(No Model.) 4 Sheets—Sheet 1.

R. SKEEN.

ELECTRICAL SIGNAL SYSTEM.

No. 574,953. Patented Jan. 12, 1897.

Fig. I.

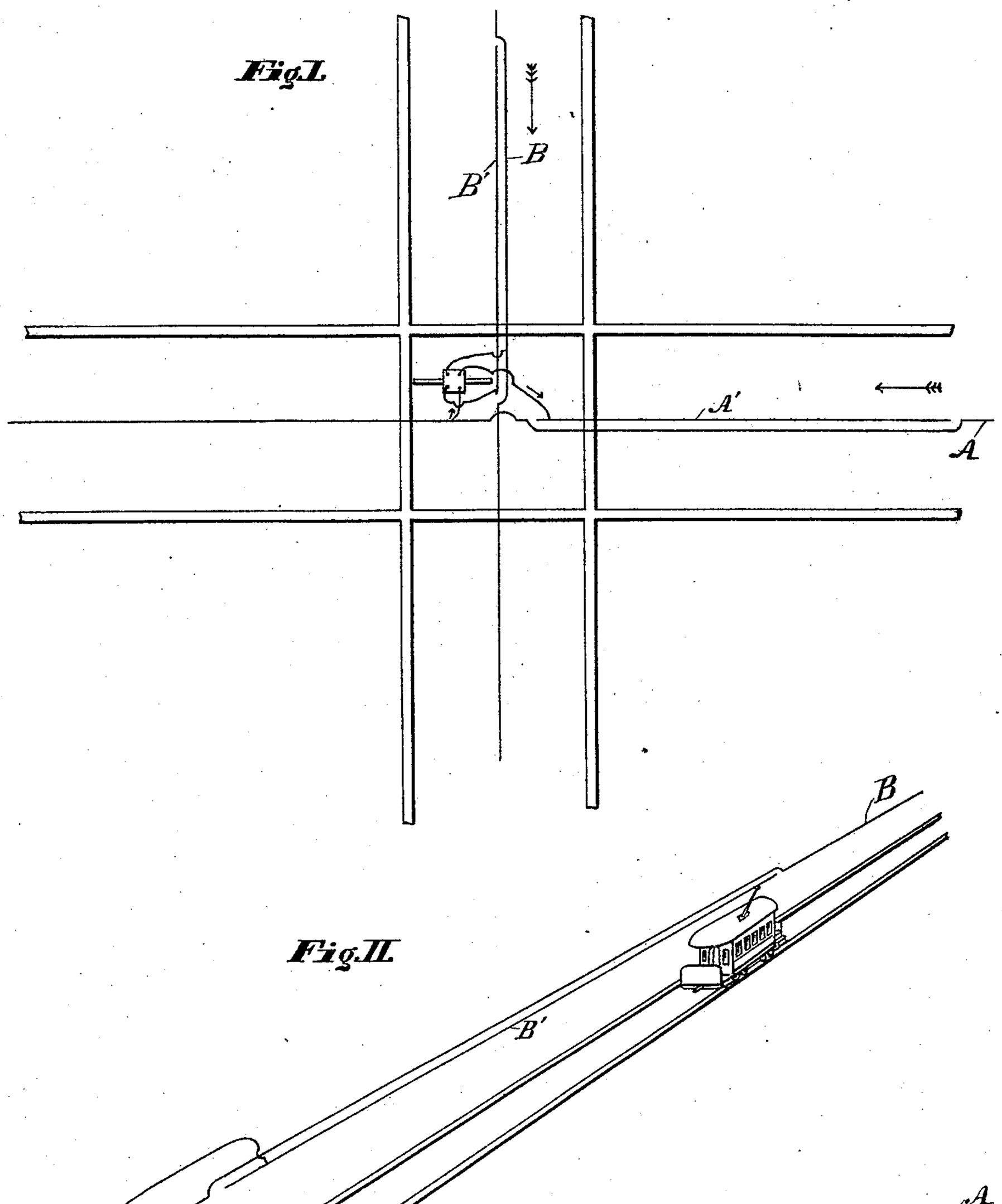

Fig. II.

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Fig. III.

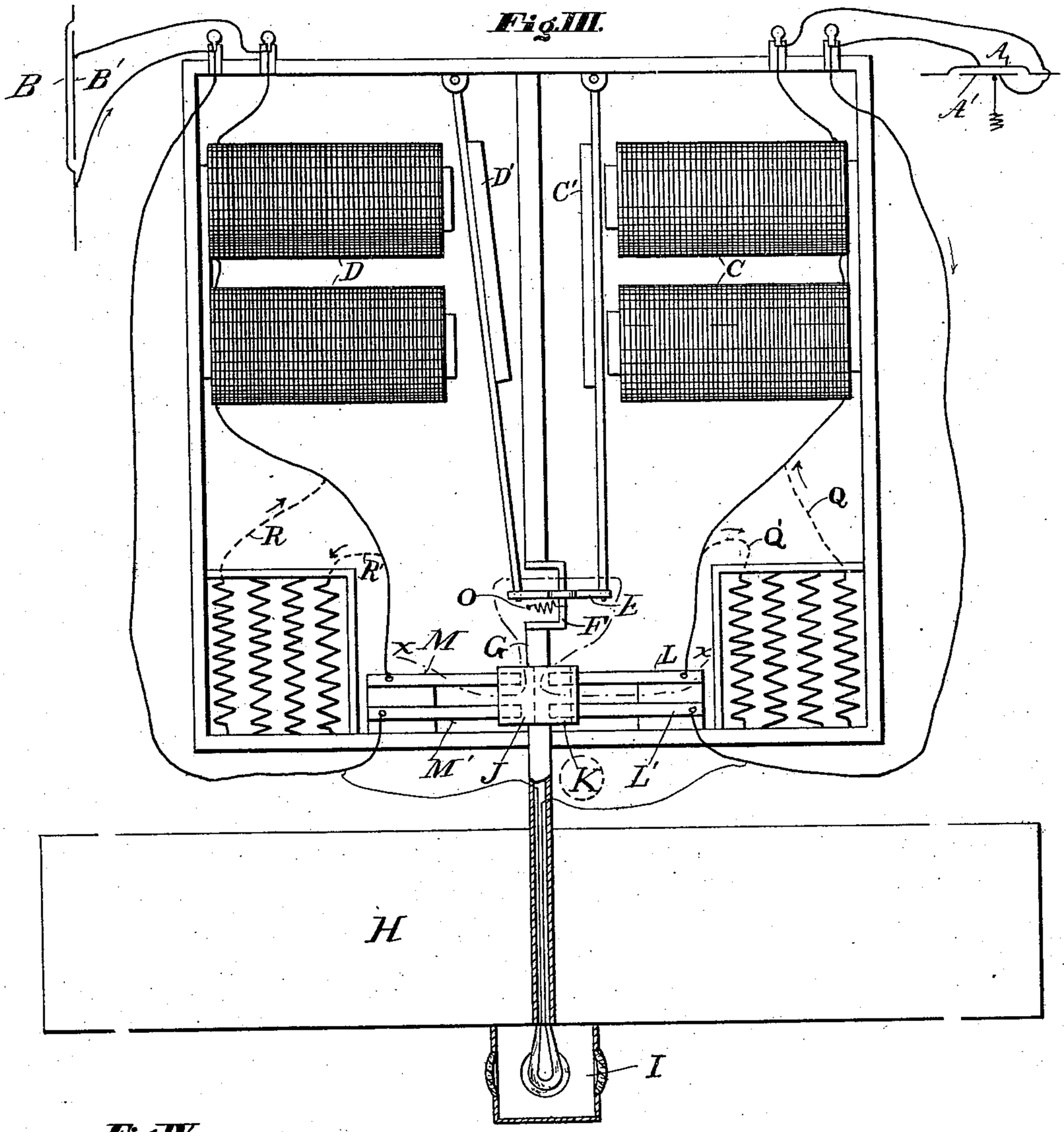


Fig. IV.

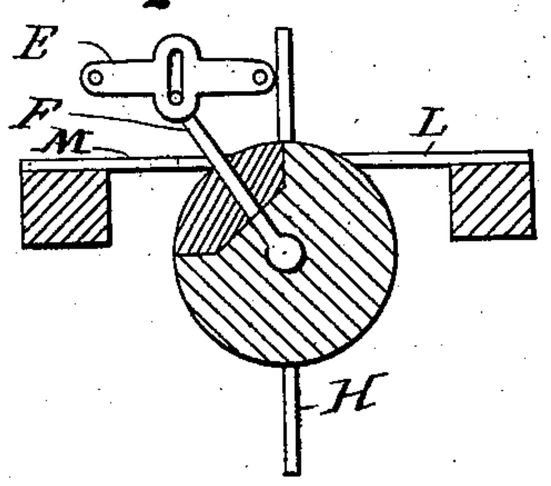


Fig. V.

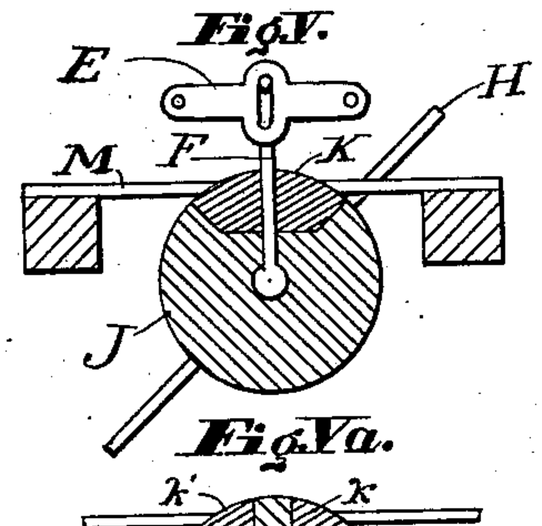


Fig. VI.

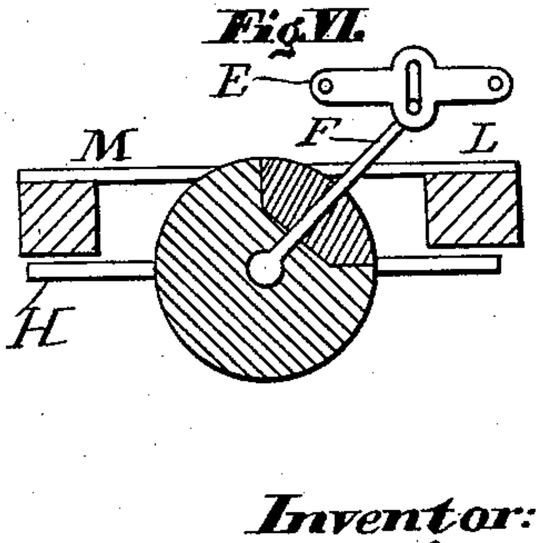
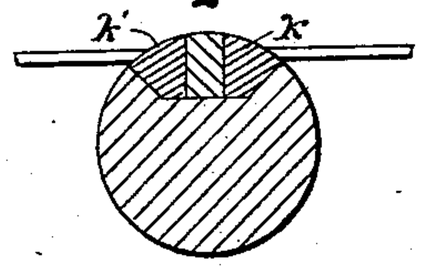


Fig. Va.



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(No Model.) 4 Sheets—Sheet 3.

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ELECTRICAL SIGNAL SYSTEM.

No. 574,953. Patented Jan. 12, 1897.

Fig. VII.

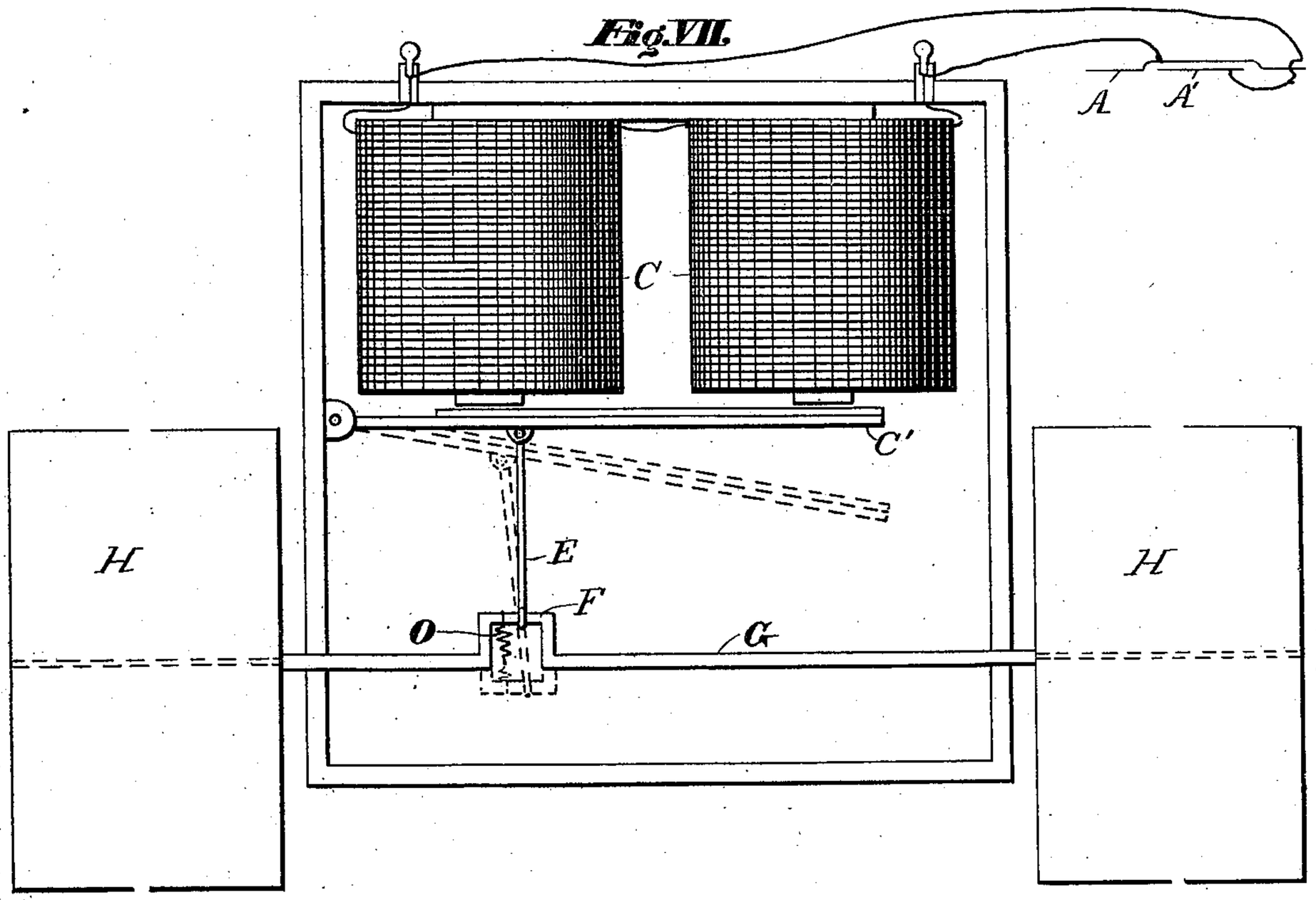
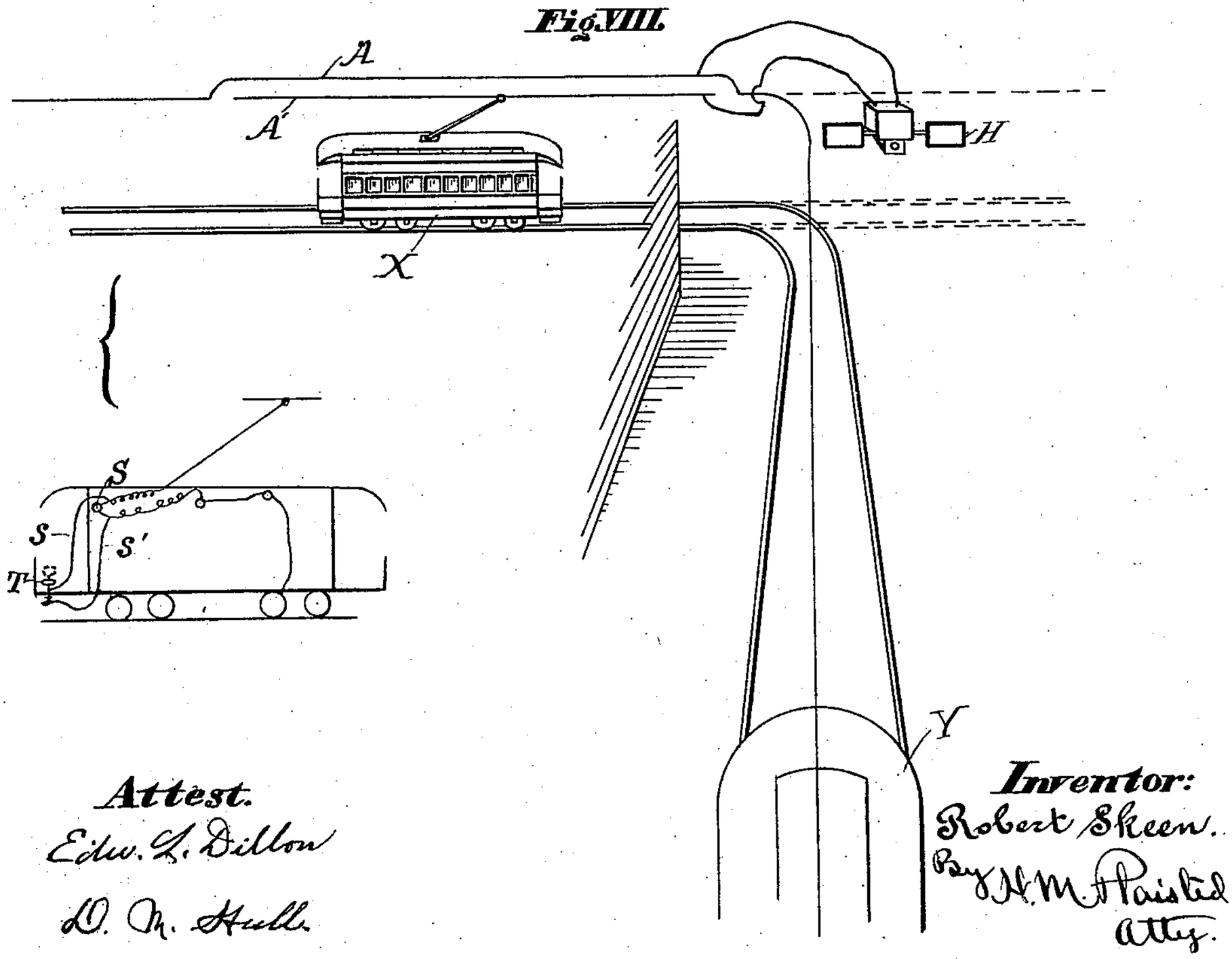


Fig. VIII.



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(No Model.) 4 Sheets—Sheet 4.

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ELECTRICAL SIGNAL SYSTEM.

No. 574,953. Patented Jan. 12, 1897.

Fig. X.

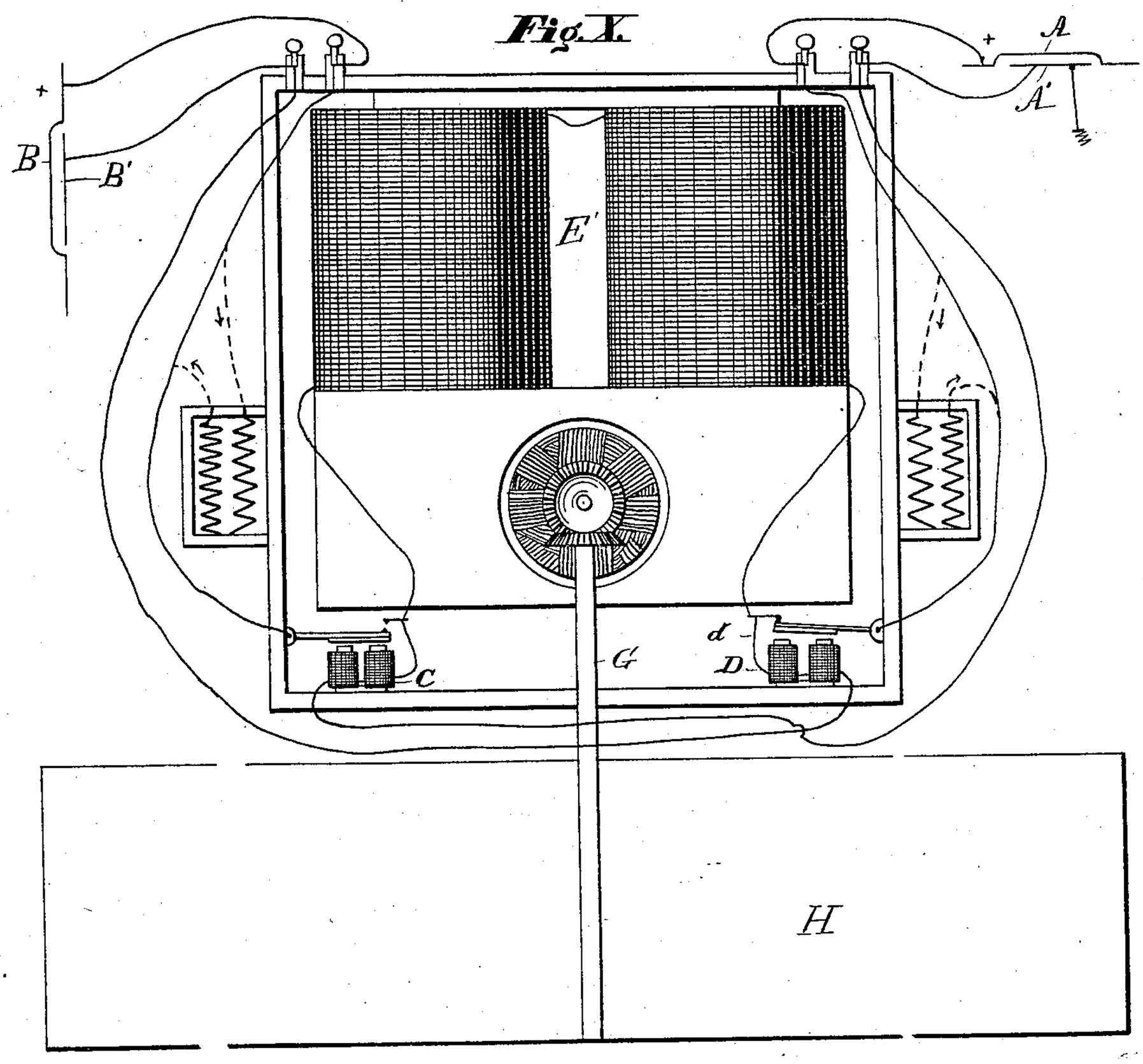
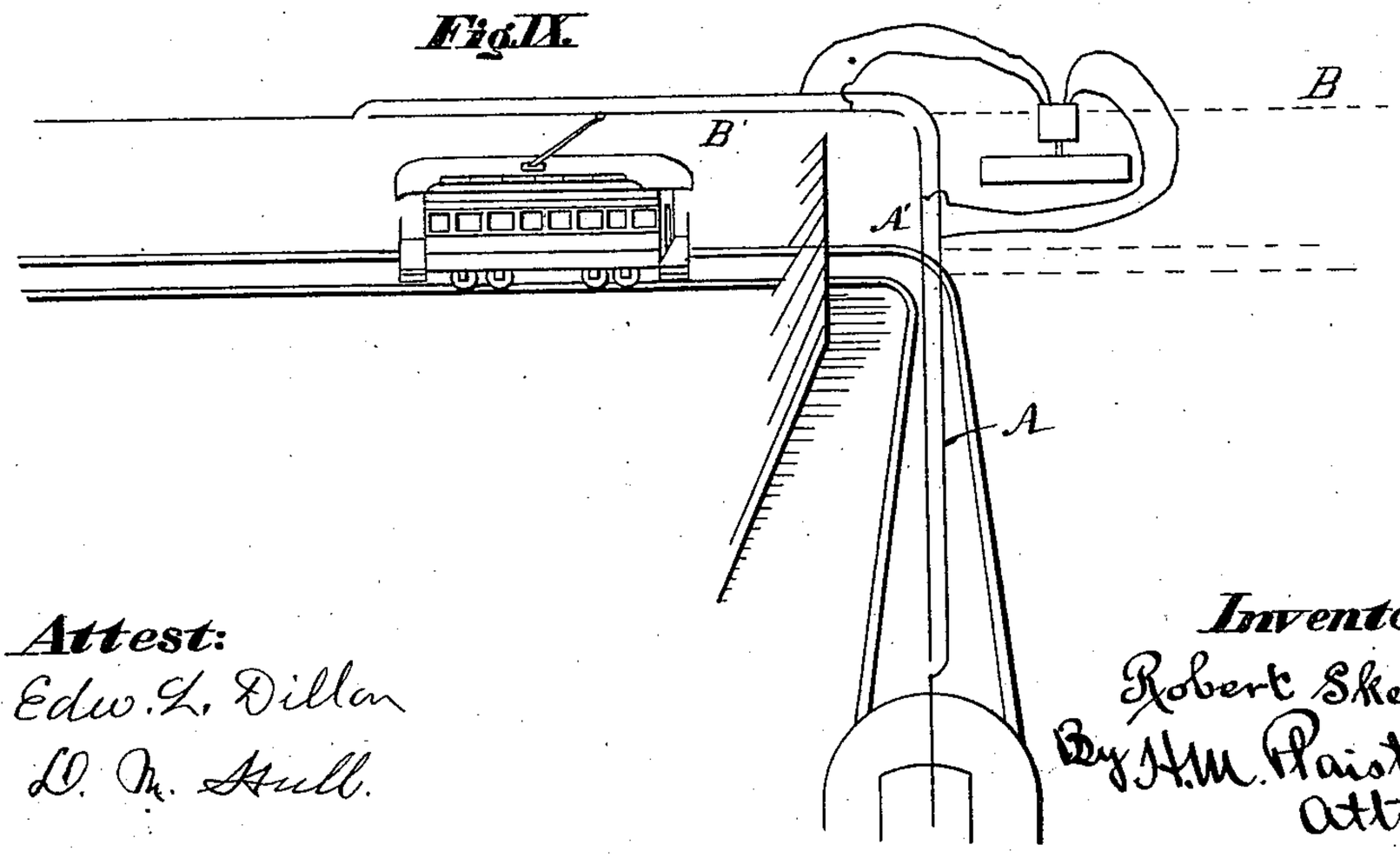


Fig. IX.



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UNITED STATES PATENT OFFICE.

ROBERT SKEEN, OF MADISON, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SKEEN ELECTRIC SWITCH AND SIGNAL COMPANY, OF ST. LOUIS, MISSOURI.

ELECTRICAL SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 574,953, dated January 12, 1897.

Application filed March 4, 1895. Serial No. 540,489. (No model.)

To all whom it may concern:

Be it known that I, ROBERT SKEEN, a citizen of the United States, residing at Madison, in the county of Madison and State of Illinois, have invented certain new and useful Improvements in Electric Signal Systems, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in electric signal systems; and the chief object of my invention is to cut off the current from the second of two cars approaching or adjacent to a point where there is danger of collision, whether the cars are upon tracks that cross each other or upon the same track.

To this end my improvements have reference to a section of trolley-wire insulated from the main line, but forming a part of such line, so that the trolley-wheel will run from the main line upon the insulated section and constitute a ground connection through the car-motor; have reference to a switch combined with the insulated section and a source of electricity; have reference to two or more insulated sections and electrical devices operating to cut out one section when the first has obtained ground connection; have reference to visible signals operated alone or in conjunction with the cutting out of one section by another; have reference to operative devices electrically actuated in conjunction with said signals, and have reference to other points of detail and construction hereinafter shown and described.

In the accompanying drawings, on which like reference-letters indicate corresponding parts, Figure 1 represents a plan view of a crossing of single-track electric railways and diagram of the electrical connections; Fig. 2, a perspective view of said crossing with cars approaching that point; Fig. 3, an elevation of a signal and switch device for said crossing, with its electrical connections in diagram; Figs. 4, 5, and 6, plan views taken on the section *x x*, Fig. 3, showing the position of the switch and semaphore in different positions. Fig. 5[a] is a sectional view of a modified form of switch device; Fig. 7, a similar view to Fig. 3, showing a transverse semaphore-axis; Fig. 8, a perspective view of a single track at a crossing and electrical connections between the signal and trolley-wire; Fig. 9, a motor and its electrical connections for operating the semaphore; Fig. 10, a similar view to Fig. 8, showing the double sections on the same line.

Referring to the drawings, the letter A indicates the live trolley-wire of one electric railway-line, say the east and west, and the letter B the wire of the other line, crossing the former, as shown in Figs. 1 and 2. For simplicity and ready understanding of the invention we will take the cars running in the direction of the arrows, to the west and to the south. On each line a portion of the trolley-wire A′ B′, respectively, is cut out or insulated from the main wire, but remains in line with such wire, so that the trolley-wheel will follow normally along the same. The insulated section on each line extends from or near the crossing to a point, say, one hundred feet or more distant, according to the grade and other circumstances. The main trolley-wire on each line passes above or at one side of the insulated section and then is brought into line again at the other end of the section.

An automatic switch device is electrically interposed between the insulated sections, and an electromagnet is also in circuit with the switch device and source of electricity, whereby the said switch may be operated automatically to cut out one of the insulated sections and make it "dead," whether any car is under that section or not. At the same time the switches are operated a visible signal, such as a semaphore or changing light, is also operated at the crossing or other convenient point to indicate to the motorman of the second car the reason he is without current. In other words, the first car reaching the insulated section on its line will effectually prevent the approach of the other car reaching its corresponding insulated section later until the first car has passed off its insulated section and by the point of danger.

Referring to Figs. 3 to 6, a pair of opposing electromagnets C D is provided with armatures C′ D′, respectively, which are connected by a cross-piece E, insulated from the armatures. This cross-piece engages with a crank F on the main shaft G, bearing the sema-

phore H and changing light I. The semaphore is for day signaling and the light to show at night. On the main shaft G is an insulated drum or sector J, bearing a conducting-piece K, which is adapted to bear upon a double set of brushes or other contact-pieces L L′ and M M′, respectively. These brushes are otherwise insulated from each other. The brush L′ is wired to the main line A, and the other brush L is wired to the insulated section A′. The electromagnet C, which may consist of one or more coils, is preferably in circuit with the insulated section and the brush L, as shown in Fig. 3. The brushes M M′ are similarly wired to the insulated section B′ and the trolley-line B, and the electromagnet D is also in circuit therewith. The current will not pass through either of the electromagnets till a car arrives at the insulated section of one line, and this completes the circuit between that section and the ground through the trolley-wheel and motor. In the normal position of the semaphore and conducting-piece K all the brushes are on the said contact-piece and the current flows through the brushes M′ and L′. The electromagnets remain inoperative and the current does not pass through them until the circuit is completed by the arrival of a car on the insulated section, say A′. The electromagnet C then acts strongly on its armature C′, which operates the crank F and throws the piece K to one side, away from the brushes M M′, though still retaining contact with the brushes L L′. This position cuts out entirely the insulated section B′, since the brushes M M′ are insulated from one another. If a second car should reach B′ while the parts were in this condition, it could receive no current and would be inoperative as to the switch device as long as the first car remained on the section A′, and thus kept the switch thrown so as to receive all the current.

When the car passes from the section A′, the circuit is broken, the electromagnet C releases the armature C′, and a spring O or other mechanical means returns the crank F and the semaphore to normal position, as shown in Fig. 5. The second car, if it be on its section B′, can now obtain current through the piece K, connecting the brushes M M′, and cause the electromagnet D to attract its armature D′, thus throwing the switch to the left, as in Fig. 4, and cutting out the section A′. Any car following on the line A cannot pass the crossing till the car on the line B releases the switch and allows it to receive the current. A modification of this arrangement is shown in Figs. 7 and 8. It is adapted to prevent accidents by rear-end collisions, such as when the car X turns a corner and is out of sight of the car Y closely following it. An insulated section A′, Fig. 8, extends a suitable distance away from the corner and the signal remains at "danger" while the car X is on the section A′. In this modification the electromagnet C is wired, as before, to the insulated section and main trolley-wire and attracts an armature which rotates the semaphore H. (Shown here as on a horizontal axis.) In this case the switch device is not used for cutting out the following car, although, if desired, it may be combined therewith, as illustrated in Fig. 3. If such combination, a switch and signal, in order to cut out a car following another on the same track, be desired, a plurality of insulated sections forming "blocks" will constitute an absolutely safe block system and cut out the current from the block it has just left till it reaches the next block.

Fig. 9 shows a pair of insulated sections abutting at a corner, whereby one car will cut out the current from the section to the rear of it and prevent the car following from leaving this section or block till the first car just ahead has passed off its section or block.

Fig. 10 shows a motor P, connected by gears or otherwise to a switch device similar to that previously described and in circuit with two or more insulated sections and their main trolley-wires. In this case the car that reaches its section first will draw all the current through the motor and rotate the signal in one direction. The car reaching its corresponding section even an instant later than the first car will not be able to supply the motor-current, and will be practically cut out. The first car passing off from its section or block will allow the second car to take the current through the electromagnet in the opposite direction, which will rotate the motor in the opposite direction to the first rotation and set the signal for the other line. In this form the switch device consists of a pair of contact-points for each electromagnet's armature instead of the brush forms of contacts with the rotary conducting piece or armature K, previously shown. Thus the car on section A′ would complete the circuit between the said section through the electromagnet C and the motor back to the trolley-line A. The electromagnet D will be cut out, as before, by separation of the contact-points. The wire connecting the electromagnet D with the other insulated section B′ finds no outlet for any current shunting through the wire *d*, passing to the motor. When, however, the car leaves the section A′ and a second car arrives at the section B′, then the circuit will be completed through this wire *d*, the motor, and the electromagnet D to the insulated section B′, separating the contact-points at the electromagnet D, as was done previously at the other side. This change of direction of current reverses the motor. The motor will therefore turn the signal to one direction or the other and likewise cut out the current from one line or the other, according to the direction of the current through the motor, which is determined by the car which first arrives at this insulated section.

Referring back to Fig. 3 once more, I have provided for a difference of voltage or poten-

tial in the crossing lines by a resistance-coil or rheostat Q and R for each electromagnet C D, respectively. The wires Q Q′, dotted in Fig. 3, replace the other wire and convey the current through the resistance-box to the electromagnet and allow only the safe quantity of current to flow through the magnet C. Similarly a resistance-box may be used with the motor in Fig. 10. In case two cars following close to one another should both enter the insulated section, both cars would only be able to take the safe quantity of current for their electromagnets. Where the electromagnets do not need that protection, I can dispense with the rheostat and send the current from the brush L, for instance, directly to magnet C. In the other case the current will go first through the rheostat.

I have spoken of the arrangement of the main trolley-line at one side of the insulated section as well as above. This lateral location of the live wire possesses certain advantages. For instance, it may be necessary to move the car that was on an insulated section which had been cut out by another car. To pass an obstruction or return to the main wire, the conductor would merely have to change his trolley from the dead-section to the main wire at one side and obtain current for his car.

I do not confine myself to the exact construction and wiring herein shown and described, as these are but exemplifications of the working out of my invention.

Referring once more to the switch device shown in Figs. 3 to 6, I would say that while there may be no objection to the current passing through from B to A by means of the conducting-block K in the position shown in Fig. 5, when both lines are similar or positive as to their electricity, yet I have provided in Fig. 5ª a separate conducting-piece for each pair of brushes, so as to prevent the current passing between M′ of one pair and L′ of the other, as before described. When the movable piece K in the later form is separated by an insulating space or metal, so that it is really in two parts *k k′*, the circuit through the electromagnet C, when completed by the car passing on the section A′, will throw this double block so that the brushes L L′ rest upon the half *k′* and the other brushes are out of contact entirely with the same. This is readily shown by Fig. 6, assuming that the left-hand portion of the conductor K represents the small conductor *k′*, insulated from the right-hand portion.

Referring again to Fig. 8, the diagram portion of this figure indicates the wiring of a car whereby the signal will be maintained at "danger" when the car stops, as previously described, and thus cuts the current from the motor. In the diagram figure a shunt-circuit is arranged in connection with the lamp-circuit. The shunt-circuit is completed by a contact-piece operated by the motorneer when he stops on turning a corner, as previously described. The switch S for the lamps may be turned off, for instance, as in the daytime. In this case the circuit will be made from the signal through the trolley and completed by the shunt-wires *s s′*, connected by the contact-piece T. When the lamps are lighted the motorneer is not required to complete the connection at T, since the lamp-circuit will complete the connection to the ground, as indicated in this diagram. This is but one way of wiring in order to provide a shunt-circuit that will maintain the signal at danger position when the car-motor itself is cut out, as in the case of stoppage. I have described this signaling thus completely in connection with electric railways. I wish to be distinctly understood as not confining myself to electric railways, since it is evident that this system of signaling and the operative electric devices herein shown and described as comprised in my invention may be equally applicable to steam-railways, cable-roads, and the like without the use of the switch cut-out mechanism, by which it is adapted to cut off the motive power to electric cars. I have therefore shown in Fig. 7 this signal separate from the switch device, and have so claimed it broadly, whether it be in the exact form shown by this figure or not. For instance, I may also use the semaphore and operative electromagnets, arranged as shown in Figs. 3 and 10, but without the switch device, which in the case of steam and cable roads is superfluous.

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

1. A system comprising an electrical railroad provided with a trolley-wire for supplying current thereto having an insulated section, a switch for cutting off the current from said section, and a railroad crossing the former road, the one end of the insulated section terminating substantially at the crossing road, and a live wire over the electrical road in addition to the insulated section.

2. A signal system, comprising a pair of insulated sections of trolley or other electrified lines, a pair of brushes insulated from each other, one brush fed from the trolley-wire, the other brush wired to the insulated section, an electromagnet in circuit with said brushes and their corresponding section, another pair of brushes and electromagnet for the other insulated section, a conducting-piece movably mounted adapted to electrically connect the said pairs of brushes, or complete the circuit through one pair only, and mechanical connections between said conducting-piece and said electromagnets, substantially as described.

3. In an electric signal, the combination with a main line and an insulated section therein, of an electromagnet and its armature, a switch device comprising a crank-shaft, a conducting-piece thereon and a pair of brushes normally contacting therewith,

one brush wired through the electromagnet to the insulated section and the other brush to the main wire.

4. In an electric signal, the combination with a main line and an insulated section therein, of an electromagnet and its armature, a switch device comprising a crank-shaft, a conducting-piece thereon and a pair of brushes normally contacting therewith, one brush wired through the electromagnet to the insulated section and the other brush to the main wire, and a rheostat in circuit with the first brush and the electromagnet.

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

ROBERT SKEEN.

Witnesses:
M. JACOBY,
H. M. PLAISTED.