(No Model.) 3 Sheets—Sheet 1.

J. B. BLAIR.

ELECTRIC RAILWAY.

No. 399,236. Patented Mar. 12, 1889.

Fig. 1.

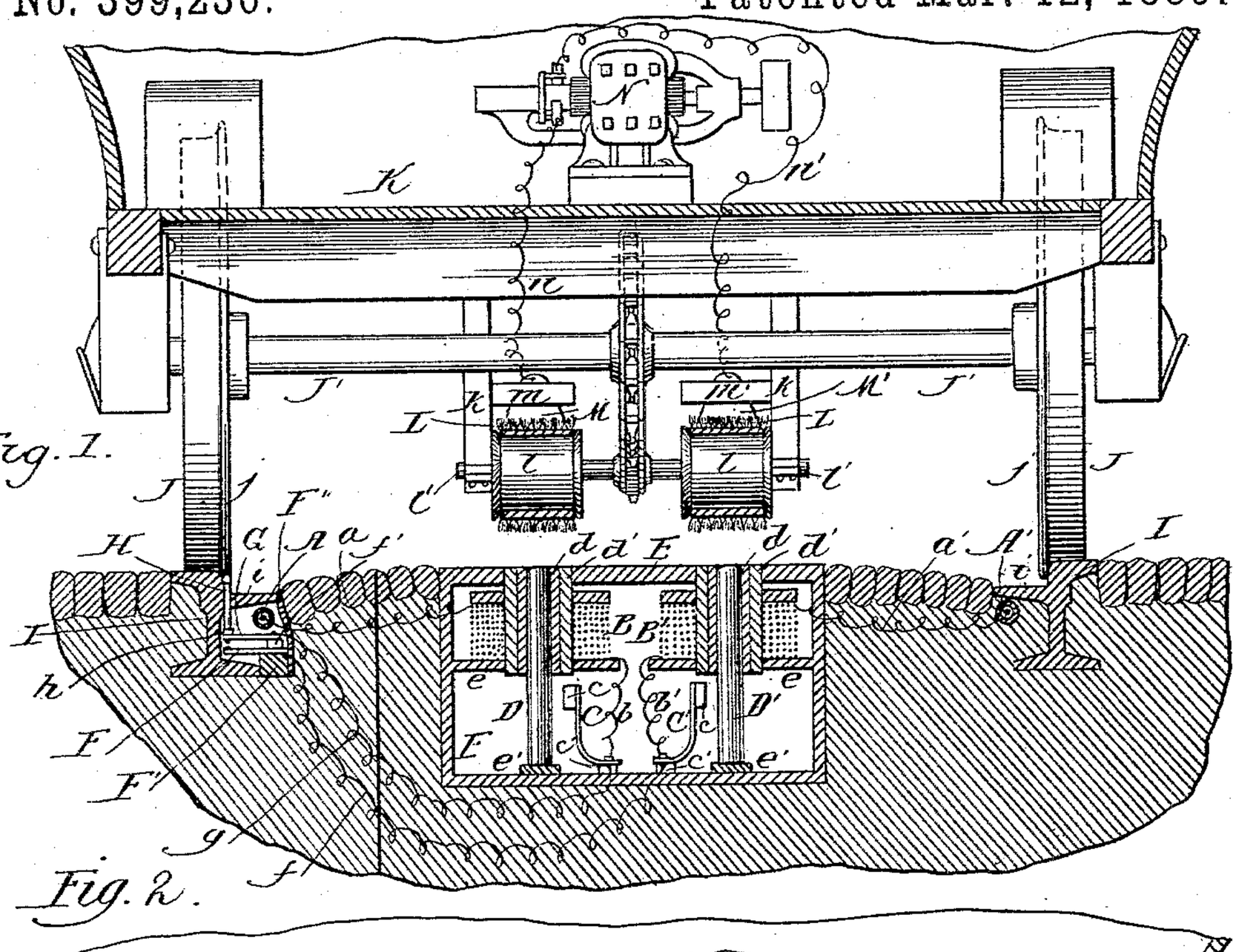
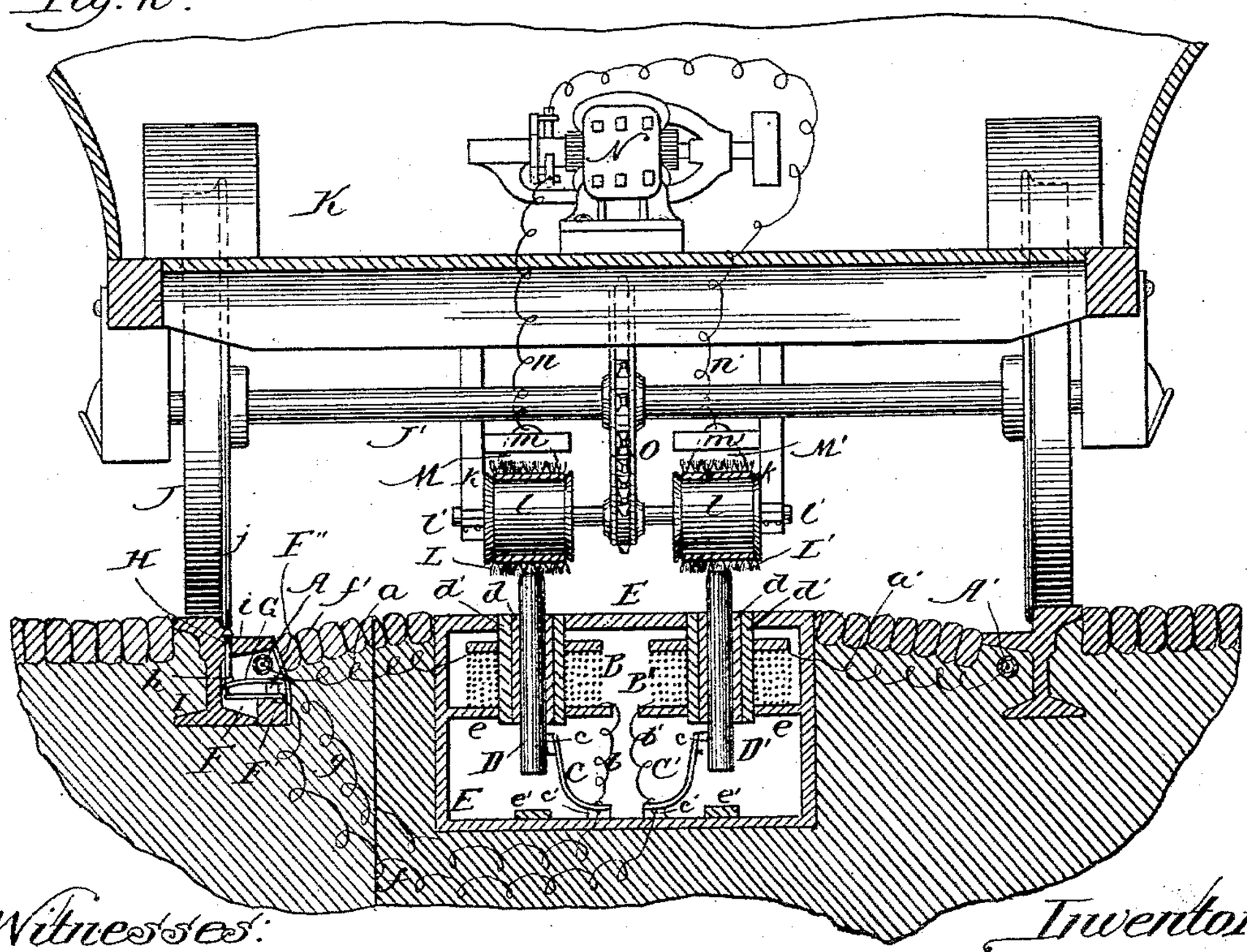


Fig. 2.



Witnesses:
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Harry T. Jones.

Inventor:
John B. Blair

(No Model.)

3 Sheets—Sheet 2.

J. B. BLAIR.

ELECTRIC RAILWAY.

No. 399,236. Patented Mar. 12, 1889.

Fig. 3

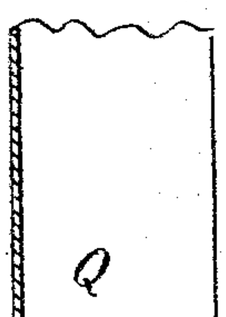


Fig. 5.

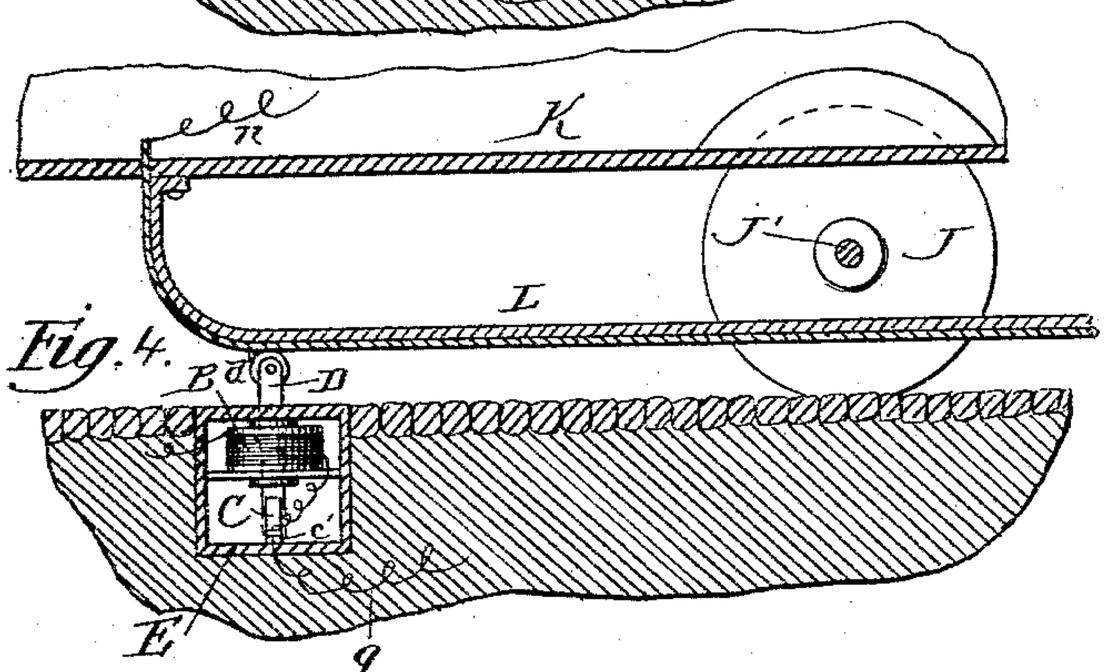


Fig. 4.

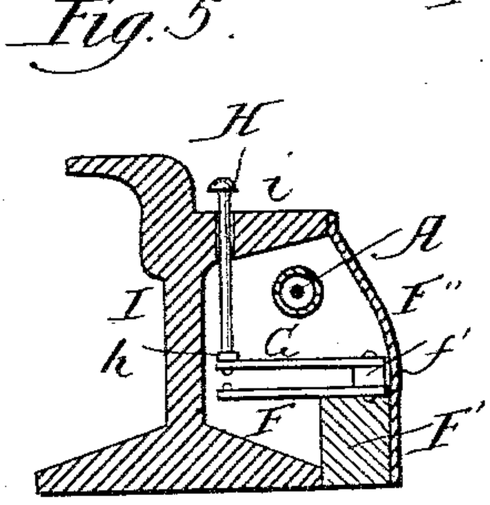


Fig. 6

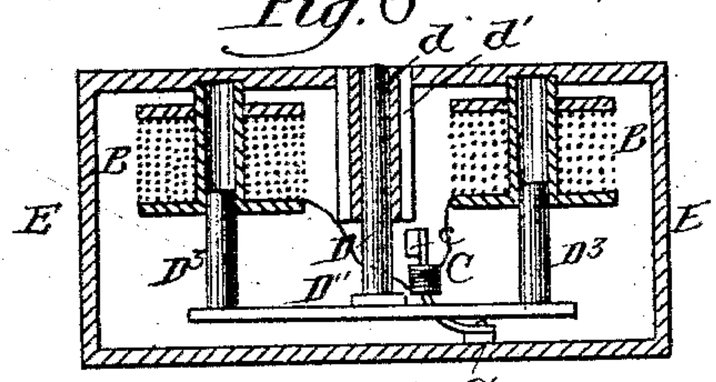


Fig. 7.

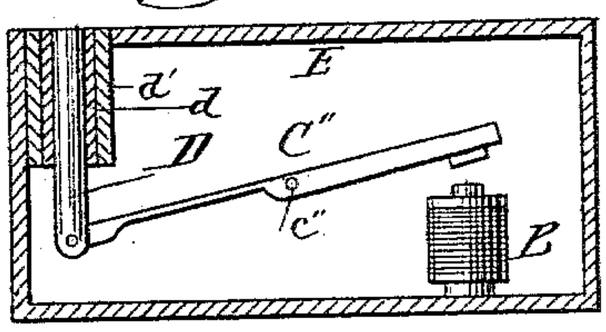
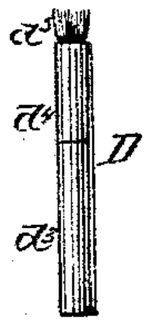


Fig. 8.



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Harry T. Jones.

Fig. 9.

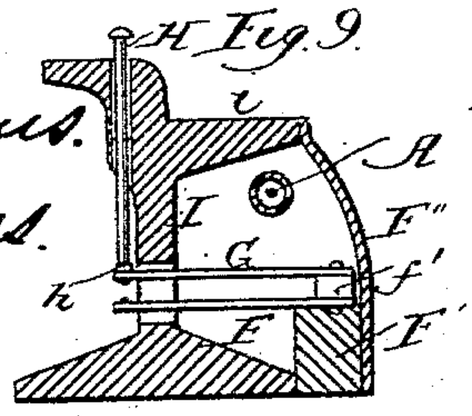

Fig. 10.

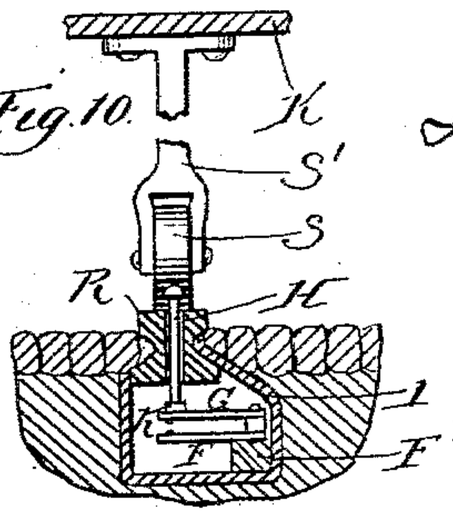

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Fig. 11.

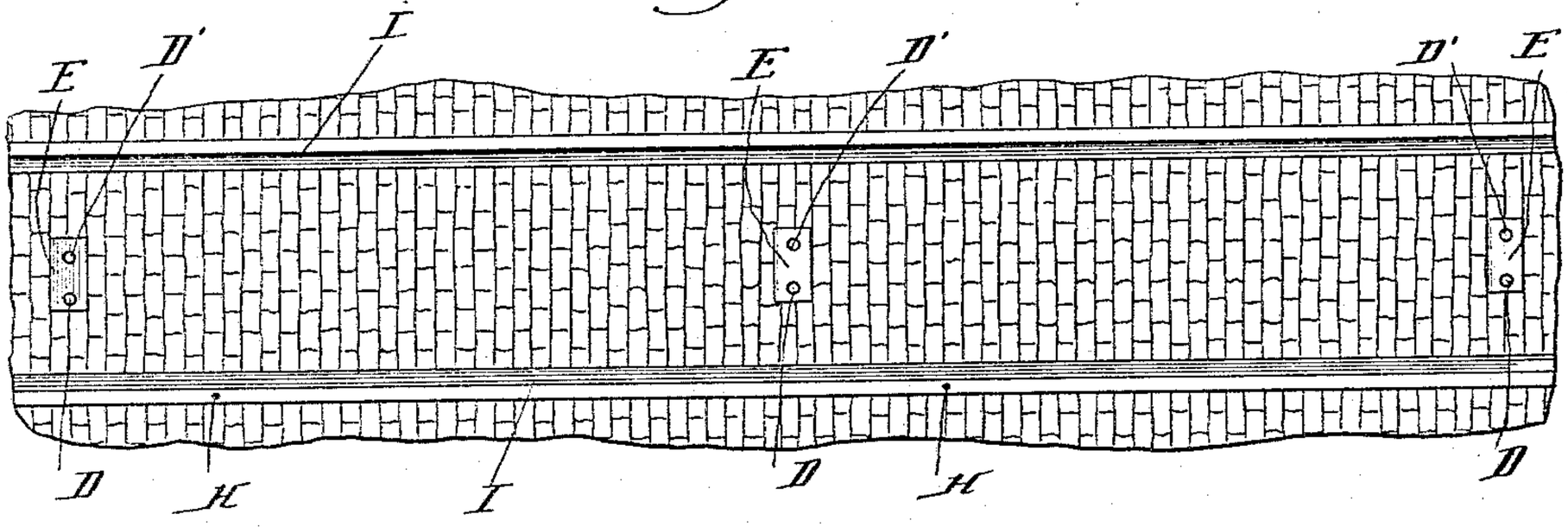


Fig. 12.

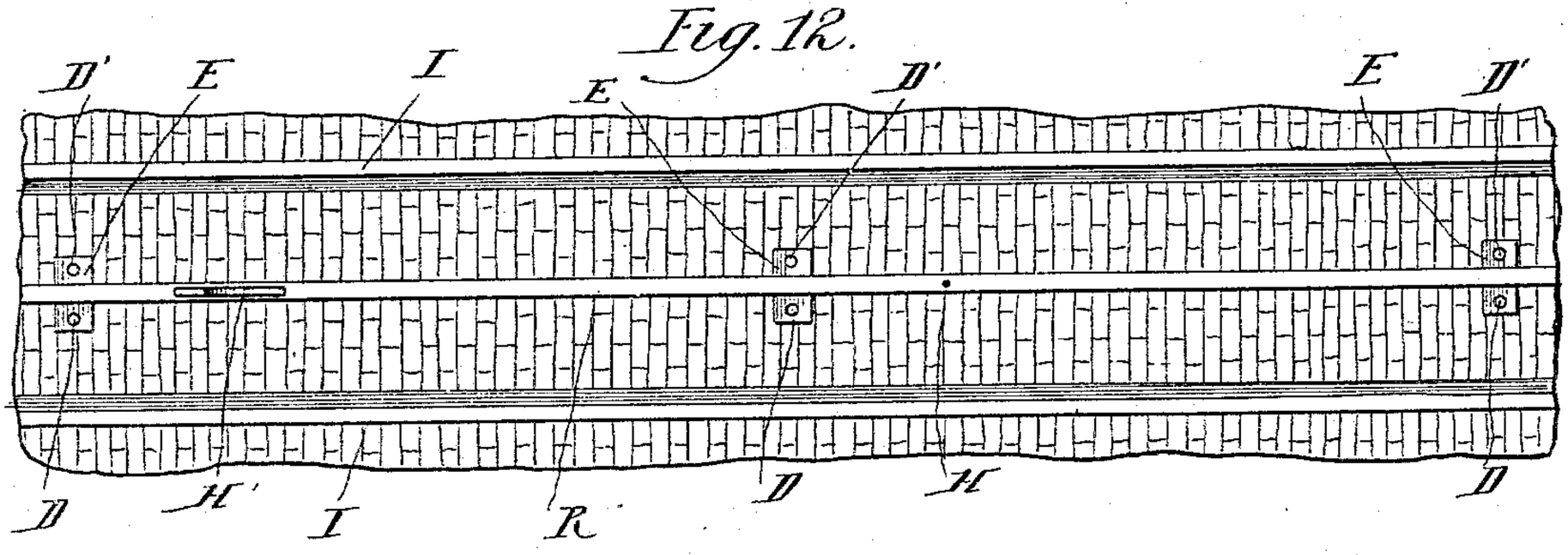
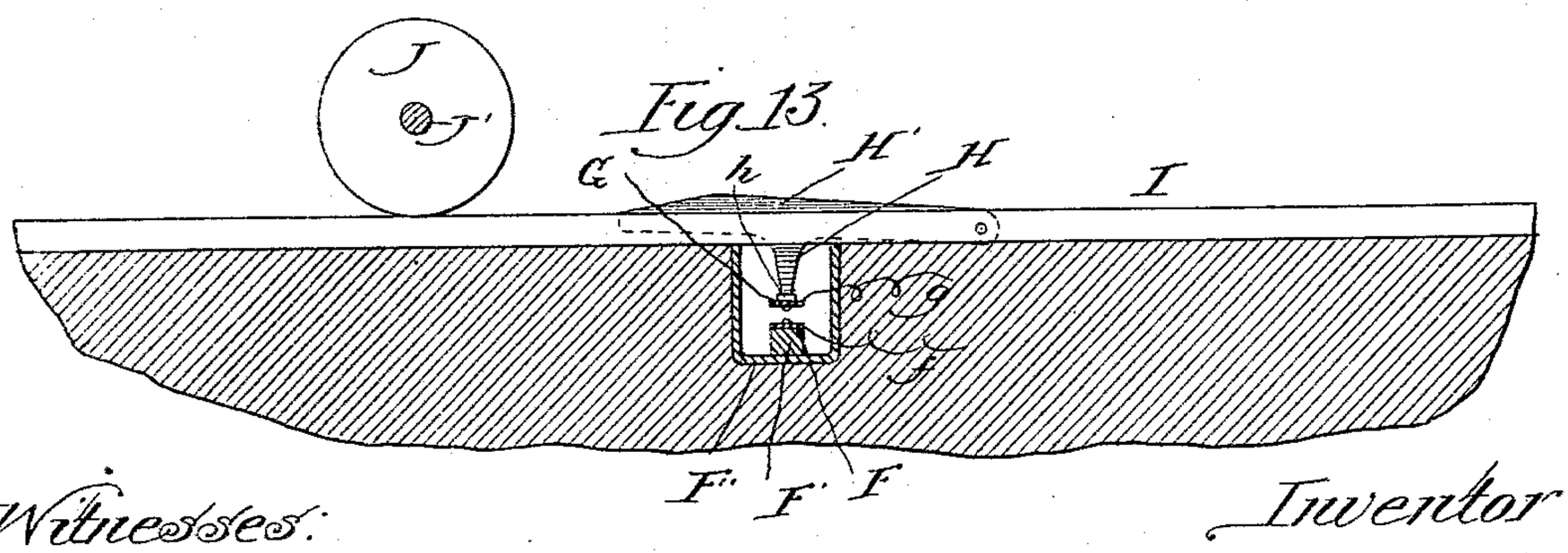


Fig. 13.



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N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN B. BLAIR, OF CHICAGO, ILLINOIS, ASSIGNOR TO HIMSELF AND ULRIC BLICKENSDERFER, OF SAME PLACE.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 399,236, dated March 12, 1889.

Application filed November 19, 1887. Serial No. 255,582. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. BLAIR, residing at Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Electric Railways, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation showing the car upon the track with the contact-bolts out of circuit. Fig. 2 is a similar view with the contact-bolts in circuit. Fig. 3 is a sectional side elevation with the parts as in Fig. 2. Fig. 4 is a detail in section showing another form of conductor attached to the car. Fig. 5 is a detail in section showing an arrangement of the contact-springs and moving pin therefor. Fig. 6 is a detail in section showing the contact-pin and two helices or coils. Fig. 7 is a detail in section showing a magnet and armature-bar for operating the contact-bolts. Fig. 8 is a detail showing a contact-bolt made partly of soft iron and partly of brass with a brush end. Fig. 9 is a detail in section showing the moving pin for the contact-springs in the tread of the rail instead of in the flange. Fig. 10 is a detail showing a moving pin for the contact-springs in the center of the track and operated by an independent wheel attached to the car. Fig. 11 is a section of the track, showing the sliding pin in the rail. Fig. 12 is a section of the track, showing the sliding pin in the intermediate rail. Fig. 13 is a detail showing the moving pin carried by an elongated arm.

Heretofore the practice has been to use either an overhead wire or wires or a slotted underground conduit, in which the wire or wires are placed for an electrical connection between a stationary generator and moving car or motor; but it has been found, in constructing electrical railways on this plan, that there are a number of objectionable features—such as the exposure of the wire or wires to atmospheric influences and the danger arising from the exposed wire or wires, and the liability of causing injury by contact with the wires or conductors, and other features which are well known.

The object of this invention is to overcome the objectionable features heretofore found in constructing electrical railways on the old plan, and this is accomplished by providing electro-magnetic devices located along the track at the required distance apart to coincide with the length of the moving car or motor-car, with which device a series of axially-moving bolts are combined, having the required range of movement to project above the road-bed or track a sufficient height to come in contact with the conductor suspended along the car-bottom, and form an electrical circuit which remains closed during the passage of the car, after which the contact-bolt falls to its normal position out of contact until again projected by the action of the moving car, so that when the bolt is out of contact and in its normal position the circuit from the main conductor is broken, and no injurious results will be had by contact with the bolt.

The nature of the invention consists in the several parts and combinations of parts hereinafter described, and pointed out in the claims, as new for obtaining the objects sought.

In the drawings, A represents the main wire or conductor, which can be inclosed in a casing of gas-pipe or other suitable conduit, and insulated in any usual and well-known manner, and A′ is a return-wire in the arrangement shown, also incased in a gas-pipe or other conduit.

B are helices or coils of the usual construction, and connected with the conductor A by a wire, *a*, and B′ is a helix or coil similar to B, connected with the return wire or conductor A′ by a wire, *a′*.

C is a spring having at its outer or free end a contact-block or armature, *c*, and secured to a block, *c′*, for insulation, located on the bottom of the casing in which the devices are arranged and connected to the helix or coil B by a wire, *b*; and C′ is a similar spring to spring C, having a contact block or armature, *c*, and secured to the bottom of the casing by an insulating-block, *c′*, and connected to the helix or coil B′ by a wire, *b′*.

D is a bolt or core formed entirely of soft iron or partly of soft iron and partly of brass, with or without a contact brush or block at

the end, as shown in Figs. 4 and 8, Fig. 8 showing a soft-iron portion, d^3, and brass portion d^4, and a brush, d^5, and Fig. 4 showing a brass portion provided with a contact-wheel, d^2. This bolt or core is located at the center of the helix or core B, and has an axial motion by which it can be projected until the center of the bolt or core is in line with the center of the helix or core crosswise, and this bolt is surrounded by a sleeve, d, of brass or other material, inclosed in a sleeve, d', of insulating material, around which the helix or coil is wound, and the insulating-sleeve d' may be a core of wood prepared in any suitable manner, so as to be a non-conductor, and also a non-absorbent of water or moisture, or it can be a sleeve of any suitable insulating material. A corresponding bolt, D', is provided for the helix or coil B', also incased in a sleeve, d', of insulating material surrounding a sleeve, d', in the same manner as for the bolt D and helix or coil B.

E is a casing made of iron or other suitable material, and having, as shown, a plate, e, on which the helices or coils B B' are supported, the said plate having an opening for the passage of the wires b b', which connect the respective helices to the respective springs C C', and, as shown, on the bottom of the casing in line with the bolts or cores D D' are insulating-blocks e', on which the bolts or cores rest when down.

F is a spring secured at one end to a suitable block or support, F', adjacent to the track-rail and having at its outer or free end a contact-point, and this spring is connected by a wire, f, with the spring C'.

G is a spring secured to an insulating-block, f', on the spring F, and having at its free end a contact for engagement with the contact-point of the spring F, and an insulating-block, h, for engagement with the moving pin, and this spring G is connected by a wire, g, with the spring C.

H is a sliding pin located, as shown in Figs. 1, 2, 3, and 5, in the flange of the track-rail and in line with the insulating-block h of the spring G, with which block the end of the pin H is in contact. This pin H can be located in the tread of the track-rail, as shown in Fig. 9, in which case the web of the rail can be slotted and the springs F and G passed through the slot for the pin H to rest on the block h, or the pin can be located in a central rail, as hereinafter described.

I is the track-rail, which may be of the construction shown or of any other suitable form, and, as shown, at the point where the sliding pin H and the springs F and G are located, a housing or boxing, F^2, can be used for inclosing the springs in the space below the flange i of the rail and the web thereof.

J is the car-wheels, of the usual construction, having a tread and a flange, j, which flange, for the arrangement shown in Figs. 1, 2, and 3, as the car moves along, comes in contact with the head of the pin H and forces the pin down to make a contact between the springs F G. With the pin arranged as shown in Fig. 9, the tread of the wheel will come in contact with the head of the pin H, to force it down and make a contact with the springs F G.

K is a car supported by the wheels J, as usual, the wheels being connected by the axle J'.

L is a conductor formed, as shown in Figs. 1, 2, and 3, of a brush running over pulleys l on a shaft, l', supported in brackets k, depending from the bottom of the car, a pulley and supporting-brackets being provided for each end of the car, and L' is a similar brush, also running over pulleys l on the shaft l'. The brush L is arranged to be in line and come in contact with the bolt or core D when projected, and the brush L' is located and arranged to be in line for contact with the bolt or core D' when projected, as shown in Fig. 2.

M is a spring or plate secured to a support, m, projecting out from the bracket k, which spring has its free end in contact with the conductor L to receive the current from the conductor, and M' is a similar spring, and is secured to the support m' from the bracket k to transmit the current to the brush L' from the motor.

N is a motor, which may be of any of the usual and well-known forms, for the propulsion of cars, and this motor is connected by a wire, n, with the spring or plate M, and by a wire, n', with the spring or plate M'.

O is a driving-chain passing around a sprocket-wheel, o, on the shaft J', and a sprocket-wheel, o', on the shaft l', which chain drives the shaft l' from the sprocket-wheel o' through the rotation of the wheel o from the axle J', and through the pulleys l drives the brushes or conductors L L' in a direction to have the bottom of the conductors run in the opposite direction from the direction of travel of the car, as indicated by the arrow in Fig. 3.

P is the platform of the car, from which depend the brackets k, which support the shaft of the driving-pulleys of the brush conductors L L'.

Q is the dash-board of the car.

R is a central rail parallel with the track-rails, and having therein at intervals the pins H. When this intermediate rail is used, the track-rails will not be provided with the sliding pins H, and the contact-springs F and G will be located below the rail or support R, as shown in Fig. 10, instead of adjacent to the track-rail.

S is a wheel supported by a standard, S', from the bottom of the car in such manner as to run over the support or rail R and engage the heads of the pins H in succession to force each pin down and make a contact for the springs F and G of the respective pins H.

The motor N is to be connected by a suitable train of gear or otherwise to impart rotation to the carrying-wheels of the car, in any usual and well-known manner, and the sliding pins

H, by which the circuit is closed for each contact bolt or core, are to be located at such distance apart in relation to the length of the machine or car, and the conductors along the car, and the wheels of the car, or the independent wheel when so used, that a wheel will come in contact with the sliding pin to make the contact between the springs F and G at a point when the forward end of the car and conductor is over the bolt or core to be projected to complete the circuit.

In use, as the car moves forward from the action of the motor, the contact-wheel will come in succession onto the head of the sliding pins H, causing the circuit through the springs F G, wires *f g*, and springs C C′ to electrify the contact bolts or cores when projected axially to engage with the car-conductor, and after the bolts or cores are projected and the contact had with the car-conductors the circuit is complete from the main conductor A by the wire *a*, helix or coil B, wire *b*, spring C, bolt or core D, conductor L, spring or plate M, and wire *n*, to the motor N, and the return is had by the wire *n′* from the motor N to the spring or plate M′, car-conductor L′, bolt or core D′, spring C′, helix or core B′, and wire *a′* to the return-wire A′, and the circuit thus formed will remain closed so long as the projected bolts or cores D D′ are in contact with the car-conductors L L′, and as one set of bolts or cores passes from contact with the car-conductor another set of bolts or cores will be projected and electrified in the same manner by the sliding pin H to complete the circuit, as already described, so that a continuous circuit for the motor is had at all times through the devices and by the means described.

A moving brush conductor for the car is shown in Figs. 1, 2, and 3; but instead of a moving conductor a rigid conductor for the car, located in the same manner as the flexible conductors, can be used, and such conductor is shown in Fig. 4. With a rigid conductor, if desired, the projected end of the bolt or core can be provided with a roller, *d′*, for contact, which roller obviates friction to a large extent; or, if desired, a bolt or core of the construction shown in Fig. 8 can be used, it being understood that either form of bolt can be used with a flexible or a rigid car-conductor.

The contact bolts or cores work on the well-known principle of axial motion where the bolt or core finds its level at the center of the helix or coil and the center of the bolt or core, and for this reason, when the bolt is normally at rest, its length below the helix or coil is greater than the length projected, in order to leave sufficient space for the axial motion to hold the bolt or core projected with play sufficient for any unevenness in the motion of the car.

The bolt or core to be projected can be secured to a cross-bar, D″, having at each end a pin, D^3, to center the helix or coil, as shown in Fig. 6, and when so used two helices or coils are provided, which gives a greater amount of force in projecting or holding the bolt, as well as an increase in the current. The bolt or core can also be projected by means of an armature-lever, C″, pivoted at *c″* and attached at one end to the lower end of the bolt or core, and having at its other end an armature or block to coact with the center of the coil B, as shown in Fig. 7, and instead of using a return-wire and connections the return can be made, if so desired, through the track-rail or the ground.

The bolts or cores, when at a state of rest, do not carry an electrical current; but when projected by the magnetic action and the armature or block of their contact-spring is in connection with the bolt they become electrified and pass the current generated to the conductor along the car-bottom.

With the construction shown, where the bolt or core passes through the coil the magnetism is always present; but with the construction shown in Fig. 6, in order to make a live bolt or core of a dead one, the spring which coacts with the motor-core is to be provided with a coil having a connection with the helices or cores, as shown in Fig. 6.

The head of the moving pin H can be elongated to give a longer contact between the springs F and G, and this pin can be operated by direct contact with its head, as in Fig. 3, or the pin can be carried by an arm, H′, as in Fig. 13, which will give a longer period of contact.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric railway, the combination, with the car, of a motor carried by it for propelling its wheels, an electrical connection between said motor and conductors along the car, contact bolts or cores adapted to be projected above the road-bed or track, the main conductor-connections between said conductors and the contact-bolts, and means for projecting said bolts or cores above the bed or track to complete the circuit through the motor, substantially as described.

2. The combination, with an electric motor carried by a car and having electrical connections with conductors along the car, of bolts or cores adapted to be projected above the road-bed or track, helices or coils around such bolts or cores, and means for completing a circuit to project the bolts or cores above the road-bed or track and form an electric circuit from a main conductor through the car-motor, substantially as described.

3. In an electric-railway system, the combination, with the road-bed or track, of helices or coils, bolts or cores having an axial motion through said helices or coils and above the road-bed or track, the main conductors and connections between the same and said contact-bolts, a circuit-closer, a car carrying a motor having electrical connections with conductors along the car, and a trip or arm on

the car for operating said circuit-closer, substantially as and for the purpose described.

4. In an electric-railway system, the combination, with the road-bed or track, of a main conductor, helices or coils having electrical connection, bolts or cores through the coils and having an axial movement above the road-bed or track, and a circuit-closer, substantially as and for the purpose set forth.

5. In an electric-railway system, the combination, with the road-bed or track and a car carrying a conductor and a motor having electrical connections with the conductors, of a bolt or core adapted to be projected above the road-bed or track, electrical connections for influencing said bolt, and a circuit-closer, the said electrical connections and circuit-closer projecting said bolt and establishing a current through it while the car is passing over it and permitting it to drop and cutting off the current therefrom in its normal position after the car has passed, substantially as described.

6. In an electric-railway system, the combination, with the road-bed or track and a car carrying a conductor and a motor having electrical connections with said conductor, of a bolt or core adapted to be projected above the road-bed or track, a main conductor, a circuit-closer acted on by a part of the car, and electrical connections between the bolt and the circuit-closer and main conductor, substantially as described, for projecting the bolt and holding it projected and passing a current through it while the car is passing, and cutting off the current and permitting the bolt to drop to its normal position after the car has passed, substantially as described.

7. The combination, with the main conductor A, helix or coil B, spring C, and axially-moving bolt or core D, and wires *a b*, of contact-springs F and G, sliding pin H, and connecting-wire to the spring C, completing a circuit to project the bolt and complete a circuit from the main conductor through the coil and bolt, substantially as and for the purpose specified.

8. The combination of a main conductor, A, helices or coils B B′, springs C C′, sliding bolts or cores D D′, and connecting-wires *a b b′*, with the contact-springs F G, sliding pin H, and connecting-wires *f g*, for closing a circuit and projecting the bolts or cores to form a circuit from the main wire or conductor, substantially as and for the purpose specified.

9. The combination of the wire or conductor A, helix or coil B, spring C, axially-moving bolt or core D, contact-springs F and G, sliding pin H, conductors L, plate M, wire *n*, motor N, wire *n′*, plate M′, conductors L′, axial moving bolt or core D′, spring C′, helix or coil B′, and electrical connection between the main conductors, the helices, and the contact-spring, substantially as and for the purpose described.

10. The combination, with a main conductor and a helix or coil connected therewith, of a bolt or core adapted to project above the road-bed or track, and a connection between the bolt or core and its helix or coil for completing the circuit from the main conductor through the bolts or core when the helix is energized, substantially as specified.

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