No. 624,304.

Patented May 2, 1899.

H. B. COX.

ELECTRIC RAILWAY.

(Application filed Oct. 31, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

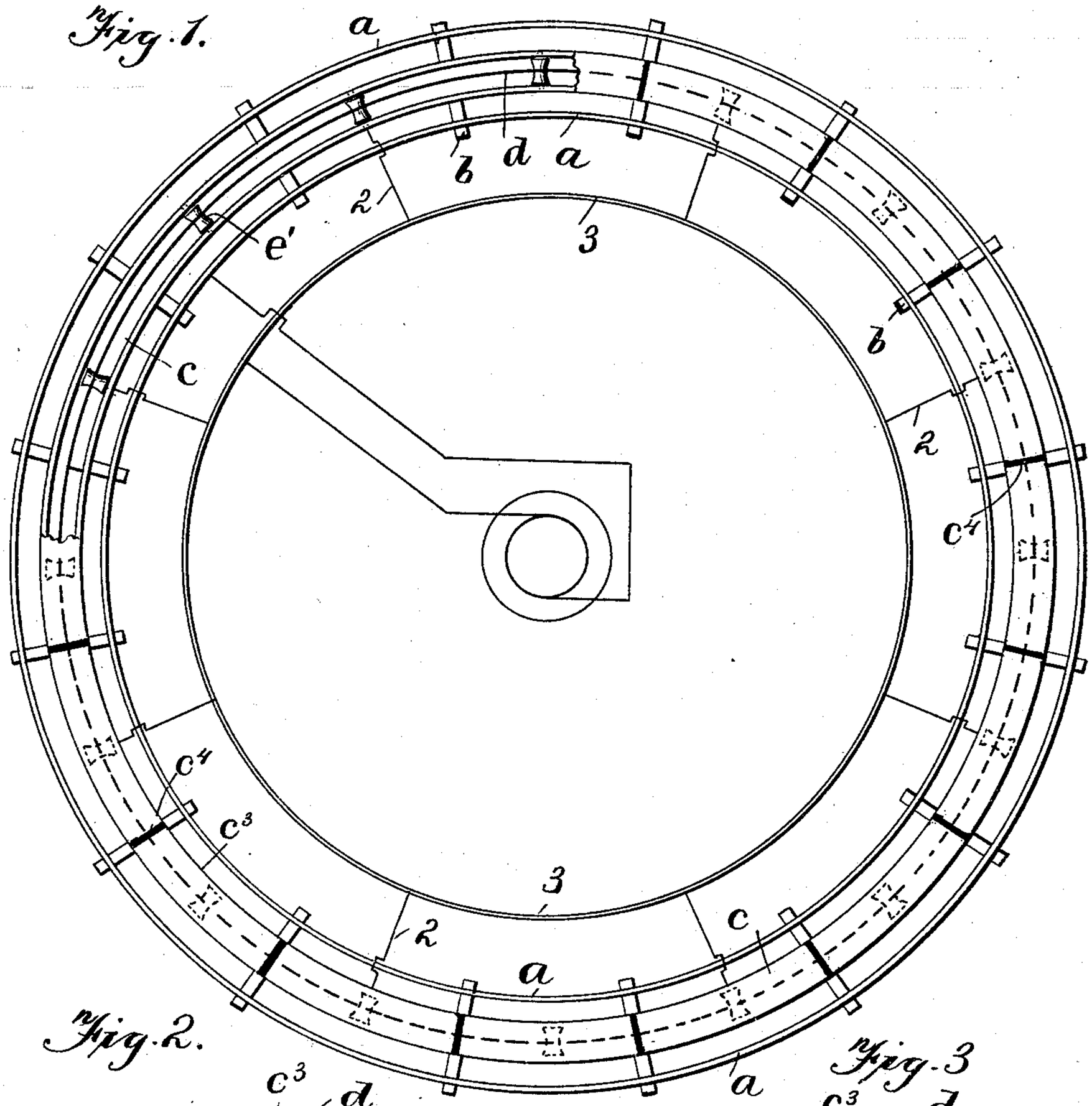

Fig. 2.

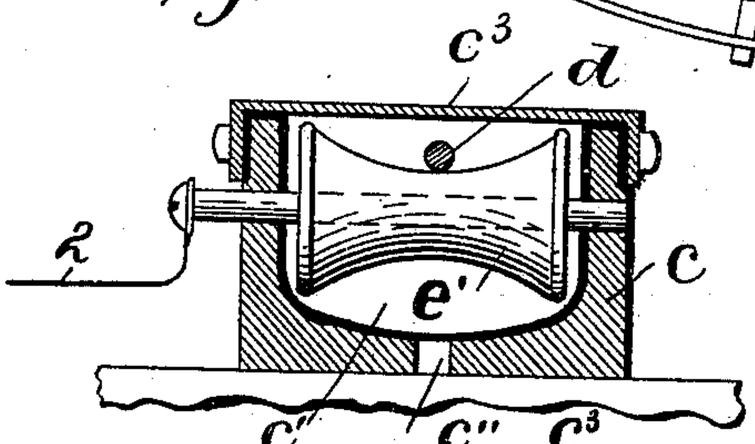

Fig. 3

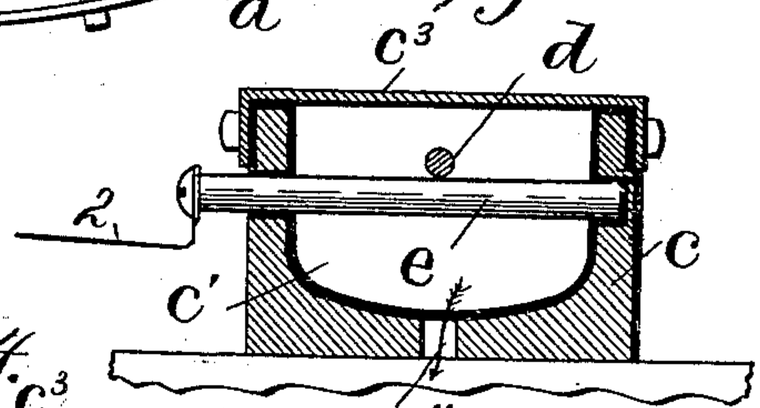

Fig. 4.

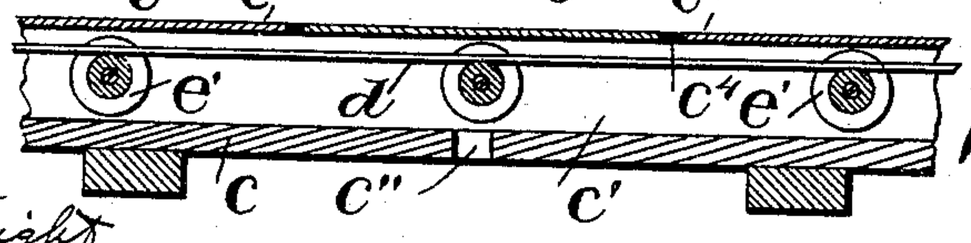

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Fig. 5.

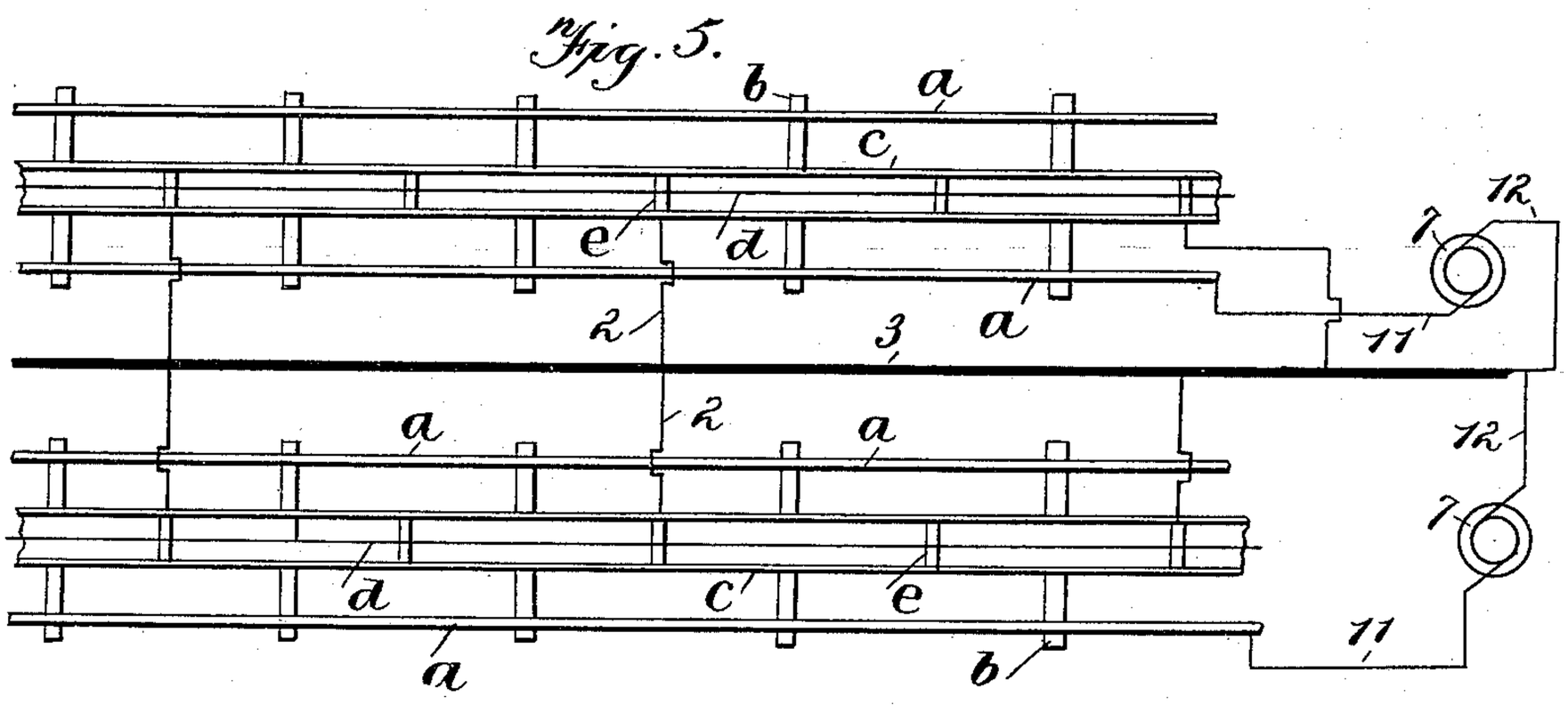


Fig. 6.

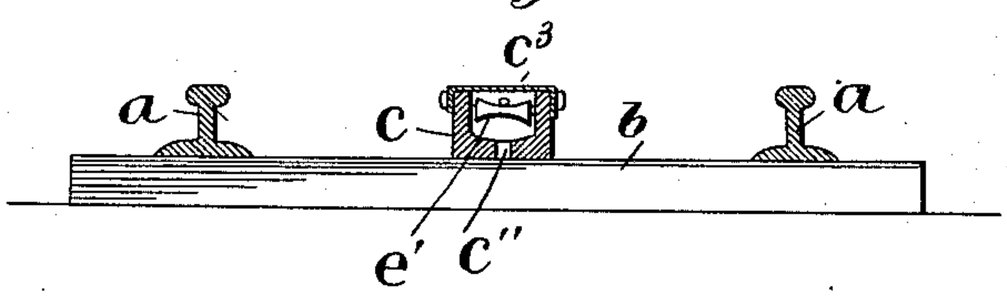


Fig. 9.

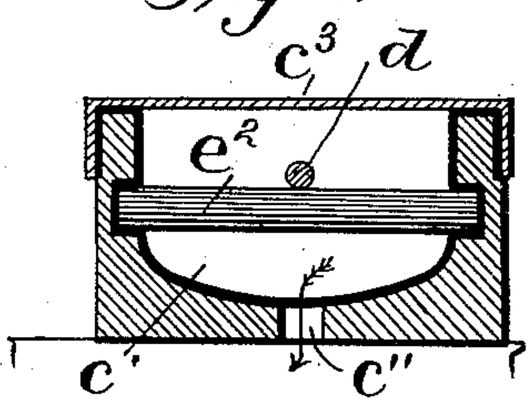


Fig. 7.

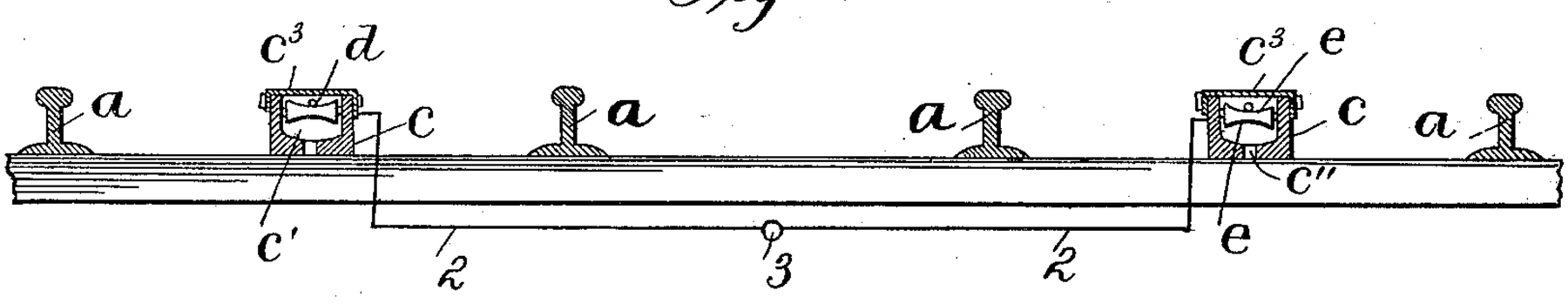
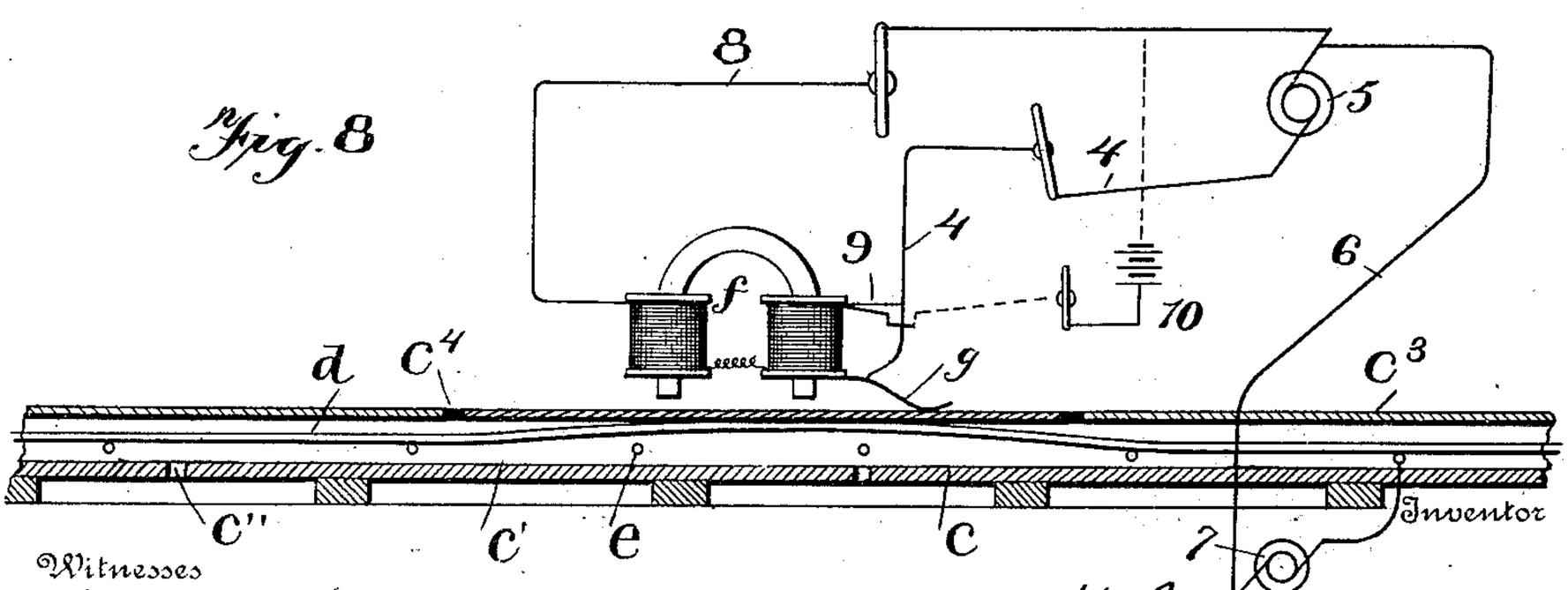


Fig. 8



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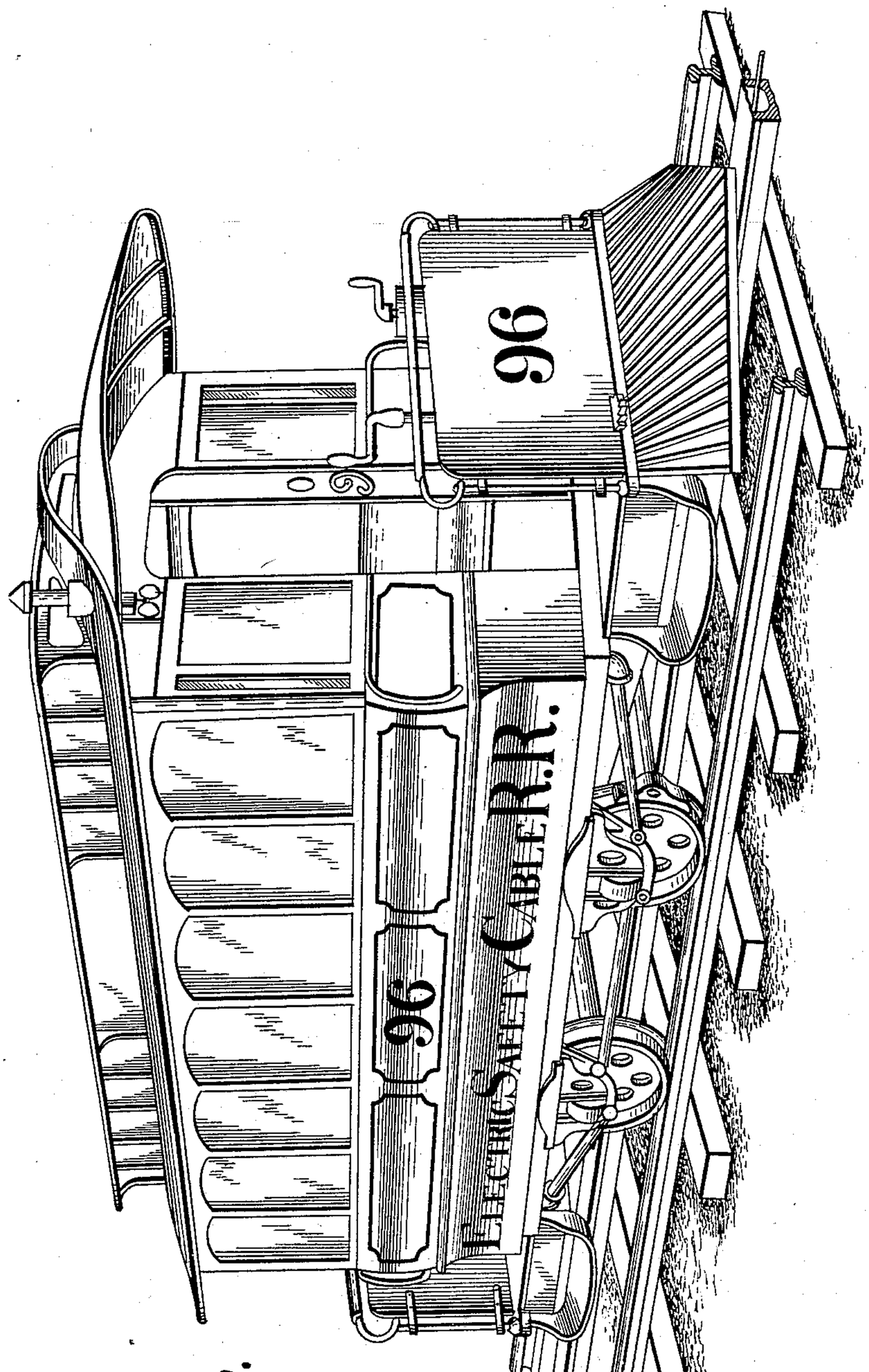

Fig. 10.

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UNITED STATES PATENT OFFICE.

HARRY BARRINGER COX, OF NEW YORK, N. Y.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 624,304, dated May 2, 1899.

Application filed October 31, 1898. Serial No. 695,072. (No model.)

To all whom it may concern:

Be it known that I, HARRY BARRINGER COX, 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 Safety Electric-Railway Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in electric-railway systems, and more particularly to an improved, what might be termed, "safety" electric-cable-railway system; and the objects and nature of the invention will be more fully set forth in detail hereinafter.

The invention consists in certain novel features of construction and in combinations and arrangements and details of parts, as particularly described and specified in the following specification, taken in connection with certain examples of construction which might be employed in carrying out my invention as shown in the accompanying drawings.

Referring to the accompanying drawings, Figure 1 shows in diagram a belt or loop electric-railway line in accordance with my invention, showing part of the exposed insulated conducting-sections removed. Fig. 2 is a detail cross-sectional view through the conduit, showing supporting means for the movable live line conductor in elevation. Fig. 3 is a corresponding view showing a different form of supporting means for said line conductor. Fig. 4 is a detail longitudinal sectional view through a part of the conduit, showing the sleepers or railroad-ties in cross-section. Fig. 5 is a diagram showing my invention as it can be employed in a double-track railway and provided with a three-wire system of supplying and returning the power-current. Fig. 6 is a cross-sectional view through the railroad-track and conduit, showing the same on the ties. Fig. 7 is a corresponding view taken through the double-track system. Fig. 8 is the conduit in longitudinal section with the live line conductor elevated by the magnet of the car into contact with the exposed conducting-section, the car-magnet and collecting-brush and the current connections of the car being shown in diagram. Fig. 9 shows a cross-section wherein an elevated insulated cross-support for the line conductor is provided which does not form a supply-conductor. Fig. 10 shows a section of track, broken away, with a car thereon.

In the drawings, *a* are the ordinary or any suitable construction of railroad-rails, laid and secured on the cross-ties *b* in any suitable manner.

My invention comprises the employment of a movable live bare line conductor arranged loosely in a suitable inclosing and insulated case or conduit, which is usually and preferably made of non-magnetizable material, except at that portion provided with the exposed sections of conducting material with which said line conductor is drawn into contact by the magnet of the car. This inclosing case or conduit can be and is preferably, although not necessarily, composed of a grooved wooden stringer or beam *c*, running parallel with the rails of the track. This conduit is preferably secured directly on the cross-ties and can be arranged midway between the rails, as shown, or at other points parallel with and adjacent to the rails or one rail. The wooden stringers are formed with the top grooves or longitudinal passages *c'* and are laid to form a continuous conduit which is thoroughly insulated, preferably by being coated at the interior with insulating material, so that the live line conductor is insulated from said grooved piece. The conduit is formed with bottom draining openings or passages *c''* for the outflow of any moisture which might by some possibility gain access to the interior of the otherwise-sealed conduit.

The conduit is closed at the top and insulated from the conducting-sections c^3, which cap and seal the top of the conduit. These sections are suitably formed of the proper conducting metal and fit the sides of the grooved stringers and close and extend across the top thereof and are bolted or otherwise rigidly fastened to the stringers or ties. The conducting-sections are exposed and formed of the desired length—say about half the length of a car—and at their ends are insulated from each other, as seen at c^4, Figs. 1, 4, and 8.

d is the live continuous bare line wire or conductor, arranged movably and loosely in the conduit adjacent to, but normally out of contact with, the exposed conducting-sections which cap the conduit. This line-wire is without such mechanical connections as would prevent free movement thereof, but on the contrary is so supported and arranged as to facilitate such free movement within the conduit. For instance, the line-wire can be loosely upheld in an elevated position within the conduit by any suitable cross or horizontal supports—such as pins or rods *e*, as shown in Fig. 3—arranged at intervals within the conduit, or grooved or other rollers, such as *e'*, can be provided to turn loosely on such pins or other supports and carry the line-wire loosely and permit the free lateral and forward movement. Also, if desired, the feed-wires 2 from the main feed-wire or conductor 3 can connect electrically with such pins or pins and pulleys or rollers, which in such case would be composed of conducting metal, whereby the bare line-wire in electrical contact with such supports would be supplied constantly with the power-current at various points along the line through such supports from the main feed-wire.

It will be observed that the live bare line-wire is mounted and movable about as in the ordinary mechanically-operated cable street-railway, although of course in my system I have a sealed insulated conduit, with the other obvious differences from the mechanical cable system.

In carrying out my system the car is provided with any suitable magnet, such as *f*, (shown in the diagram of Fig. 8,) which is suitably mounted and moves over the exposed capping conducting-sections of the conduit. *g* in the said diagram is any suitable contact device carried by the car and moving in electrical contact with said exposed conducting-sections beneath the car and collecting and taking off the power-current, which passes therefrom through suitable connections—say 4—to the car-motor 5, and thence returns through a connection 6, which is supposed to include a car axle and wheel and rail, to the generator 7 of the system. If desired, a shunt 8 9 can be provided to throw part of the power-current through the magnet-coils, if such be provided. It is obvious that the various car connections are provided with the usual switch and other proper appliances and that the invention is in no way limited to the kind or construction of magnet or current-collector employed or to the connections or arrangements of the electrical devices or connections on the car.

If desired, a storage battery or other supplemental source of current can be placed upon the car to provide for energizing the magnets, as indicated by 10 in Fig. 8.

I preferably employ a bare live line conductor *d* which is not "flexible" in the ordinary meaning of that term, but which, on the contrary, would usually be termed "stiff," yet such wire is of sufficient flexibility, by reason of its great length, to respond to the power of the car-magnet and move laterally in a long bend or off-set into electrical contact with the exposed normally electrically dead conducting-sections in succession as the magnet moves over the same. The collecting-brush or other contact of the car engages the conducting-section of the conduit over which the magnet is located and which is in electrical contact with the line-wire for the moment and collects the power-current therefrom, while the other conducting-sections not beneath the car are electrically dead, and hence the system is absolutely safe, as the live line-wire is thoroughly inclosed and insulated in the conduit and is only brought into electrical contact with the exposed conducting-section immediately beneath the car. I am also enabled to effect the slightest possible area of contact between the line-wire and the conducting-sections, the point of contact being practically a mathematical point only, as is the case with the ordinary trolley-wheel and wire in the overhead system, and yet all the current necessary passes from my line-wire to the sectional conducting-plates, as the line-wire in the form, it might be said, of a long extended wave bulges up against the said plates in succession and yet without kinking or doubling up within the conduit.

The line-wire, by reason of the construction and arrangements as generally before mentioned, moves slightly horizontally or forwardly under the impulse of the car-magnet, and hence constantly creeps within the conduit, thereby keeping the wire and the under side of the conducting-sections bright and free from such corrosion as would increase the resistance and prevent the proper electrical contact, whereby I am enabled always to secure the proper electrical contact between the line-wire and conducting-sections no matter how slight the actual mechanical contact or engagement.

In Fig. 1 I show a belt-line railway in which the movable loose live line conductor is endless, with the return through the inner line of rails, as shown, and the endless main feed-conductor supplied from the system-generator 7, and having the lateral feed connections 2 at intervals to the supports of the line conductor in the conduit. The main feed-conductor is preferably buried and is completely insulated and inclosed to prevent leakage.

In Figs. 5 and 7 I show a double-track system having a three-wire system of supplying and returning the current from the two generators 7 7, one generator for each track, having their like poles connected by connections 11 11, respectively, with the return connection rails of their respective tracks and their opposite like poles both connected by connections 12 12, repectively, with the single main feed-conductor 3 adjacent both tracks and supplying the line conductor of each by

the lateral feeder-wires 2, as before described. With such an arrangement each track-circuit is complete, with its generator, and yet the two generators are connected in series or in the usual method of connecting generators, with the obvious advantages of utilizing the well-known economy of the three-wire system.

It is evident that various changes might be made in the forms, constructions, and arrangements of the parts described without departing from the spirit and scope of my invention. Hence I do not wish to limit myself to the construction shown.

What I claim is—

1. A safety electric-railway system comprising a closed insulated conduit, a live movable line-wire loosely arranged in said conduit, and raised supports of conducting material on which said line-wire loosely rests at intervals, and electric feeder connections to said supports at intervals.

2. A safety electric-railway system comprising a closed insulated conduit having conducting elevated supports, a main feed-conductor, feeder connections therefrom to several of said insulated supports, and a movable line-wire resting loosely and movably on said supports and electrically supplied wholly or in part therefrom.

3. A safety electric-railway system comprising a closed conduit along the track, having exposed insulated conducting-sections, a live line conductor movably located in said conduit, means to facilitate the longitudinal movement of said line conductor, a main feed connection from the generator and inclosed and insulated, and feeder connections from said main feeder arranged at intervals and electrically but not mechanically connected with said line conductor.

4. A safety electric cable-railway system for a double track comprising live line conductors for the tracks, respectively, arranged in closed insulated conduits having exposed conducting-sections normally electrically dead, a single main feed-conductor insulated and having lateral feeder connections at intervals to both of said line conductors, generators for said tracks respectively, each having its track-return connected thereto, and both generators connected with the single main feed-conductor, substantially as described.

5. In a safety electric-railway system, the combination of a closed insulating-conduit having a sectional exposed conductor, a movable line wire or conductor within the conduit, and means facilitating the longitudinal movement of said line-wire within the conduit, substantially as described.

6. In a safety electric-railway system, the combination of a closed insulated conduit having a sectional exposed conductor, a live line-wire movably located in said conduit, and means elevating said wire and facilitating the longitudinal movement thereof, substantially as described.

7. In combination, a sealed conduit having exposed conductors, insulated feed-conductors in said conduit, an inclosed insulated main feeder outside of said conduit and provided with branch feed connections to said feed-conductors, and a live line-wire, located in the conduit, and at intervals loosely resting on or movably contacting said feed-conductors within the conduit and receiving, in whole or in part, current therefrom, substantially as described.

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

HARRY BARRINGER COX.

Witnesses:

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A. C. BOUGHTON.