(No Model.) 2 Sheets—Sheet 1.

W. T. WATERS.

ELECTRIC RAILWAY SIGNAL.

No. 314,760. Patented Mar. 31, 1885.

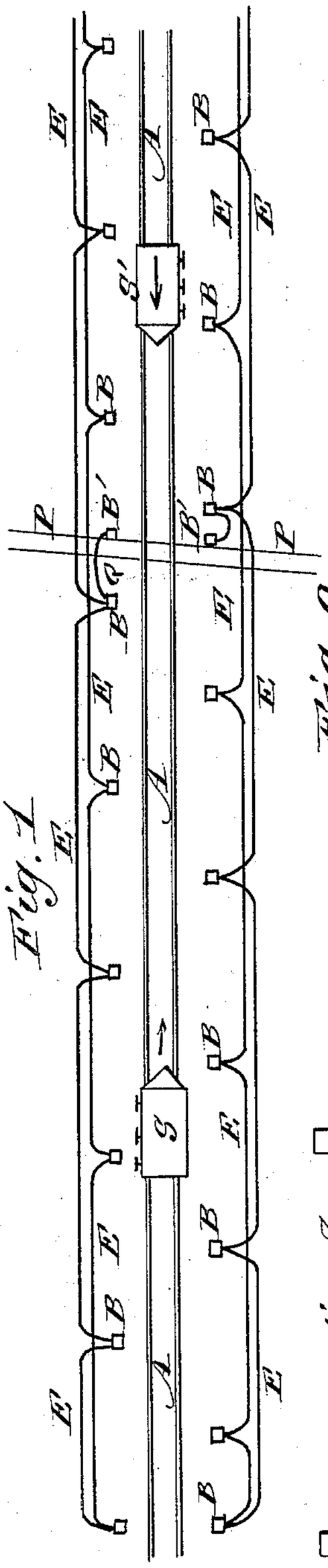

Fig. 1.

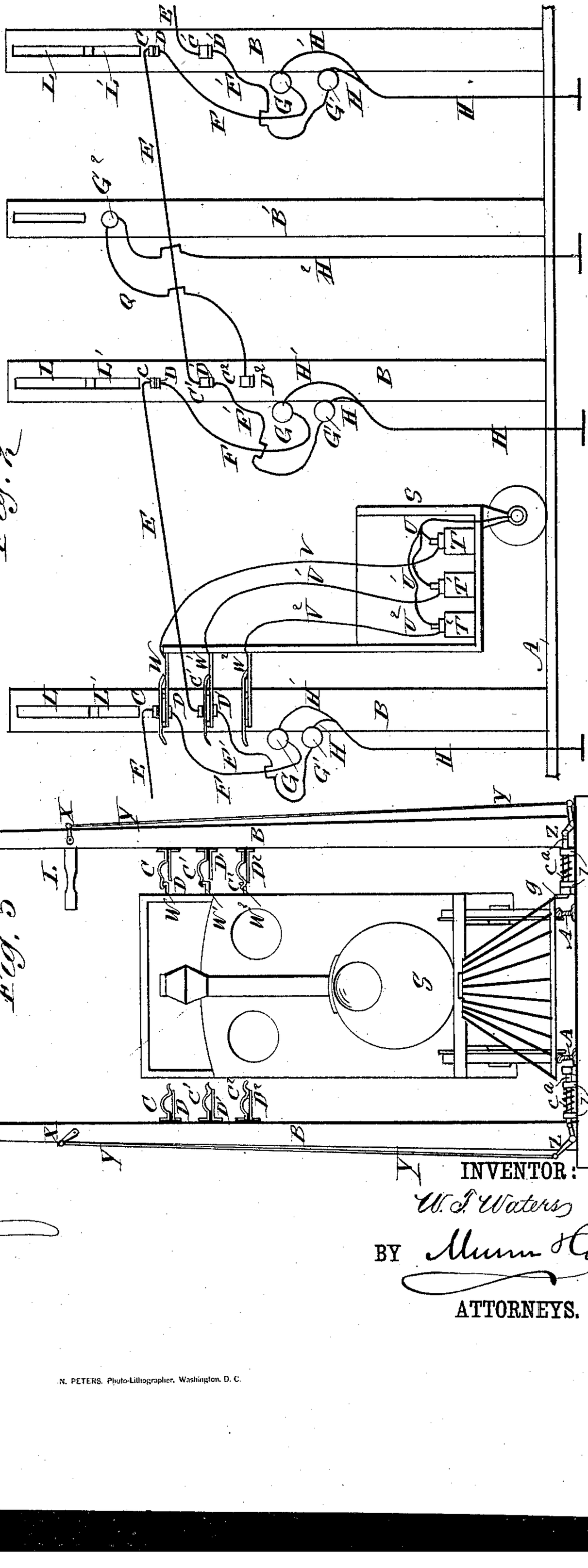

Fig. 2.

Fig. 3.

WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

W. T. Waters

BY Munn & Co

ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

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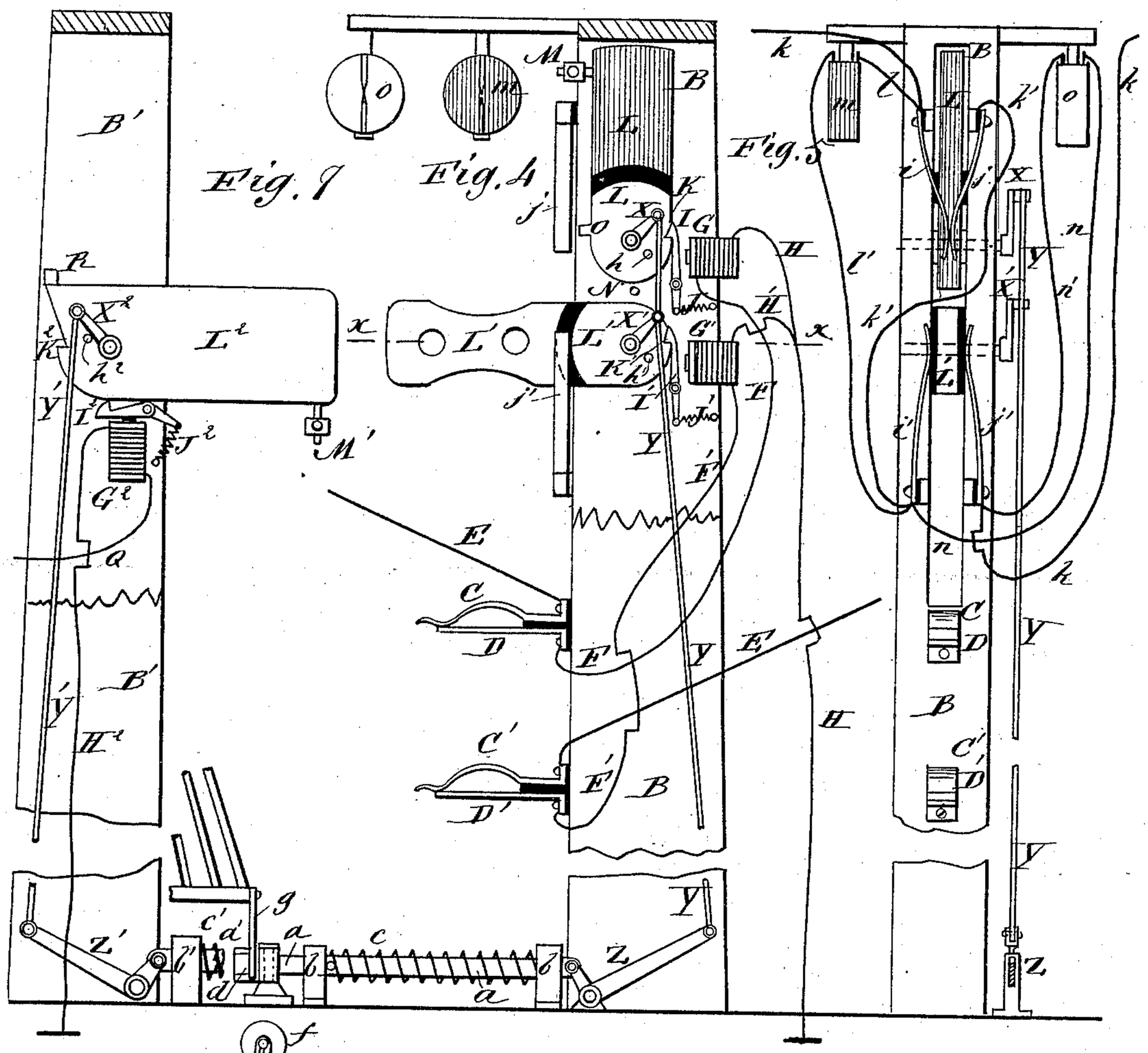

Fig. 1

Fig. 4

Fig. 5

Fig. 6

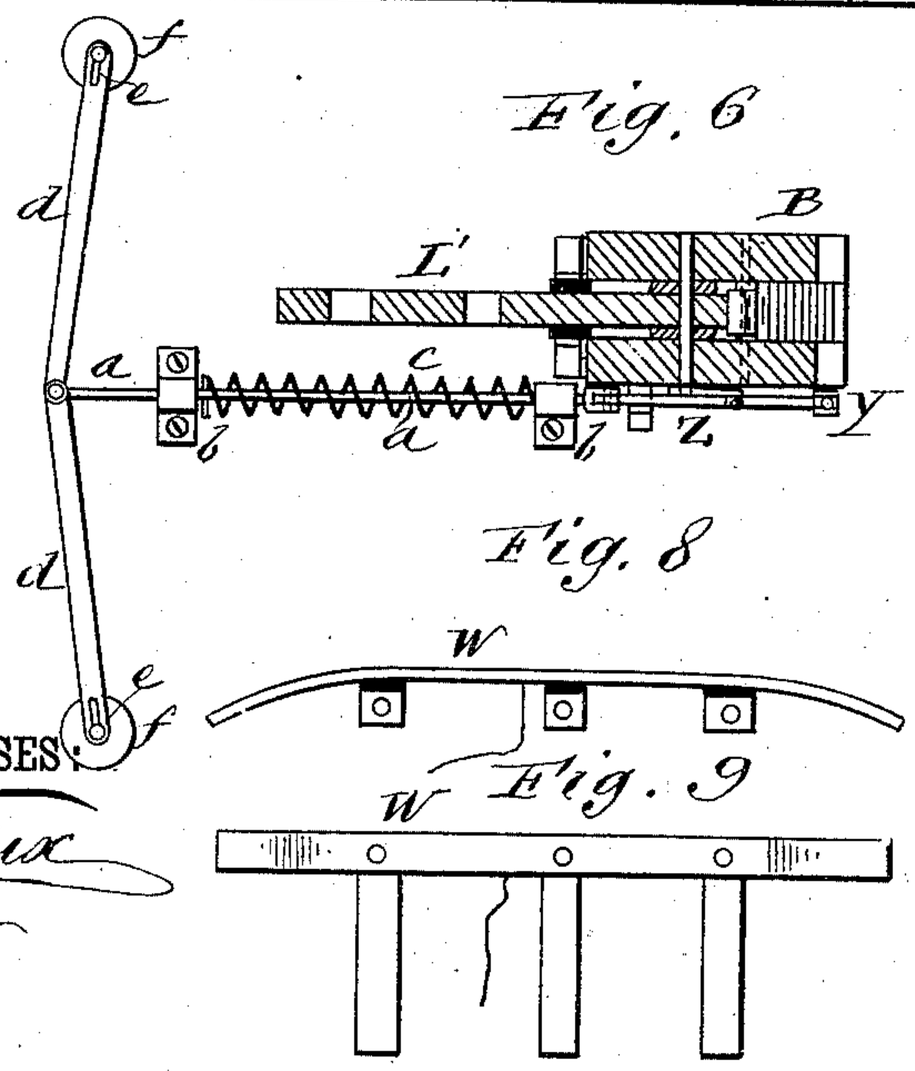

Fig. 8

Fig. 9

WITNESSES:

C. Neveux

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UNITED STATES PATENT OFFICE.

WILLIAM T. WATERS, OF ATLANTA, GEORGIA.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 314,760, dated March 31, 1885.

Application filed January 27, 1883. Renewed October 12, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. WATERS, of Atlanta, in the county of Fulton and State of Georgia, have invented a new and useful Improvement in Electric Railway-Signals, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1, Sheet 1, represents a series of posts on each side of a railroad-track and the wires connecting the said posts. Fig. 2, Sheet 1, is a side elevation of a part of the same and illustrating the electrical connection. Fig. 3, Sheet 1, is an end elevation of the same. Fig. 4, Sheet 2, is a front elevation, partly in section, of one of the posts and its various appliances, the lamp-connection wires being omitted. Fig. 5, Sheet 2, is a side elevation of the same, showing the lamp-connection wires. Fig. 6, Sheet 2, is a sectional plan view of one of the signal-posts, taken through the line *x x*, Fig. 4. Fig. 7, Sheet 2, is a front elevation, partly in section, of a post for special signals and its appliances. Fig. 8, Sheet 2, is a side elevation of the contact-bar connected with the train. Fig. 9, Sheet 2, is a plan view of the same.

The object of this invention is to display, automatically, danger-signals both in advance and in rear of and at any desired distance from a moving railway-train, to prevent the too near approach to the said train of another train from either direction, and also to display special danger-signals at crossings and other dangerous places, to announce the approach of a train in advance of its arrival.

The invention consists in electric railway-signals constructed with a series of insulated contact-bars projecting from the train, to engage with pairs of insulated contact-arms projecting from posts at the side of the track, provided with wire conductors extending forward and rearward, and connected with electro-magnets secured to other posts, and having pivoted armatures provided with hooked ends and springs to engage with signals pivoted to the said posts, so that, the circuit being closed by the passing train, a current of electricity may be sent to the said electro-magnets, which will withdraw their armatures from the said signals and allow them to swing down from a vertical to a horizontal position and to be swung from a horizontal to a vertical position. The signals are provided with stops to engage with cranks connected by a rod with one arm of an elbow-lever, the other arm of which is connected with a sliding bar held forward by a spring and provided with inclined end bars to be struck by an arm projecting from the train, which will automatically withdraw the advance signal and display the rear signal upon the successive signal-posts. Electric lamps are connected with a line-wire at or near each signal-post by pairs of insulated conducting-arms and a series of wires, so that the displaying of either signal will send the electric current through its corresponding lamp, and thus give proper and unmistakable night-signals, all constructed and operating as will be hereinafter fully described.

A represents an ordinary railroad-track, along each side of which is erected a series of posts, B, at uniform or unequal distances apart. At suitable points, practically the same distance from the center of the track, are located two pairs of conducting-arms, C D and C′ D′, which are placed at different heights above the level of the track; or, if convenient, they may be attached directly to the posts B, upon which they may be placed a short distance apart, so that one battery will be sufficient to energize the whole series successively; or, if more convenient, they may be placed vertically, as shown in the drawings, in which case a separate battery and contact-bar would be necessary for each set of contact-arms. The arms C D and C′ D′ are insulated from each other and from the posts B, and each upper arm C is made elastic and longer than the lower arm D, as shown in Figs. 2, 3, and 4, and may terminate in a metallic contact point or brush.

From each upper arm C′ a wire, E, leads to the upper arm C of the next forward post B, as shown in Fig. 2, or to the upper arm C of the second forward post B, as indicated in Fig. 1, or to the upper arm of the third forward post B, according to the distance in front and rear of the train at which it is desired to display the advance and rear signals.

To each lower arm D is attached the end of a wire, F, the other end of which is connected

with the end of the coil of a magnet, G, attached to the post B, the other end of the said coil being grounded through wire H. In the same manner each lower arm D′ is connected by a wire, F′, with the coil of a magnet, G′, attached to the same post as the magnet G. The other end of the coil of the magnet G′ is grounded through the wire H′, which may be a branch of the ground-wire H or a separate wire, as may be most convenient. The armature I of the magnet G is pivoted to the post B, or a base-plate thereon, and held away from the said magnet G, when not affected by an electric current, by a spring, J. Upon the face of the armature I is formed a hook adapted to engage with a notch, K, in the rounded base of an advance signal, L, which, when the said armature is not affected by its magnet G, will hold the said advance signal, L, in an upright position out of sight. When the signal L is released by the withdrawal of the hooked armature I by the attraction of the magnet G, the said signal L is drawn down into a horizontal position and displayed by a weight, M, or equivalent spring connected with it. The signal L is stopped in a horizontal position by a suitable stop or pin, N, or other stop attached to the post B, against which strikes a pin, O, attached to or formed upon the edge of the rounded base of the said signal L. The armature I′ of the magnet G′ is held away from the said magnet, when unaffected by an electric current, by a spring, J′, and its hooked upper end engages with a notch, K′, in the rounded base of the rear signal, L′, so as to hold the said signal displayed or in a horizontal position. When the armature I′ is withdrawn from the base of the signal L′ by the attraction of the magnet G′, the said signal, by its own weight, swings down into a vertical position within the post B and out of sight.

In the case of a crossing, P, or other dangerous locality, a post, B, adjacent to or at any desired distance from the said crossing, is provided with a third pair of contacts, C^2 D^2, placed below or beyond the arms C′ D′, and having the end of a wire, Q, connected with the upper arm, C^2. The other end of the wire Q is connected with the end of the coil of a magnet, G^2, attached to a special post, B′, placed near the crossing P, and provided with a hooked armature, I^2, held away from the poles of the magnet G^2 by a spring, J^2. The hook of the armature I^2 engages with a notch, K^2, in the pivoted end of a special signal, L^2, pivoted to the special post B′, so as to hold the signal L^2 in an upright position within the said post B′ and out of sight. When the armature I^2 is withdrawn from the signal L^2 by the attraction of the magnet G^2, the signal L^2 is drawn down into a horizontal position and displayed by a weight, M′, or equivalent spring, attached to it. The signal L^2 is stopped in a horizontal position by the edge of its pivoted end striking against a stop, R, attached to the post B′. The other end of the coil of the magnet G^2 is grounded through the wire H^2.

Upon the engine S, or any desired car of the train, are placed three separate batteries, T T′ T^2, the negative poles of which are connected by wires U U′ U^2 with the running-gear of the engine, which, in connection with the rails of the track A, forms the ground-connection.

As before stated, one battery may be used instead of several, it depending entirely upon the preferred method of arranging the contacts C D, C′ D′, C^2 D^2.

The positive poles of the batteries T T′ T^2 are connected, respectively, by wires V V′ V^2, with projecting arms W W′ W^2, attached to and insulated from the side of the engine S, in such positions as to come in contact with the lower sides of the projecting ends of the upper arms, C C′ C^2, and raise the said arms out of contact with the lower arms, D D′ D^2. With this construction, when the engine S comes opposite each post B, the conducting-arms W W′ come in contact with and raise the arms C C′. As each arm C′ is raised the electric current from the battery T′ will pass through the wire V′, the arms W′ C′, and the wire E, to the post B, with which the other end of said wire E is connected, where it will pass through the arms C D, the wire F, the coil of the magnet G, and the wire H, to the ground, completing the circuit. As the electric current passes through the coil of the magnet G the said magnet attracts the armature I, withdrawing it from the advance signal, L, and allowing the said signal to drop into a horizontal position. At the same time the contact of the conducting-arms W C causes an electric current from battery T to pass through the wire V, the arms W C, and the wire E, back to the post B, with which the other end of the said wire is connected, where the electric current passes through the arms C′ D′, the wire F′, the magnet G′, and the wire H′, to the ground, completing the circuit. As the electric current passes through the magnet G′ the said magnet G′ attracts the armature I′, withdrawing it from the signal L′, and allowing the said signal to swing down into the recess in its post B and out of sight, so that as the train passes each post B a signal is displayed at the proper distance in advance of the train, and a signal is lowered at the proper distance in the rear of the train. As the engine S passes each post provided with a third pair of contact-arms, C^2 D^2, the arm W^2 comes in contact with and raises the arm C^2, and an electric current is sent from the battery T^2, through the wire V^2, the arms W^2 C^2, the wire Q, the coil of the magnet G^2, and the wire H^2, to the ground, completing the circuit. As the electric current passes through the coil of the magnet G^2 the said magnet attracts the armature I^2, withdrawing it from the signal L^2, allowing the said signal to swing down into a horizontal position, so as to be seen. The ends of the conducting-

arms W W′ W² are bent downward, so that they will readily pass beneath the ends of the arms C C′ C², and the said arms W W′ W² are made of such a length as to maintain a contact with the arms C C′ C² long enough to allow the electric current to do its work.

It is obvious that the arms W W′ W² might be replaced by one arm of similar construction; or two of the series of arms and batteries shown might be dispensed with, providing the contacts C C′ C² were arranged in horizontal series instead of vertically.

To the journals of the signals L L′ are attached short cranks X X′, the ends of which are pivoted to a rod, Y. The lower end of the rod Y is pivoted to the end of the long arm of an elbow-lever, Z, which is pivoted at its angle to a support at the base of the post B, and to its short arm is pivoted the end of a bar, *a*. The bar *a* slides in supports *b* between the post B and the track A, and is held forward, or toward the track A, by a spiral spring, *c*, placed upon it between the said supports *b*. The outer end of the spring *c* rests against the outer or rear support, *b*, and its inner or forward end rests against a pin, collar, or other stop attached to or formed upon the said bar *a*.

To the forward end of the sliding bar *a* are hinged the adjacent ends of two bars, *d*, which incline outward, and have slots in their outer ends to receive pins *e*, attached to the blocks *f*, or other supports, upon which the said slotted ends of the bars *d* rest.

To the cow-catcher or some other part of the engine or train is attached an arm, *g*, which projects downward into such a position that it will strike the inclined bar *d*, pushing back the inclined bars *d* and the sliding bar *a*, and operating the elbow-lever Z, and causing the said lever to draw the rod Y downward and operate the cranks X X′. As the engine reaches each post B the advance signal, L, is displayed and the rear signal, L′, is concealed, and the pins *h h′*, attached to the said signals, rest against the under side of the cranks X X′, so that as the said cranks are drawn downward they will turn the advance signal, L, up into the recess in the post B, concealing it, and will turn the rear signal, L′, up into a horizontal position, displaying it. The rear signal, L′, remains displayed until lowered by the action of the electric current, as hereinbefore described.

The special signal L² is provided with a sliding bar, *a′*, having supports *b′* and spring *c′*, an elbow-lever, Z′, and a rod, Y′, and has a crank, X², attached to its journal, and a pin, *h²*, attached to it in such a position as to rest against the lower side of the crank X² when the said signal is displayed, so that the signal L² will be raised into its recess in the post by mechanical action as the engine passes the said special post B′, in the same manner as the signal L is raised from a horizontal to a vertical position, and the signal L′ from a vertical to a horizontal position, as hereinbefore described.

To each signal-post B are attached two pairs of elastic insulated conducting-arms, *i j i′ j′*, which incline toward each other, so that when left free their outer ends will be in electrical contact. The pairs of arms *i j* and *i′ j′* are placed in such positions that the signals L L′, when turned from vertical to horizontal positions, will pass between the said arms and separate them, interrupting the electric circuit. The parts of the signals L L′ that come in contact with the arms *i j i′ j′* should be suitably insulated. At a terminal or other station is placed an ordinary dynamo-electric machine, from which a wire, *k*, leads along the posts B. At each post B the wire *k* is divided, one end being connected with the arm *i* of one pair of arms, and the other end being connected with the arm *j′* of the other pair. The arm *j* of the first pair is connected with the arm *i′* of the second pair by the wire *k′*. From the arm *i* a wire, *l*, passes to an electric lamp, *m*, from which a wire, *l′*, passes to the arm *i′*, and from the arm *i′* a wire, *n*, passes to the electric lamp *o*, from which a wire, *n′*, passes to the arm *j′*, as shown in Fig. 5. The lamp *m* should correspond in color with the advance signal, L, and the lamp *o* should correspond in color with the rear signal, L′, so that the said lamps will be readily distinguishable at night. With this construction, when the signals L L′ are withdrawn and the arms *i j* and *i′ j′* are in contact, an electric current passing along the wire *k* will pass through the arms *i j*, along the wire *k′*, through the arms *i′ j′*, and thence to and along the line-wire *k*. When the advance signal, L, is displayed and the rear signal, L′, withdrawn, the current of electricity passing along the line-wire *k* cannot pass through the arms *i j*, as the said arms are separated by the signal L, and will pass along the wire *l*, through the lamp *m*, along the wire *l′*, through the arms *i′ j′*, to and along the line-wire *k*. When the advance signal, L, is withdrawn and the rear signal, L′, is displayed, as shown in Fig. 5, the electric current passing through the line-wire *k* passes through the arms *i j*, through the wire *k′* to the arm *i′*, through the wire *n* to the lamp *o*, and from the said lamp through the wire *n′* to the arm *j′*, and thence on through the line-wire *k*. By this arrangement the proper lamp will be thrown into the electric circuit by the movement into sight of the corresponding day-signal, and vice versa.

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

1. In an electric railway signaling system, a series of separate signaling-circuits extending from point to point along the entire road, signal-carrying posts located at the termini of each independent circuit and provided with visual signals for protecting a moving train in both front and rear, electro-magnetic locking devices adapted to be alternately operated by electric impulses transmitted from the train being signaled, and mechanical means, oper-

ated by the moving train, whereby dropped signals are reset, substantially as set forth.

2. An electric railway signaling system comprising a series of separate signaling-circuits extending from point to point along the entire road, signal-carrying posts located at the termini of each independent line-circuit and provided with visual signals, means for displaying and housing the same, consisting in electro-magnetic latching devices, and means, carried by the train being signaled, for transmitting a current of electricity from one post to the ones with which it may be connected in front and rear, and thereby releasing an advance signal in front and a rear signal in its rear, and mechanical means, operated by the moving train, for automatically raising both signals on the post being passed, housing the advance and displaying the rear signals, said rear signals being then in position to be housed by the electro-magnetic devices when the next post is passed, leaving the line clear and the signals ready to be set by the next succeeding train.

3. An automatic system of railway-signals, comprising a series of separate signal-circuits extending from point to point along the entire road, each circuit being connected through pairs of normally-closed contact-points so located with reference to the track that any pair may be momentarily separated by a passing train, and means, substantially as described, whereby electro-magnetic signal-controlling devices located at the termini of said independent circuits may be energized and operated by a current transmitted through either pair of contact-points, in a predetermined direction, by the passing train, as set forth.

4. Electric railway-signals constructed substantially as herein shown and described, and consisting of a source of electricity carried upon a train and connected by wires with insulated contact-bars projecting therefrom, pairs of insulated contact-arms projecting from posts at the sides of the track and provided with conducting wires extending forward and rearward, and connected with electro-magnets secured to other posts, and having pivoted armatures provided with hooked ends and springs to engage with signals pivoted to the said posts, whereby the passage of a current of electricity will withdraw the said armatures from the said signals, and allow the signals to swing down from a vertical to a horizontal position, and from a horizontal to a vertical position, as set forth.

5. In electric railway-signals, the combination, with the signals L L′, provided with stops *h h′*, of the cranks X X′, the connecting-rod Y, the elbow-lever Z, the sliding bar *a*, having spring *c*, and inclined hinged bars *d*, and an arm, *g*, projecting from the train, substantially as herein shown and described, whereby a passing train will automatically withdraw the advance signal and display the rear signal upon each succeeding signal-post, as set forth.

6. In electric railway-signals, the combination, with automatically-operated visual day-signals, and means, substantially as described, whereby the same are raised and lowered in front and behind a passing train, of an equal number of electric lamps of color corresponding to that of the day-signals, and pairs of contact-arms corresponding to said lamps, located in proximity to the said visual signals, and adapted to be separated by the displaying thereof, and thereby to direct the lighting-current to the lamp corresponding to the displayed signal.

7. In electric railway-signals, the combination, with the signals L L′, the line-wire *k*, and the electric lamps *m o*, of the pairs of insulated conducting-arms *i j i′ j′*, and the wires *k′ l l′ n n′*, substantially as herein shown and described, whereby the displaying of either of the said signals will send the electric current through the corresponding lamp, and thus give proper night-signals, as set forth.

WM. T. WATERS.

Witnesses:
M. McBURNEY,
F. W. NASH.