(No Model.) 3 Sheets—Sheet 1.

M. W. LONG.

RAILWAY SIGNAL.

No. 359,512. Patented Mar. 15, 1887.

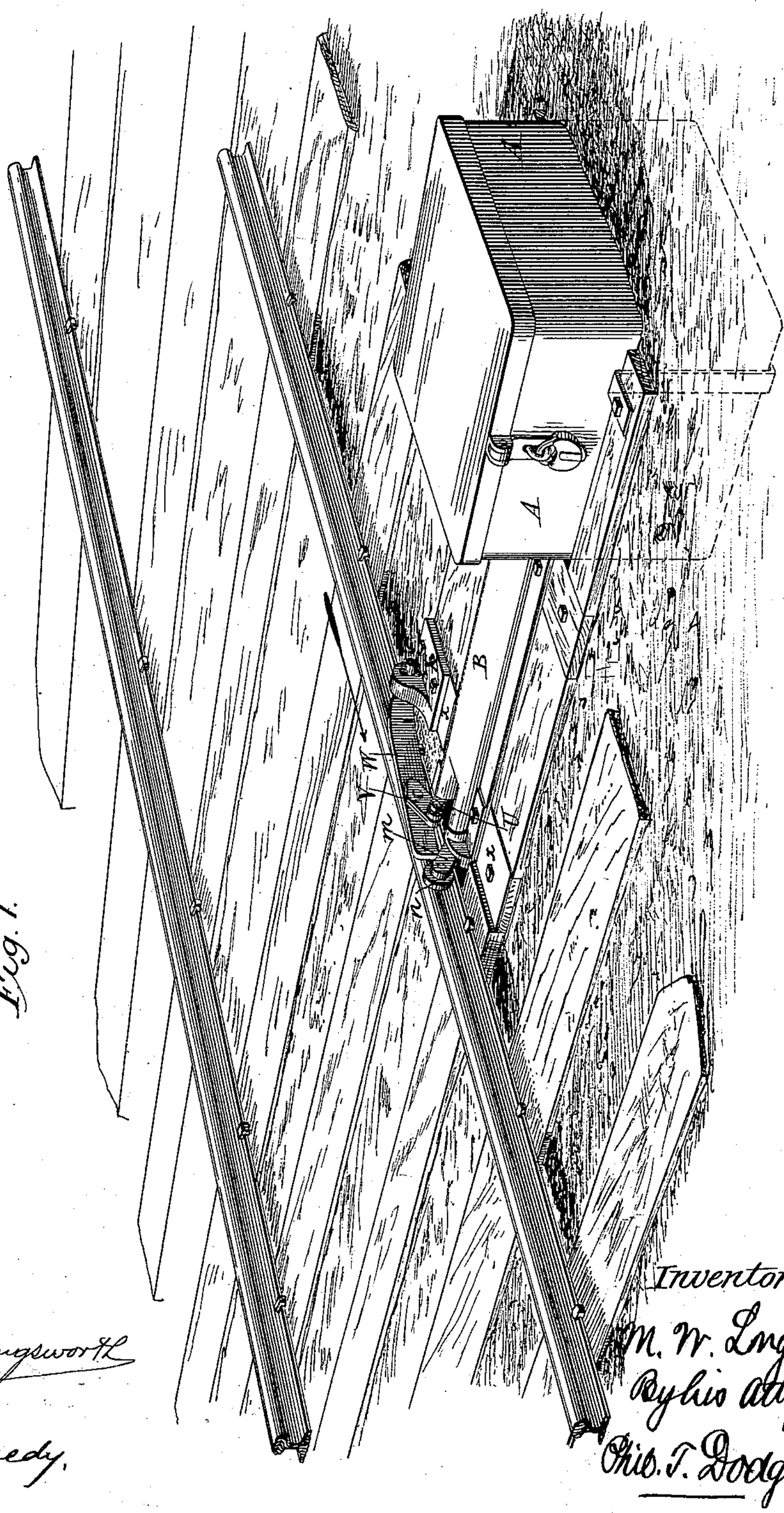

Fig. 1.

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Inventor.

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By his atty

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M. W. LONG.

RAILWAY SIGNAL.

No. 359,512. Patented Mar. 15, 1887.

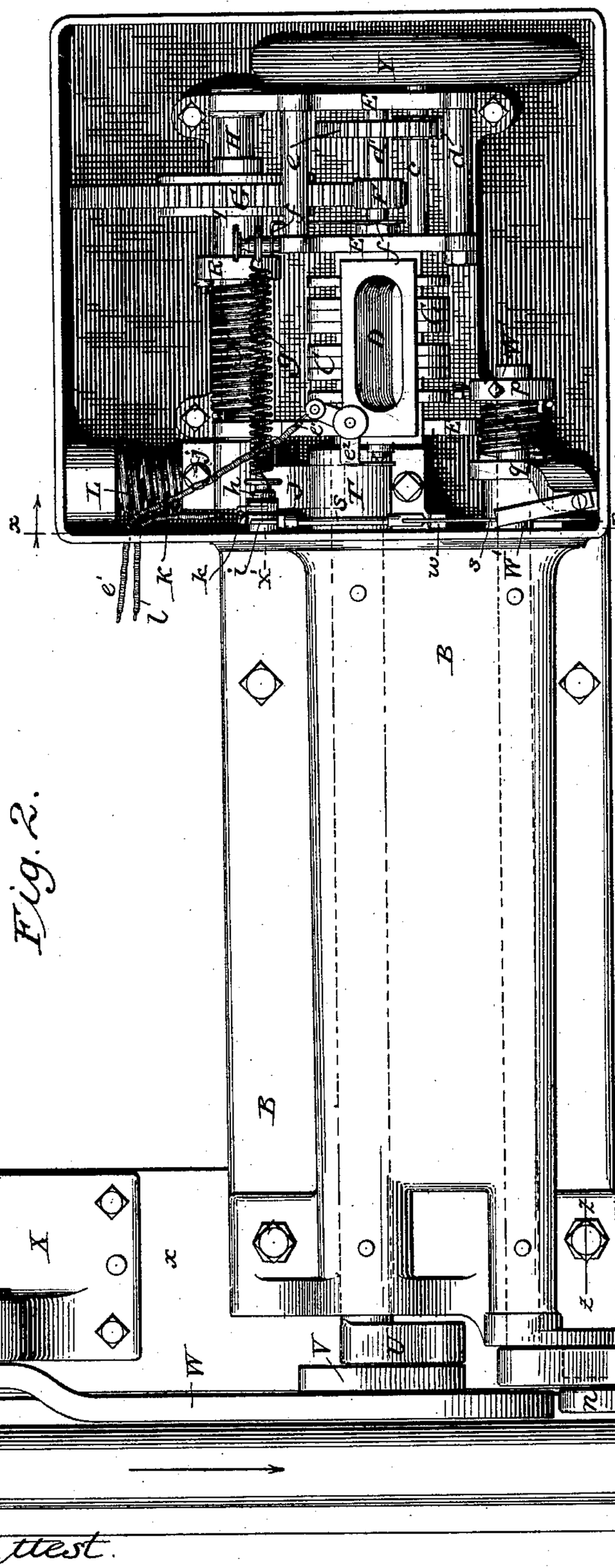

Fig. 2.

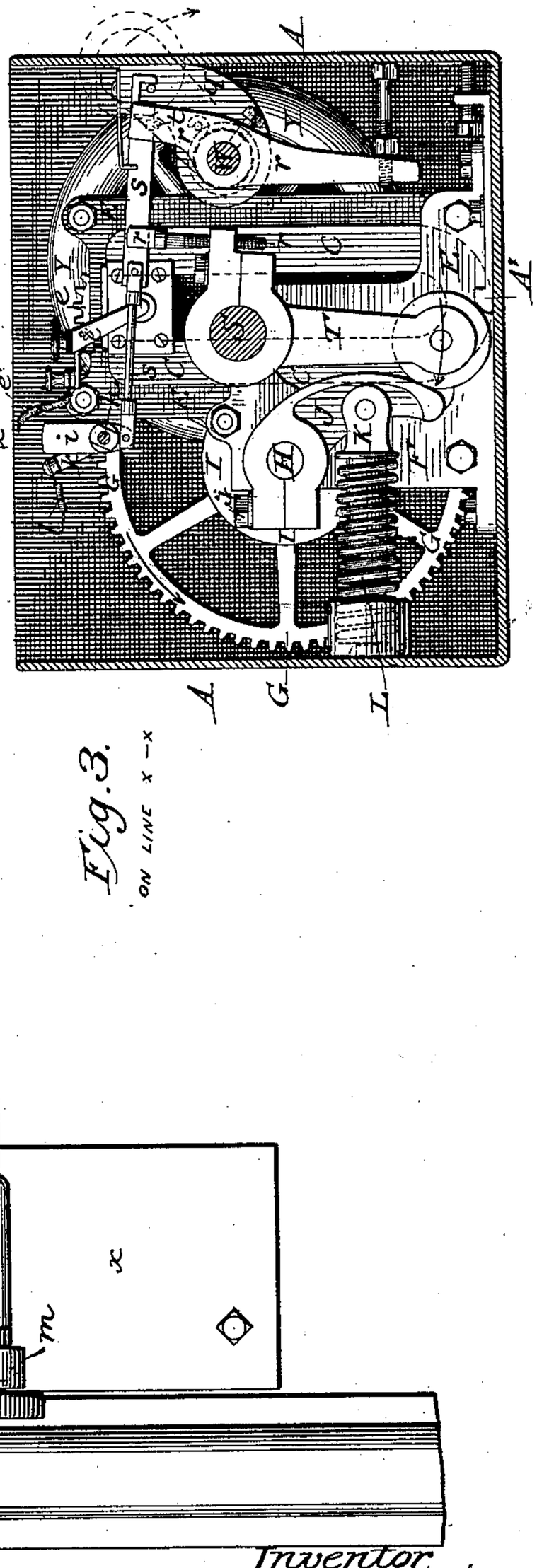

Fig. 3.
ON LINE x—x

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M. W. LONG.

RAILWAY SIGNAL.

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Fig. 4

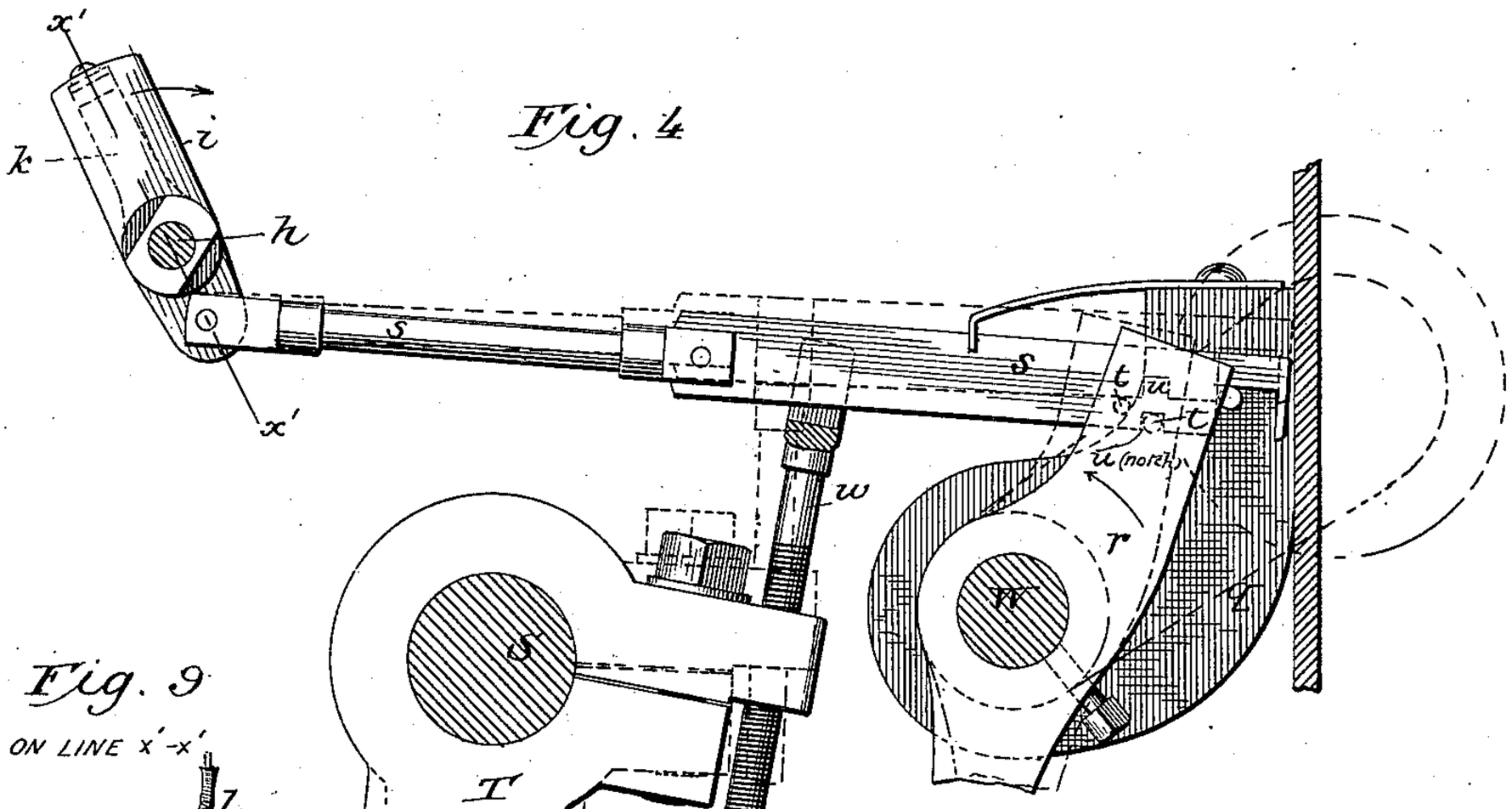


Fig. 9

ON LINE x'-x'

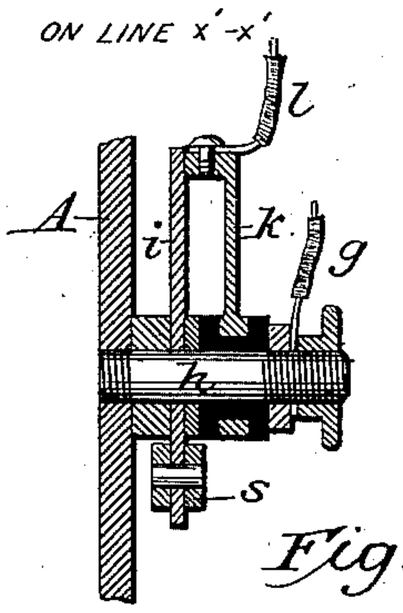


Fig. 5.

Fig. 6.

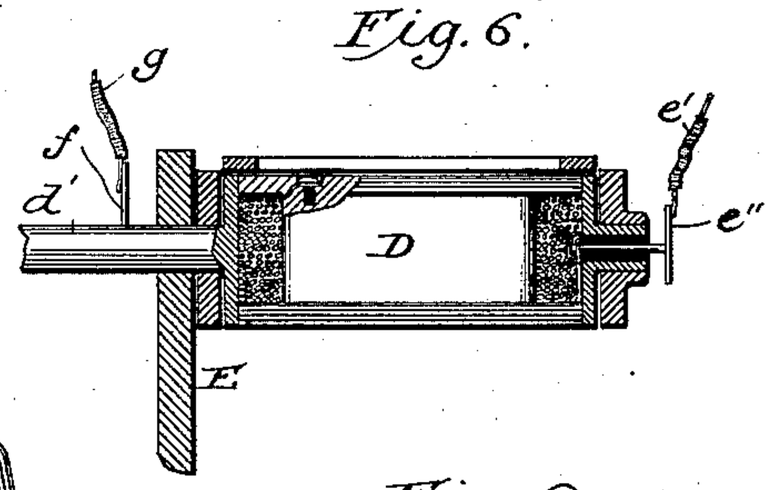


Fig. 8.

DIAGRAM

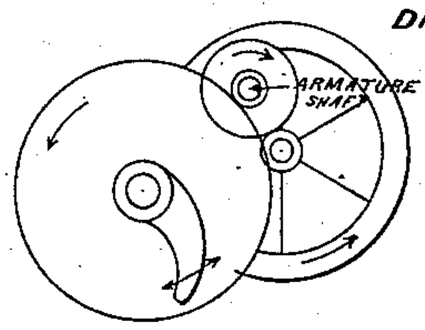
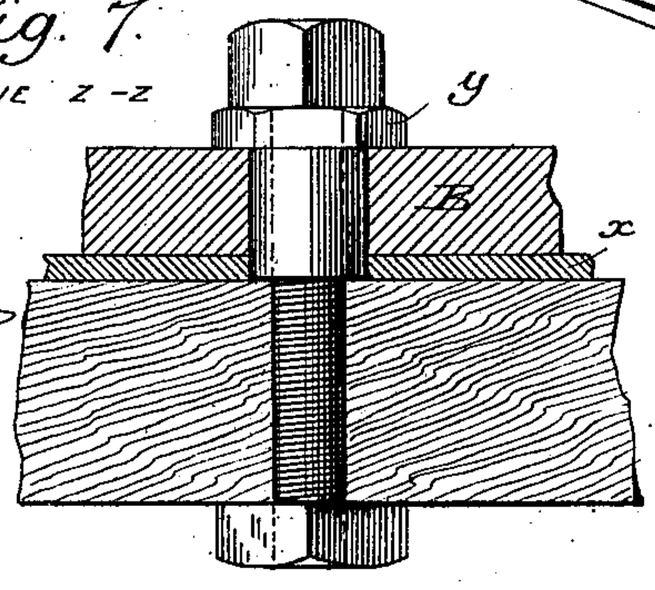


Fig. 7.

ON LINE z-z



Attest.

Sidney P. Hollingsworth

Wm. L. Kennedy.

Inventor.

M. W. Long

By his Atty

Phil. T. Dodge.

UNITED STATES PATENT OFFICE.

MALCOLM WALLACE LONG, OF HARRISBURG, PENNSYLVANIA.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 359,512, dated March 15, 1887.

Application filed May 26, 1886. Serial No. 203,316. (No model.)

To all whom it may concern:

Be it known that I, MALCOLM WALLACE LONG, of Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented certain Improvements in Magneto-Generators for Operating Railway-Signals, &c., of which the following is a specification.

My invention has reference to that class of electric generators which are used to control or operate railroad-signals, and which are provided with or connected to track-levers, through which they receive motion from passing railway-trains.

The aims of my invention are to provide improved means for supporting, inclosing, and protecting the generating mechanism, and for maintaining the operating devices, commonly designated, whatever their form, as "track-connections," in proper relation thereto; to provide circuit-controlling devices adapted to be actuated by the car-wheels and arranged to keep the circuit closed as the train moves in one direction, but keep it open as the train moves in the reverse direction, whereby the signal is actuated by approaching but not by receding trains, and to overcome various defects in the details of the generators as heretofore constructed.

In the accompanying drawings, Figure 1 represents a perspective view of a railway with my improved generator and its connections in position for use. Fig. 2 is a top plan view of the parts shown in the preceding figure, the lid of the casing being removed to expose the internal mechanism to view; Fig. 3, a vertical section on the line *x x* of the preceding figure, looking in the direction indicated by the arrow, the circuit being open; Fig. 4, an elevation, on an enlarged scale, of the circuit-controlling devices, the circuit being closed; Fig. 5, a perspective view of the casing or housing of the generator; Fig. 6, a longitudinal section of the armature; Fig. 7, a vertical cross-section on the line *z z* of Fig. 2. Fig. 8 is a diagram illustrating the arrangement of the driving-gear. Fig. 9 is a cross-section through the circuit-controlling fingers on the line *x' x'* of Figs. 2 and 4.

At the present time there are known in the art various electric generators operated by track-connections of different forms to actuate signals. In practical operations with these generators, which are frequently left for considerable periods of time without attention or inspection, many difficulties have been encountered, and among others the liability of water, dust, and other obstructive and injurious matters to find their way to the generating and conducting devices, and the tendency of the generator and connections to move, under the vibration and concussion produced by the train, out of their proper adjustment. To avoid these troubles I now provide a metallic casing, box, or housing closed at its four sides and bottom, provided with a removable lid, and adapted to inclose and sustain the generating devices and their adjuncts. This housing, which is adapted to be seated in the earth, I provide with a rigid horizontal arm adapted to inclose and sustain the rock-shaft which drives the generator. The housing (shown at A, Figs. 1, 2, 3, and 5) is preferably cast complete in one piece, without joint or opening in its lower part, and of a rectangular form; but it may be made of such form and size as circumstances may demand in each case.

On the side of the housing, at suitable height to lie upon planks supported by the track-timbers near the surface of the ground, there is a rigid horizontal arm, B, either cast thereon or flanged and bolted thereto, care being observed in the latter case to form a water-tight joint at the union of the two parts. A hole, *a*, extends longitudinally through the arm, as shown in Fig. 5, into the interior of the casing to receive the shaft which operates the generator, and if a second circuit-controlling shaft is used a second hole is formed in the arm to receive the same, as shown in Figs. 1 and 2. The arm is preferably provided with outside flanges, as shown, to receive fastening-bolts.

The generator may be of the "magneto-electric" type or a "dynamo," as preferred; but the former is recommended and shown in the drawings. It consists, essentially, of a series of permanent horseshoe-magnets, C, and a Siemens armature, D, mounted between their poles. These parts are mounted in standards E, bolted to the base of the housing, and the armature receives motion through a pinion, F, on its shaft from a gear, G, mounted loosely on a shaft, H, and connected thereto by an ordinary silent clutch, I, through which the

gear receives motion only when the shaft turns in a forward direction. On the forward end of the shaft H there is adjustably secured a curved arm, J, carrying a stud, K, which enters one end of a spiral spring, L, seated against the wall of the casing. The hub of the silent clutch I is extended and enlarged at the end to form a flange, R.

Upon the shaft H is placed a spirally-formed torsion-spring, N, bearing at one end against a stud on the frame and at the other end against a stud on the flange R. The springs L and N both tend to turn the shaft forward, as indicated by the arrows, so that it will in turn act through the clutch and gear to revolve the armature. The shaft H is adjusted to vary the tension of the spring N by slacking the bolt *j*, so that the shaft H may be turned in the curved arm J. When revolving the fly-wheel backward the end of the torsion-spring N, which is engaged with the stud on the flange R, is strained around until the proper tension of the spring is secured, when the bolt *j* is drawn tight, causing the shaft H to be gripped by the hub of the curved arm J.

The rock-shaft S, extending through the arm of the housing, is secured at its inner end to a crank-arm, T, having at its end a roller to act against arm J. At its forward end the rock-shaft has a crank-arm, U, connected by link V to the free end of a vertically-movable plate, W, lying adjacent to the outer side of the railway-rail and pivoted to a fixed plate, X, the edge of the plate W being normally above the surface of the railway-rail. As a car-wheel passes over the rail it rides upon and depresses plate W, which through the link turns the shaft S, causing its arm T to force the arm J rearward, straining spring N and compressing spring L. As soon as the plate W is relieved from the weight of the wheel the springs react, and, turning the shaft, cause a rapid motion to be imparted to the armature, and at the same time restoring the track-connections to their original positions, which are regulated by an adjustable stop, A′, secured to the bottom of the casing, limiting the backward travel of the arm T. By means of the adjustable stop A′ the position of the plate W is exactly determined and regulated, and its edge is made to project above the top of the railway-rail the proper distance, which will be varied, according to the length of trains, speed, and other conditions. In the adjustable stop I have means of adjustment to counteract the wear on the edge of the plate W.

For the purpose of controlling the speed of the armature and continuing its operation after the driving devices have ceased their action, so that the current may continue after the train has passed the generator, I employ a fly-wheel, placed on a separate shaft, connected with the armature by gears to revolve at a higher speed, as in my original application, No. 103,600, filed August 13, 1883, this feature forming no part of the present invention.

In Fig. 2, Y represents the fly-wheel on shaft *c*, provided with pinion *d*, engaging the larger gear *e* on the armature-shaft, so that the wheel makes three revolutions, more or less, during each revolution of the armature.

By properly proportioning the weight of the fly-wheel to the other parts, I am enabled, when it is geared as above, to secure a highly satisfactory action of the parts. In this connection the provision for adjusting the tension of the driving-spring is of importance. When the generator is of the type which produce pulsatory currents, or currents of alternating polarity, its speed should be kept within moderate limits in order to insure a proper responsive action of the signal mechanism. To this end the tension of the spring should be adjusted according to the general character of the trains passing over the road, the nature of the signal mechanism, and other dominating circumstances.

Reference has been made to the fact that the arm J, on which the arm T acts to strain the driving-springs, is curved. On reference to Fig. 3 it will be seen that the curved arm presents its convex surface toward the arm T, and that the two have their axes near each other, and in such relation that the arm T or the roller thereon first acts on the outer end of the arm J and in the course of its action moves inward over the same toward its axis. This action is of twofold advantage: First, it causes the arm T to act with the greatest leverage at the beginning of its movement, thus lessening the shock in overcoming the inertia of the parts; second, it enables the arm J to receive a longer movement than it could otherwise receive by a given movement of the arm T.

The generator and its operating appliances above described will have the effect of developing and transmitting a current whenever a train passes the generator in either direction. In many places, particularly on single track roads, over which trains pass in both directions, it is desirable to provide for the automatic opening of the circuit whenever trains pass the generator in one direction. To this end I combine with the generator when required the automatic circuit-controlling devices, which in their approved form I will now describe.

As shown in Figs. 1, 2, and 6, one terminal of the armature-coil extending through an insulated collar in the axis of the armature connects, through a contact-finger, e^2, with the conductor e', leading outward from the apparatus. The other terminal of the coil connects with its spindle d', and thence through a contact-finger, *f*, with a conducting wire, *g*, which is in turn attached at its opposite end to a metallic stud, *h*, attached to the side of the box or casing A, and serving as a support for a conducting-finger, *i*, which vibrates thereon. Adjacent to the finger *i* there is a second stationary finger, *k*, also mounted upon the stud *h*, but insulated therefrom. To this stationary finger *k* the outgoing conductor *l* is attached. On turning the finger *i* into contact

with the finger *k*, as shown in Fig. 4, the circuit is closed and the current transmitted from the generator; but on moving the finger *i* out of contact with its companion, as shown in Fig. 3, the circuit is broken and the operation of the generator rendered idle or of no effect.

I will now describe the devices by which the finger *i* is actuated.

A rock-shaft, W′, is mounted horizontally in the arm of the housing, one end extending into the interior of the housing and the other end projecting adjacent to the track. To this outer end is applied a crank-arm, *m*, provided with a roller, *n*, in position to be depressed by the car-wheels passing thereover; or, if preferred, the roller may be omitted and the end of the crank itself adapted to receive the pressure of the wheel for the purpose of rocking the shaft. The inner end of the shaft is encircled by a spiral spring, *o*, one end of which engages a stud on a collar, *p*, adjustably secured to the shaft, while the other end engages a stud on a plate, *q*, mounted loosely on the shaft and bearing against the casing. This spring acts to return the shaft to its original position and to maintain its outer cranked end normally above the top of the rail. To the inner end of the shaft W′ is securely fixed an upright arm, *r*, carrying at its upper end, on the inner face, a stud, *t*, as shown in Figs. 3 and 4. To the vibratory circuit-controlling finger *i* there is pivoted an arm, *s*, extending rearward over the pin *t* and provided in its under side with a notch, *u*, in which the pin engages at the proper time, so that the vibratory motion of the arm *r* will operate the finger *i*, and thus open or close the circuit. The rod *i* is urged constantly (preferably by a spring) downward. It is, however, lifted at the proper times to prevent engagement with the stud by means of an arm, *w*, fixed to the arm T and bearing loosely beneath the arm *s*, as shown in the several figures.

The operation is as follows: A train receding from the signal having passed the generator, the parts are left in the position shown in Fig. 3, with an open circuit. If, now, a train passes toward the signal in the direction indicated by the arrow in Fig. 2, its wheel will first depress the arm U and strain the driving-springs of the generator at the same time through the arm T and its arm *w*, lowering the rod *s* into engagement with the stud *t* of the arm *r*, as indicated by full lines. While the parts are in this position, the car-wheel, encountering the arm *m*, causes the arm *r* to move backward, the arm, through its stud *t*, moving the rod *s* and finger *i* to the position shown in full lines in Fig. 4, thereby closing the circuit. The arm T in reacting lifts the arm *s* out of engagement with the stud *t* to the position shown by dotted lines in Fig. 4, thus leaving the circuit closed, when the arm *r* resumes its normal position. (Shown by dotted lines in the same figure.) If, now, a train passes in the reverse direction over the track, it will first operate to turn the arm *r* to the position shown by full lines in Fig. 4, placing the stud *t* directly under the notch in the rod *s*, and before the arm *r* resumes its normal position the arm T is actuated, and its arm *w* lowers the bar *s* into engagement with the stud *t*. As the car-wheel releases the arm *r* before the arm T is released, the arm *r* moves the rod *s* forward and opens the circuit before the rod is lifted out of engagement by the arm *w*.

While I prefer to retain the details of construction herein shown, it is manifest that they may be variously modified without departing from the limits of the invention, which consists, essentially, in combining with a magneto-generator adapted to be operated by passing trains a circuit opening and closing device also operated by the train and acting to open the circuit when the trains move in one direction and to close it when they move in the opposite direction. I have invented and practically used various devices to this end; but deeming the construction represented in the drawings the best that can be employed, I have considered it a sufficient disclosure of my invention in this regard.

In making use of my generator I prefer to locate the same outside of and adjacent to the railway-track, as shown in Fig. 1, and to seat the lower part of the casing or housing in the earth, bolting its shaft-supporting arm firmly to a metallic plate, *x*, which is in turn bolted to tracks which rest upon two of the ties which support the track.

In order to prevent the parts from being jarred out of position, I commonly employ metallic thimbles *y*, passing through the arm of the generator and into or through the underlying plate *x*, and to secure this thimble in place by means of the vertical bolt passing downward through the plank beneath, as shown in Fig. 7. This arrangement relieves the bolt to a great extent from lateral strain, and is also advantageous in that it lessens its tendency to work loose.

While I recommend the employment of track-connections such as herein described for imparting motion to the rock-shaft, it is to be understood that they may be replaced by track-connections of any other appropriate character, various devices for this purpose being familiar at the present day to persons skilled in the art.

While I employ in ordinary cases generators producing intermitting or alternating currents, electricians will understand that I may use those which are adapted, by the use of a commutator or otherwise, to produce continuous currents of constant polarity, and also that in place of a magneto-generator I may use a dynamo, using electro-magnets in place of the permanent magnets herein shown.

I am aware that generators and other electric instruments have been inclosed by casings or boxes variously constructed, and therefore I do not claim, broadly, a metal box or casing;

but I believe myself to be the first to provide a metallic box tightly closed or sealed at the bottom and provided with a laterally-extending arm adapted to receive a rock-shaft. I am not aware that any one has heretofore constructed a metallic casing adapted to contain a generating mechanism and provided with a rigid arm to support and maintain in proper relation to the other parts an operating rock-shaft.

Having thus described my invention, what I claim is—

1. In a magneto-generator for operating railway-signals, the combination, with the generating apparatus, of the metallic housing or casing consisting of the metallic box cast complete in one piece and provided with the arm B, extended rigidly from its side, said arm serving to support the operating-shaft and also as a means of connecting the apparatus with the railway-track to maintain it in proper relation thereto.

2. In a railway-signal and in combination with a magneto-generator, a horizontal rock-shaft for operating the same, and track-connections for moving the shaft, the metallic housing or casing of box-like form provided near its top with the rigid shaft-inclosing arm extended, substantially as described, for connection with the track-supports, whereby said casing is adapted to serve the threefold purpose of protecting the generating mechanism and excluding moisture therefrom, of supporting the rock-shaft, and of holding the apparatus as a whole in proper relation to the track.

3. In a railway-signal, the combination of a magneto-generator, a metallic housing or casing, subtantially as described, an operating-shaft, track-connections, substantially as described, for operating said shaft, and a shaft-supporting arm or plate connected rigidly to the casing and to the support for the track-connections, whereby the several parts are retained in their proper relative positions.

4. In combination with the magneto-generator, an actuating-spring, a curved arm, J, by which said spring is strained, and a vibratory arm, T, arranged to act on the convex face of the curved arm from its outer toward its inner end.

5. A magneto-generator for operating railway-signals, provided with a circuit-controlling device, in combination with two track-levers, one to cause the operations of the generator and the other to operate the circuit-controlling device.

6. In a magneto-generator provided with a driving-shaft and an arm, *J*, thereon, a spring acting directly against one side of said arm and an operating-arm, T, acting against the same from the opposite side, whereby the impelling and resisting forces are directly opposed to each other.

7. In combination with the circuit-controlling rod *s*, its actuating-arm *r*, and a track-lever connected to the latter, the arm *w*, to disengage the arm *r* from the rod, and a second track-lever connected with arm *w*, whereby the circuit is opened by trains passing in one direction but closed by those passing in the opposite direction.

8. In a magneto-electric apparatus for operating railway-signals, a magneto-generator and track-connections for operating the same from trains passing in each direction, a circuit-controlling device and track-connections whereby the circuit is closed and left closed by trains passing in one direction but opened and left open by trains passing in the opposite direction.

9. In a magneto-electric apparatus for operating railway-signals, a magneto-generator and a circuit-controlling device, in combination with two track-levers connected one to the driving-gear of the generator and the other to the circuit-controlling device, said levers arranged as described, one in close proximity to the other, so that although operated by the car-wheels, successively, the second is operated before the other is released.

10. In combination with a track lever or plate to receive motion from passing car-wheels, an adjustable stop, substantially as described, limiting the elevation of said plate, whereby the plate may be adjusted to receive a longer or shorter motion from the car-wheels, as required.

11. In a mechanism for transmitting motion from car-wheels, the combination of a vertically-movable plate arranged for the passage of the car-wheels thereover, a rock-shaft, intermediate devices, substantially as described, connecting said plate with the rock-shaft, and an adjustable stop to regulate the elevation of the movable plate, whereby the wheels may be caused to operate upon the shaft a greater or less distance and to a greater or less speed, as the occasion may demand.

In testimony whereof I hereunto set my hand this 19th day of May, 1886, in the presence of two attesting witnesses.

MALCOLM WALLACE LONG.

Witnesses:
GEO. W. PARSONS,
PAUL CHARLTON.