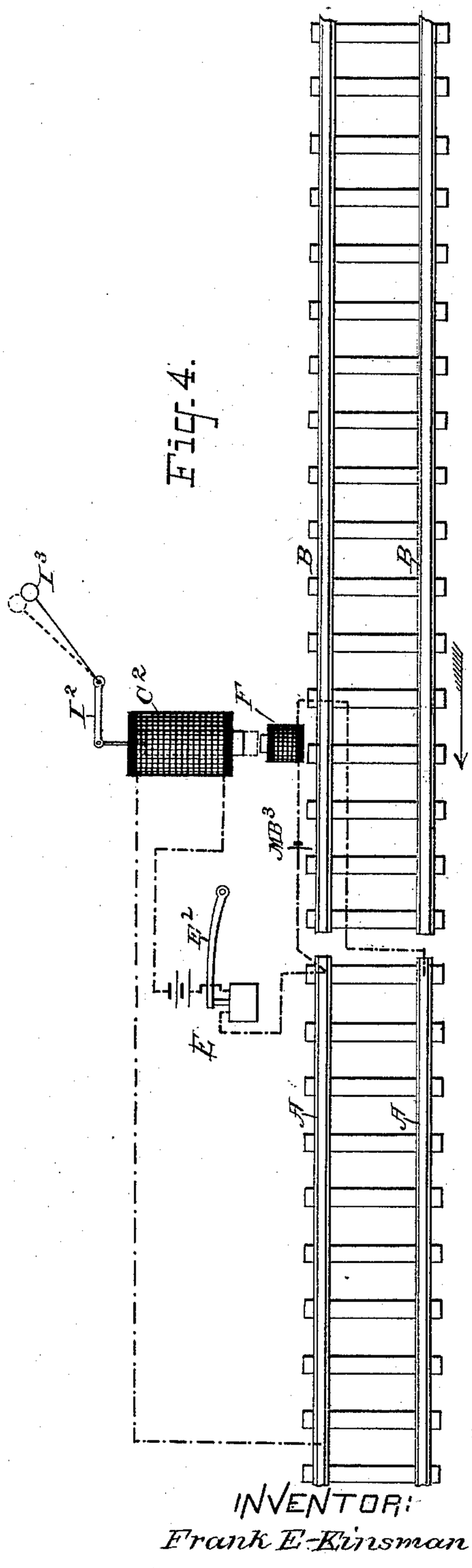

Fig. 4.

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(No Model.)

4 Sheets—Sheet 3.

F. E. KINSMAN.

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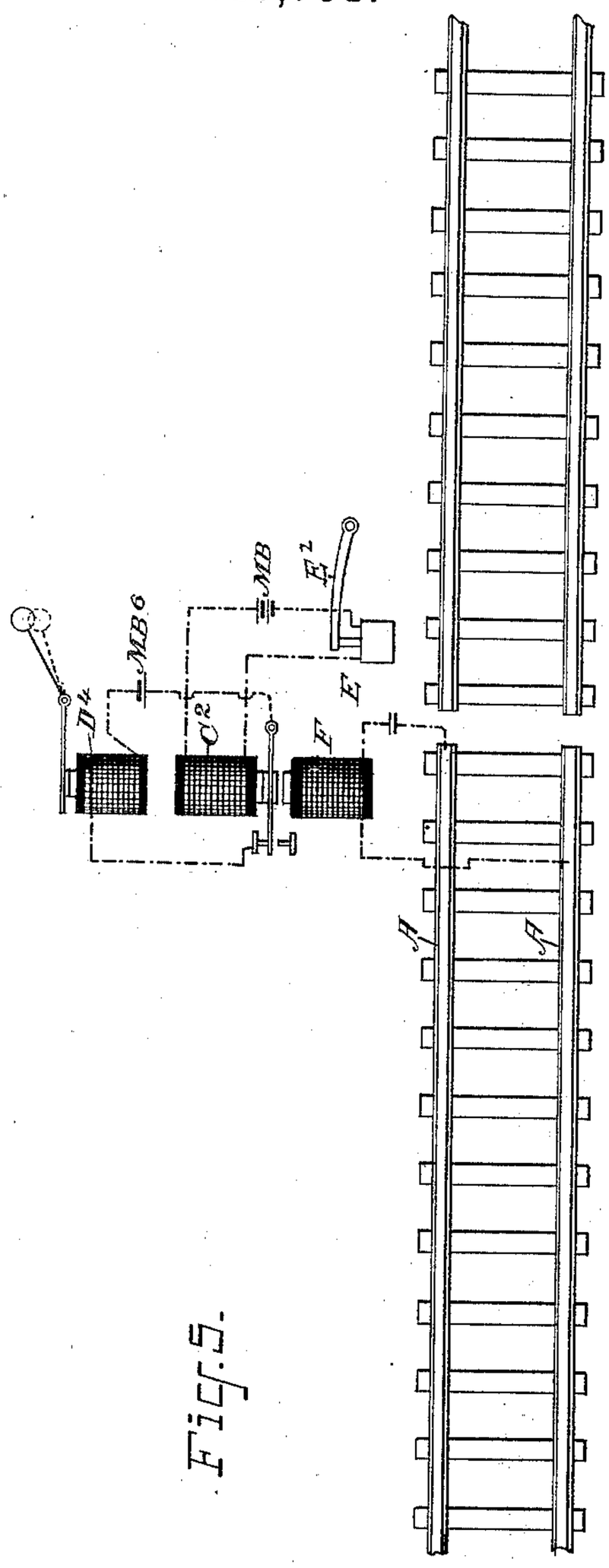

Fig. 5.

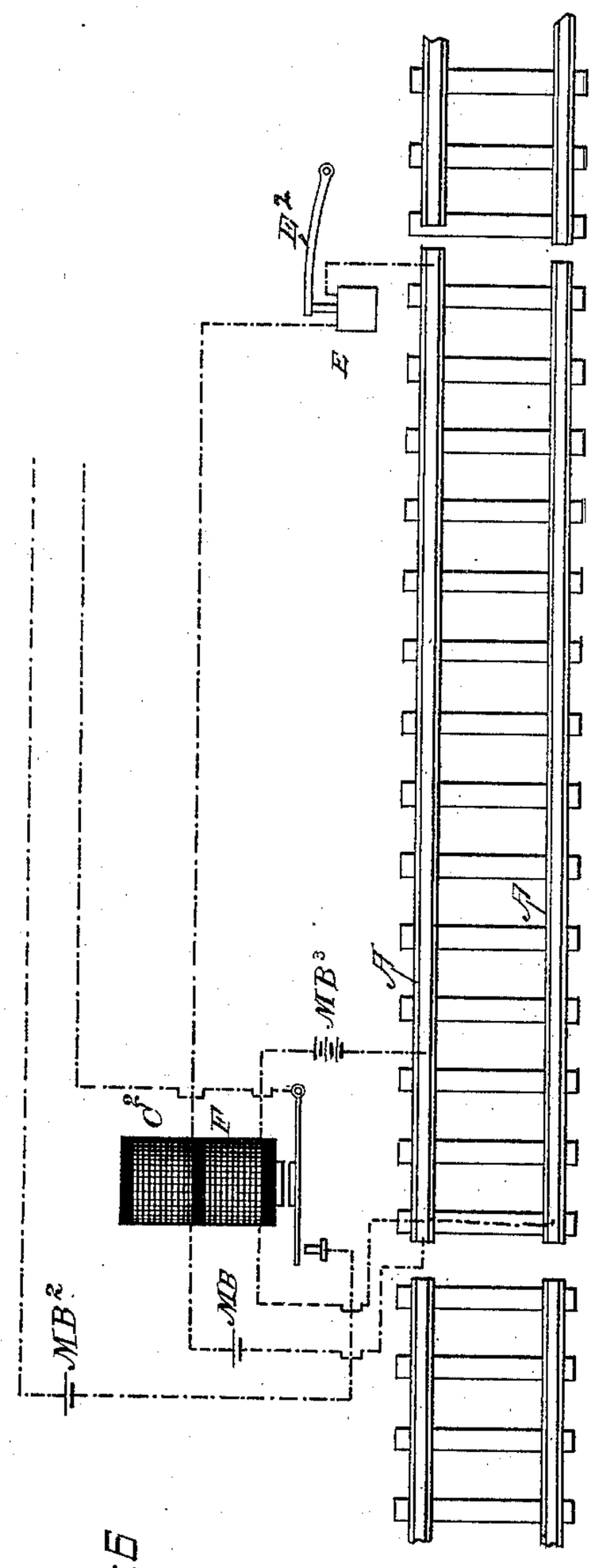

Fig. 6

ATTEST!

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(No Model.) 4 Sheets—Sheet 4.

F. E. KINSMAN.

RAILWAY CIRCUIT FOR SIGNALING AND CONTROLLING TRAINS.

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Fig. 7.

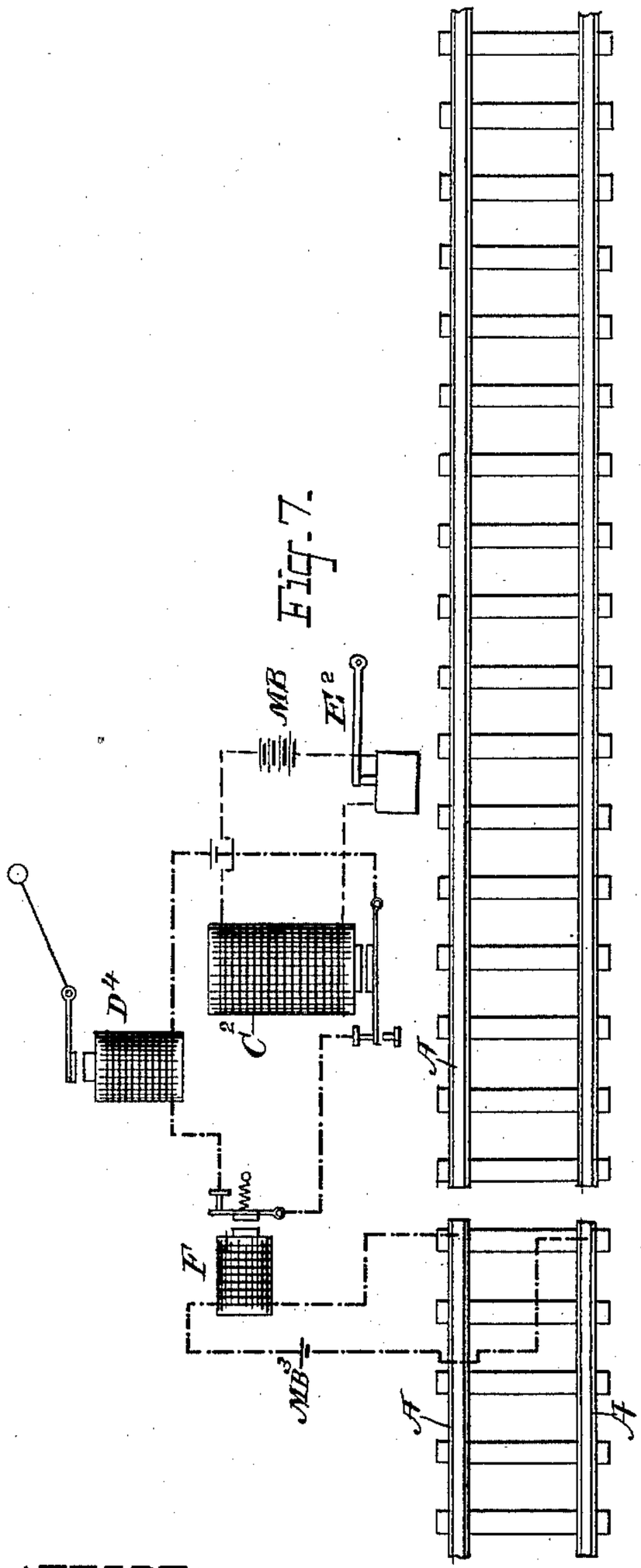
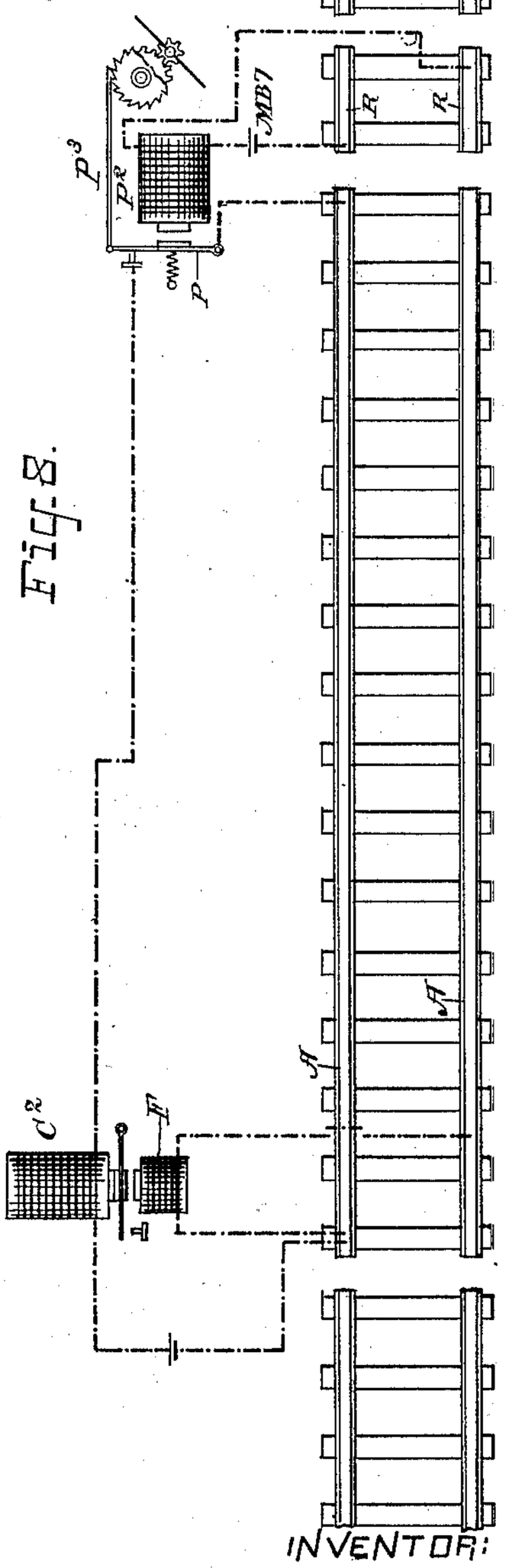


Fig. 8.



ATTEST:
J. A. Hurdle
Wm. H. Capel

INVENTOR:
Frank E. Kinsman
By H. B. Townsend
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UNITED STATES PATENT OFFICE.

FRANK E. KINSMAN, OF PLAINFIELD, NEW JERSEY.

RAILWAY-CIRCUIT FOR SIGNALING AND CONTROLLING TRAINS.

SPECIFICATION forming part of Letters Patent No. 448,751, dated March 24, 1891.

Application filed June 11, 1890. Serial No. 355,006. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. KINSMAN, a citizen of the United States, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Railway-Circuits for Signaling and Controlling Trains, of which the following is a specification.

My invention relates to combinations of circuits and apparatus for use in connection with railways for the purpose of controlling or operating signals, switches, brakes, or other devices employed in signaling to trains and controlling the movement thereof in any manner.

My invention consists in the combination, with an electro-magnet which is placed in a normally-charged circuit and controls directly or indirectly the signals, brake-actuating devices, or other apparatus when it is de-energized by any desired means and automatically or otherwise, of a supplemental electro-magnet or magnet-coil, which is placed in a circuit completed through the rails of a section of track and any car wheels and axles on such section, said supplemental magnet or magnet-coil being employed for the purpose of keeping the armature of the first-named magnet or the apparatus controlled thereby in "danger" condition until the section of track to which said supplemental magnet is connected is clear.

My invention consists, further, in special combinations of apparatus, as hereinafter more particularly described, whereby the restoration of the controlling apparatus to "safety" position cannot take place so long as a given section of track is occupied by a train or a portion of a train.

My invention consists, further, in especial combinations of apparatus wherein the circuit of the main controlling-magnet is formed through the rails of a section as well as through devices for interrupting the circuit automatically by the passage of a train or by manual devices, as hereinafter described.

In the accompanying drawings, Figure 1 illustrates diagrammatically a simple arrangement of circuits and apparatus embodying my invention, and shows the invention applied to controlling the circuits of magnets which set the brake, as described in my prior patent, No. 345,700, dated July 20, 1886. Fig. 2 illustrates in detail a part of the circuit-breaking mechanism at the entrance of a section of track. Fig. 3 illustrates a modified arrangement of apparatus embodying my invention. Figs. 4, 5, 6, 7, and 8 illustrate other modifications of my invention to be hereinafter more fully described.

Referring to Fig. 1, A indicates a section of track, and B B the section to the rear thereof, the invention being shown as applied to a railway-track wherein the trains move only in one direction, as in the direction of the arrow *k*.

C^2 is an electro-magnet which is in a normally-charged circuit and the armature of which requires to be retracted to assume the "danger" position, or position in which the apparatus or device designed to bring a train to a stop shall be thrown into operative condition. The circuit of the magnet C^2 is through one or both of the rails of the section A to a circuit-interrupting appliance of any suitable description (indicated at E) and placed at the entrance of the section.

M B is the battery which charges the circuit of magnet C^2.

My invention is herein shown applied to a block system wherein the magnet C^2 controls the circuit of a series of magnets D, applied to the section B at the rear and designed to stop a train on such section by applying the brakes through the intervention of devices such as set forth in my prior patents, No. 345,700 and No. 405,964, or through other appliances. For such purpose the armature of the magnet C^2 when it drops back by the action of gravity or a spring closes the circuit of the battery M B^2 and the magnets D.

The devices placed at the entrance of a section may operate in any desired manner on the entrance of the train onto the section. A simple construction of device for the purpose is indicated in Fig. 2, where I have shown a track-lever E^2, adapted to be struck by a wheel of the train and to depress a plunger E^3, normally sustained by a spring E^4. In the side of the plunger E^3 is an insulating-block E^5. Circuit-closing springs E^6 normally complete the circuit of the magnet C^2 by

bearing upon the conducting portion of the plunger. When the plunger is depressed, the block E^5 interrupts the circuit.

In order that the plunger may not immediately return to connect the circuit again, I provide it with a dash-pot or retarding device consisting of a piston E^8, which works in a cylinder E^9 rather loosely and is provided with a flap valve that opens upward, so that the plunger may be freely depressed, but will rise slowly, because the flap valve closes on upward movement and the air may pass only slowly around the edges of the piston to the space below. Any other means might be used for interrupting the circuit, and some of the devices suitable for the purpose are hereinafter referred to.

For holding the apparatus in "danger" condition so long as the train or any portion thereof is on the section A, even though the circuit of the magnet C^2 may be restored, I employ a supplemental electro-magnet F, or magnet-coil, which is included in the circuit of a battery or other generator M B^3, connected to opposite rails A A, so that the circuit will be completed and the magnet charged when any car wheels and axles are on such section. The magnet F may conveniently operate upon the armature of the magnet C^2, for which purpose it is applied in position, as shown, to hold the armature for the magnet C^2 down in "danger" position. So long as the magnet F is charged the magnet C^2 will be incapable of drawing back its armature to "safety" position, and hence, even though part of the train should pass from section A and onto a section, as C, the magnets D will still block the train on section B and keep it from entering section A until the latter is entirely clear. The action of the magnet F also assists in throwing the armature of magnet C^2 into "danger" position, where it will render the magnets D operative when a train enters on the section A. The armature of the magnet C^2 is therefore operated first by the joint action of the circuit-interrupting appliance E and by the closure of circuit across the rails A A, which energizes magnet F. The return of the apparatus to "safety" condition can only take place by the restoration of the circuit of magnet C^2, followed by the interruption of the circuit of magnet F, as just described.

In Fig. 3 I have illustrated a modified arrangement of device wherein the circuit-interrupting appliance E is restored to position for interrupting the circuit of magnet C^2 by the action of a track-instrument of any proper kind, such as is typified at E^{12} at or near the exit end of the section A. I have shown in this figure also a second magnet C^2, the circuit of which is normally formed through the rail A, so as to be interrupted should the line of rail be broken, as described in my prior patent. The armature of either magnet C^2 will close the circuit of the battery M B^2 and charge the magnets D either in the section C, or, in case of a single-track road, in the section B B when the train enters on section A.

In the instrument E the plunger E^3 is held in circuit-breaking position by means of a latch H, which is drawn by a spring into a notch into the plunger E^3, when the latter is depressed and is withdrawn in order to free the plunger and allow it to return to circuit-closing position by means of a magnet H^2, that is in a circuit extending from the track-instrument E^{12} at the remote end of the section. The instrument E^{12} is of any suitable character for closing the circuit of the battery M B^5, thereby energizing the magnet H^2 and causing the circuit of the magnet C^2 to be reclosed as the train leaves the section.

It will be understood that the instruments will be properly duplicated in the case of a single-track road, but the instruments and circuits to be used in such case are omitted from the diagram for the sake of simplicity.

In Fig. 4 I have shown my invention as applied to a case where the magnet C^2 controls the position of a signal-disk instead of charging magnets D. In this instance the magnet C^2, instead of having a movable plate-armature, has a movable core, as indicated, which is suspended from a lever I^2, carrying the signal-disk I^3. While the magnet C^2 is charged, the signal-disk is held in "safety" position; but when the circuit of the magnet is interrupted by means of the device E at the entrance of the section, the weight of the core of the magnet, being unopposed by the pull of the magnet C^2, throws the disk into "danger" position. As the core comes down by gravity, its end is brought into proximity with the magnet F, connected to rails of section A, as before explained, whereby the core will be held down and the signal exposed so long as the train or a car-axle thereof is over section A. The circuit of the magnet C^2 is, as before, through a rail of the section A, and in order to give warning to the engineer before entering section A, in case the rail should be broken, the signal-disk I^3 is located some distance rearwardly on the section B. When the train enters the section A, it will set the signal controlled by C^2 to give warning to a following train, and will not be reset to "safety" until the magnet F is discharged by the passage of all of the train off of section A.

In Fig. 5 I have illustrated the use of the magnet C^2 in controlling an ordinary block-signal disk in an equivalent manner. In this case the armature controls the circuit of a battery M B^6, the armature of the magnet C^2 keeping such circuit closed and charging the magnet D^4. The armature of magnet D^4 operates on a signal-disk to hold the same normally in "safety" position; but when the magnet is discharged the signal-disk comes to "danger" position. The discharge of the magnet takes place when the circuit of magnet C^2 is interrupted and its armature drops back. The armature is held in "danger" position, as before explained, by the magnet F, connected

to the rails of the section A A. The apparatus is kept in the "danger" position so long as the rails A A are bridged by a car-axle. The electro-magnet or coils of electro-magnet which hold or keep the apparatus in "danger" condition through the bridging of a section may be applied in other ways, as will be obvious to electricians. Thus, for instance, as shown in Fig. 6, the coils F might be wound on the same core with the magnet C^2, being applied in such way as to neutralize or oppose the action of the coils of C^2. In this case, while the coils F would not assist in throwing the apparatus to "danger" condition, they will nevertheless prevent the restoration of the same to "safety" position, even though the circuit of magnet C^2 should be closed, and will act in such manner so long as the train or a portion thereof is on the section of track A. At the same time interruption of the rail-circuit A, including coils C^2, will, as before, throw the apparatus into "danger" condition. In this case the current in the coils F neutralizes the action of the current in the coils C^2; but when the circuit of F is interrupted by the withdrawal of the bridging cars and axles from the section A then the coils of magnet C^2 may act without opposition to restore the armature to the "safety" position.

The magnet or magnet-coils F might operate in other ways to hold the apparatus in "danger" condition. Thus, as illustrated in Fig. 7, where I have shown the armature of magnet C^2 as operating to break the circuit of a signal-magnet D^4, the magnet F might act when charged to keep the circuit of said magnet D^4 open. In this instance the magnet C^2, though it might draw its own armature up to complete a break in a circuit, would be ineffective to restore the apparatus to "safety" position because the magnet F would keep the circuit interrupted at its relay contact-coils. The interruption of the circuit of magnet F by the passage of the train completely off the section A would, however, permit the complete closure of the circuit of the magnet D^4, and the signal-disk or other safety device would be thereby restored to "safety" or normal position.

As illustrating the fact that the circuit of the magnet C^2 might be interrupted by other appliances than those described, I have shown a further device suitable for the purposes in Fig. 8. In this case the circuit of C^2 through the rails A includes a circuit-interrupting lever P, which is acted upon by a magnet P^2. The latter is in the circuit of a battery M B^3, and the rails R R form a short section of track which is bridged by the wheels of the locomotive and axles therefor just before entering on section A. The circuit of magnet P^2 being thereby closed, the circuit of magnet C^2 will be interrupted as before. The immediate restoration of the circuit of magnet C^2 may be prevented by connecting to the lever P a pawl P^3, which shall engage with a wheel gearing with a vane or fly-wheel, as shown. The retractor of the lever P moves the lever back to position to close the circuit of C^2, but the retarding influence of the vane or fly-wheel rotated by the action of said retractor slows the movement, and by the time that the circuit is closed by P the train will have entered section A and magnet F will hold the apparatus in "danger" position.

I do not limit myself to any particular means for interrupting the circuit of magnet C^2, and other appliances suitable for the purpose will readily occur to those conversant with railway signaling appliances governed or actuated by electricity. It will also be obvious that the circuit completed across the rails of the section by the wheels and axles might be made to hold the apparatus in "danger" condition by other means than those specifically described without departing from the invention.

What I claim as my invention is—

1. In an apparatus for controlling the movement of railway-trains, the combination, with a controlling-magnet in a normally-charged circuit, and means for interrupting such charged circuit to set the apparatus in "danger" condition, of a supplemental magnet or magnet-coil for keeping the apparatus in "danger" condition, and a circuit therefor independent of that used in setting the apparatus, said circuit being through the rails and car wheels and axles of a section of road upon which the train moves while the apparatus requires to remain in "danger" condition.

2. The combination, with an electro-magnet, of a circuit therefor controlled by a train on entering a section, and an opposing magnet-coil in a circuit completed through the car wheels and axle on said section, as and for the purpose described.

3. The combination, with the magnet on a normally-closed circuit, of means for interrupting the flow of current therein, so as to throw the armature to "danger" position when a train enters a section, a circuit completed through the rails of said section and car wheels and axle in said section, and means controlled by said circuit for keeping the armature in "danger" position, as and for the purpose described.

4. The combination, with the magnet having a circuit formed through the rails and normally closed, of a circuit-breaker at the entrance of a section of track, and means for keeping the armature of said magnet in "danger" position controlled by a circuit formed over the track and the car axle and wheels of any car on said section.

5. The combination, with the magnet on a normally-charged circuit, of a circuit-breaker operated by a passing train, and a magnet-coil for keeping the armature of the first-named magnet in "danger" position, said magnet-coil being in a circuit formed through the wheels and axles of any car on the section of track protected.

6. The combination, with a magnet in a normally-charged circuit including the rails,

of a mechanically-operated circuit-breaker actuated by a passing train for setting the armature or equivalent portion of the magnet to "danger" position, and a magnet or magnet-coil for keeping the apparatus in "danger" position while the train is on a section of track, said magnet being in a circuit completed through the rails and car wheels and axles on the said section.

7. The combination, substantially as described, with a magnet in a circuit normally charged or closed and including the rails of a railroad-track, and an armature or equivalent device controlling signaling or other appliances, as described, of means for interrupting the circuit of said magnet, and a supplemental magnet or magnet-coil for holding the apparatus in "danger" position, or position into which it is placed by the interruption of the circuit for the field-magnet, said magnet or magnet-coil being in a circuit which includes the rails of a section of track and the car axles and wheels on said section.

Signed at New York, in the county of New York and State of New York, this 3d day of June, A. D. 1890.

FRANK E. KINSMAN.

Witnesses.

WM. H. CAPEL,

THOS. F. CONREY.