(No Model.) 4 Sheets—Sheet 1.

E. D. CHAPLIN & L. DION.

CLOSED CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

No. 536,918. Patented Apr. 2, 1895.

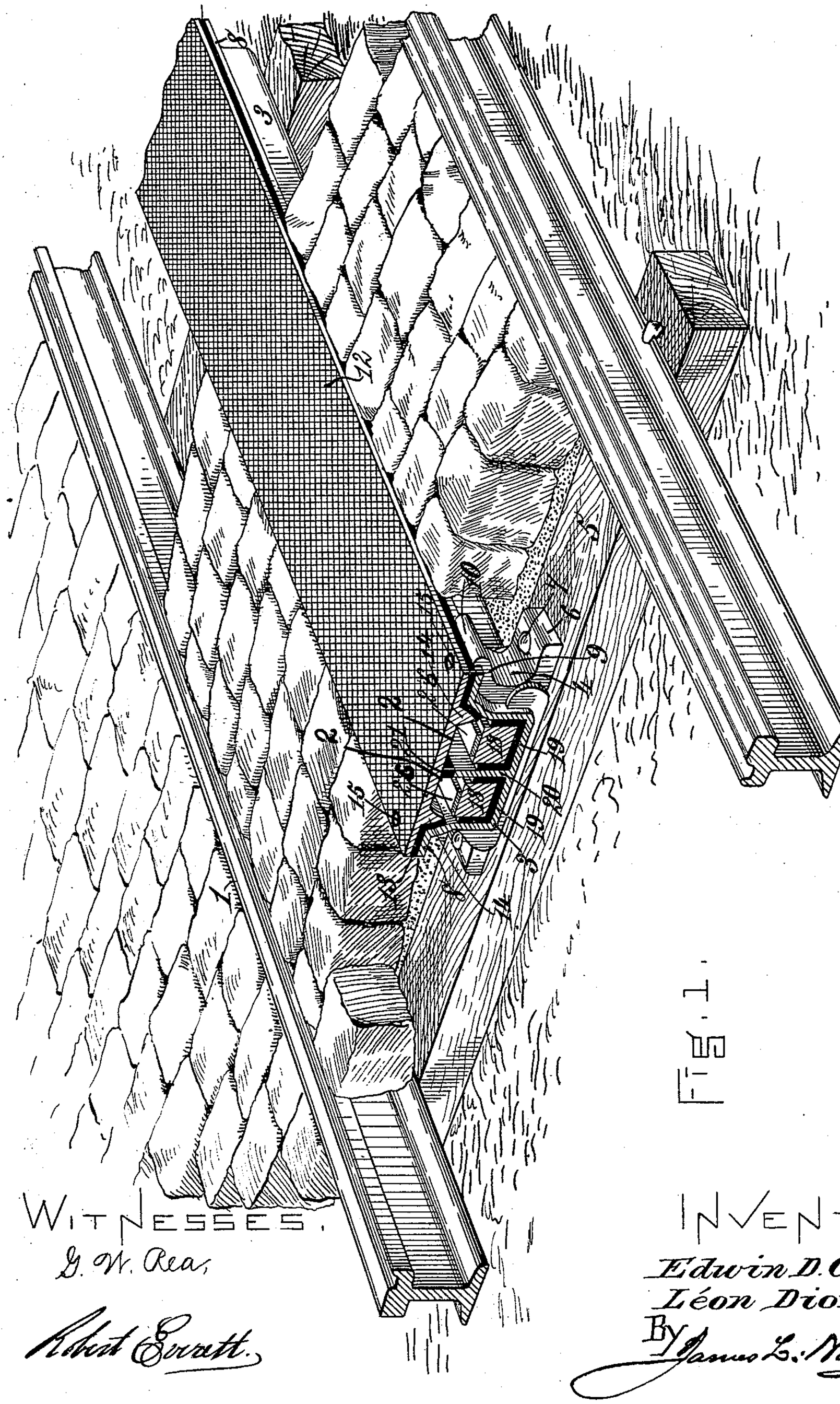

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

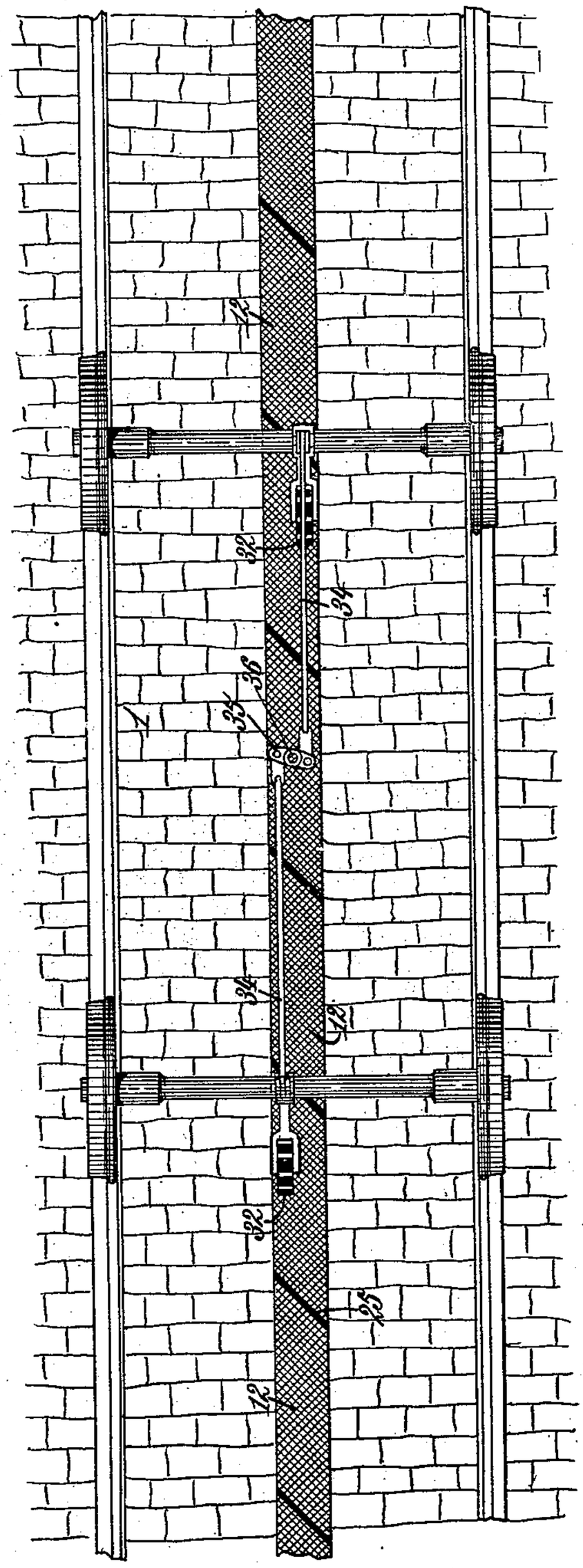
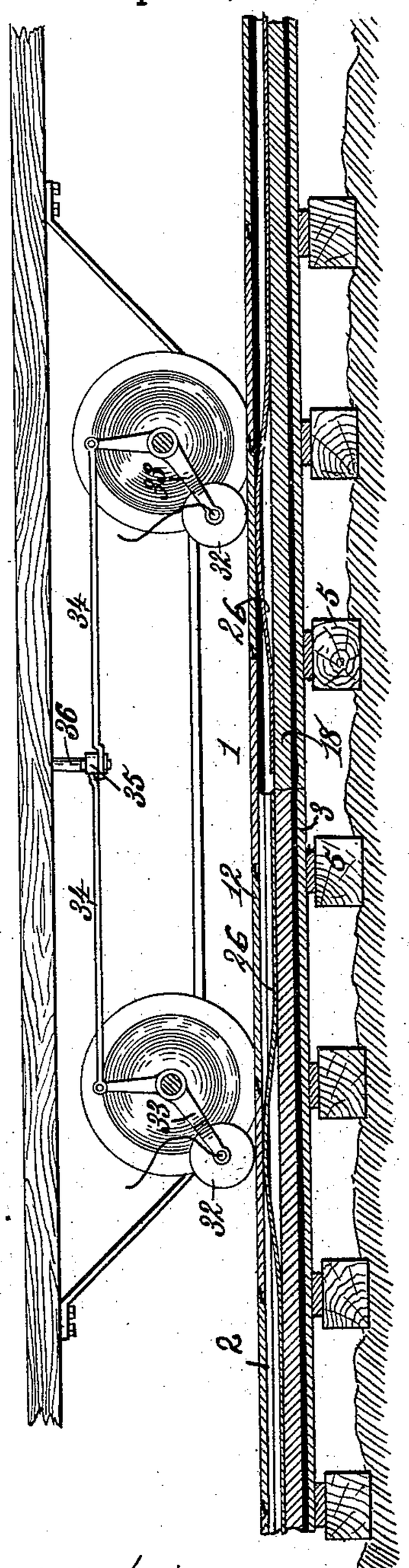


Fig. 3.



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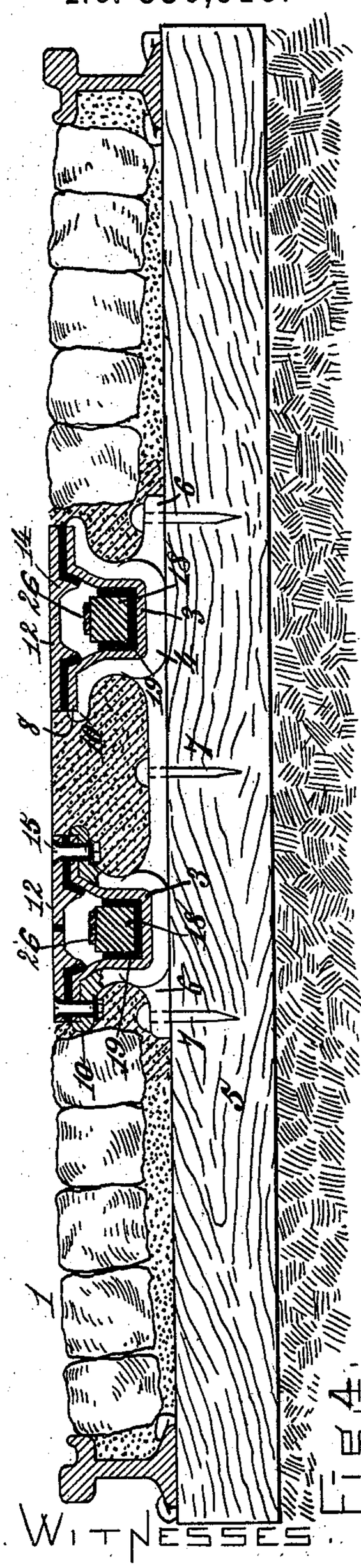

FIG. 4.

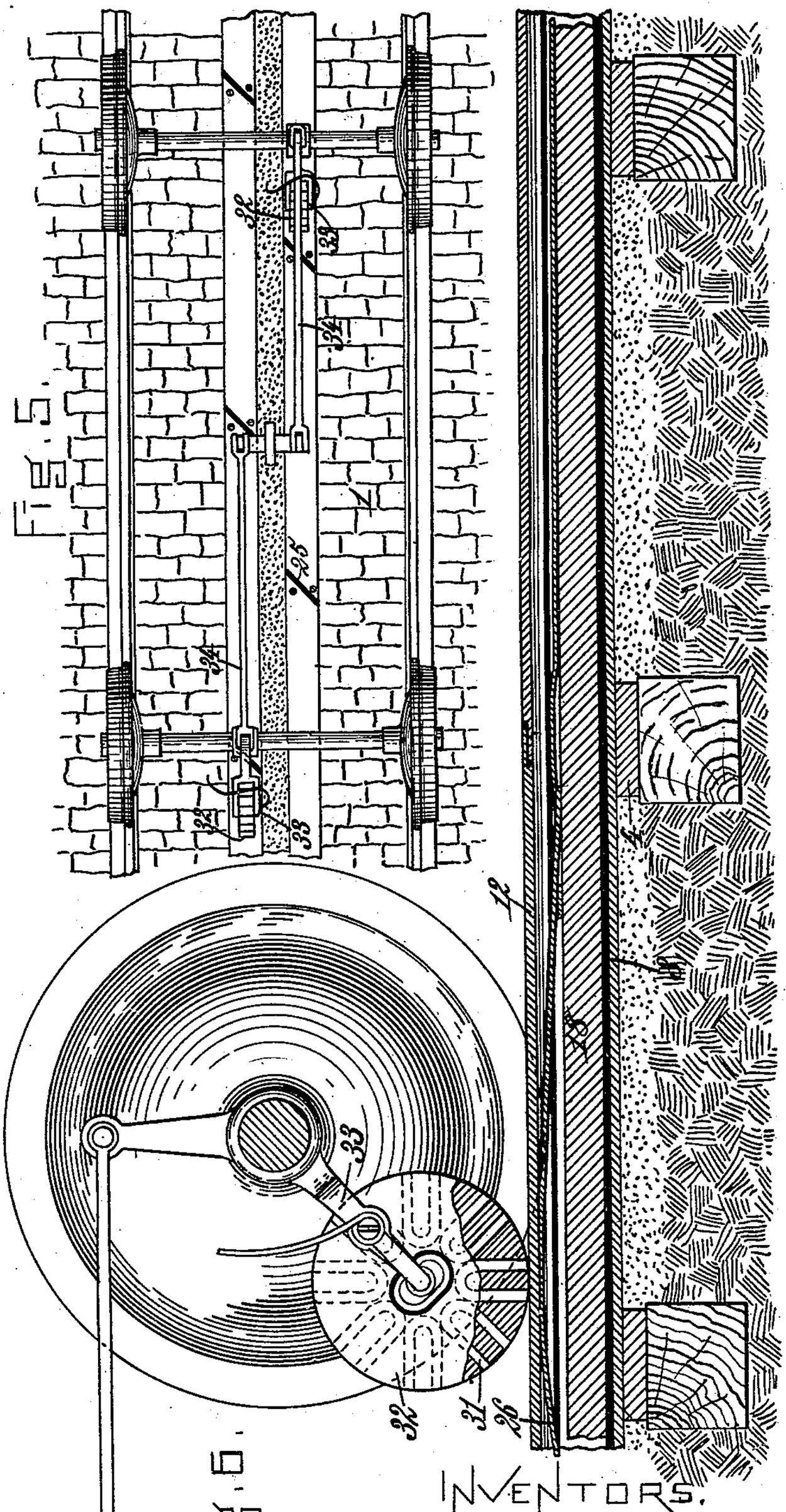

FIG. 5.

FIG. 6.

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CLOSED CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

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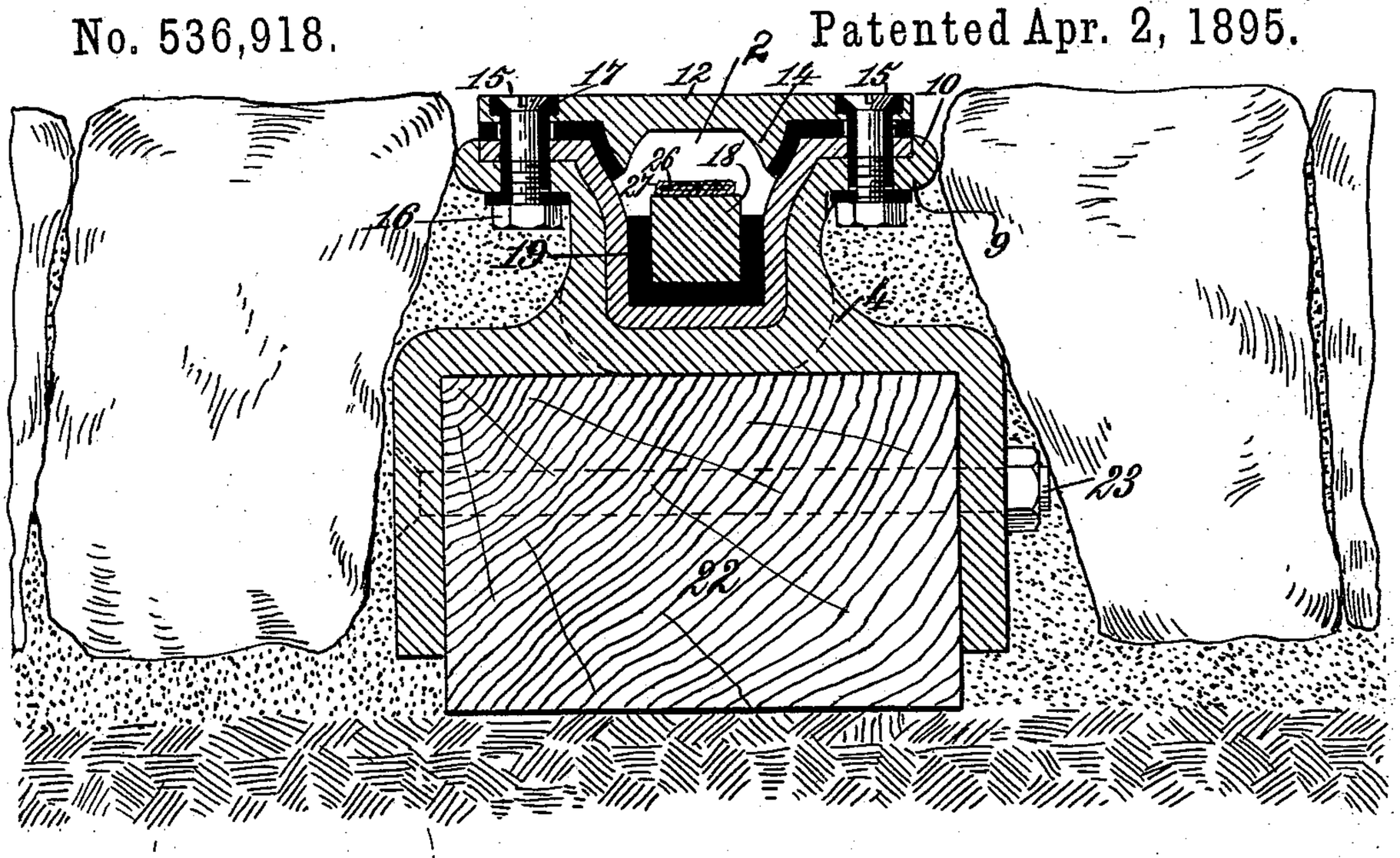

Fig. 7.

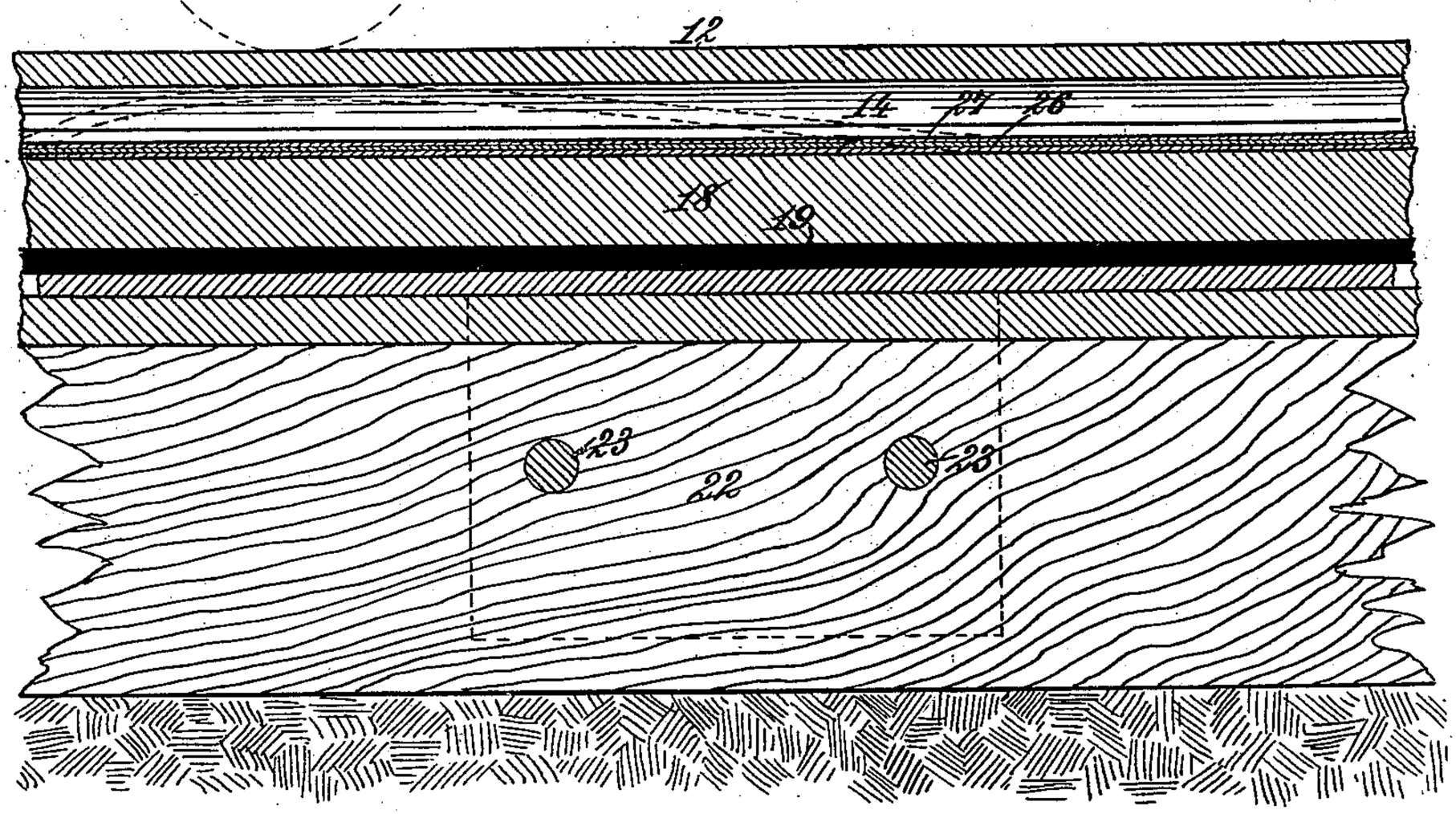

Fig. 8.

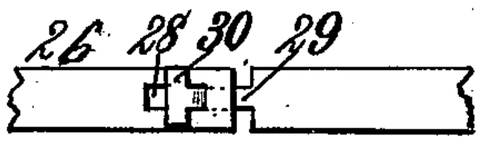

Fig. 9.

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UNITED STATES PATENT OFFICE.

EDWIN D. CHAPLIN AND LÉON DION, OF NATICK, MASSACHUSETTS.

CLOSED-CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 536,918, dated April 2, 1895.

Application filed June 14, 1894. Serial No. 514,604. (No model.)

To all whom it may concern:

Be it known that we, EDWIN D. CHAPLIN and LÉON DION, citizens of the United States, residing at Natick, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Systems of Electrical Propulsion for Cars, of which the following is a specification.

Our invention relates to systems of electrical propulsion for railway cars, and especially to that class of railways in which the conductors of electricity, or feeders, are placed in closed conduits, or sub-ways.

It is the purpose of our present invention to provide means whereby the motor upon the car may be supplied with current from a conductor lying within a conduit which is wholly inclosed, where it is entirely separated, mechanically, from the track and from the device employed to take off the current. In order to make suitable provision for the presence of one, or a number, of cars upon the same track, at varying intervals of separation, each of which is supplied with current from the same conductor, or feeder, by means of an intervening, or auxiliary flexible feeder, lying upon the main feeder in close contiguity to a series of conducting-plates which inclose the top of the conduit, we make provision of means for lifting the auxiliary feeder, at, or near, the point where the current for the motor is taken off, thereby bringing it into electrical contact with the conducting plates; maintaining this point of contact as the car moves.

It is the special object of our present invention to provide an improved construction of the auxiliary feeder whereby the aggregate of the local elongations, due to the several operative contacts of the auxiliary feeder, may be allowed, as well as the corresponding contractions, due to changes of place, as the cars move, without disturbing the relative position of the two feeders, as a whole. It is our purpose, in other words, to combine with a main feeder, an auxiliary feeder, or conductor, having such construction that it shall be capable of elongation and contraction at points separated by uniform intervals, whereby it may be raised, at one or more points, into electrical contact with conducting plates above, without displacing it longitudinally.

Our present invention is, in some respects, similar to that shown and described in an application for Letters Patent filed by Léon Dion upon the 14th day of June, 1894, Serial No. 514,596. In the application last named, the invention comprises an auxiliary conductor which is either continuous and flexible and susceptible to magnetic attraction, or composed of similar members connected by intermediate links of conducting material, but not necessarily susceptible to magnetic attraction.

Our present specification contains an invention in which the auxiliary conductor is formed of a series of strips containing metal which is both magnetic and conducting, the ends of said strips being overlapped and connected in such manner that they may have a sliding movement one upon the other.

We make no claim to any subject matter substantially shown and described in the said application of Léon Dion, Serial No. 514,596.

The invention consists in the novel features of construction and in the new combinations of parts hereinafter fully explained and then particularly pointed out in the claim which makes part of this specification.

To enable others skilled in the art to which our invention pertains to fully understand and to construct and use the same, we will proceed to describe said invention in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of a portion of a single line of railway in which our invention is incorporated. Fig. 2 is a plan view of a similar portion of roadway, with the running gear of a car in place upon the rails, to show the relative position of the two trolleys, or other devices, for taking up and returning the current. Fig. 3 is a central-vertical longitudinal section of the parts shown in Fig. 2. Fig. 4 is a vertical transverse section of a line of railway, showing a slight modification in the construction of the conduit. Fig. 5 is a plan view, upon a slightly reduced scale, of the parts shown in Fig. 4, including the running-gear of a car to show the relative position of the trolleys, or other equivalent means for taking off and returning the current. Fig. 6 is a vertical, longitudinal section, upon an enlarged scale, taken in the central line of one of the surface series of contact plates shown in Fig. 5, including part of the

running-gear of a car and one of the trolleys. Fig. 7 is a transverse vertical section, upon an enlarged scale, of a conduit constructed in accordance with our invention and showing a slight modification in the form of the auxiliary conductor, or feeder. Fig. 8 is a vertical longitudinal section of the parts shown in Fig. 7. Fig. 9 is a detail view showing the form of connection between the overlapped ends of the strips forming the auxiliary conductor.

The reference-numeral 1, in said drawings, indicates a railway of a construction suitable for the propulsion of cars by electric energy. The manner of laying and supporting the rails, though shown in the drawings, requires no description, as it does not differ, essentially, from the methods heretofore used. Between the rails of the track is arranged the conduit, or sub-way 2, which is either duplex, in the sense that provision is made therein for a return conductor, or feeder, as shown in Fig. 1, or in duplicate, as shown in Figs. 4 and 5, in which the two feeders are arranged in two separate, but similar, conduits, entirely removed one from the other. In all essential respects, however, the features of construction are the same in both types, whatever minor difference there is being pointed out hereinafter.

The conduit consists of an approximately U-shaped casing 3, formed of any suitable material. It is supported in chairs 4, which rest upon the sleepers 5, sustaining the rails, laterally projecting foot-pieces 6, being formed upon each to provide for the insertion of spikes 7, (Figs. 1 and 4) which are driven into the sleepers 5. The upper, outwardly inclined edges of the casing 3 are provided with laterally projecting flanges 8, and similar extensions 9, are formed upon the arms of the chairs 4, with upwardly projecting lugs 10, which engage the edges of the flanges 8. The top of the casing is closed by a series of flat contact-plates 12, of such width that their edges are flush, or substantially so, with the outer edges of the horizontal flanges 8. Strips 13 of insulating material are interposed between the flanges 8 and the plates, and said strips also extend partly over the inclined upper portions of the side-walls of the casing, against which they are compressed by angular ribs 14, formed upon the lower surface of the contact-plates 12. Bolts 15, passing through apertures in the margins of said plates, through the flanges 8 and arms 9 on the chairs, receive nuts 16 by which the required compression is effected. Suitable insulations 17 are provided for these bolts and for the nuts. If desired, similar bolts and nuts may be employed at any other point, or points.

The main electrical conductor or feeder 18, is usually copper and is preferably square, or rectangular, in cross-section. An insulation 19 separates it from the bottom and side-walls of the conduit, and may also serve as a packing to hold the feeder firmly in place.

When the conduit is duplex, as shown in Fig. 1, it is of greater width and a central, vertical wall 20 is formed therein rising nearly to the contact-plates 12. A strip 21 of insulating material is interposed between said plates and the edge of this wall, dividing the conduit into two similar chambers, each of which contains a feeder, or conductor. Except in the matter of width, the construction is the same as that already described.

When the conduit is of the construction shown in Fig. 4, the inner, or adjacent foot-pieces 6 of the chairs 4 may be extended and united or formed, in a single piece, and provision may be made for a central spike 7. We may, however, support either form of conduit upon a longitudinal base 22, as shown in Figs. 7 and 8. In this case, the foot-pieces 6, of the chairs 3 may be prolonged and formed at such an angle as to embrace the opposite sides of the base 22, to which they are secured by bolts 23.

The contact-plates 12, in either form of conduit, are of such width as to coincide, at their edges, with the edges of the flanges 8. Their upper surfaces are flush, or substantially so, with the road-bed, and the plates are constructed of a metal, or composition, which possesses suitable conductivity, but it is incapable of exerting magnetic attraction. They are formed in suitable lengths and are separated at their ends upon diagonal lines, (Figs. 2 and 5) making angles with the edges of the plate of forty-five and one hundred and thirty-five degrees, respectively, or thereabout. This angularity may be varied, however, as circumstances may require. Its purpose is to enable the trolley, or brush, to make contact with each plate, successively, before leaving the plate preceding, thereby preserving the continuity of the current. The narrow intervals of separation are filled with insulating material 25.

Upon each main conductor, or feeder, lies an auxiliary feeder 26, composed of, or containing, a metal that is susceptible to magnetic attraction, but not capable of being permanently saturated with magnetism. A strip, or filament, of soft iron possesses these characteristics and can be used for the purpose mentioned. To increase its conductive power, however, we may adopt the construction shown in Figs. 7 and 8, in which the soft iron filament 26 lies between two filaments 27 of copper, or other suitable non-magnetic metal, or composition, which possesses good electrical conductivity. The three filaments are united by any of the processes in familiar use.

Each auxiliary conductor, or feeder, is formed of a series of strips, or filaments, of equal length, or nearly so, their ends being overlapped and connected in any suitable manner, for example, by a slot 28, in one,

and, on the other a tongue 29, having a cross-head 30. This construction, however, provides a connection which will permit a limited elongation and contraction in length of the auxiliary feeder. This provides for expansion and contraction, due to changes of temperature, and for the local elongation and shortening caused by the rise and fall of the auxiliary feeder in supplying the motor on the car.

The auxiliary feeder is raised, to make contact with the series of plates 12, by the attraction of one or more magnets 31, moving with the car, and suitably arranged in relation to the trolley, or other means of taking off the current from the contact plates 12. For example, the magnets 31 may be upon, or within, the trolley 32, as shown in Fig. 6. When rolling contact is employed, the trolley is journaled in a forked bearing 33, which may be sleeved upon the axle, or otherwise supported. The trolley for the return circuit is similarly formed and mounted, and the two supports are connected by rods 34, pivoted to a cross-head 35, on a hanging stud 36. By turning the latter both trolleys can be removed from, or brought into, contact with the plates 12.

When the duplex conduit, with a single series of contact-plates, is used, the trolleys will roll near the opposite margins of the latter, as in Figs. 2 and 3. Being separated by a plurality of the surface insulations 25, no short circuit can occur. In the construction shown in Figs. 4 and 5, each trolley, or brush, makes contact with its own separate series of contact plates.

What we claim is—

In an electric-railway, a conduit, or subway, entirely closed at all points, a main conductor or feeder, arranged therein, and an auxiliary conductor consisting of a series of strips, or filaments, having conductivity and susceptible to magnetic attraction, their ends being overlapped and connected by a slot in one and a tongue and cross-head on the other, substantially as described.

In testimony whereof we have hereunto set our hands and affixed our seals in presence of two subscribing witnesses.

EDWIN D. CHAPLIN. [L. S.]
LÉON DION. [L. S.]

Witnesses:
HENRY G. HALLORAN,
FRED JOY.