

(No Model.)

3 Sheets—Sheet 1.

W. M. SCHLESINGER.
ELECTRIC RAILWAY.

No. 574,632.

Patented Jan. 5, 1897.

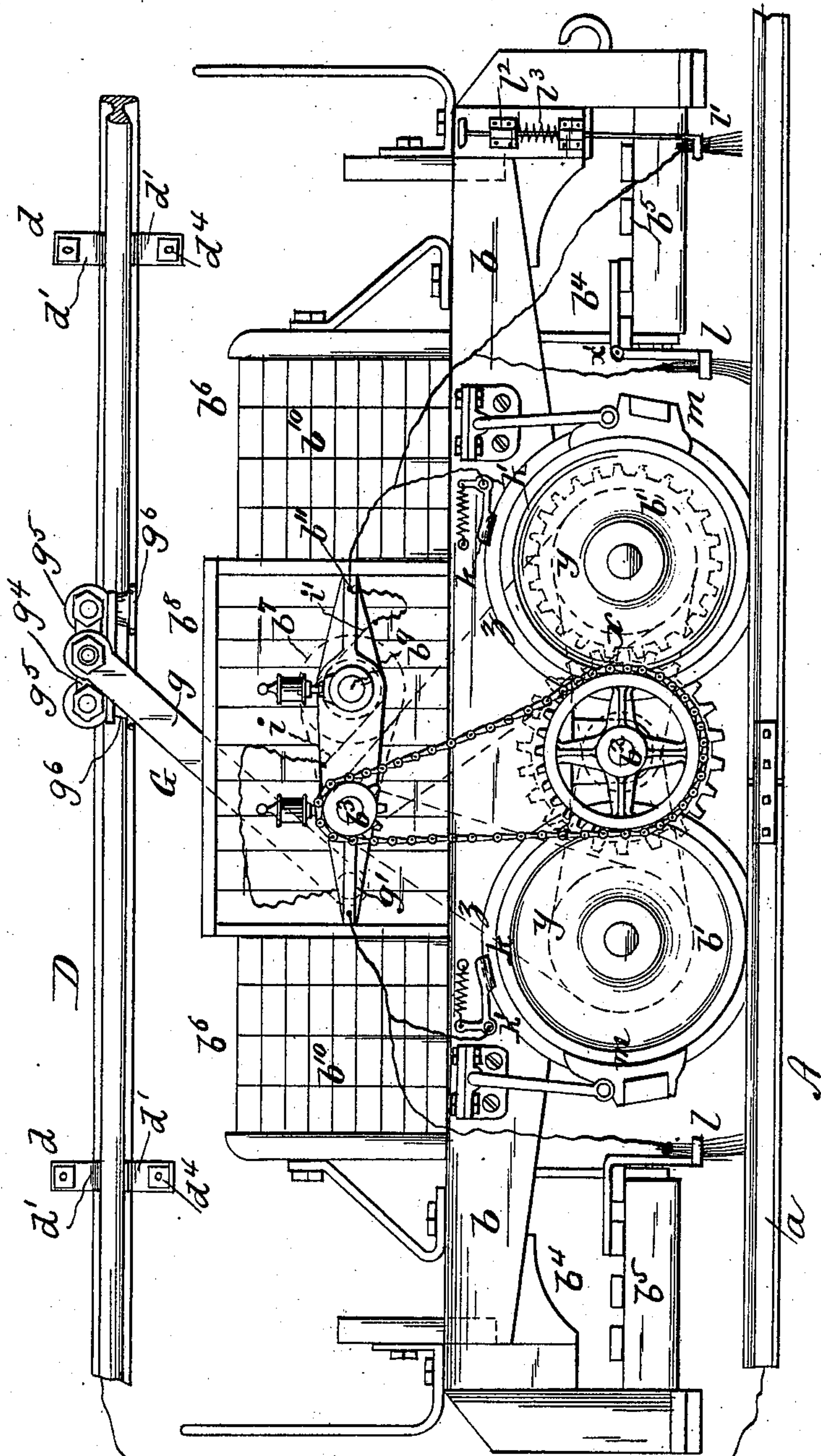


Fig. 1

WITNESSES:

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Chas. P. Ramon

INVENTOR

Wm. M. Schlesinger

By S. J. Vandervoort

ATTORNEY

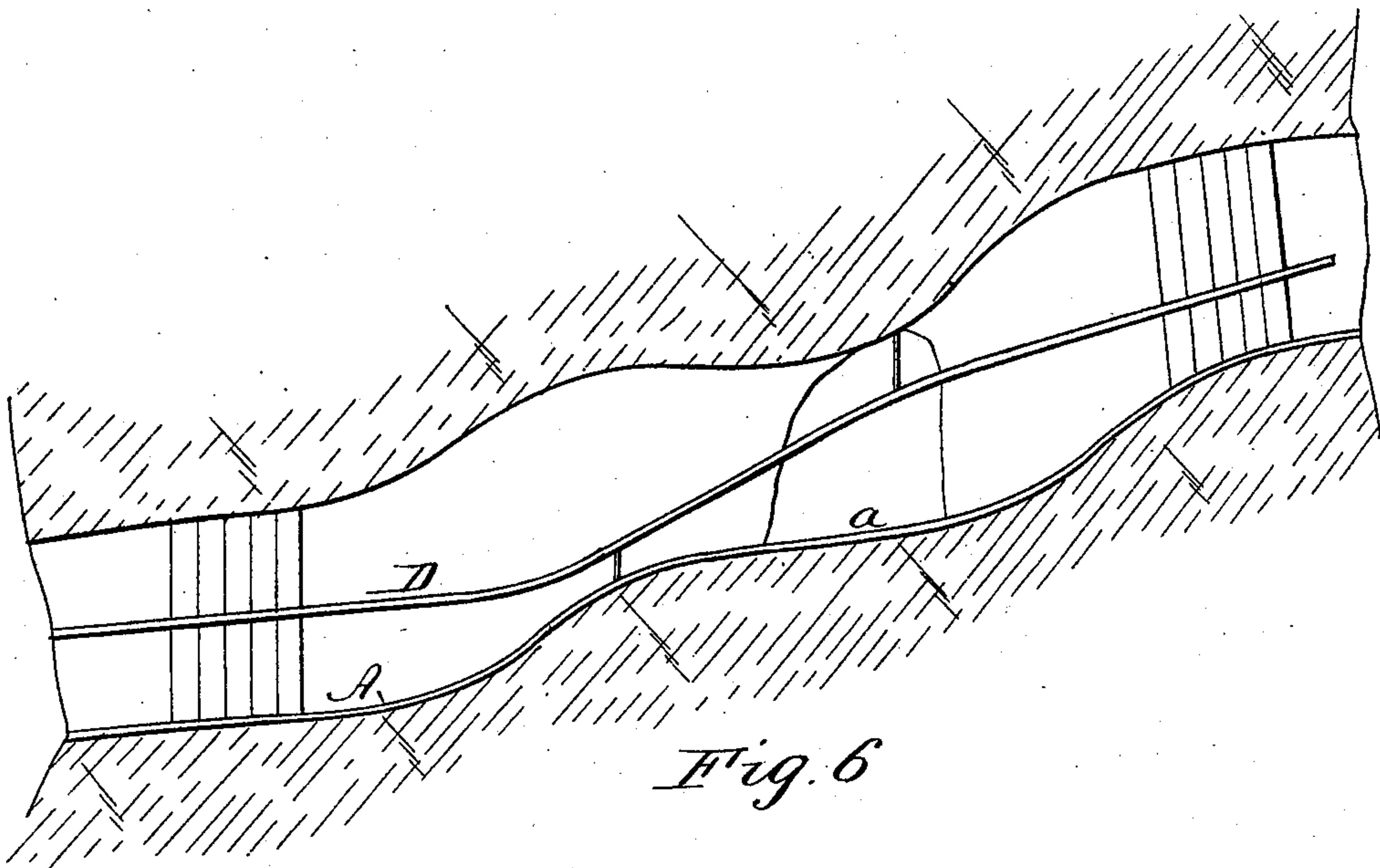
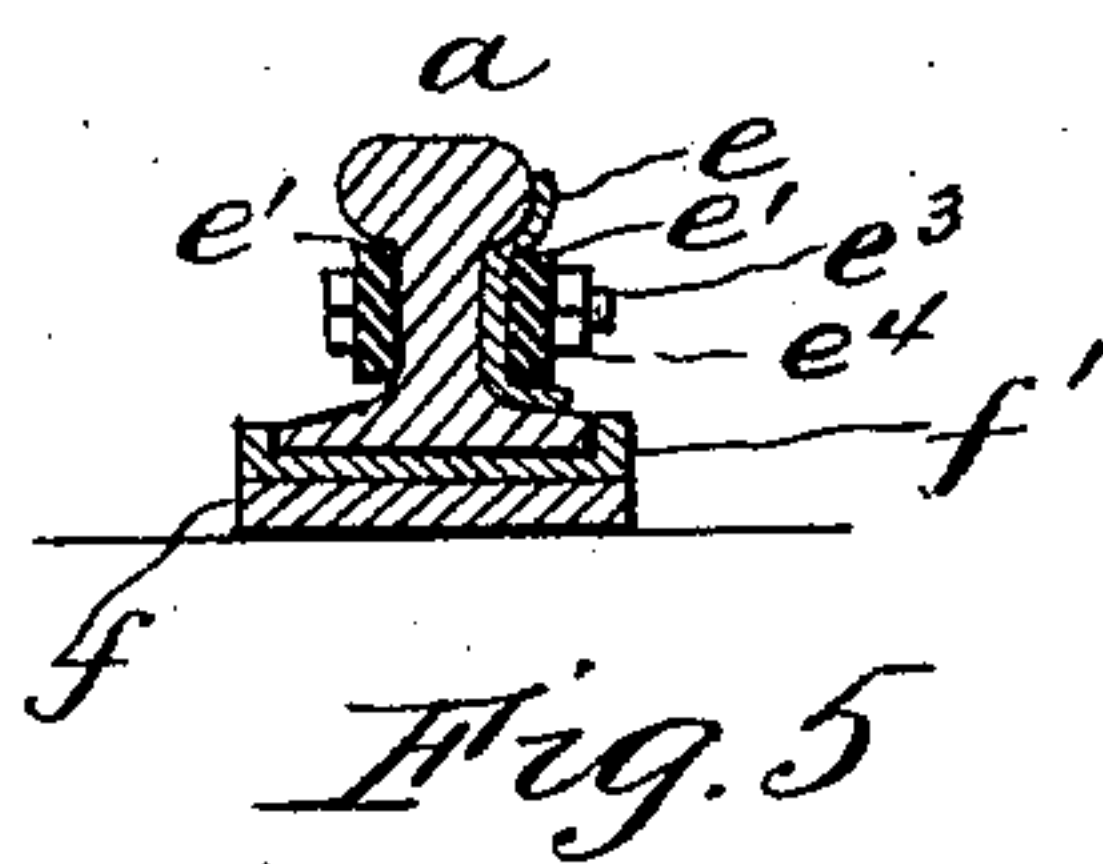
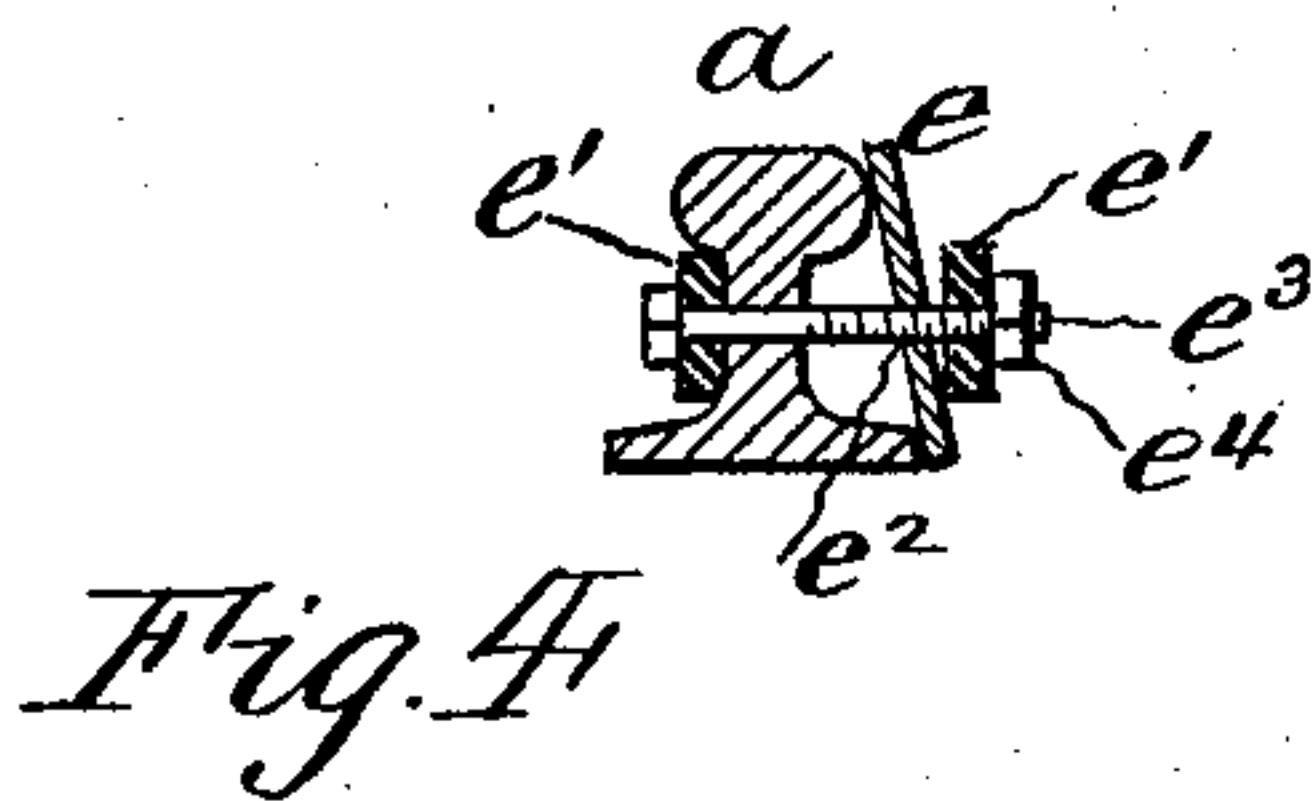
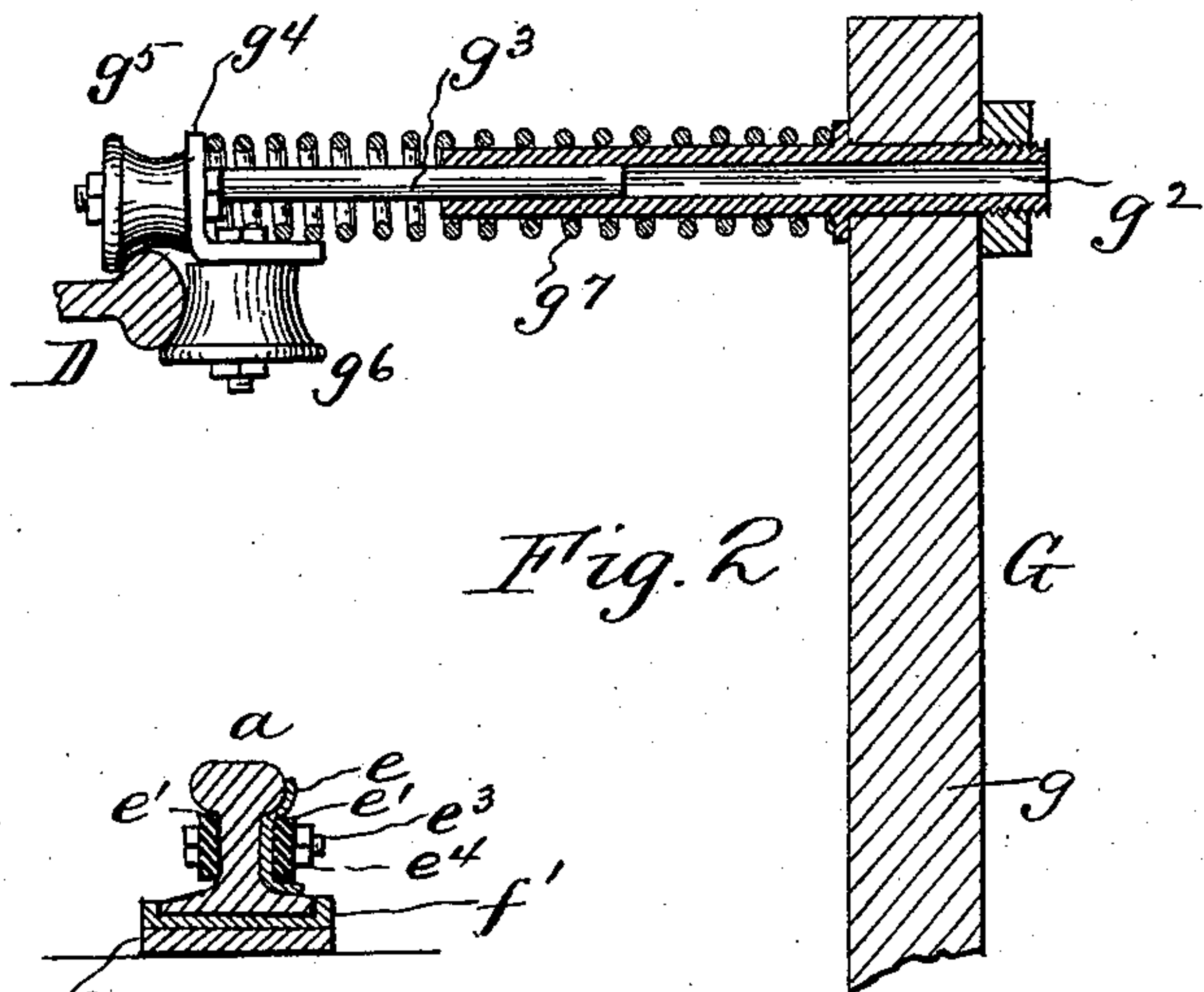
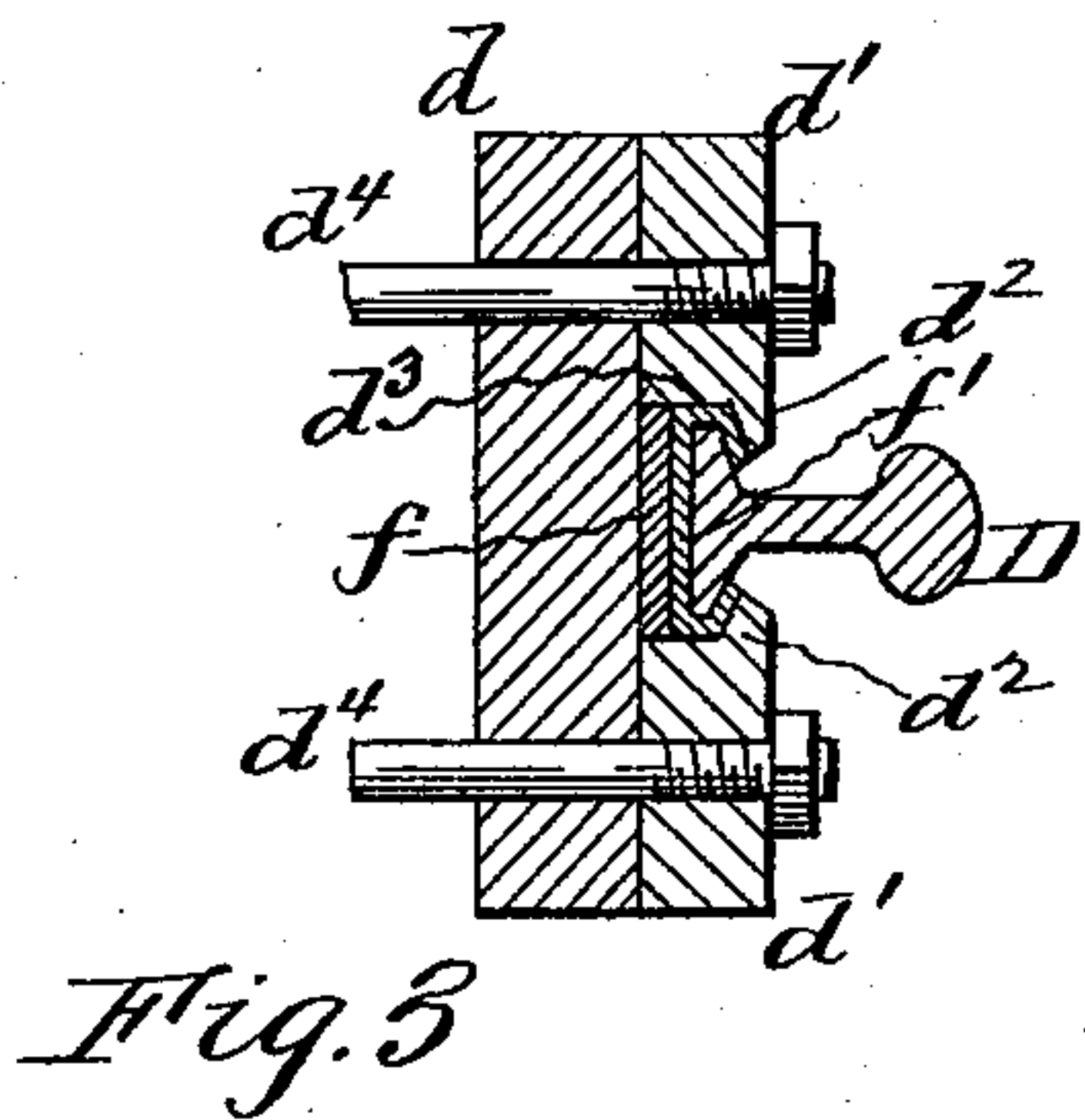
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3 Sheets—Sheet 2.

W. M. SCHLESINGER.
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Patented Jan. 5, 1897.



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(No Model.)

3 Sheets—Sheet 3.

W. M. SCHLESINGER.
ELECTRIC RAILWAY.

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Patented Jan. 5, 1897.

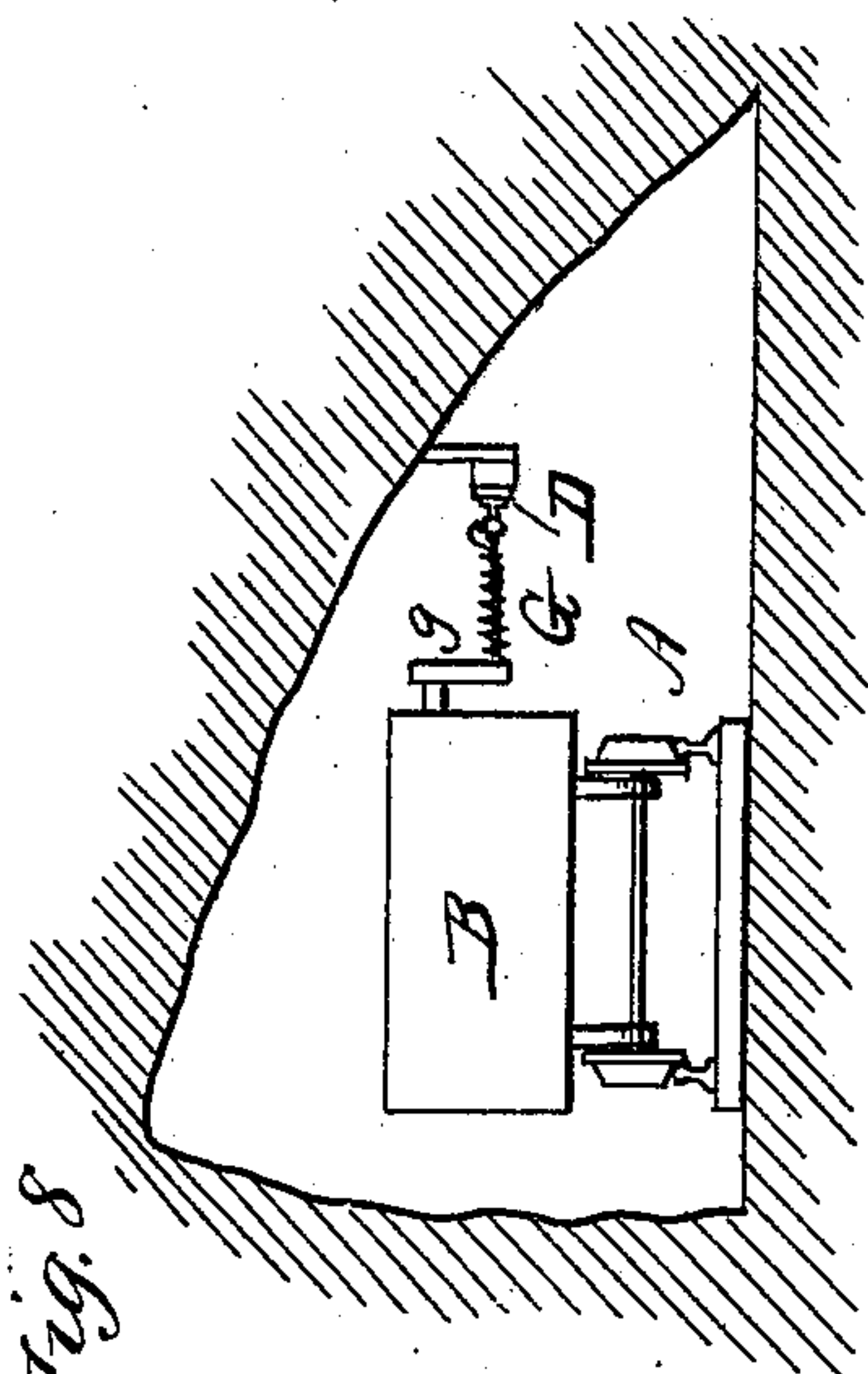


Fig. 8

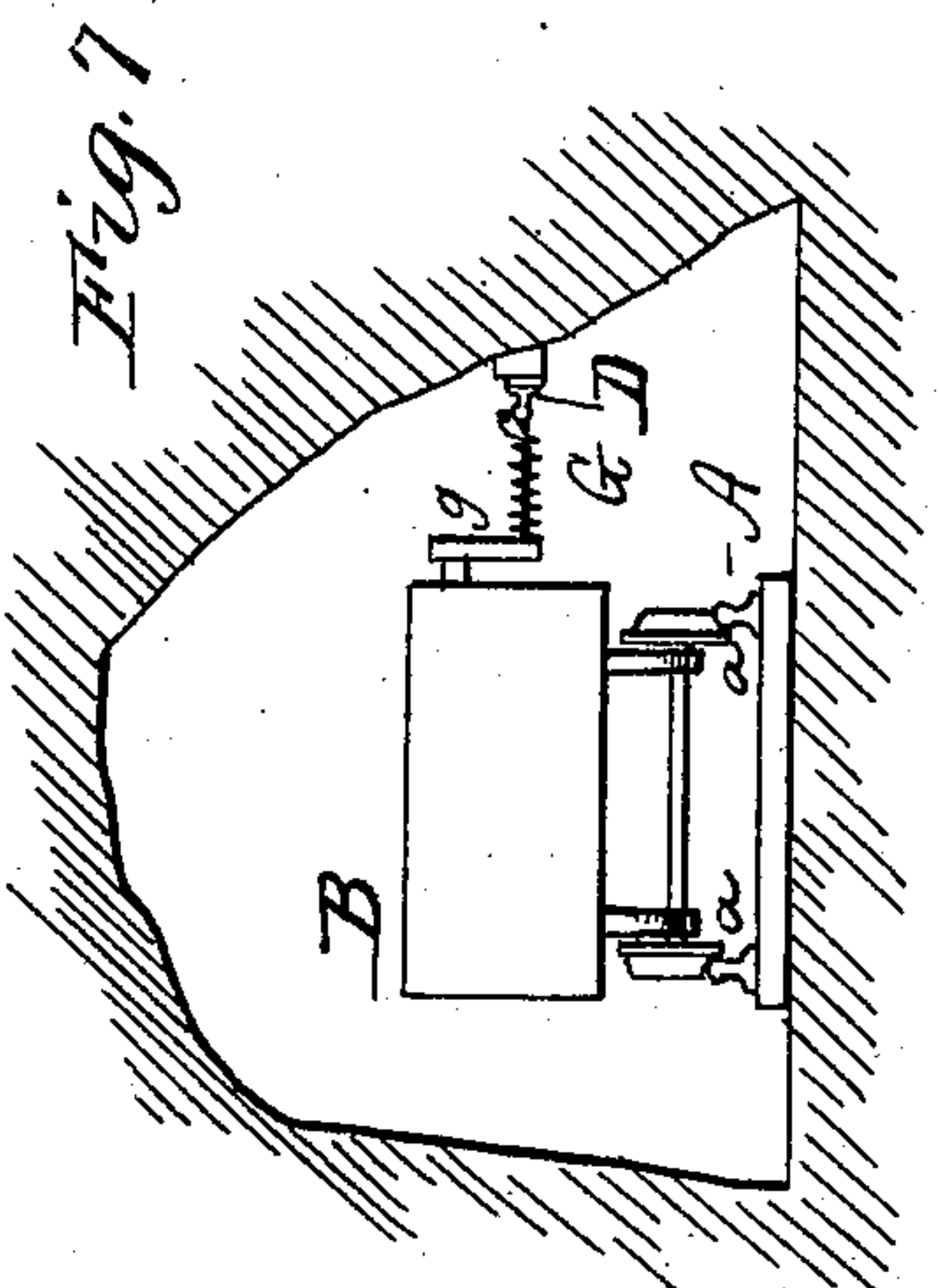


Fig. 7

WITNESSES:

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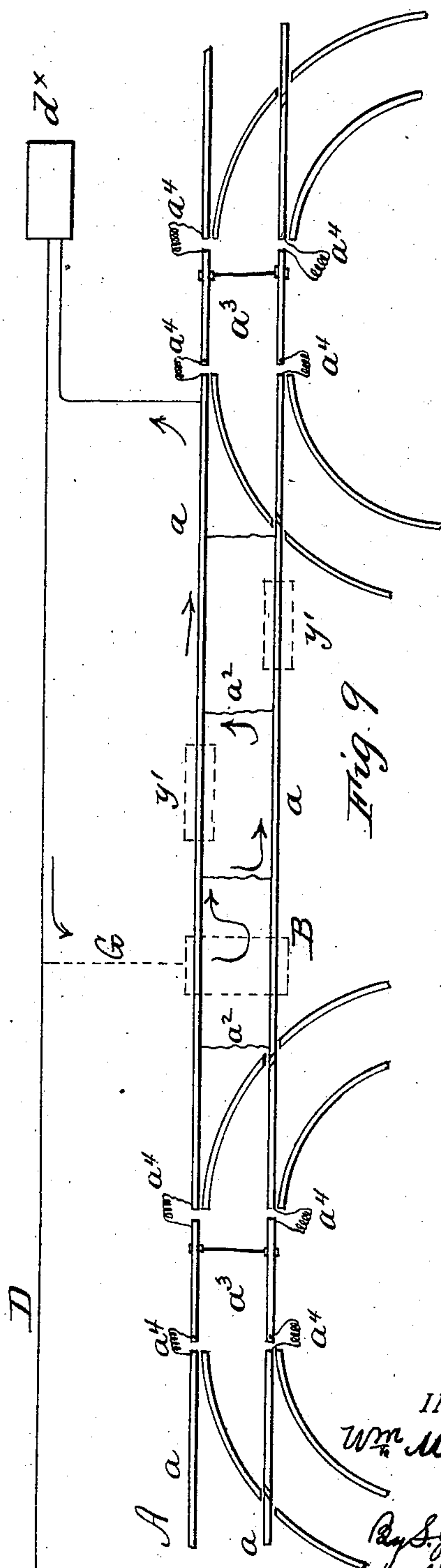


Fig. 9

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UNITED STATES PATENT OFFICE.

WILLIAM M. SCHLESINGER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR,
BY MESNE ASSIGNMENTS, TO A. H. WILLIAMS, OF SAME PLACE.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 574,632, dated January 5, 1897.

Application filed October 12, 1887. Serial No. 252,113. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. SCHLESINGER, a subject of the Queen of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

My invention has relation generally to electric-railway systems comprising line conductors in circuit with generating devices located at a station or stations along the line of way and electrically-propelled cars having current-collectors traveling with the car in contact with the conductors, and particularly to that form of the same wherein one of the lines of railway-rails is used for one of the electric conductors and the other conductor is a rail separate from the track-rails, the whole being known as the "third-rail" system.

My invention has for its object simplicity, durability, and efficiency of parts comprising the electrical appliances for the system generally, and particularly to adapt it for use in mines and other like places.

It is well known that the slopes, drifts, or gangways of mines are of limited space or area in cross-section; that they are more or less irregular in their outline and configuration in cross-section (see Figures 7 and 8) and in their grade and direction, (see Fig. 6;) that these gangways are the avenues through which the employees, animals, and materials used in and the products of the mines either pass or are transported to and from the same; that the trackways in the slopes or drifts for the mule cars or wagons to travel upon are not laid with the care, accuracy, and solidity of surface roads, because it is unnecessary to do so and, further, on account of economy; that the disintegration of the rock or other material composing the walls of the gangways, due to natural and other causes, and the consequent falling of such material upon adjacent portions of the tracks in the gangway to obstruct the travel or transportation thereon are of more or less frequent occurrence; that in repairing the road-bed and tracks in the gangways it is essential, as well as preferable, that only a section of the trackway be removed and replaced or repaired at a time, so as not

to interfere with the movement of the cars from and into the mine, and that the shifting of the empty or loaded cars from one gangway to another is a matter of absolute necessity. 55

In equipping the mines or their gangway-tracks with a system of electric-motor appliances for the cars all of the above-described circumstances must be duly considered in order to secure an electric-railway system therefor in which the economy of construction, efficiency and durability of its parts, and the provision of the utmost safety or protection for the employees and animals passing to and fro in the main gangway, and from the latter to other gangways in the neighborhood of the electric conductors render it available for practical use and capable of being economically operated. 60 65

For the accomplishment of the same I have found that the plant for the third-rail system of electric railways is the most economical, because one of the conductors—viz., one of the lines of the railway-rails—is already laid and only needs that its rails should be electrically connected and insulated, and, further, as there is always a quantity of unused rails in or about the mine a very considerable saving is effected in utilizing them for the remaining conductor or third rail, and by securing or putting the latter upon one of the sides of the gangway or slope the conductors are separated as much as possible to secure the utmost safety or protection against the dangers incident to their too-close proximity. I have further found, owing to the varying configuration in cross-section of the gangways, their varying direction and grade, and the necessity for admitting the employees, animals, and cars passing from one gangway to another, that the third rail or conductor secured to one of their sides cannot be laid parallel with the railway-track and at an equal height therefrom throughout their length. Hence at points along the line either or both the lateral and longitudinal parallelism of the third rail with the railway-tracks varies as the conditions and working of the mine require. To admit of utilizing this described required way of laying the side or third-rail conductor, I have devised a contact-plow or current-collector which rises and falls with 70 75 80 85 90 95 100

the varying lengthwise grade or parallelism and yields to the variations in lateral outline or parallelism of said conductor without breaking electrical contact therewith.

5 To prevent the continuity of the circuit of the track conductor being broken by falling rock or other material and while repairing any portion of the same, I use both lines of track-rails for the track conductor and at
10 intervals of, say, one hundred yards, more or less, as desired, I electrically connect both lines of track-rails with each other, so that if a section of one line of track-rail is cut out the circuit is still closed through the
15 adjacent section of the opposite line of track-rail.

To admit of shifting the cars from one gangway to another, the switch-rails are provided with flexible circuit connections between them and the main-line conductors or
20 tracks.

As the cross-section of the gangways is confined or limited and irregular, it follows that the motor on the car, the ballast thereon for
25 giving it the necessary traction upon the rails, and the space or apartments for the attendants must be as compact as possible, and to this end I arrange the motor directly over the wheels, place the ballast or weight in
30 apartments at each end of the motor, and beyond these apartments are other apartments or spaces for the attendants, the current-collector or plow being on the side of the motor-car preferably.

35 As the trackway in the drifts is more or less roughly and unevenly laid, it is necessary to provide, first, a good electrical contact or connection between the motor and the track-rail conductor, and to this end I provide two or
40 more paths or electrical connections from the track-rail conductor to the motor-brushes, so that if one connection is open one or more of the others are closed; and, second, a simple and economical permanent electrical connection
45 for the rails composing the track-rail and the side-rail conductors, and to this end I preferably take brass, copper, or other flexible metal plates of a width preferably larger than that of the fish-plates connecting the rails, provide them with openings corresponding to
50 those of the fish-plates, and by first placing a flexible plate back of a fish-plate and then screwing or bolting the latter in position the flexible plate is bent to conform to the configuration of the side of the rail and clamped
55 between the latter and the fish-plate to provide a permanent or fixed electrical connection for said rails, which connection may at any time be readily removed when desired.

60 My invention accordingly consists of the novel combination, construction, and arrangement of parts, as hereinafter described and claimed.

Reference is had to the accompanying drawings, forming a part hereof, and wherein—

65 Fig. 1 represents a side elevation of a line of railway, conductors, and an electric-motor

car with traveling current-collector embodying my improvements; Fig. 2, an enlarged vertical section of the main portion of the
70 traveling current-collector; Fig. 3, a cross-section of the side or third rail conductor and insulating support or bracket therefor; Fig. 4, a cross-section of one of the conductor-rails, showing the first step or operation for electrically connecting said rails; Fig. 5, a like
75 view showing the connection made; Fig. 6, a sectional diagram illustrating an approximate conformation as to grade and direction of drift or slope and relatively thereto the direction
80 and height of the third or side rail conductor. Figs. 7 and 8 are cross-sections of same, showing car and traveling current-collectors; and Fig. 9 is a diagrammatic plan of a system of
85 railway tracks, switches, and electrical connections therefor embodying my improvements.

A represents a line of railway-track, one or both of the lines of track-rails a of which, preferably the latter, is used as an electrical
90 conductor; B, the motor-car, and D the other conductor, which conductors are in circuit with a generator or generators d^x , located at any suitable station along the line of way.

The conductors for the general purposes of
95 my invention may be of any suitable configuration in cross-section and electrically connected as desired; but for special application to mines and other places where economy of construction is essential they consist, preferably, of railway-rails, and are electrically connected as follows: e represents plates of brass, copper, or other flexible conductor-plates, preferably of a greater width than that of the fish-plates e' for the rails a . The plates e and
100 e' have corresponding bolt-holes e^2 . In connecting the conductor sections or rails together as they are laid upon the cross-ties or ground or in electrically connecting them after they are laid, one of the fish-plates e' being
105 removed at the points whereat the electrical connection is to be made, the plate e is first placed upon the bolts e^2 , and the fish-plate e' and nuts e^4 for the bolts are inserted in position, as shown in Fig. 4. The nuts e^4 are then
110 turned to clamp or secure the fish-plates and rails together. As this is done the plate e is by the said fish-plate bent to conform to the configuration of the rail or conductor and is also tightly clamped between the rail and fish-
115 plate and overlaps the edges of the latter, as shown in Fig. 5, to provide a good electrical connection between said parts, which connection can be readily broken or removed, when necessary, for repairing the trackway.
120

If desired, the plates e may be bent to conform to the rails before being placed in position; but this is not essential.

The side conductor-rail D is suitably insulated in supports in brackets d , preferably of
130 wood, having removable blocks d' , provided with oppositely-projecting lugs d^2 , bounding an intervening recess d^3 , in which the conductor-rails are inserted and held therein by

said lugs d^2 , the whole being fixed in position by screw-bolts or other fastening devices d^4 . Between the conductor rails or sections and their supports are blocks or plates of red fiber, glass, or other suitable insulating material f , and also pads of soft rubber f' , the rubber being between the rail and the fiber or glass. The rubber is not only an insulator, but, being soft, also acts as a cushion to take up or compensate for the vibration of the rails produced by the hammering or the movement of the current-collector thereon, and for this reason it is preferably placed next to the rails or sections.

The side or third conductor D is preferably located upon the side of the slope, drift, or gangway of the mine or other railway of like character to keep the conductors separate from one another as much as possible for protection against the dangers incident to their too-close proximity.

The supports for conductor D may be secured to the side, top, or bottom of the gangway, as desired, or as economy and the necessity of passage of men, animals, and cars from one gangway to another demand. (See Fig. 6.)

The motor-car B consists, essentially, of a frame b , mounted upon the running-gear b' , and having, if desired, a counter-shaft b^2 in direct gear-wheel connection with one of the axles of running-gear b' , as indicated at x , Fig. 1, or by a drive-chain connection with one or both of the axles of said gear, as illustrated at y in said figure. If desired, however, a direct connection may be made from a counter-shaft b^3 in the motor-frame to the axles of running-gear b' , as indicated at z . Said frame has at each end a platform-apartment b^4 , the floors b^5 of which are below the longitudinal sill-pieces for said frame, and the sides and one end of each said apartment are formed by the adjacent parts of the sill-pieces of frame b , as shown. These apartments b^4 are for the engineer and other trainmen, so that they can take their position at either end, as necessity requires, and can readily jump from the car when necessary.

Upon the top of the frame b and next to the apartments b^4 are other apartments b^6 , and between these or in the center of the car above the frame b is an electric motor b^7 , inclosed in a box or apartment b^8 , as shown.

The motor armature-shaft b^9 has a drive-chain or other connection with the counter-shaft b^3 . In the apartments b^6 is placed the necessary ballast or weight b^{10} for traction purposes, and as the motor b^7 and the ballast b^{10} are located at the middle or center of the car and directly over its running-gear, as shown in Fig. 1, they are in the most desirable position for giving the best traction results to prevent the car jumping the tracks. The provision of a platform apartment b^4 at each end of the car and located near to the tracks gives ample space for the engineer and

attendants to stand erect at either end of the car in passing through drifts, tunnels, or gangways of a mine, which would not be the case if the floors of said apartments b^4 were raised to the top of the frame b .

The current-collector or plow G is composed, preferably, of a bar g , pivoted or hinged at g' to the car-frame or a fixture thereon, and it has at its outer end a tubular sleeve g^2 , secured thereto by a collar and screw-nut, as shown, or otherwise, as desired.

In the bore of sleeve g^2 is a loose sliding plunger-rod g^3 , having at its outer end a bent or right-angle bracket g^4 , upon which are suitably and preferably mounted two pairs of contact brushes or rollers g^5 g^6 , grooved or otherwise configured to conform to the cross-section outline of the side or third rail conductor D. These pairs of contact rollers or brushes are located at right angles to one another, so that one pair contacts with the top and the other with the side of the rail.

Between the right-angle roller or brush bracket g^4 and the bar G and encircling the sleeve g^2 and plunger-rod g^3 is a spiral spring g^7 for imparting an outward or lateral pressure to the contacting rollers.

The weight of bar G, sleeve g^2 , rod g^3 , bracket g^4 , spring g^7 , and the pairs of rollers g^5 g^6 imparts a downward pressure to said rollers, and as they are located at an angle to one another the lateral and downward pressures to which they are coincidentally subjected keep them in close or good electric contact with the conductor D under all conditions of service, irrespective of the line of its direction or of the changes in its grade longitudinally or laterally.

If the grade of the conductor dips or alters from that of the track-rails, the hinged arm falls or rises to compensate for the same, and if the conductor varies laterally from its parallelism with the track-rails the plunger-rod slides in the bore of the pipe to compensate for such variation.

The current-collector G is electrically connected to one of the brushes i of the motor b^7 . The other brush i' thereof is electrically connected for general purposes through the running-gear of the car with the track-rail conductor in any desired manner, but for use in mines I prefer to provide several electrical connections between said last-named brush i' and the conductors a , and to do this I electrically connect the brush i' to frame b^{11} of the motor and put the latter in electrical connection with conductor a , first, by way of spring-actuated shoes k , pivoted at k' to frame b to bear against the periphery of the wheels of the running-gear; second, by way of the motor armature-shaft, drive-chains, counter-shaft b^3 , and gearing between it and the axles of the running-gear; third, by way of wires or brushes l and l' , respectively, so that if one or more of these circuit connections are opened or out of contact the others

are in position to make contact or remain closed to complete the loop-circuit from the conductors to the motor on the car.

The brushes l are preferably fixed, and are used, preferably, only when the road is started, to clean or brighten the contact-surface of the conductor, and they are taken off when no longer required, or they may be hinged or otherwise arranged, as indicated at x' , Fig. 1, to admit of being thrown up out of the way when not needed. The brushes l' are loose vertically-sliding brushes suitably mounted in bearings l^2 , and have reaction-springs l^3 for keeping them normally out of contact with the conductor-rails a . These brushes are employed for the following-described purpose: In traveling upon heavy grades or other places where it is sometimes necessary to sand the tracks to prevent slipping of the wheels, the brushes l not being then in use, the accumulation of sand upon the tracks sometimes prevents the running-gear making contact with the rail as it passes over the sanded parts of the track in making successive trips, and when this occurs one or more of the brushes l' are manually pushed down through the sand to make the necessary contact with conductor a .

All the brushes l' are of course suitably insulated from their handles.

The brake-shoe beams m are mounted upon the car-frame, as shown in Fig. 1, and they may be electrically or otherwise operated, as desired, as the appliances for doing so form no part of my invention.

I have shown the armature-shaft b^9 of the motor in gear with a counter-shaft mounted upon the motor-frame b^{11} , and this counter-shaft is in gear by means of the drive-chains either with the counter-shaft b^2 on the car or directly with the axles of its running-gear, as above described. I prefer this mode of connecting the armature-shaft to the running of the car in order to admit of the use of a high-speed motor and also for distributing as much as possible the strains of jolting, vibration, and other like movements of the car throughout said gearing, so as not to affect the armature-shaft of the motor. Either or both the track-rails a may be used for one of the conductors, but for mines I prefer to use both, and, as shown in Fig. 9, they are at suitable intervals electrically connected, as indicated at a^2 and have suitable switch or turnout rails a^3 , which have a flexible electric connection a^4 with the main rails a , the object whereof is to admit of moving the switch-rails without breaking the continuity of the circuit for the rails a , and admit of the shifting of cars from one gangway to another by the movement of the electric motor on the main or electric trackway conductors.

The lines of rails a being electrically connected at intervals or both being placed in multiple-arc relation with one another, as shown, any obstruction—such as rock, dirt, or other like material—falling upon a section of one of said lines, as indicated at y' in Fig. 9,

fails to break the circuit of said conductor, as the current then passes from one line of rail to the other, as indicated by the arrows, and for the same reason any of said sections may be repaired or removed for replacement without destroying the continuity of the circuit for said rail conductors.

As the various details of construction and arrangement of the parts herein described may be varied without departing from the spirit of my invention I do not limit myself to the same as shown and described.

What I claim is—

1. In combination with a line of railway-rails electrically connected to form a working conductor, another conductor separate from the track-rails, and an electrically-propelled car having separate traveling collectors between its motor and said conductors, one of the collectors for the rail conductor being normally out of contact and adapted to be manually placed in contact with said rail, substantially as set forth.

2. In combination with a car having an electric motor and transmitting devices between the motor-shaft and the running-gear of the car, a line of electric conductors, a traveling current-collector on said car in circuit with one of the brushes for the motor-commutator, circuit connection between the remaining commutator and the motor-frame and two or more separate traveling current-collectors between the remaining conductor and said motor-frame, substantially as set forth.

3. The electric-motor car B having a frame or body provided with end apartments b^4 , ballast-apartments b^6 and an electric motor located between the apartments b^6 , substantially as set forth.

4. The car B having frame or body b in the center of which is a casing inclosing an electric motor, apartments b^6 at each end of said casing, and end apartments b^4 the floors of which are below the floor of said body and frame, and part of the sides and the ends of the latter forming the sides and one end of apartments b^4 , substantially as set forth.

5. The car B having frame b , centrally-located electric-motor casing b^8 , apartments b^6 at each end of said casing above said frame, and end apartments b^4 extending below said frame, substantially as set forth.

6. In combination with an electrically-propelled car, line conductors and traveling current-collectors normally in contact with said conductors, of a separate traveling contact-brush located upon the car in circuit with the electric motor on the car, and normally out of contact with said conductors and adapted to be put at will in contact with one of the conductors substantially as set forth.

7. In combination with an electrically-propelled car, line conductors and traveling current-collectors normally in contact with said conductors of a separate sliding contact-brush l' having an operating-handle, circuit connections with the electric motor on the car,

and devices for normally maintaining said brush out of contact with one of said conductors, substantially as set forth.

5 8. A current-collector having two contact-shoes arranged at an angle to one another and secured to a sliding bar or plunger, and spring-actuating devices for moving said plunger and shoes in the direction of the length of the plunger substantially as set forth.

10 9. In combination with an electrically-propelled car, a traveling current-collector comprising a pivoted bar *g* having at its outer end a tubular sleeve, a plunger-rod in said sleeve, having at its outer end a bent plate, contact
15 rollers or shoes on each bend of said plate, and an actuating-spring for said plunger-rod, substantially as set forth.

10. In combination with an electrically-propelled car a line of conductors one of which

forms one of the track-rails, a traveling current-collector on the car in contact with said track-rail, and a separate traveling current-collector on the car provided with contact-shoes some of which have a gravity contact and others a lateral spring-pressure contact
25 with the remaining conductor, substantially as set forth.

11. The combination of conductor *D*, a supporting-bracket *d* having recess *d*³, and lugs *d*², and insulating-block *f*, and elastic block
30 *f*' substantially as set forth.

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

WILLIAM M. SCHLESINGER.

Witnesses:

S. J. VAN STAVOREN,
CHAS. F. VAN HORN.