No. 812,790. PATENTED FEB. 13, 1906.

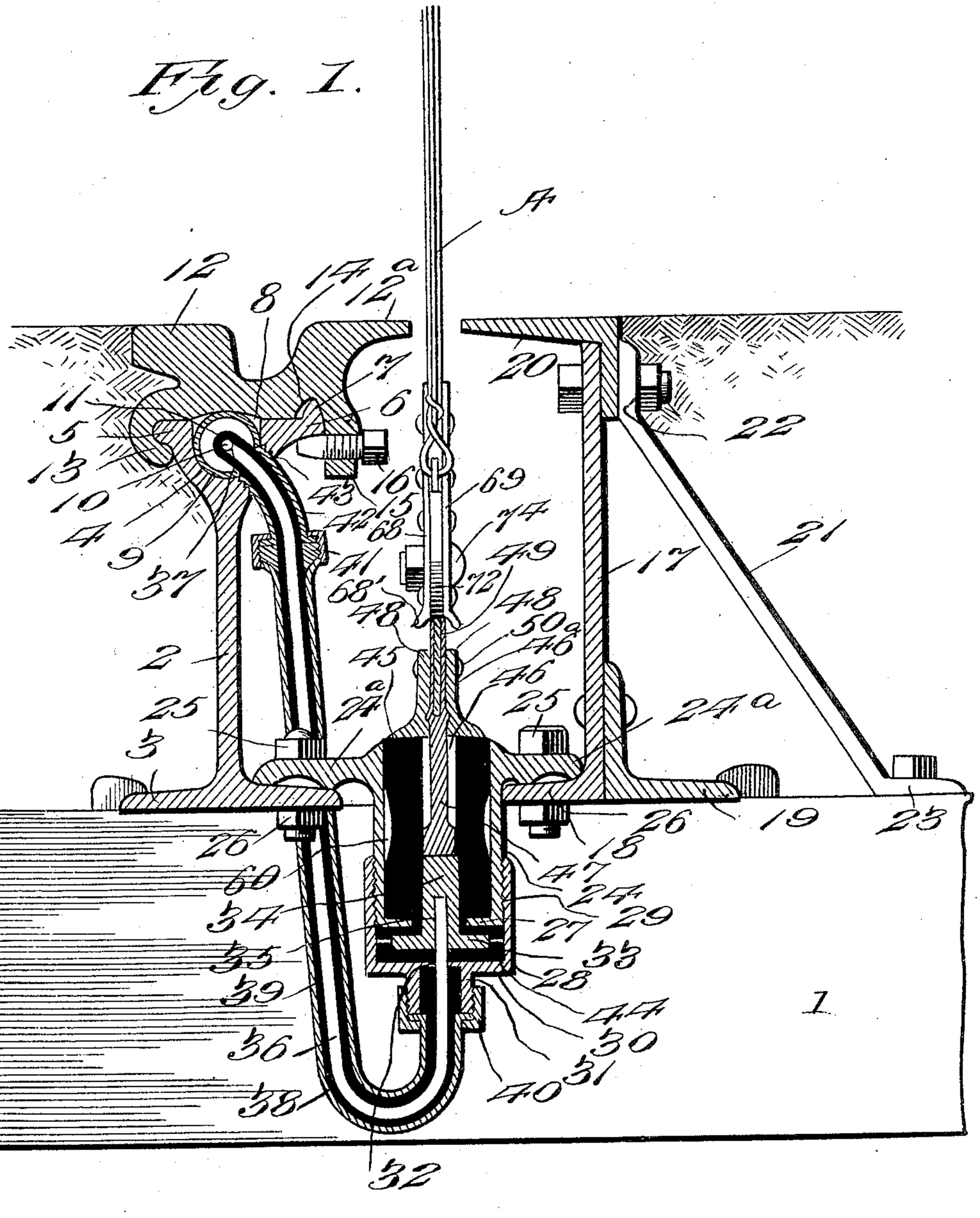
W. N. HARING.

ELECTRIC RAILWAY SYSTEM.

APPLICATION FILED OCT. 31, 1903.

6 SHEETS—SHEET 1.

Fig. 1.



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6 SHEETS—SHEET 2.

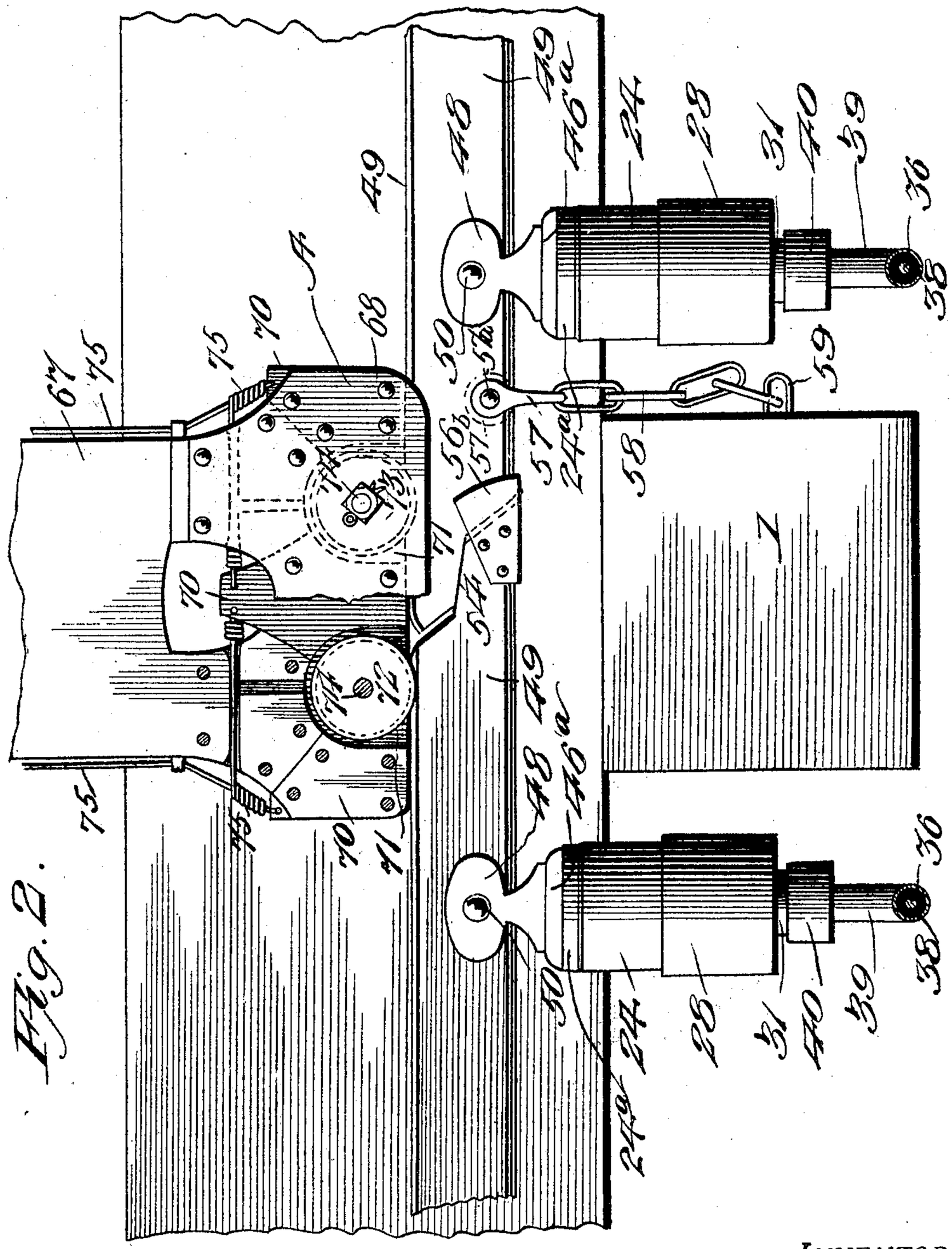

Fig. 2.

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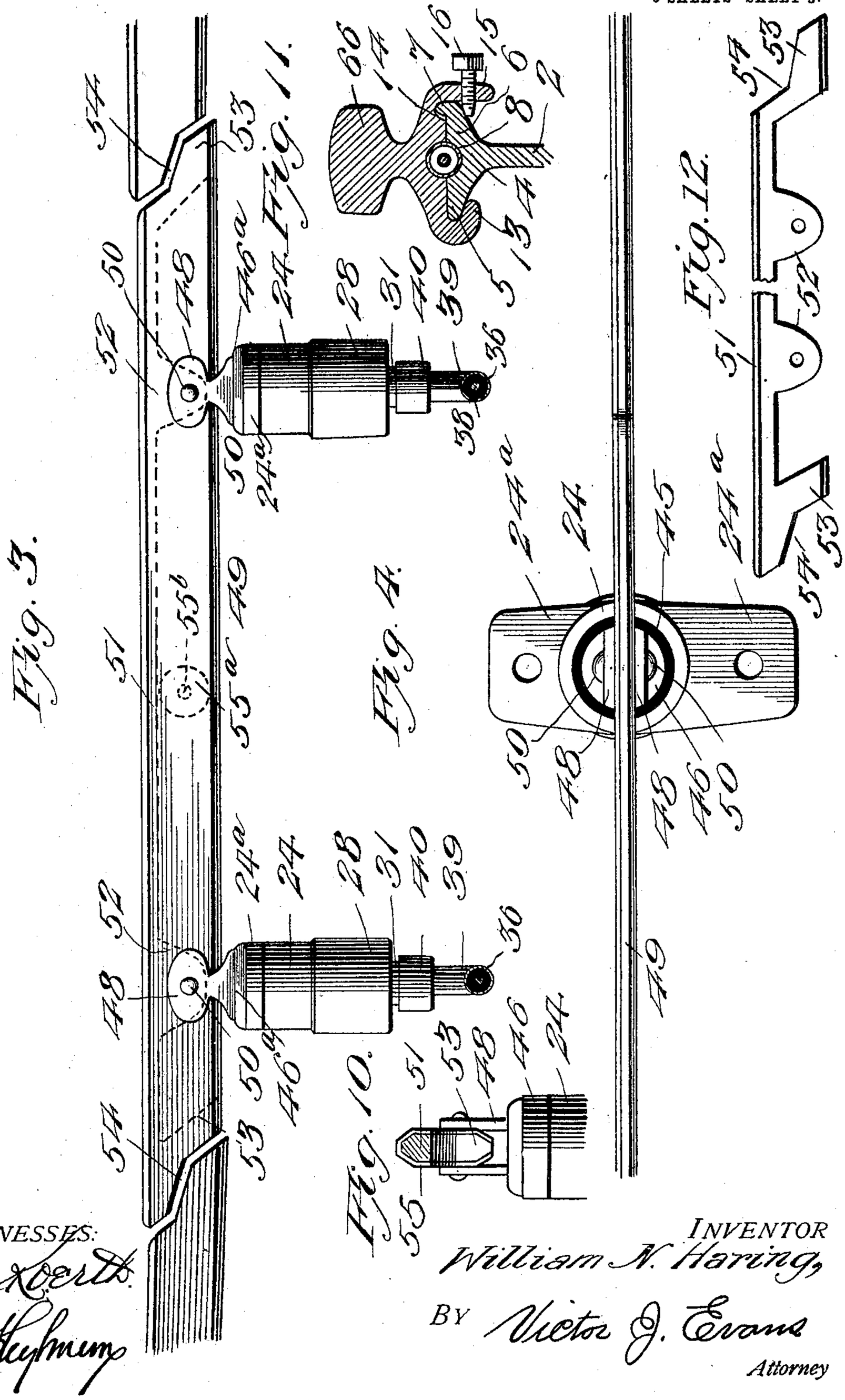
6 SHEETS—SHEET 3.



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6 SHEETS—SHEET 4.

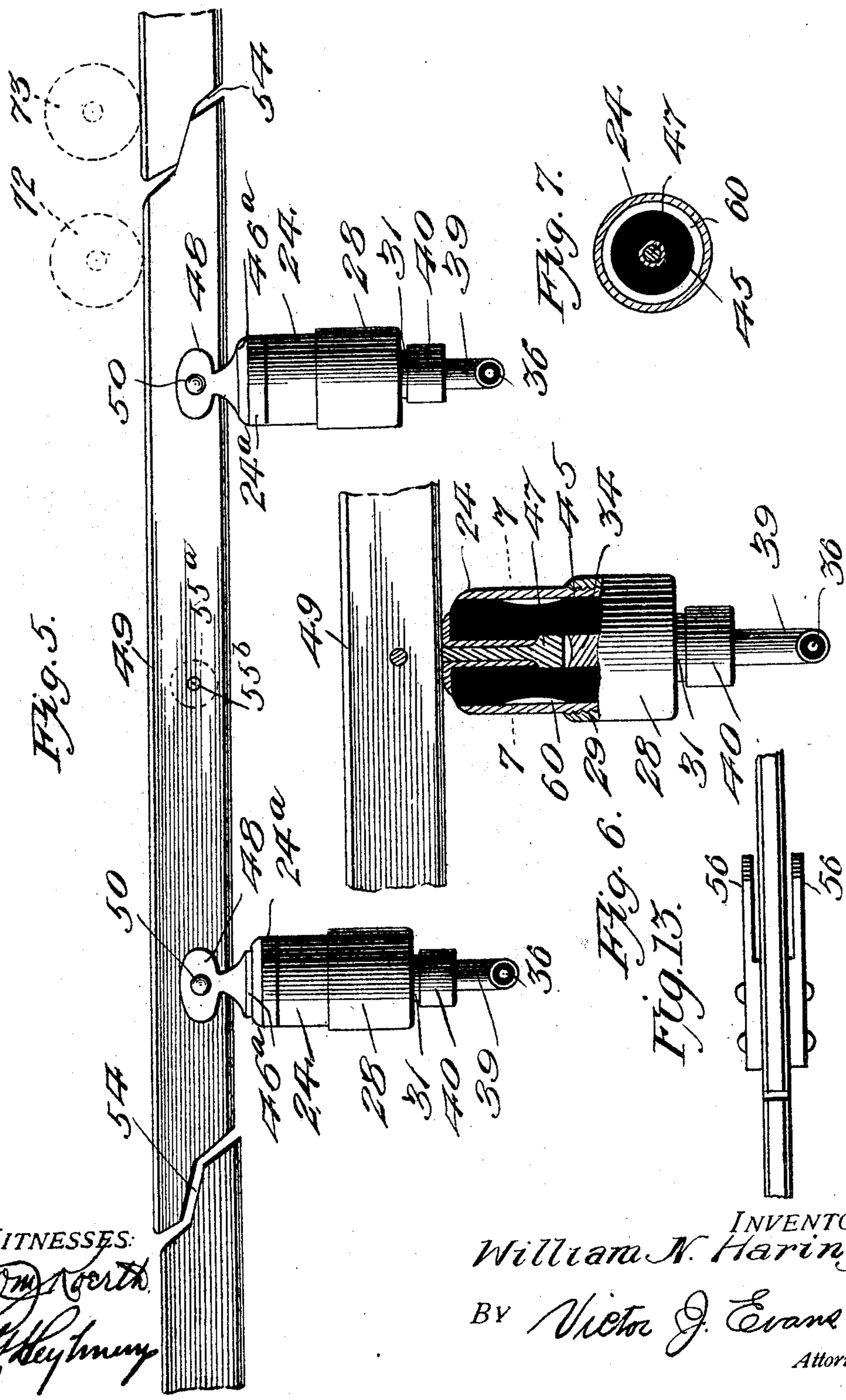

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 13.

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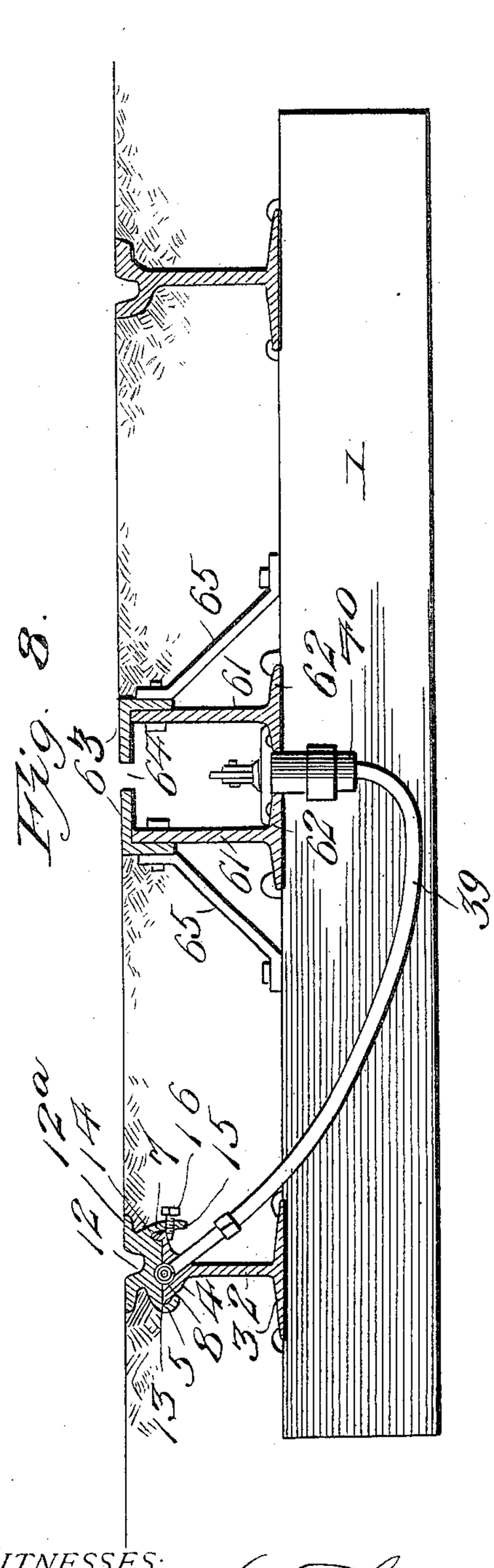
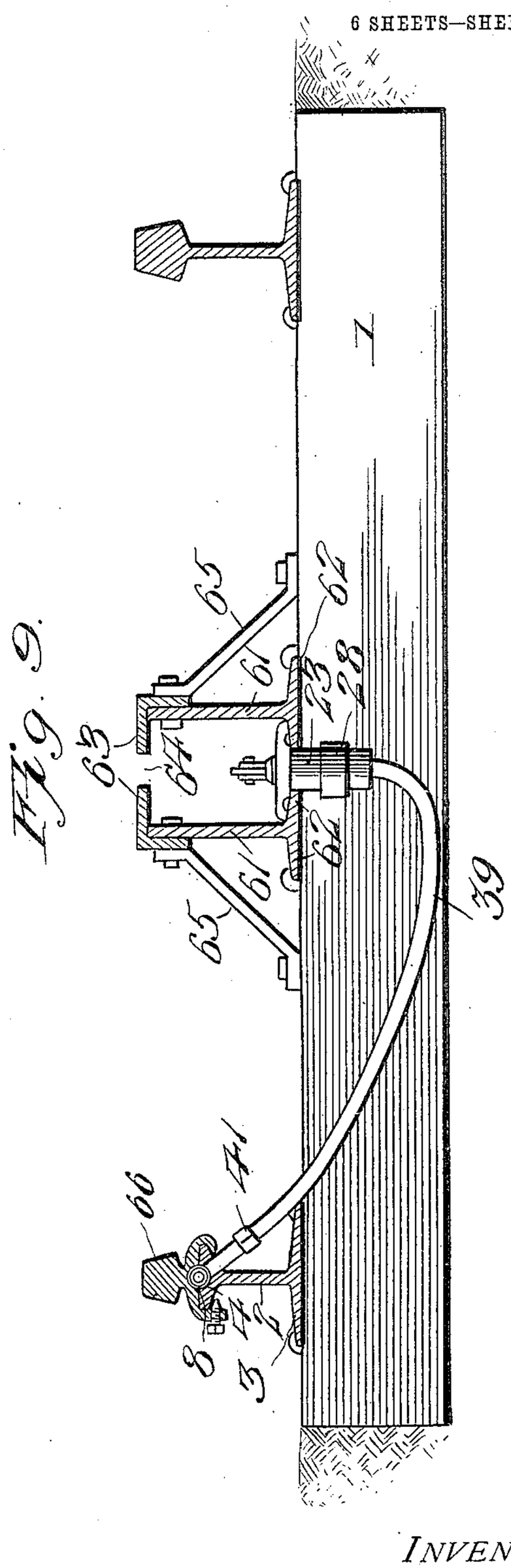
6 SHEETS—SHEET 5.





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W. N. HARING.

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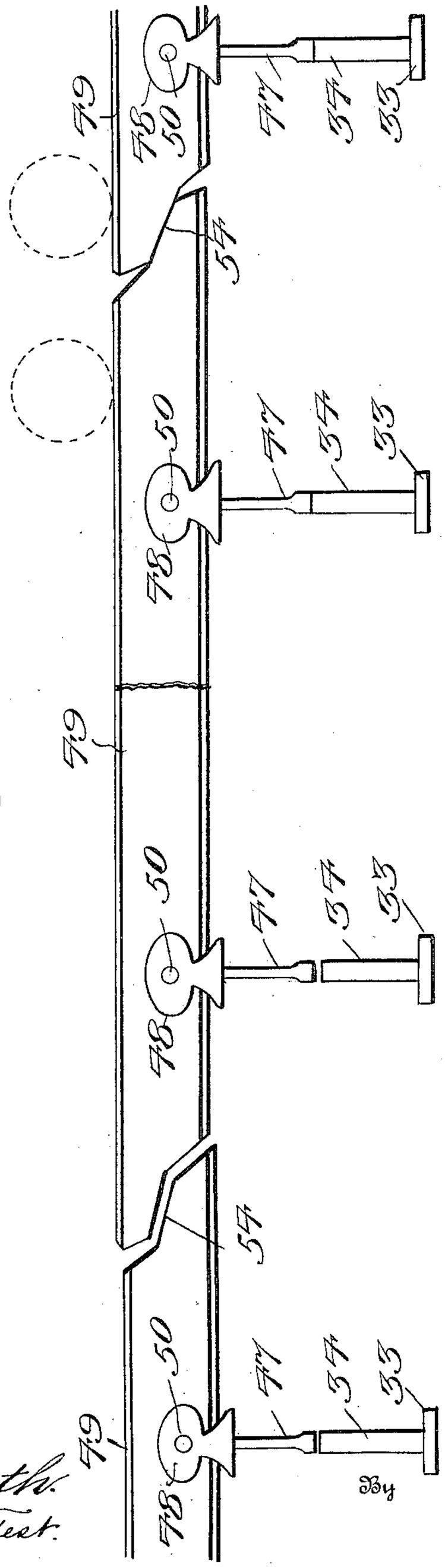
6 SHEETS—SHEET 6.

Fig. 14.



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UNITED STATES PATENT OFFICE.

WILLIAM N. HARING, OF NYACK, NEW YORK.

ELECTRIC-RAILWAY SYSTEM.

No. 812,790. Specification of Letters Patent. Patented Feb. 13, 1906.

Continuation of abandoned application Serial No. 107,822, filed May, 17, 1902. This application filed October 31, 1903. Serial No. 179,379.

To all whom it may concern:

Be it known that I, WILLIAM N. HARING, a citizen of the United States, residing at Nyack, in the county of Rockland and State of New York, have invented new and useful Improvements in Electric-Railway Systems, of which the following is a specification.

My invention has relation to new and useful improvements in electric-railway systems, and more especially to systems of that character or type embodying an underground conduit in which is located a conductor arranged to be engaged by a collector carried by the car, by means of which the current is collected and conveyed to the motor to provide for the propulsion of the car.

The present application is successor to my abandoned application filed May 17, 1902, Serial No. 107,822, and allowed January 14, 1903.

The object of the invention is to provide a system of the character mentioned embodying a conduit of novel construction in which is arranged a conducting-rail consisting of a plurality of sections adapted to be moved into contact with a feed-wire by the engagement of the plow therewith as the car progresses, so that only such sections will be energized as are located directly beneath the car, the sections being provided with means to throw them out of connection with the feed-wire as soon as the plow leaves the sections.

The invention consists in providing a traction-rail of novel construction, including a conduit in which is arranged a feed-conductor, associating with said rail a conduit in which is arranged a conductor comprising a plurality of sections each one of which is adapted to be moved into engagement with contacts which are electrically connected to the feed-wire, the said sections being provided with means to normally hold them out of engagement with said contacts.

I have fully and clearly illustrated my invention in the accompanying drawings, forming a part of this specification, and wherein—

Figure 1 is a vertical transverse section through a structure embodying my improved conduit and the sectional rail associated therewith. Fig. 2 is a view showing in side elevation two of the sectional rails and a plow in operative engagement therewith. Fig. 3 is a detail view, in side elevation, of one of the sectional rails and the means for supporting the same. Fig. 4 is a top plan view of a sectional rail and its support. Fig. 5 is a view in side elevation of a rail-section and its support, showing the manner in which the end of one section is placed in contact with an adjacent section as the plow passes from one section to the other. Fig. 6 is a view of a portion of rail-section and one of the supports, partly in section, showing the arrangement of the contacts carried by said section and support and the manner in which they are associated. Fig. 7 is a transverse horizontal section on the line 7 7 of Fig. 6. Fig. 8 is a view in cross-section of a road-bed and system embodying a modified form of the invention. Fig. 9 is another modified form similar to that shown in Fig. 8, but employing rails of the T type instead of the grooved form. Fig. 10 is a view in end elevation of one of the rail-sections. Fig. 11 is a view in cross-section of a modified form of traction-rail from that employed in Fig. 1. Fig. 12 is a detail view of the core of one of the sectional rails. Fig. 13 is a plan view of the meeting terminals or joints of two of the conductor-rails, showing the flanges as clearing the adjacent rail. Fig. 14 is a view similar to Fig. 5 with the casing 24 and attendant parts omitted to expose the terminals 34 and contacts 47 to view.

Referring to the drawings, 1 designates a cross-tie of suitable material and dimensions, such as is usually employed in the construction of railway road-beds. Mounted upon this cross-tie is a traction-rail of novel construction, embodying a web portion 2, provided with a flanged base 3, adapted to be seated upon the cross-tie and spiked or otherwise secured thereto. At its upper portion this rail is formed or provided with an enlarged head 4, having flanges 5 6 extending laterally both sides of the rail-web, one of said flanges being provided with a vertical marginal bead 7, as clearly shown in Figs. 1, 8, and 11. In the upper surface of the head 4 is a longitudinal channel or conduit 8, extending the full length of the rail, and within said channel or conduit is laid a line of pipe 9, in which is located a feed-wire or conductor 10, insulated from the said pipe and rail by means of a suitable insulating-covering 11. The channel or conduit above mentioned is closed by means of a detachable rail-tread 12, formed at one of its lower edge portions with a curved flange 13, which is adapted to engage the flange 5 on the rail-head, and is also

formed on its lower face with a longitudinal groove 14, arranged to set over and receive the bead 7 when the tread is in position on the rail-head. The tread is provided at the side opposite to the curved flange 11 with a depending flange 15, through which is projected a fastening-bolt 16, the inner end of which engages the rail to secure the tread in position. At its inner edge the tread 12 is provided with a laterally-projecting flange 12ª, which constitutes one side of the conduit-slot through which the plow travels. This traction-rail, as just described, not only provides a conduit to carry the feed-wire or conductor, but also constitutes one side or wall of the conduit in which the sectional conductor-rails are located and the plow A travels during the progress of the car. The side of the conduit opposite to the traction-rail is formed by means of a vertical member or beam 17, spaced apart from the traction-rail a suitable distance to provide room for the arrangement of the conductor and movements of the plow, and is provided at its base with oppositely-directed lateral flanges 18 19, which rest upon the cross-tie 1 and are engaged by suitable means to secure them rigidly thereto. At its upper portion the beam 17 is provided with a horizontally-disposed flange 20, extending the full length of said beam and terminating at its free end such a distance from the flange 12ª of the head 12 as to leave sufficient space to provide for the slot through which the plow travels. The wall of the conduit formed by the beam 17 is braced and held in proper position by means of an inclined brace member 21, which engages and is secured to the upper end of said beam, as at 22, the lower end of the brace being securely fastened to the cross-tie 1, as at 23.

Arranged within the conduit formed by means of the track-rail and the beam 17 are a number of supports at suitable intervals longitudinally of the conduit, the said supports being disposed preferably in pairs, each of which is adapted to support one of the sectional rail-conductors through which the current is conveyed to the plow.

Each of the supports above mentioned comprises a hollow cylindrical body or casing 24, open at its upper end portion and provided with laterally-projecting wings or flanges 24ª, arranged to be seated upon the base-flange 3 of the traction-rail and the inner flange 18 of the member 17, the said casing 24 being fastened in position by means of bolts 25 passing therethrough and through the flanges of the rail and beams and held by nuts 26, as clearly shown in Fig. 1. This cylindrical body depends between the cross-ties of the road-bed a suitable distance and is provided at its lower end with an interiorly-arranged annular flange 27, which provides a central opening through the bottom of the body, as shown. At its lower end the body is also provided with exterior screw-threads adapted to be engaged by interior threads of a cap-piece 28, as shown at 29, closed at its bottom, as at 30, and provided with a depending exteriorly-threaded nipple 31, the bottom 30 having an aperture 32 opening through the nipple. This cap-piece 28 is so adjusted when in position on the body 24 as to leave a space between the bottom of said cap-piece and the lower end of the body, within which space is arranged the lower portion of a terminal plate 33, provided with a vertically-extending contact 34, projecting upwardly through the opening in the bottom of the body 24 to a point intermediate the ends thereof. Within the plate 33 and terminal 34 is a vertical seat 35, in which is projected and snugly fitted one end of a connecting-wire 36, the other end of which is carried into contact with the feed-wire 10, as shown at 37. The wire 36 is covered by a suitable insulation 38 and is inclosed in a pipe 39, one end of which is secured to the nipple 31 by means of a coupling 40, the opposite end being connected, by means of a coupling 41, to one end of a short pipe-section 42, the other end of which is threaded, as at 43, into the head of the traction-rail, the pipe being employed for the purpose of protecting the wire and its insulation from the water, which is liable to accumulate in the conduit. The contact-plate and its terminal are insulated from the body by means of a suitable non-conducting substance arranged in the space between the bottom of the body and the cap-piece, as shown at 44.

Arranged within the hollow body 24 is a cylindrical block of resilient rubber 45, which extends to the upper end of the body and is formed with a central longitudinal opening 46, extending entirely therethrough, and which receives at its lower portion the terminal 34, as shown in Fig. 1, the bottom of the block resting upon the flange 27 in the body 24. Upon the upper face of the block 45 is arranged a metallic piece 46ª, to the lower portion of which is secured a contact-piece 47, which is adapted to be moved into engagement with terminal 34, but is held normally out of engagement therewith by means of the resiliency of the rubber block 45. The metallic block 46ª carries upon its upper face vertical ears 48, spaced apart a suitable distance and between which is arranged an end portion of one of the sectional rails 49, from which the current is collected by the plow, the rail being held in position by suitable bolts 50, projected through it and the said ears on the block 46ª. These sectional rails are of a peculiar and novel structure, as will be now described. As shown in Figs. 3, 10, and 12 of the drawings, they consist of bodies or cores 51, composed of copper or other suitable conducting metal and which

at points adjacent their ends are formed with depending projections 52, which are arranged to be disposed between the ears 48 on the block 46[a] and to receive the bolts 50. These core-pieces 51 are also provided with depending portions 53 and are scarfed at their extreme end portions, as at 54, so that the ends of the rails will be moved into contact with each other as the plow progresses from one to the other, as will appear more fully hereinafter. Arranged upon the core-pieces is a jacket 55 of steel, which jacket carries the preponderance of the current supplied from the feed-wire and which has sufficient rigidity to withstand the pounding incident to the movement of the plow in its progress. This form of what might be called a "composite" rail will be found very serviceable in use, much greater, in fact, than if it were constructed of copper alone, inasmuch as the copper would be bent and twisted by the force of the blows exerted upon it by the plow. The jacket is held in position by having its depending side portions extended between the ears 48 on the block 46[a] and the core-piece, as clearly shown. In order to prevent the sides of the jacket 55 from collapsing toward each other, I provide spacing-washers 55[a], arranged intermediate the ends of the rails between the side portions of the jacket and held in place by means of a transverse pin 55[b]. A similar washer may also be placed upon the pin 57[a] of the link 57, as shown at 57[b] in dotted lines in Fig. 2.

The rails 49 are arranged in engagement with the contacts 47 or so as to receive any current which may pass thereto when said contact engages the terminal 34. As hereinbefore stated, the said contacts 47 are held normally out of engagement with the terminals 34 by means of the resilient block 45, so that under ordinary conditions when no car is passing over the rail no current is fed thereto, but when the plow passes over the contact-rail said rail will be forced downwardly until the contacts 47 meet the terminals 34, when the current will pass from the feed-wire 10 by way of the connecting-wire 36 to the contacts, rail 49, and through the plow to the motor, which is driven thereby, the other side of the motor-circuit being through the opposite track-rail or other suitable conductor, which is not material to my invention. For the purpose of compensating for the expansion of the block 45 intermediate its ends when compressed by the plow bearing upon the rails the said block is formed with an annular reduced portion 60, which provides for the free expansion of the block and adds to its resiliency, which would be reduced were said block formed to fit snugly in the body 24 throughout its entire length.

In Figs. 2, 5, and 14 I have shown the plow as just passing from one sectional rail onto the other, under which circumstances the scarfed ends of said rails are moved into engagement with each other, so that the current will be supplied from both rails as the meeting ends of both are depressed sufficiently to receive current from the wires 36, as the case would be were no means provided for contacting the ends of the rails. To permit the forward end of each contact-rail to be brought into engagement with the rear end of the adjacent contact-rail, as just described, the contacts 47 which are secured to the forward ends of said rails have a greater downward movement than that of the contacts 47 which are secured to the rear ends of said rails. This increased downward movement of the forward end of each rail relative to the rear end of the next adjacent rail is due to the fact that, as seen in Fig. 14, the terminal 34 at the forward end of each rail is shorter than that at the rear end of the next rail, while the contacts 47 are of equal length, it being apparent from this arrangement that after the contact 47 at the rear end of one of the rails has through the depression of said rail moved into engagement with the coöperating terminal 34 the forward end of the preceding companion rail will have sufficient additional movement prior to engagement of its contact 47 with the underlying coöperating terminal 34 to permit contact of the scarfed ends of the rails in the manner and for the purpose explained. In order that the ends of the rails will be guided into proper engagement with each other, each one is provided at its rear end with a pair of guide-plates 56, which project on either side of the end of the adjacent rail and which prevent the said rails from overlapping each other when moved together. These guide-plates are so arranged as to rest normally clear of the rail they overlap, as shown in Fig. 13, in order that they will not engage the same when the rails are not being traversed by the car, which engagement would convey the current from one rail to the other.

In order to limit the upward movement of the sectional rails caused by the expansion of the rubber blocks, I provide the rail with a link 57, in which is fastened one end of a chain 58, the other end of which is secured to a staple 59, driven into the cross-tie 1, the upward movement of the rail being limited to the length of said chain.

In Figs. 8 and 9 I have shown a modified form of the invention in which the conduit is arranged separate from the traction-rail and is constructed of two vertical walls 61, spaced apart from each other to form the conduit and provided with flanged bases 62, which rest upon the cross-ties and are spiked thereto. At their upper edges the walls are provided with inwardly-directed flanges 63, leaving a suitable space between them to provide the plow-slot 64. Suitable inclined braces 65 are secured at their respective ends to the

walls 61 and the cross-tie, whereby the said walls are rigidly maintained in position. The construction of the body constituting the support for the sectional rails and the said rails are the same as shown in Fig. 1 and are associated with the conduit structure in the same manner.

In Figs. 9 and 11 I have also shown a modified form of traction-rail in which a T-tread 66 is employed instead of the grooved rail, as shown in the other views.

The advantages I claim for the structure and arrangement of the various elements, as shown and described, are that the current as fed to the car will be confined to the sections immediately over which the car is traveling and all others will be cut out of the circuit, and in view of the complete insulation of the conductor and the contact-rail, except when in contact with the trolley, the loss of current by leakage or induction will be materially minimized. It will be also seen that the danger of persons coming into contact with active conductor-rails will be obviated in view of the fact that all the rails are dead except the one, or possibly two, engaged by the plow.

In connection with the system as above described I employ a plow or collector embodying the structure as shown in Figs. 1 and 2, and which will now be described. This plow or collector comprises a standard 67 of any approved structure, to the lower portion of which is secured two vertically-disposed plates 68 69, having at their lower edges oppositely-disposed flanges 68′, overlapping the contact-rails, so that the plow will be guided thereon during its movement. These plates are spaced apart by intermediate lining-plates 70, cut away to provide recesses 71 for the reception of supporting-wheels 72 73, journaled upon pins 74, carried by the plates 68 69, and which are arranged to travel upon the contact-rails to provide for the easy movement of the plow and insure positive depression of the rails over which the plow is traveling. From the lining-plates 70 the current is carried to the motors by means of the conductors 75, connected to the lining-plates in any approved manner, as shown in the drawings.

In order that others skilled in the art to which this invention pertains may readily understand the construction and manner of operating the same, I specifically describe what to me at this time appears to be the best means to accomplish a desired result; but I would have it understood that I reserve the right to make such slight changes and alterations as may suggest themselves from time to time without departing from the spirit of the invention.

Having thus fully described the invention, what is claimed as new is—

1. In an electrical-railway system, a conduit constructed with walls provided with projections, a hollow body in said conduit and provided with flanges adapted to engage said projections to support the body, means to engage the flanges and projections to secure the body in applied position, a terminal contact mounted in said body, a feed-wire having connection with said contact, a contact movable in said body to engage said first-named contact, conductors carried by the last-named contact, and means to maintain said contacts normally separated.

2. In an electric-railway system, the combination of a conduit constructed with flanged walls, one of which is formed with a channel containing a feed-wire, a hollow body in the conduit provided with projecting portions seated upon the flanges of the walls, a contact in the hollow body connected to the feed-wire, a contact movable to engage said first-named contact and supporting a conductor, and means in the hollow body to hold the contacts normally separated.

3. In an electric-railway system, the combination of a rail having a channel therein and a flange, a feed-wire in the channel, hollow bodies provided with projecting portions seated upon said flange, a contact-terminal in said body connected to the feed-wire, a movable contact adapted to engage said contact-terminal, a conducting member supported by the movable contact and means to maintain said contacts normally separated.

4. In an electrical-railway system, a conduit constructed with walls provided with projections, a hollow body in said conduit and provided with flanges adapted to engage said projections to support the body, means to engage the flange and projections to secure the body in applied position, a resilient block arranged in the body and reduced intermediate its ends, a terminal contact carried by the body and projecting into an opening in the resilient block, a contact movable in said opening and adapted to be normally separated from the first-named contact by the resilient block, and a conductor carried by the last-named contact.

5. In an electric-railway system, the combination with a conduit, of hollow bodies arranged therein, a resilient block in each body reduced intermediate its ends, a cap-piece on the bottom of each hollow body, a terminal between the cap-piece and body and provided with a shank which projects into an opening in the resilient block, a vertically-moving contact projecting through the upper end portion of the block and carrying a conductor-rail and adapted to be moved into engagement with said shank.

6. In an electric-railway system, the combination with resilient supports of a sectional conductor, comprising a core provided with means to attach it to the supports and a conducting-jacket on the core.

7. In an electric-railway system, the combination with supports of a conductor, comprising a rigid core, provided with means to attach it to the supports, and a conducting-jacket on the core.

8. In an electric-railway system, the combination with supports of a rigid core-piece formed with depending portions engaging the supports and secured thereto, and a conducting-jacket on the core.

9. In an electric-railway system, the combination of a conduit, one wall of which is a traction-rail, having a channel and a detachable tread to close the channel, a feed-wire in said channel, hollow bodies supported in the conduit carrying contacts connected to the feed-wire, movable contacts carrying a conductor-rail, and adapted to be brought into engagement with the first-named contact, and means to hold said contacts normally separated.

10. In an electrical-railway system, a conduit constructed with walls provided with projections, one of said walls being formed with a channel containing a feed-wire, and a screw-threaded opening communicating with said channel, a hollow body in said conduit and provided with flanges to engage said projections, said body also having a screw-threaded portion, a cap-piece adjusted to engage the threaded portion of the body and provided with a depending exteriorly-threaded nipple, a resilient block arranged in the body and reduced intermediate its ends, a terminal plate arranged between the body cap-piece and provided with a contact extending into an opening in the resilient block, means for insulating the terminal plate and its contact, a pipe-section secured in said threaded opening and provided with a coupling, a coupling secured to said nipple, a pipe secured to said pipe-section and nipple by means of the coupling, a connecting-wire adapted to convey the current from the feed-wire to said contact and arranged in said pipe and pipe-section, a contact movable in the opening of the resilient block and adapted to be normally separated from the first-named contact by said block, and a conductor carried by the movable contacts.

11. In an electric-railway system, a conduit, hollow bodies arranged therein, a resilient block having a central opening throughout its entire length and mounted in each hollow body and reduced intermediate its ends, a contact projecting into the lower portion of the resilient block, a movable contact projecting into the upper portion of the resilient block and adapted to engage the first-named contact, said movable contact being normally held out of engagement with the first-named contact by the resiliency of the block and permitted to be brought into contact therewith by the resiliency of said block, and conductors carried by the said movable contacts.

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

WILLIAM N. HARING.

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