No. 849,842. PATENTED APR. 9, 1907.

C. S. HELLER.

SAFETY GATE CONTROLLING MEANS.

APPLICATION FILED OCT. 3, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

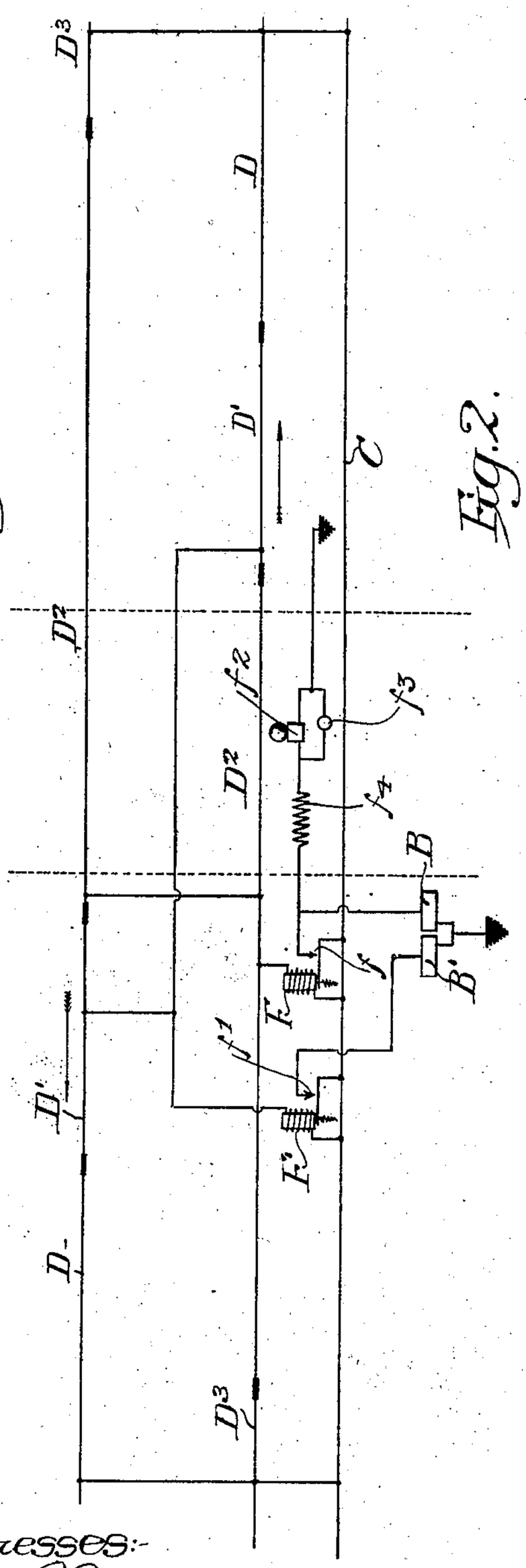
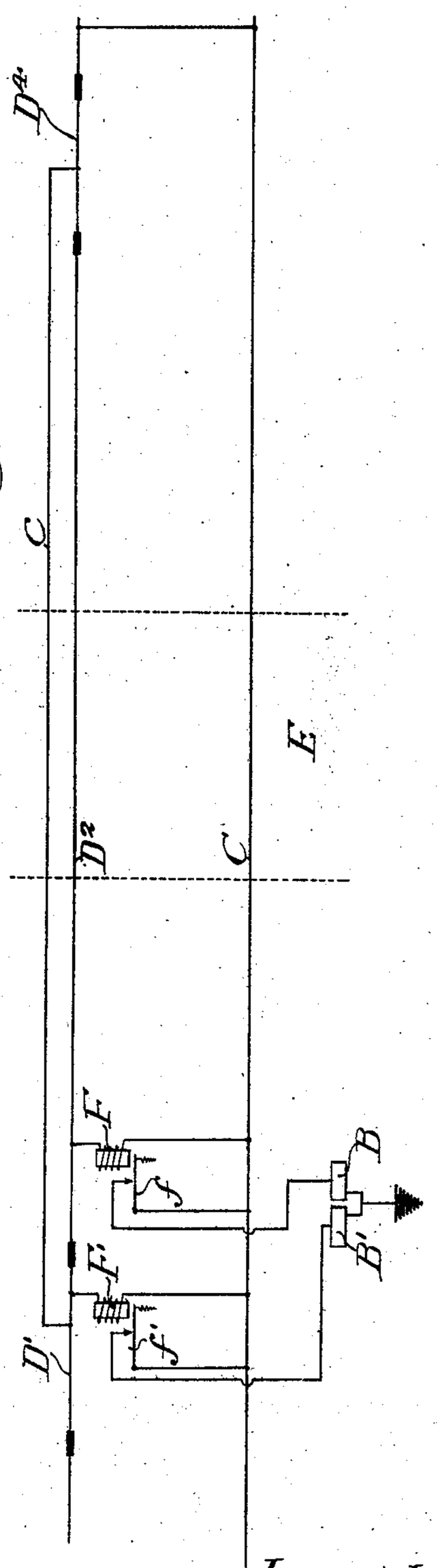


Fig. 2.



Witnesses:-
Walter J. Pellinger.
Titus H. Lords

Inventor
Charles S. Heller.
by his Attorneys,
Howson & Howson

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Fig. 5.

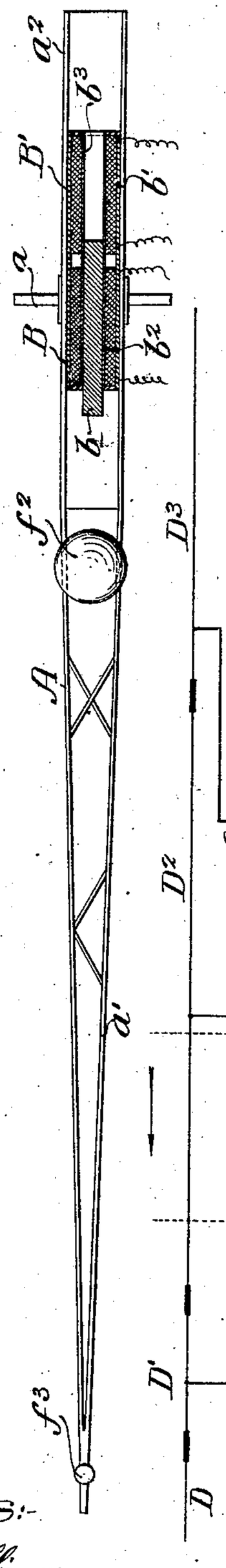


Fig. 3.

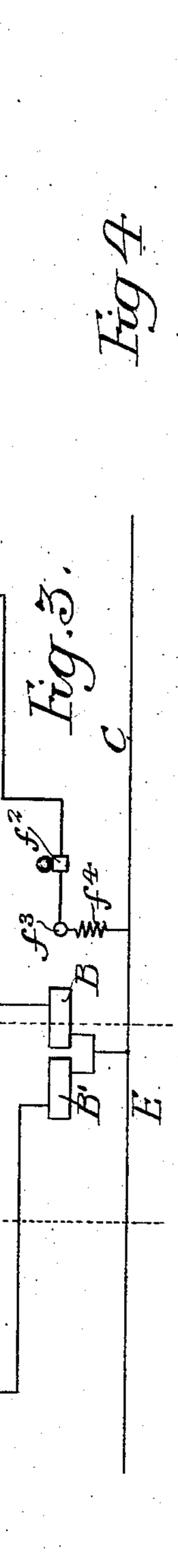
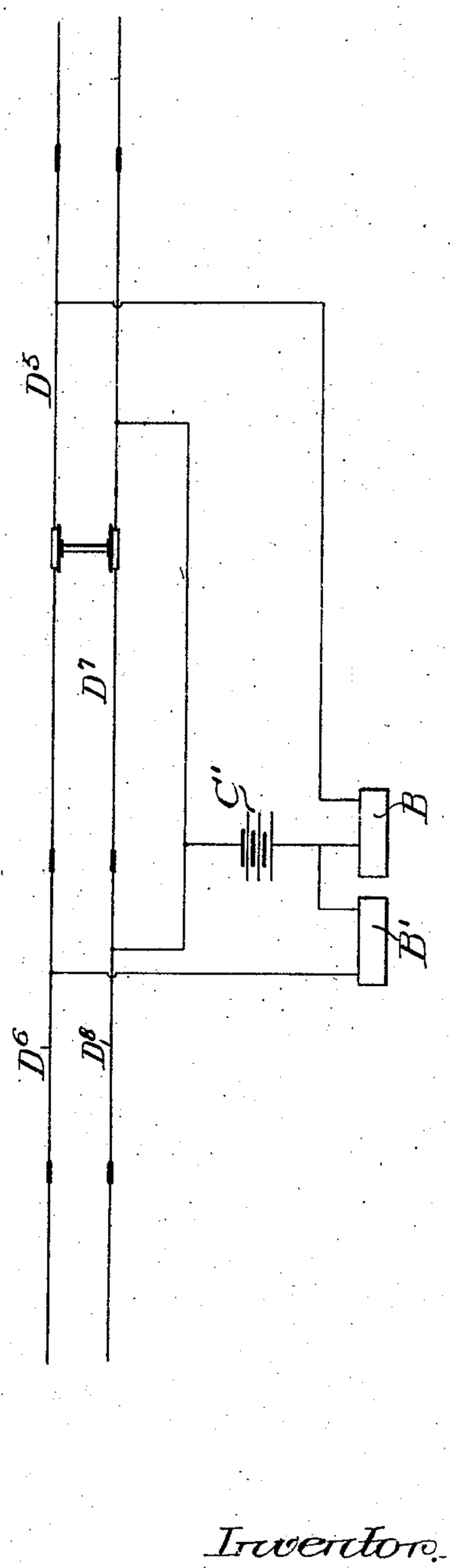


Fig 4



Witnesses:-
Walter J. Pellinger.
Petus H Ford.

Inventor.
Charles S. Heller.
by his Attorneys.
Howson & Howson

UNITED STATES PATENT OFFICE.

CHARLES S. HELLER, OF PHILADELPHIA, PENNSYLVANIA.

SAFETY-GATE-CONTROLLING MEANS.

No. 849,842. Specification of Letters Patent. Patented April 9, 1907.

Application filed October 3, 1906. Serial No. 337,226.

To all whom it may concern:

Be it known that I, CHARLES S. HELLER, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Safety-Gate-Controlling Means, of which the following is a specification.

One object of my invention is to provide an electromechanical device whereby a car, usually of the electrically-operated type, shall be caused to automatically control the operation of safety-gates at a crossing, the invention contemplating such an arrangement of apparatus that as a car approaches such crossing the gates will be automatically lowered and will remain in a closed position until after the car has passed over the crossing regardless of whether or not current may or may not have been cut off of the supply-circuit. After the car has passed the crossing the safety-gates are caused to automatically rise.

Another object of the invention is to provide a safety-gate with operating means consisting of a pair of solenoids and a core movable from one side to the other of the pivotal line of the gate and to so connect said solenoids that their energization, and hence the opening or closing of the gate, will be either directly or indirectly controlled by the current-flow for operating the car, it being my intention to employ such apparatus either by itself or in connection with visual or audible alarm devices on or adjacent to the safety-gate.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the apparatus preferably employed by me in carrying out my invention when this is applied to a double-track electric road. Fig. 2 represents diagrammatically the connections and apparatus employed when the invention is applied to a single-track road. Fig. 3 is a diagrammatic view illustrating the invention in its simplest form as applied to a single-track electric road. Fig. 4 is a diagrammatic view illustrating the invention as applied to a steam or other railroad in which current for operating the solenoids is derived from a battery; and Fig. 5 is a plan, partly in section, illustrating a safety-gate provided with operating-solenoids arranged according to my invention.

Referring first to Fig. 5 of the above drawings, A represents the framework of a pivoted safety-gate of the well-known construction commonly employed to guard railroad-crossings, this being equipped with a pivotal shaft or spindle a, supported in suitable bearings. (Not shown.) Carried by the safety-gate adjacent to its pivotal spindle are two relatively large solenoids B and B′, having between them a single soft-iron core b. These solenoids are so placed on the gate that they are axially in line with one another and are protected from the weather as well as from accidental injury by a suitable metallic casing b', enveloping both of them, there being, moreover, a metallic tube or tubes b^2 and b^3 within the solenoids, whereby injury from the movement of the core b is prevented. Moreover, said solenoids are so supported that when the core b is in a position of magnetic equilibrium within the solenoid B it overbalances the short arm a^2 of the safety-gate and causes it to move to its closed position. When, on the other hand, the core b is in a condition of magnetic equilibrium within the solenoid B′, the long arm a' of the safety-gate is overbalanced and the latter tends to assume a substantially vertical or open position.

In order to energize the solenoids B and B′, I connect them in the simplest form of my invention, as shown in Fig. 3—that is to say, the solenoid B′ has one end connected to the feed-wire C, from which the trolley-wire or third rail D, D′, D^2, and D^3 is supplied with current, while its second end is connected to a relatively short section D′ of the wire or rail, having a length of fifty feet, for example, and insulated by suitable means from the adjacent portions D and D^2. Similarly the solenoid B has one end connected to the feed-wire C and its second end connected to the section D^2 of the third rail or trolley-wire, which in like manner is provided with section-insulators between it and the adjacent sections D′ and D^3. The section D^2 of the current-conductor is of greater length—say from a quarter to half a mile—and it will be seen that if an electric car or train moves upon the railroad in the direction of the arrow, Fig. 3, it will, as soon as it passes from the section D^3 to the section D^2, receive its current from the feed-wire C through the solenoid B, said current passing thence to the third rail or trolley-wire D^2 and through the motors of the car, from whence it returns to the power-house through the rail or negative conductors in the well-known manner. As a

result it will be seen that the energization of the solenoid B causes the core *b* to be drawn into the position shown in Fig. 5, so that the gate is automatically moved to its closed position across the roadway, which is indicated in dotted lines at E. If for any reason the current-supply should fail while the car still occupies the section D^2, it will be seen that the gate will nevertheless remain in its closed position, since there is no force tending to change the position of its core *b*. As soon as the car has crossed the roadway E and entered the section D′ the current for actuating its motors will pass from the feed-wire to the solenoid B′, so that this latter will be energized, with the result that the core *b* is drawn into it. Such movement of such core overbalances the long arm of the safety-gate and causes this to move to its raised position, where it will remain until the solenoid B is again energized. Should there be two cars on the section D^2, the passage of one of them onto the section D′ would not cause raising of the gate, for, as will be understood by those skilled in the art, if both solenoids be energized the core will remain without moving within that one of said solenoids which was first energized.

In the case shown in Fig. 1 I have illustrated my invention as applied to a double-track electric road, the trolley-wire or third rail of which is divided into sections similar to those shown in Fig. 3, which, however, are so placed that a car or train will pass from the section D^3 to the end of a long section D^2 relatively distant from the roadway and will cause energization of the solenoid B, thereby causing closing of the safety-gate. After passing over the roadway onto the section D′ the car causes raising of the safety-gate, it being noted that the magnet F is connected to both of the sections D^2 of the two tracks, while the magnet F′ is similarly connected to both of the short sections D′.

In many cases it may be unadvisable to connect the solenoids for operating the safety-gate directly in circuit between the feed-wire and the third rail or trolley-wire, and in such case I arrange the connections of the apparatus as shown in Fig. 2. Under the conditions illustrated I connect the magnets F and F′ between the feed-wire C and the sections D^2 and D′, respectively, and cause the first of said magnets to operate a switch *f*, connected between the feed-wire C and the solenoid B, the second end of said solenoid being grounded. Similarly the magnet F′ is made to control a switch *f*′, connected between the solenoid B′ and the feed-wire C, said second solenoid being likewise grounded.

Under operating conditions when a car enters the relatively long section D^2 the magnet F is energized, and thereby causes closing of the normally open switch *f* with the result that the solenoid B is energized and the safety-gate closed, as above described. If the flow of current through the magnet F should cease from any cause, the switch *f* would immediately open, and though this would cause deënergization of the solenoid B it would not in any way cause a change in the position of the safety-gate. As soon as the cars, however, enter the section D′ the magnet F′ is energized, thereby causing closing of the switch *f*′ and energization of the solenoid B′. This latter would immediately cause movement of the core *b*, so as to open the safety-gate, as above described.

In the case illustrated in Fig. 2 I have shown a trolley-wire or third rail designed to cause operation of the safety-gates no matter in what direction the cars operate, and for this purpose the section D^2 is extended for a certain distance on both sides of the roadway E. At one extremity of the section D^2 is a relatively short section D′, while at the other is a second short section of wire or rail D^4, and said short sections are connected together by the wire *c*. As a result whenever a car approaches the roadway E it must first pass onto one of the sections D′ or D^4 and in any case will energize the solenoid B′, so as to cause opening of the gate A. While still at a safe distance from the roadway the car will pass onto the section D^2 regardless of the direction from which it approaches and by causing energization of the solenoid B will cause closing of the safety-gate. After passing off of the section D^2 it again enters the section D′ or the section D^4 and by causing energization of the solenoid B′ restores the safety-gate to its open position.

If it is desired to employ a safety-gate constructed as shown in Fig. 5 on roads where other motive power than electricity is used, I may connect the solenoids B and B′ as shown in Fig. 4. In this instance the two rails of an ordinary track are normally insulated from one another and the rails are also divided by suitable insulating-joints into a pair of relatively long sections D^5 and D^7 and a pair of relatively short sections D^6 and D^8. As before, the long section is connected to one end of the winding of the solenoid B and the short section D^6 is connected to one end of the winding of the solenoid B′. The second ends of both solenoids are connected to one terminal of a battery or other suitable current-generator C′, whose second terminal is connected to the rail-sections D^7 and D^8.

Under operating conditions it will be seen that the wheels of a car or train will electrically connect the rails of the sections D^5 and D^7, thereby permitting current to flow through the solenoid B and causing closing of the safety-gate. The connection of the sections D^6 and D^8 by the wheels of a train or car similarly cause energization of the solenoid B′ and consequent raising of the safety-gate.

It is of course obvious that the solenoids B and B′ may be connected so as to be energized to open and close the safety-gate by means of a local current-generator with arrangements of insulated rail-sections similar to the insulated trolley-wire, and it will be noted that so far as actual operation of the system is concerned it is immaterial whether the current for operating the motors of a car be used to energize the solenoids B or B′, as shown in Fig. 1, or whether it be caused to operate switches which in turn control said solenoids.

From the above it will be seen that I employ electromagnetic means for automatically controlling the gravity-actuated operating means of a safety-gate, and I have found the device in practical operation to be eminently successful by reason of the fact that it is not only of a relatively inexpensive nature to install and operate, but is of such simplicity and contains so few parts that the likelihood of its getting out of order or requiring repairs is reduced to a minimum.

If desired, I may provide alarm devices to be automatically controlled by the cars of a railroad and for this purpose connect to the switch *f*, Fig. 1, an electric bell f^2 either by itself or in connection with an electric lamp f^3, both of these devices being preferably carried on the safety-gate. Under these conditions when the magnet F is energized on the approach of a car or train the bell and lamp are supplied with current, there being, if necessary, a body of resistance f^4 in circuit with them in order that they may properly be operated by current at the voltage employed on the railroad system. Such alarm devices may be operated, if desired, with their connections arranged as shown in Fig. 3—that is, either a bell or lamp, or both, may be connected directly between the feed-cable C and the section D^3 and in shunt to the solenoid B or magnet F, either with or without resistance f^4 for cutting down the voltage. In such case the alarm devices will be actuated whenever a car is operated on the section D^3, it being particularly noticeable that both of said devices are of such a nature as to give indication of the approach of a car or train on said section before the movement of the core *b* could by any possibility cause closing of the safety-gate. As a consequence it would be a practical impossibility for a person or train to be struck by the gate or be caught between two gates on the crossing without due warning having first been given of the fact that said gate or gates would shortly close.

I claim as my invention—

1. A system employing gravity controlled by electricity, including a safety-gate, a movable weight constructed to cause closing of the gate when in one position and opening of the said gate when in another position, electromagnetic means for moving said weight from one position to the other, and means for governing the operation of said electromagnetic means, substantially as described.

2. A system including a safety-gate, two solenoids adjacent to the pivotal line of said gate, a common core for said solenoids movable from one side to the other of the pivotal line of the gate, and means for controlling the energization of the solenoids, substantially as described.

3. A system including a safety-gate, two solenoids therefor, a common core for said solenoids movable so as to close or open the gate, and means controlled by a moving vehicle for governing the energization of said solenoids, substantially as described.

4. The combination with the current-supply feeder of an electric railway, of a conductor divided into a plurality of sections insulated from each other, a safety-gate, solenoids for said gate, a common core for said solenoids constructed when in one position to cause opening of the gate and when in the other position to cause closing of the gate, and means including electrical connections between said conductor-sections and said solenoids for controlling the energization of the solenoids, substantially as described.

5. The combination with a railway system including conductors divided into a plurality of sections insulated from each other, of a safety-gate having a gravitational device for controlling its opening and closing, including two solenoids, means connected to one of the insulated sections for causing one of the solenoids to be energized, to cause opening of the gate when a car is on said section, and other means connected to another insulated section for causing energization of the second solenoid and consequent closing of the gate when the car is on said second section, substantially as described.

6. The combination with the current-supply feeder of an electric railway, of a conductor engaged by a contact on a car and divided into a number of sections insulated from each other, means connecting said conductor-sections to said supply-feeder, a safety-gate having two solenoids, a common core for said solenoids so placed that in one position it causes opening of the gate and in another position closing of the same, with means whereby one solenoid is energized when an electric car receives current from one of said sections, and other means whereby the second solenoid is energized when such car receives current from another section, substantially as described.

7. The combination with the current-supply feeder of an electric railway, of conductors placed to be engaged by a contact on a car, said conductors being divided into a number of sections insulated from each other,

of means including electromagnets respectively connecting the said sections and the said feeder, a safety-gate having means controlled by said electromagnets, for causing its opening and closing, and alarm devices connected to be actuated before a certain one of said electromagnets is energized, substantially as described.

8. The combination with the current-supply feeder of an electric railway, of a conductor divided into a number of sections, of which one is of greater length than the other, with a safety-gate placed adjacent to the longer of said sections, a pair of solenoids for causing operation of the safety-gate, and means for causing energization of one solenoid and consequent closing of the gate when a car is receiving current from the longer conductor-section, and other means for causing energization of the other solenoid and opening of the gate when the car is receiving current from the shorter conductor-section, substantially as described.

9. The combination with the current-supply feeder of an electric railway, of a conductor placed to be engaged by a contact device on a car and divided into a number of sections insulated from each other, magnets respectively connected between the sections and said feeder, switches controlled by said magnets, a safety-gate, and operating electromagnets therefor connected respectively in circuit with said switches and said current-feeder, substantially as described.

10. The combination of a safety-gate, a source of current-supply, and a conductor divided into sections for supplying current to an electrically-operated car, a solenoid connected between one of said sections and said source of supply having means for operating the gate, and an alarm device or devices connected in shunt to said solenoid, substantially as described.

11. The combination of a safety-gate, a source of current-supply, and a conductor divided into sections for supplying current to an electrically-operated car, a solenoid connected between one of said sections and said source of supply having means for operating the gate, and an alarm device or devices connected between said source and a section of the conductor other than that having said solenoid, said device or devices being constructed to be set in operation before the safety-gate closes, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES S. HELLER.

Witnesses:

ROBERT KAISER,

JOS. H. KLEIN.