

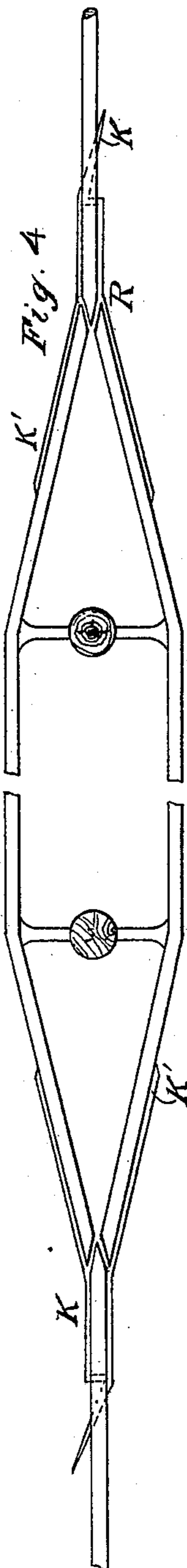
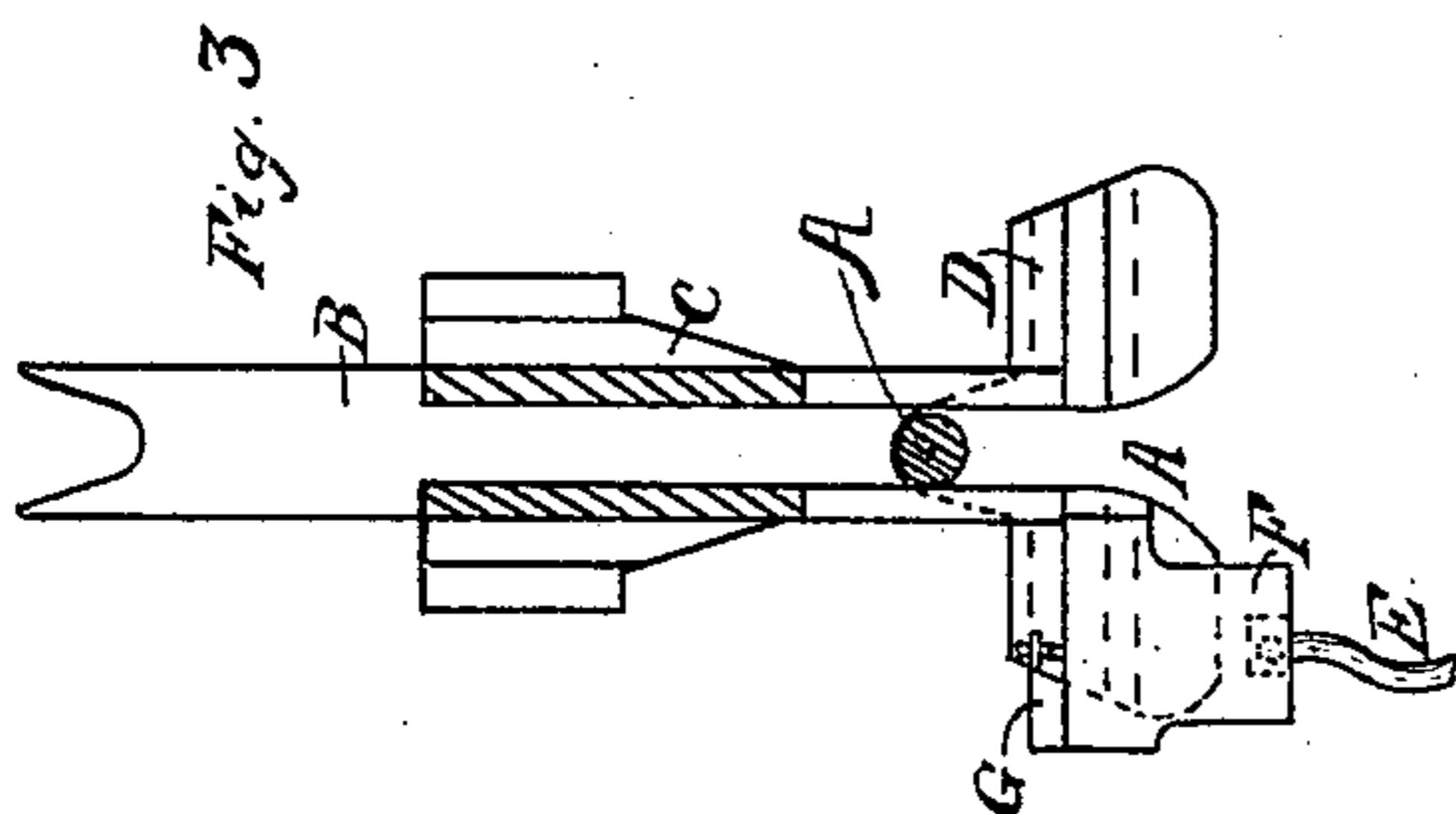
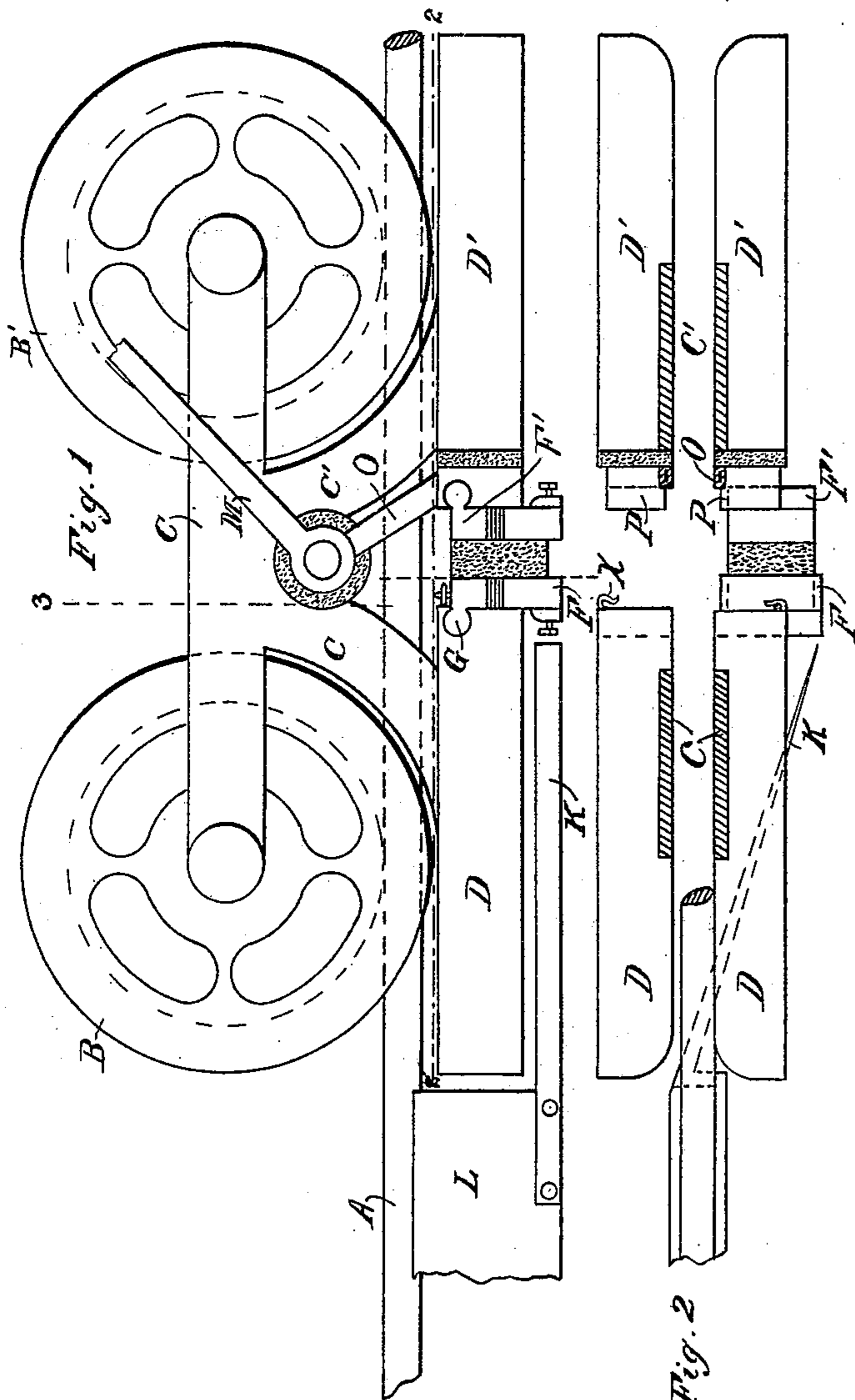
(No Model.)

4 Sheets—Sheet 1.

E. M. BENTLEY.  
ELECTRIC RAILWAY.

No. 449,792.

Patented Apr. 7, 1891.



WITNESSES

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INVENTOR

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(No Model.)

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FIG 5

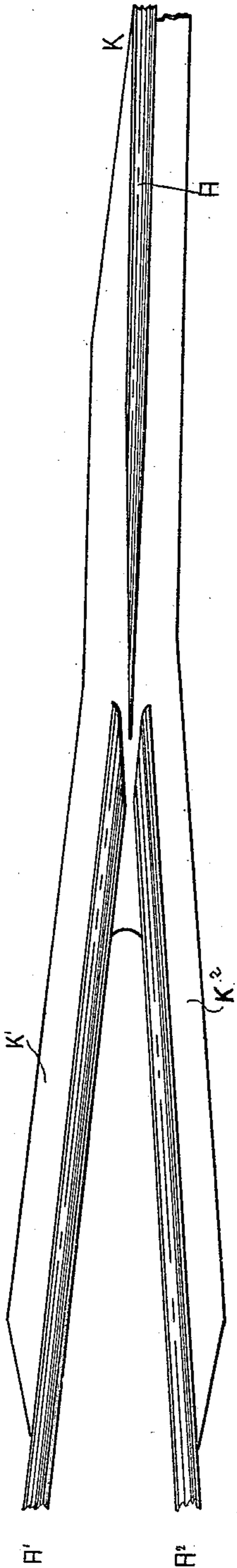


FIG 6

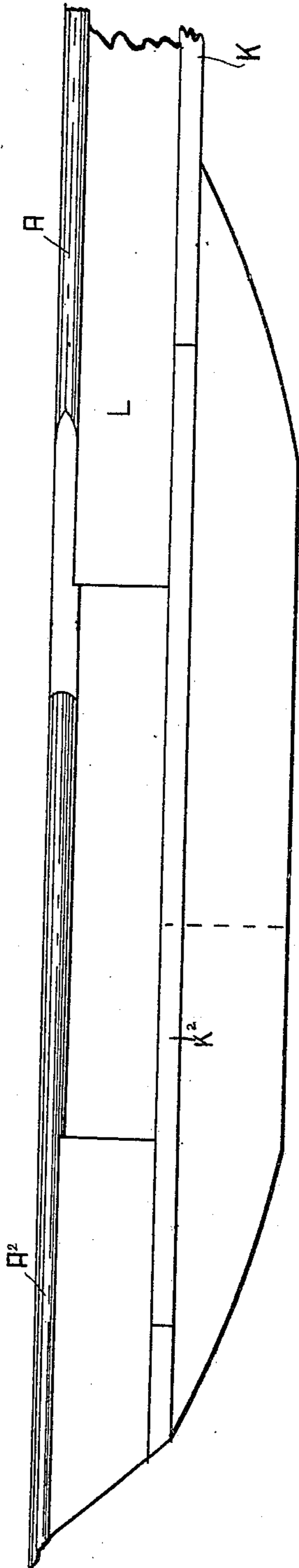
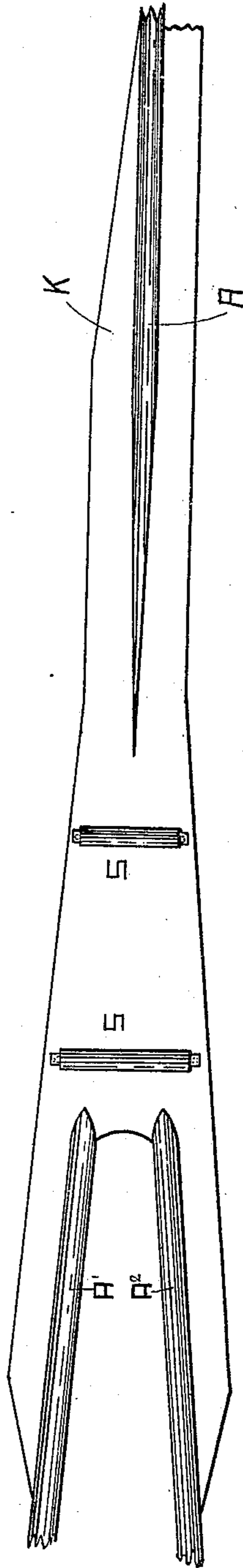


FIG 7



WITNESSES

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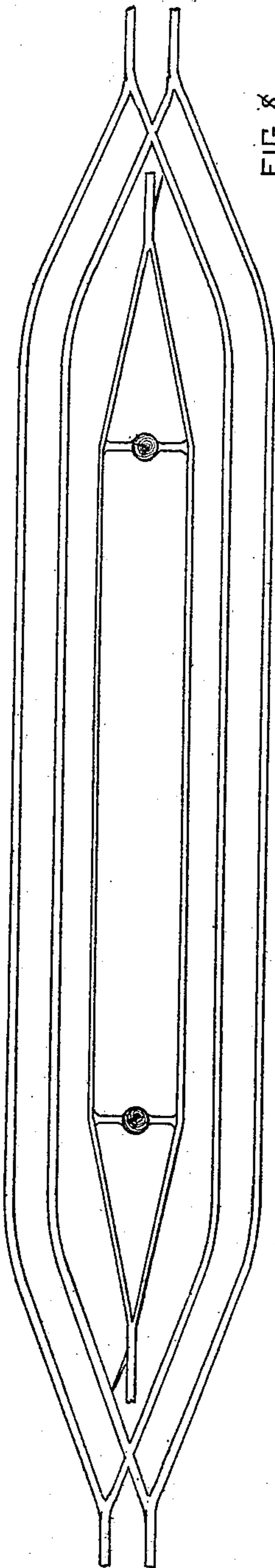


FIG. 8

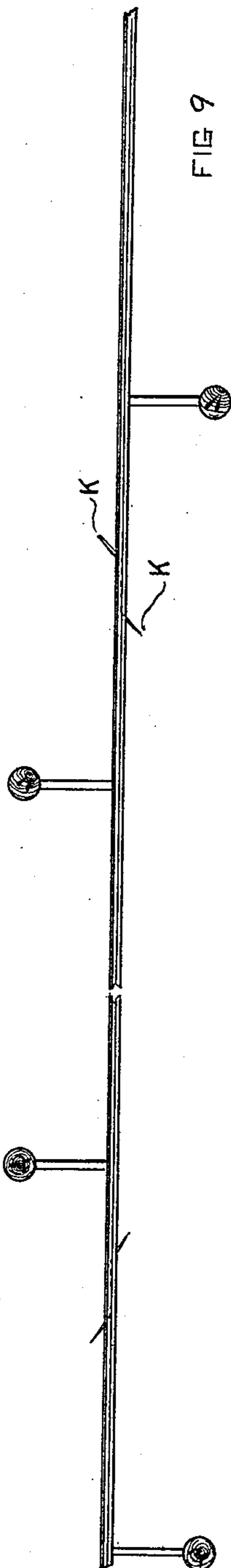


FIG. 9

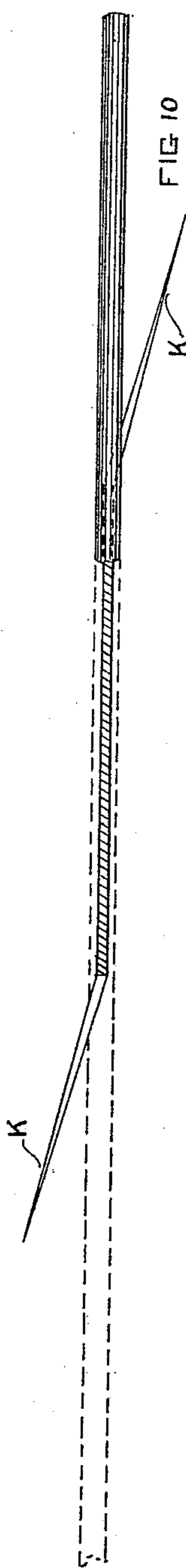


FIG. 10

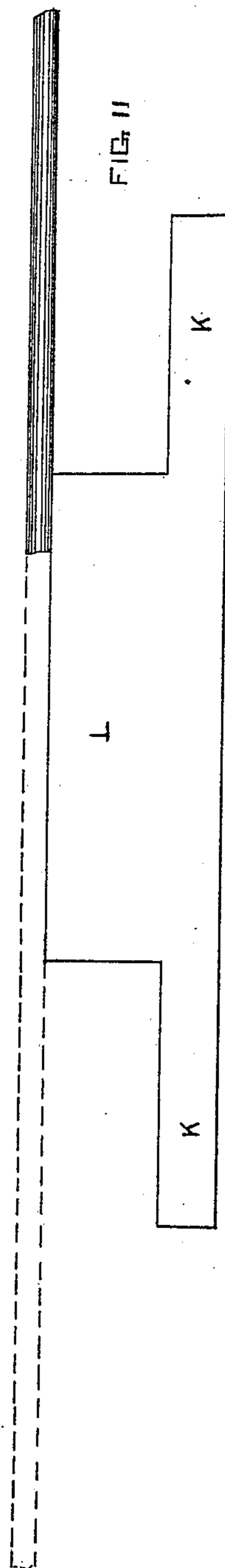


FIG. 11

WITNESSES

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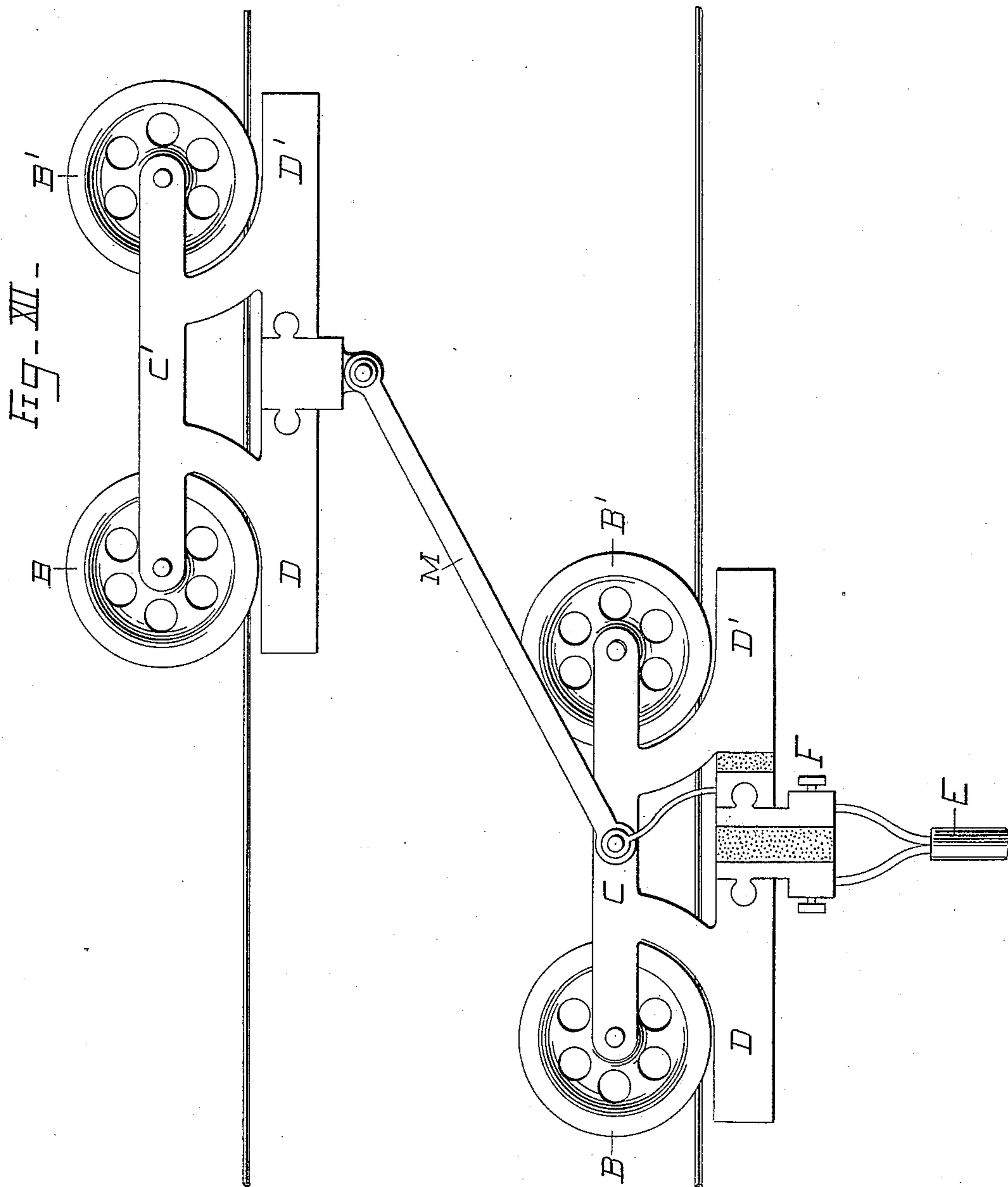
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# UNITED STATES PATENT OFFICE.

EDWARD M. BENTLEY, OF NEW YORK, N. Y.

## ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 449,792, dated April 7, 1891.

Application filed January 30, 1888. Serial No. 262,304. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD M. BENTLEY, a citizen of the United States, residing at New York, in the county of New York, and State of New York, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

My invention pertains to electric railways of the kind in which the main supply-conductor is supported above the roadway and electrical connection between it and the vehicle maintained by means of a contact device traveling along the conductor and connected to the vehicle on the roadway below.

My invention consists in providing a trolley adapted to ride upon the supply-conductor, with a pulling wire or rope having a shifting-point of connection therewith, whereby the trolley can be pulled from one side or the other of the main conductor, as may be desirable. By this arrangement the supports for the main conductor can be placed on either side of it, and at turn-outs or switches the contact device can be made to take the proper course in a simple and reliable manner.

My invention also consists of an improved switching device, as hereinafter claimed, by means of which the contact device can pass from the main to either branch conductor without interference from the guards normally securing the retention of the contact device in engagement with the conductor. This switching device is adapted for general use, irrespective of any particular arrangement of the supply-conductors or construction of the contact device.

Certain details of construction in the contact-trolley and in the means for coupling up the trolley with the car-connection also enter into my invention.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a trolley on the line-wire. Fig. 2 is a section of the same on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 is a plan of a turn-out. Fig. 5 is an enlarged plan of the switch. Fig. 6 is a side elevation of the same. Fig. 7 is a plan of the switching-conductors and intermediate extension-plate. Fig. 8 is a plan of a turn-out, showing the relative po-

sitions of the conductors and track-rails. Fig. 9 shows the guides K at successive points along the line. Figs. 10 and 11 are details of the said guide; and Fig. 12 shows the two contact-trolleys, one above the other.

In Fig. 1, A is the main supply-conductor, consisting of the wire suspended above the roadway. B B' are the two wheels of the trolley, which are grooved to fit the upper surface of A. C is the frame of the trolley. This frame has two projections *c c'* extending vertically down on each side of the main wire in close proximity thereto, which, with the counter-weights D D', carried by *c c'*, respectively, form guards which normally retain the trolley upon the conductor and guide it in its movements therealong. These guards have also a peculiar function in connection with the switching-plate, as described hereinafter, and as their function is precisely the same whether the guards be separate pieces, as herein shown, or merely the projections of the grooved contact-wheels beyond the conductor, the term "guards" should be understood as covering either construction.

For propelling the trolley along the conductor a wire or rope E is attached to a sliding connection-piece F. F has a dovetail G, sliding in a slot or guide in D. This dovetail is of such a length that the piece F can travel from the counter-weight D upon one side of the wire A over to the corresponding counter-weight D upon the other side of the wire without ever breaking the connection with them both at the same time. This will be clearly seen by reference to Fig. 3, where the piece F is shown upon the left-hand side of A, while in Fig. 2 it is shown upon the right-hand side of A. It will be seen that by shifting the piece F from one side to the other a support for wire A coming up beneath it can extend on either side of the wire without interference with the pulling-rope E, as shown in Fig. 9.

I provide means for automatically shifting F at any desired point along the line from one side to the other of the trolley. This consists of a diagonal guide K, fastened beneath the wire, which strikes F as the trolley progresses and gradually forces it to the opposite side of the wire. The guide K is attached

to the lower edge of a metal fin or spline L, which comes in between the two counter-weights D at the moment of engagement of K with F and prevents any tipping of the trolley as F is forced over. A correspond-  
 5 ingly-shaped guide K may be placed at a subsequent point along the line, which will force F back again to its original position.

In Fig. 8 I have shown more fully a turn-  
 10 out on the railway with the main and turn-out conductors supported between the two tracks, and at each end of the turn-out are oppositely-arranged guides K K, adapted to throw the shifting attachment to the right  
 15 when the trolley is moving in opposite directions over the line. It is, however, not necessary that the shifting should be done just at the turn-out. The guide may be placed at any point along the line, and it is not es-  
 20 sential that the connection should be changed back after it has passed the switch-point. This will be more clearly seen from the arrangement indicated in Fig. 9. In this figure a part of the line is shown with the poles  
 25 and supports upon one side of the wire, while along the rest of the wire they are upon the opposite side. Two sets of guides K are shown, which insure that the attachment for the trolley will be upon the outside of the wire  
 30 away from the posts in whichever direction the trolley may be moving. In Figs. 10 and 11 these guides are shown in detail. Each set consists simply of the metallic fin or spline L under the wire, having on its two lower  
 35 corners oppositely-projecting guides K. These guides are made of brass, steel, or other resilient metal, so that when the trolley is coming in the opposite direction they will yield and allow F to pass.

40 In Fig. 12 I have shown trolleys adapted for a system wherein two suspended wires are used, one being placed above the other. The trolley B is adapted for the lower wire, and a second trolley C', running on the upper con-  
 45 ductor, is drawn along by the first through the connecting and conducting link M. In order to provide for the passage of current from the upper trolley, I provide a second piece F', corresponding to F, but insulated  
 50 therefrom. This piece F' has a dovetail like F, which engages with a piece P, attached to D', but insulated therefrom. An insulated conductor O on each side leads from the block P up along on each side of conductor to  
 55 the insulated link M, by which the upper trolley is propelled. The piece F' is somewhat narrower than F, and the block P is narrower than D, so that by no chance can F' be brought into contact with the wire A or the  
 60 fin L. At a turn-out I provide guide K at each end, which will always throw F over in the same direction. A continuation of the guide K serves to hold F over and guide the trolley onto the proper line at the frog. This frog is  
 65 shown in detail in Figs. 5 and 6, where K'

represents the continuation of K, and a corresponding guard K<sup>2</sup>, Fig. 5, on the opposite side of K<sup>2</sup>, holds the trolley over when running from A<sup>2</sup> upon A, so as to insure its going onto the point of the frog. In these figures A' 70 and A<sup>2</sup> are the two supply-conductors branching from the main conductor A. L is the supporting-fin beneath each of the lines, and at the frog this is cut away for a certain distance to permit the passage of the counter-weights 75 D D' under the wire as the trolley turns from the main line onto the branch.

In Fig. 7 the branching conductors A' A<sup>2</sup> are shortened, so as to leave a clear space between the main and branch conductors at the 80 frog for the passage of the contact device, and the guides K' and K<sup>2</sup>, which are attached to and in circuit with the conductors through fin L, form an intermediate broad flat extension-piece, bridging the conductors and ex- 85 tending horizontally across the same, upon which the tips of the guards on the contact device are adapted to bear, and, when desired, this bearing may be rendered comparatively frictionless by means of rollers S S, mounted 90 upon the extension-piece. It should be noted that the extension-piece is located on the side of the conductor opposite to that on which the contact device normally bears, and that it is arranged at a distance from the conductors 95 equal to the projections of the guards beyond the wire. Hence if a trolley be advancing along the main conductor, as the guards pass beyond the conductor they immediately find a bearing upon the extension-piece and they 100 may then move laterally over the plane upper surface of the extension-piece, so as to engage either branching conductor. Where the specific form of contact device shown in this case is employed, the extension-piece will 105 also form a support for the trolley while the wheels are off the wire, and in any case the tips of the guards contacting with the extension-piece maintain the electrical connection constant while the contact device passes the 110 frog.

By means of the shifting trolley-connection above described it becomes possible at a turn-out to place both the main and turn-out wires between the two tracks, as shown in 115 Fig. 8, whereas by all preceding such devices the two branch wires must be placed upon the same side of each track, respectively.

Sliding piece F may be held in position on one side or the other by a spring-catch  $\alpha$ , 120 which will yet allow the piece to be forced over by the action of guide K.

I claim—

1. The combination, in an electric railway having a suspended conductor, of a vehicle, 125 a contact device adapted to travel along the conductor, and an intermediate connection between the vehicle and the contact device having a shifting attachment to the latter.

2. In an electric railway, the combination, 130

with a suspended conductor, of a contact device thereon, and a connection with the vehicle having a transversely-shifting attachment with the contact device at a point between the conductor and the vehicle.

3. In an electric railway, the combination, with a suspended conductor, of a contact device thereon, a connection with the vehicle having a transversely-shifting attachment with the contact device, and a stationary guide for shifting the connection from one side to the other.

4. In an electric railway, the combination, with a main supply-conductor, of a contact device thereon, a connection with the vehicle having a transversely-shifting attachment to the contact device, and oppositely-set guides at successive points of the conductor for shifting the attachment from side to side.

5. In an electric railway, the combination, with a main conductor, of a support therefor below the conductor, a contact device adapted to ride upon the conductor, a connection with the vehicle having a transversely-shifting attachment to the contact device, and a guide for shifting said attachment, whereby a connection with the vehicle may be upon either side of the said support for the conductor.

6. In an electric railway, the combination of the main conductor and two branches therefrom, with a contact device adapted to ride along the main or either branch conductor, a connection with the vehicle having a transversely-shifting attachment to the contact device, and a guide at the branching-point for shifting the said attachment, whereby the connection with the vehicle may extend from the outer side of each of the two branch conductors.

7. The combination of two supply-conductors and two trolleys therefor, with two terminals in circuit with the two conductors, respectively, and located adjacent to each other upon one of the trolleys, and a movable car-connection carrying terminals adapted to contact with the first-named terminals, and so complete the circuit to and through a translating device upon a traveling vehicle.

8. The combination, with a main conductor and suitable supports therefor, of a contact-trolley for said conductor having upon each side one member of a suitable engaging device, and a connection extending to a traveling vehicle and carrying the other member of the engaging device, whereby the car-connection may be coupled to either side of the traveling contact.

9. The combination of the main and branching conductors with the trolley projecting below the wire and a fixed guide at the switch, also wholly below the wire, which engages with the projection of the trolley and guides it from the main to the branch line.

10. The combination of the trolley, having sides projecting down upon each side of the

wire, and guides, one in each side, with the connecting-piece F, adapted to move in said guides and of greater length than the distance between them, so as to contact with one guide before leaving the other.

11. The combination of the trolley, having sides projecting below the conductor and having guides in each side, with the car-connecting piece which shifts in such guides, and spring-catches at each end of the guideway.

12. The combination, in an electric railway, of main and branch supply conductors and a contact device traveling on the conductor and having upright guards extending below it, with an extension-piece at the branching-point, upon which the tips of said guards bear when passing the branching-point, as described.

13. In an electric railway, the combination of main and branching conductors with the horizontal extension-piece bridging and in circuit with the same and a contact device resting and traveling on the conductor, having upright guards holding it from accidental lateral displacement, which engage the extension-piece when passing the branching-point, and thereby support the contact device and maintain the electric circuit, as described.

14. The combination of the main supply-wire of an electric railway and a contact device bearing vertically against the same and having upright guards extending beyond the wire, with the branching supply-wires so arranged as to leave a clear space between the main and branching wires at the frog, and means for moving the contact device transversely at the break, whereby the projecting guards may cross one or the other of the supply-wires without interference.

15. In an electric railway, the combination of the main and branching conductors, so arranged as to leave a clear space between them at the branching-point and the horizontal extension-plate bridging the conductors, with a contact device having vertical guards embracing the conductor, which bear upon the extension-plate, and a fixed guide at the frog for directing the movement of the contact device, substantially as described.

16. The combination, in a single-track road, of a main track and a turn-out track, with supply-conductors at the turn-out corresponding to both tracks and located between the two tracks, substantially as described.

17. The combination, in a single-track road, of a main track, a turn-out track, and elevated supply-conductors at the turn-out corresponding to both tracks and located between the two tracks, substantially as described.

18. The combination of two supply-conductors with a trolley traveling along one of said conductors and connected to a traveling vehicle, a second trolley upon the second

conductor, and a conducting-link which both draws the second trolley and forms part of the circuit between conductor and car.

19. The combination of two supply-con-  
5 ductors with two trolleys therefor, a connecting-link whereby one trolley is drawn by the other, two terminals, both located upon one trolley, insulated from each other and in

circuit with the two conductors, respectively, and conducting-leads extending from said 10 terminal to a translating device upon a traveling vehicle.

EDWARD M. BENTLEY.

Witnesses:

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GEO. I. BLACKWELL.