

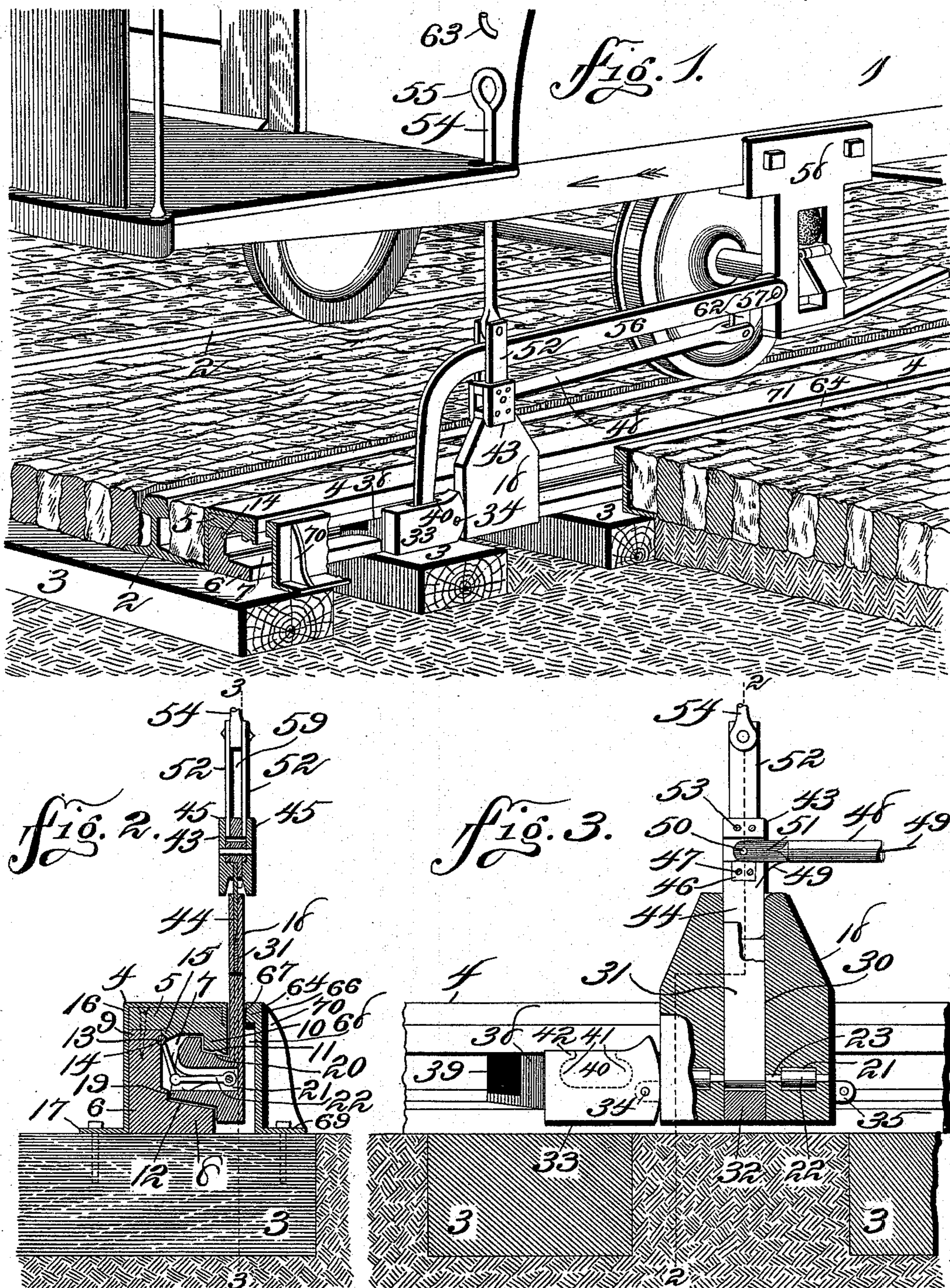
(No. Model.)

4 Sheets—Sheet 1.

J. L. HORNIG.  
CONDUIT ELECTRIC RAILWAY.

No. 528,205.

Patented Oct. 30, 1894.



Witnesses:  
W. J. Sankey.  
M. P. Smith.

Inventor: Julius L. Hornig  
 by Higdon Higdon Longan  
 Attys.

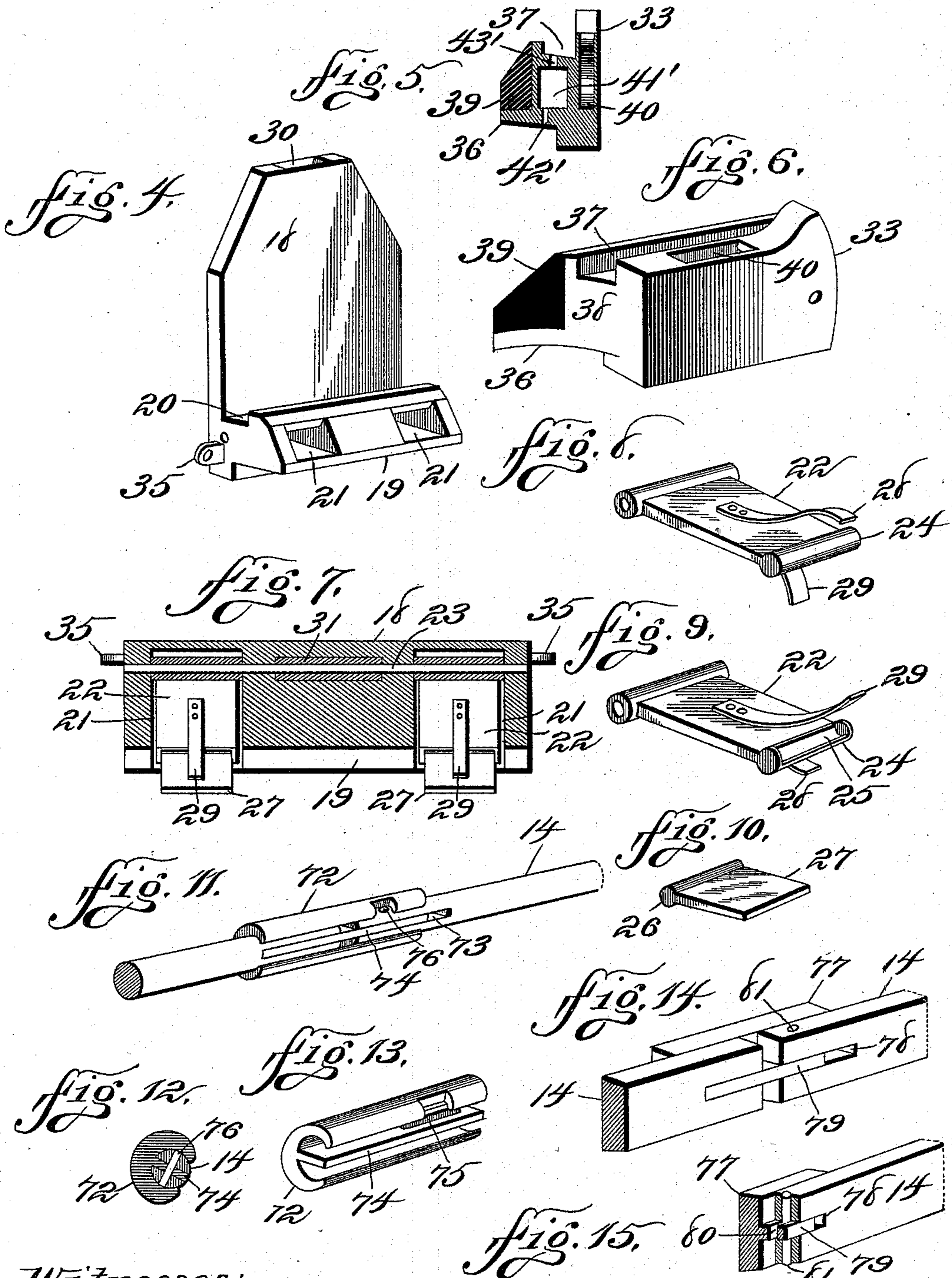
(No Model.)

4 Sheets—Sheet 2.

J. L. HORNIG.  
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Patented Oct. 30, 1894.



Witnesses:

W. J. Sanney,  
N. P. Smith,

Inventor: Julius L. Hornig,  
by Higdon Higdon Longan  
Attorneys.

(No Model.)

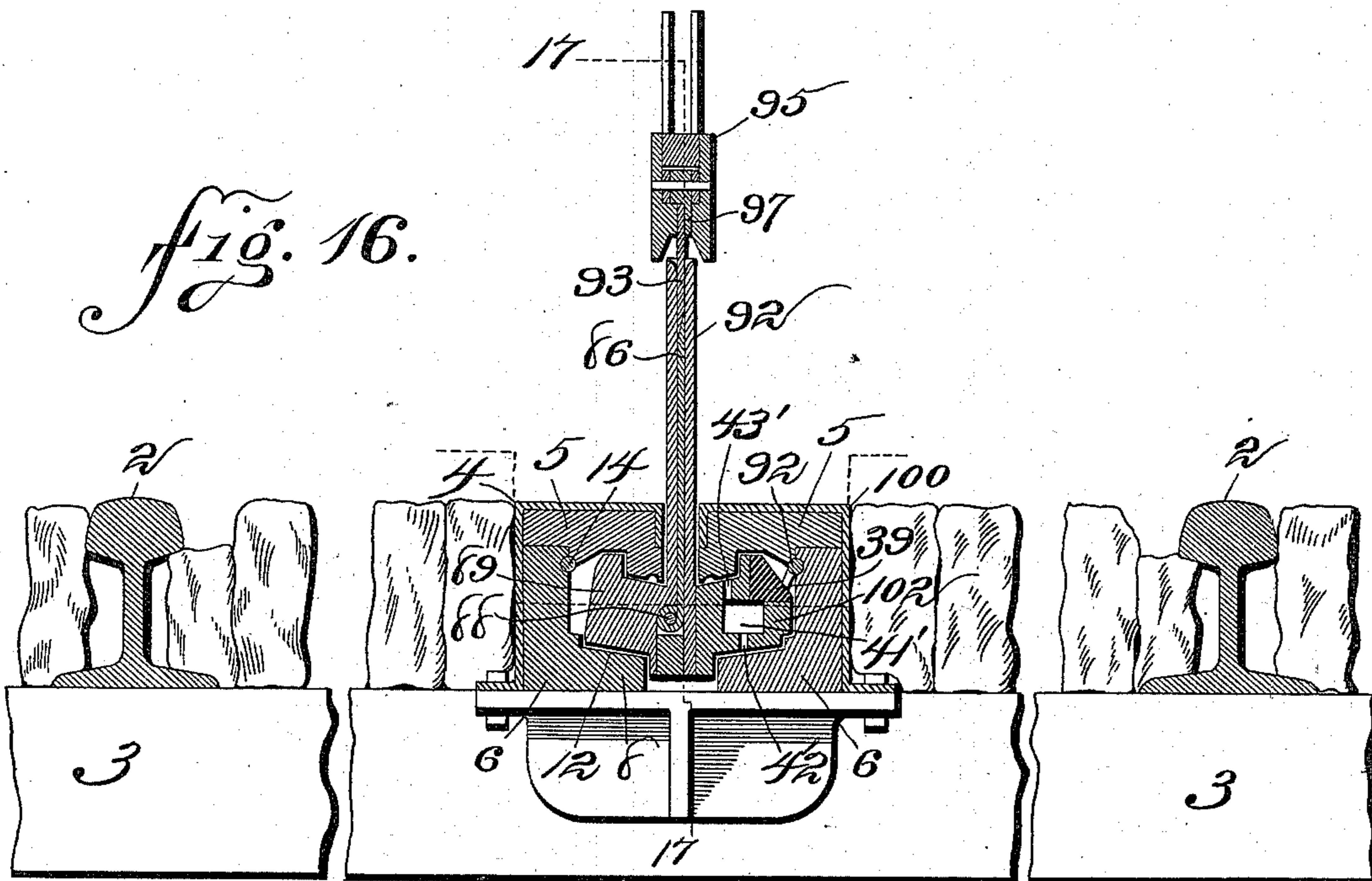
4 Sheets—Sheet 3.

J. L. HORNIG.  
CONDUIT ELECTRIC RAILWAY.

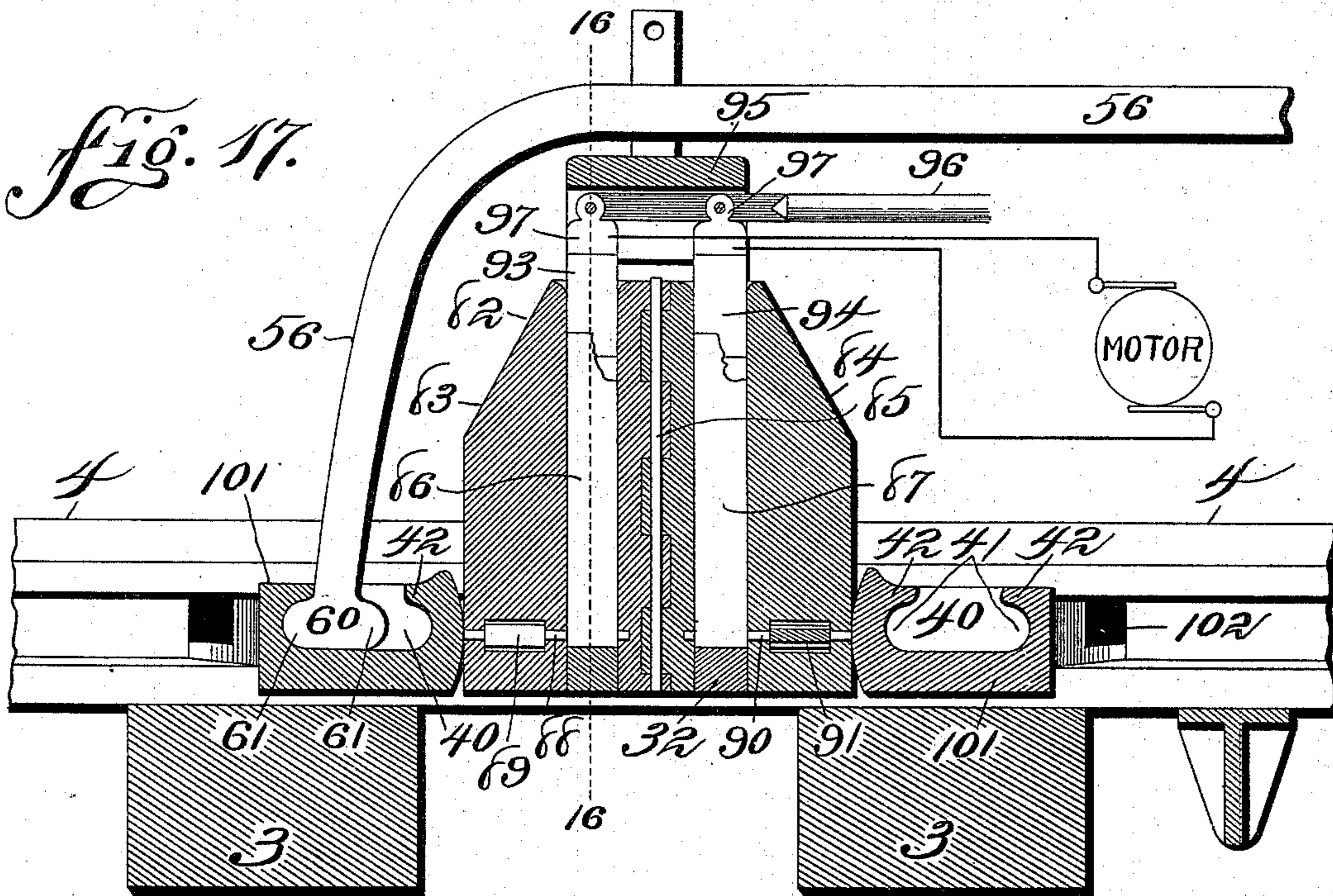
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*fig. 16.*



*fig. 17.*



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by Higdon Higdon Longan  
Attorneys,

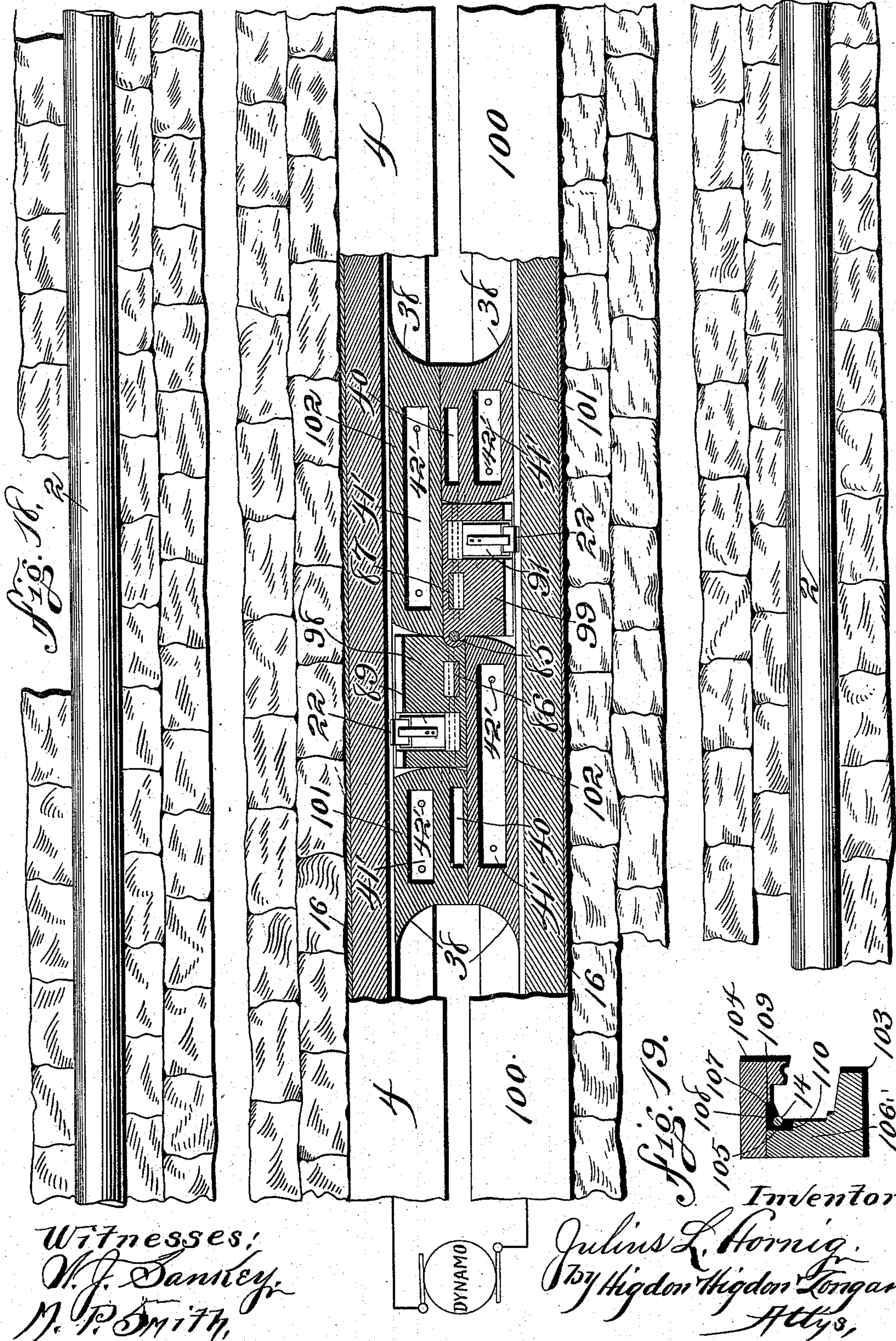
(No Model.)

4 Sheets—Sheet 4.

J. L. HORNIG.  
CONDUIT ELECTRIC RAILWAY.

No. 528,205.

Patented Oct. 30, 1894.



# UNITED STATES PATENT OFFICE.

JULIUS L. HORNIG, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO  
THEODORE H. WURMB, OF SAME PLACE.

## CONDUIT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 528,205, dated October 30, 1894.

Application filed February 19, 1894. Serial No. 500,618. (No model.)

*To all whom it may concern:*

Be it known that I, JULIUS L. HORNIG, of the city of St. Louis, State of Missouri, have invented certain new and useful Improve-  
5 ments in Underground Conduits for Electric Railways, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

10 My invention relates to an improved underground conduit for electric railways, and consists in the novel construction, combination and arrangement of parts hereinafter described, designated in the claims, and illus-  
15 trated in the accompanying drawings, in which—

Figure 1 is a perspective view of a portion of a car and track, showing my improved conduit in the position it assumes relative the  
20 track when in practical use, also showing the trolley in connection therewith, and showing means for operating said trolley in connection with the car. Fig. 2 is a vertical transverse section of the conduit and trolley, showing  
25 the position of the main conductor and the manner in which it is held in position; also showing one of the brushes in connection with said conductor, said section being taken on the line 2—2 of Fig. 3. Fig. 3 is a vertical lon-  
30 gitudinal section of the trolley, showing the plow which is carried thereby, and also showing the manner in which the electrical contacts are connected thereto. Fig. 4 is a perspective view of the trolley with the brushes and con-  
35 tacts removed. Fig. 5 is a vertical transverse section of the plow, and Fig. 6 is a perspective view of the plow. Fig. 7 is a horizontal section of the trolley, showing the manner in which the brush-carriers are connected there-  
40 to. Fig. 8 is an inverted perspective view of one of the brush-carriers, and Fig. 9 is a top perspective view of one of the same. Fig. 10 is a perspective view of one of the brushes detached from the holder. Fig. 11 is a perspec-  
45 tive view of a portion of the main conductor, showing a coupling which I make use of for allowing said conductor to expand and contract. Fig. 12 is a cross-section of the main conductor and coupling. Fig. 13 is a perspec-  
50 tive view of the coupling detached from the conductor. Fig. 14 is a perspective view of a

modified form of conductor, showing the coupling to allow it to expand and contract. Fig. 15 is a transverse section of the coupling, as illustrated in Fig. 14, more clearly showing  
55 the same. Fig. 16 is a vertical transverse section of a modified form of trolley, and a modified form of the conduit, said section being taken on the line 16—16 of Fig. 17. Fig. 17 is a sectional side elevation of the trolleys  
60 shown in Fig. 17, said section being taken on the line 17—17 of Fig. 16. Fig. 18 is a sectional plan view of the conduits and trolleys illustrated in Figs. 16 and 17. Fig. 19 is a transverse section of a modified construction  
65 of conduit.

The principal object of my invention is to construct a conduit of suitable insulating material so that when the main conductor is located therein there will be but a small portion  
70 of its surface exposed.

Referring to the drawings, the numeral 1 designates a portion of a car of ordinary construction, which is mounted upon the track rails 2, they being mounted on the cross-ties 3.  
75 These cross-ties project a distance beyond the outer edge of the rails, so that my improved conduit-casing 4 can be located thereon, it being of such a height that the upper surface will be in horizontal alignment with the up-  
80 per edge of the rails. This conduit-casing is preferably formed of two main pieces 5 and 6, they being formed of wood, or other suitable insulating material. These main pieces 5 and 6 are covered with a coat of paint, or  
85 other mixture that will prevent them from becoming water soaked, and prevent them from rotting. These main pieces 5 and 6 are so formed that when placed together in the manner illustrated in Figs. 1 and 2 they  
90 will form the conduit 7. The portion 6 of the casing is provided with a base 8, which is connected to the cross-ties, or other support, in any manner, and connected to the upwardly projecting portion 9 thereof, is the  
95 portion 5, which is a suitable amount wider than the base 8, so that water dripping from the outer edge of the downwardly pending projection 10 will not strike the upper surface of the base. The lower edge of said  
100 downwardly pending projection is formed at an angle relative to a horizontal line, so that

water cannot work back into the conduit, and a depression 11 is also formed in the lower edge of the projection 10 to aid in preventing the water from working back into the conduit. The upper edge 12 of the base 8 is at such an angle relative to the lower edge thereof, that in case water or slush works its way into the conduit, it can run off from the base. A depression 13 is formed in the side of the projection 9, adjacent the upper end thereof and adjacent the conduit in which is located the main stationary conductor 14, and a projection 15 is so formed on the lower side of the portion 5 of the casing that it will clamp the conductor 14, and retain it in the required position, it being formed in such a manner that it will cover such a portion of the conductor that there will be approximately but one-fourth exposed within the conduit.

16 indicates a metal covering, which is so formed that it will cover the upper closed sides of the casing and prevent it from being damaged by heavy vehicles being driven over it. A flange 17 is formed on said covering in such a manner that said covering can be bolted or spiked to the cross-ties.

18 indicates the sliding trolley, which is formed of suitable insulating material, and the lower end is provided with an integral horizontal projection 19, which is so formed that it will fit within the conduit, it being a suitable amount narrower than the conduit, so as to form a space between the inner projecting edge of said projection and the adjacent side of the vertical projection 9. A longitudinal depression 20 is formed in the upper surface of the projection 19, in which the downwardly pending projection 10 of the casing fits, and aids in holding said projection 19 and trolley in the required position. The main portion of the trolley 18 is oblong in cross-section, and the edges adjacent the upper end are chamfered so as to make the trolley narrower at its upper end.

Formed in the projection 19 of the trolley 18 are two horizontal transverse depressions 21, which project inward from the free edge of said projection through said projection and a portion of the trolley and terminate a short distance from the surface of the trolley so that their inner ends will be closed.

22 indicates brush-holders, one being located in each of the depressions 21 and fulcrumed on a horizontal electrical conductor 23, which extends through the trolley and through the depressions. These brush-holders 22 are constructed of electrical conducting material. Formed on the free end of each of the brush-holders is an enlarged portion 24, in which is formed a socket 25. Said sockets are constructed to be engaged by the circular portion 26 of the brush 27. By the construction of this socket when the circular portion 26 of the brush 27 is located therein, said brush can yield relative to the brush-holder. For retaining the brushes in connection

with the conductor 14, I have constructed each holder with two springs 28 and 29. One end of said spring 28 is connected to the lower surface of the brush holder, and the free end engages the projection 19 in the depression 21, and one end of the spring 29 is connected to the upper surface of the brush-holder, and the free end thereof is constructed to engage the brush. By the construction of these springs, the spring 29 will hold the brush up against the conductor 14, while the spring 28 will allow it to yield to the irregularity of the conductor.

Formed in the center of the trolley 18 is a vertical opening 30, and located therein is an electrical conductor 31. The lower end thereof is made to engage the conductor 23 by being bent around it. Said conductor 31 is preferably constructed of a thin sheet of electrical conducting material, such as copper. The opening 30 extends through the trolley, so that the conductor 31 can be inserted through the lower end of said trolley. After it has been so inserted, the lower end of the opening is closed by a suitable plug 32. The upper end of the conductor 31 is attenuated and terminates a distance from the upper end of said trolley.

33 indicates a plow which is preferably formed of cast iron. Said plow is held in engagement with the trolley by a pin 34 passing through said plow and through a perforated ear 35, which is formed on or fixed to said trolley, a suitable depression being formed in said plow to allow said ear to be inserted therein, so that the engaged end of said plow will be adjacent the trolley. The corners of the engaged end of said plow are chamfered off to allow the free end thereof to yield relative to the trolley. Formed on one side of the plow is a projection 36, which is so constructed that it will fit within the conduit and can slide longitudinally therein. A suitable depression 37 is formed in the upper surface thereof, which is engaged by the downwardly pending projection 10 of the portion 5 of the casing. The projection 36 extends beyond the inward end of the plow 33, so that it can be constructed in the form of a mold-board 38 for scraping out dirt and dust that may accumulate within the conduit. This plow is constructed of metal as hereinbefore stated, and to prevent it from causing a short circuit in case it should come in contact with the conductor 14, I have constructed that portion of the projection 36 adjacent said conductor of insulating material 39.

Formed in the upper edge of the plow 33 is a depression 40, which is constructed with cored-out portions 41 at each end which form projections 42 over said cored-out portions. Formed in the projection 36 of said plow is a chamber 41', and a series of openings 42' pass from said chamber through the lower portion of the projection 36, and an opening 43' is formed in the upper surface of said projection so as to open into said chamber 41'. The

object of this chamber 41' is to allow lubricant to be placed within the plow and the openings 42' are to allow lubricant to be discharged upon the inclined surface 12 of the conduit-casing and prevent the plow from becoming worn or hot by the friction which is caused by said plow sliding upon said inclined surface.

43 indicates the device which carries the circuit-breaker 44. Said circuit-breaker is constructed of a thin piece of electrical conducting material, and the lower end is attenuated and of such thickness and width that it can readily be inserted within the upper end of the opening 30 of the trolley, so that the attenuated end thereof will engage the attenuated end of the conductor 31 and close the circuit.

The device 43 is constructed of two pieces of insulating material 45, and a contact in the form of a perforated ear 46 is placed between them and the circuit-breaker 44 is connected to said ear by rivets 47.

48 indicates a pipe through which the insulated conductor 49 passes from the circuit-breaker 44 to the motor (which can be of any ordinary construction and placed in the usual manner upon a car) and the return conductor leading from said motor to the rail, or other main return conductor so as to form a complete circuit when the circuit-breaker is in contact with the conductor 31. Said pipe 48 is connected to the perforated ear 46 by a pin 50. The bifurcated end 51 of the pipe 48, which engages the perforated ear 46, is constructed of suitable insulating material so that a circuit will not be caused from said ear to the pipe.

Clamped between the upper ends of the pieces 45 are two vertical parallel bars 52, which are placed a distance apart, and held in engagement with said pieces by pins or bolts 53. The upper free ends of said bars are engaged by a bar 54, which projects upward therefrom and passes through a suitable slot formed in the platform of the car 1, the upper end of said bar 54 being constructed with an eye 55 for a purpose hereinafter mentioned.

56 designates the trolley-bar, one end of which is pivoted at 57 to the axle-box-bearing 58 of the car 1. This trolley-bar extends from its pivotal point through the slot 59 between the bars 52, and is then bent downward, and the lower end 60 is provided with two projections 61, which project in horizontal alignment with each other, and are of such a shape that they will conform with the cored-out portions 41 within the plow 33. This trolley-bar works loose in the slot 59, and is for the purpose of pushing the plow 33 and the trolley 18.

The pipe 48 extends from the device 43 beneath and parallel with the trolley-bar 56 and is fulcrumed to an ear 62 carried by said bar adjacent the pivotal point of said trolley-bar. By this construction the device 43, which carries the circuit-breaker 44, can be lifted up

and break the circuit without disengaging the end 60 of said trolley-bar from the plow 33, the slot 59 between the bars 52 being of such length to admit this operation, but when it is desired to disengage the trolley-bar from the plow 33, the operator lifts the bar 54 up until the upper end of the device 43 comes in contact with the trolley-bar 56, which will cause the free end 60 of said trolley-bar to be disengaged from the depression 40 in the plow and he then hooks the eye 55 of said bar 54 upon a hook 63, which will prevent said device 43 and said trolley-bar from engagement with the trolley 18 and the plow 33, the lower end of the bar 54 being pivoted between the bars 52 as hereinbefore stated.

64 designates a guard, which is the same in height as the conduit-casing, and is constructed adjacent its upper edge with an inwardly projecting projection 66, so that when said guard is placed adjacent the conduit in the manner illustrated in Fig. 2, there will be a slot 67 between the upper edge thereof and the conduit-casing, and by the construction of the projection 66 it forms an enlarged space 68 between the lower end of the trolley and the adjacent surface of said guard. The object of this space is to allow the lower end of the trolley to have the required sway and to allow space for dust and dirt that may be scraped out of the conduit by the plow 33. A flange 69 is formed on the lower edge of said guard 64, which projects outward from the conduit-casing, so that said guard can be connected to the cross-ties, or any other suitable bearing. A vertical web 70 is formed integral with the flange 69, and the adjacent surface of the guard at intervals intermediate the length of said guard, to strengthen the guard and prevent wagons, or other heavy vehicles, from fracturing it as they are driven over it.

At intervals intermediate the length of the conduit-casing, are cut-away portions in the portion 5 of the conduit to allow access to the trolley in case it should become inoperative, or otherwise need the attention of an operator. These cut-away portions are closed by a cover 71, which is so formed that its upper surface will be in horizontal alignment with the upper surface of the conduit-casing and not interfere with the trolley or plow as they pass.

Referring to Figs. 11, 12 and 13, I have illustrated a coupling 72 which is for the purpose of coupling the main conductor 14 together when it is formed in sections and allow said conductor to expand and contract. This coupling is constructed of electrical conducting material, and one end is made rigid with the adjacent end of the section of the conductor 14, and the coupling is so formed that it will cover about three-fourths of its circumference, and there will be about one-fourth of the circumference of the conductor bare, so that the brush can come in contact with said conductor. The adjacent end of

the adjacent section of the conductor 14 is provided with a bifurcation 73, which fits over a longitudinal projection 74 formed integral with the coupling 72, and extends across the space within said coupling. Said projection 74 is about the same width as the conductor is in diameter, so that when the bifurcation is placed thereon, the free edge of the projection will close the bifurcation and make the surface of the conductor smooth, so that the brush can readily pass over it.

For holding the adjacent end of the loose section of the conductor in connection with the coupling, I have constructed a slot 75 in the adjacent end of the projection 74 and a pin 76 is passed through the conductor and through the slot. By this construction, the loose section of the conductor can yield relative to the coupling, and the pin 76 will hold said conductor in engagement with said coupling.

In Fig. 14 I have shown a modified form of conductor, and the coupling which is made use of when this modification is used.

77 indicates the coupling which is constructed of electrical conducting material, and one end is made rigid with one end of the section of the conductor 14 and the adjacent end of the opposite section of said conductor is constructed with a bifurcation 78, which is engaged by a projection 79 formed integral with the coupling, and a slot 80 is formed in the engaged end of said projection which is engaged by a pin 81. Said pin passes through the end of the loose section of the conductor, and through the slot which holds said end in engagement with the coupling and allows it to move longitudinally thereon.

In Figs. 16, 17 and 18 I have illustrated a modification of the trolley and conduit, in which said trolley carries the main conductor and the return conductor, and said conduit carries both the main conductor and the return conductor.

82 indicates the trolley, which is formed of two portions 83 and 84. The adjacent edges of said portions are hinged together by a hinge 85. Said portions 83 and 84 are constructed of insulating material, and the portion 83 is provided with a conductor 86, and the portion 84 with a conductor 87. The conductor 86 is engaged adjacent its lower end by a conductor 88, which is engaged by the brush-holder 89. This brush-holder is the same in construction and operates the same as the brush-holder 22 hereinbefore described, it carrying a brush which engages the main conductor 14. The conductor 87, which is carried by the portion 84 of the trolley 82, is engaged adjacent its lower end by a conductor 90, which is engaged by a brush-holder 91, which is the same in construction as the brush-holder 89, it carrying a brush which leads to the return conductor 92. These conductors 86 and 87 are the same in construction as the conductor 31, hereinbefore described.

93 indicates the circuit-breaker, which is the

same in construction as the circuit-breaker 44, and said circuit-breaker 93 engages the conductor 86. 94 indicates a circuit-breaker, which is the same in construction as the circuit-breaker 93, and engages the conductor 87. These circuit-breakers 93 and 94 are carried by a device 95, which is formed of insulating material, and is the same in construction as the device 43, with the exception that it is made large enough to carry two circuit-breakers.

96 indicates a pipe, which is connected to the ears 97 of the circuit-breakers 93 and 94, and leads to and is connected to an ear carried by the trolley-bar 56.

The projection 98 carried by the portion 83 of the trolley projects into the conduit-casing 4, while the projection 99 carried by the portion 84 of said trolley projects into the conduit-casing 100. These conduit-casings 4 and 100 are the same in construction, with the exception that one is right-handed, while the other one is left-handed, they being placed adjacent each other, so that the conduit in one casing will be in alignment with the conduit in the other. (The same reference numerals will appear on both to designate the same parts.)

The projections 98 and 99 of the trolley 82 are the same in construction as the projection 19 of the trolley 18, with the exception that these projections 98 and 99 carry but one brush-holder.

Connected to the free ends of each of the projections 98 and 99 is a plow 101, the same in construction as the plow 33, and connected to the opposite end of each of said projections is a plow 102, the same in construction as the plow 101, with the exception that it is longer in plan view, so that the free end will be in transverse alignment with the free end of the plow 101.

In Fig. 19 I have illustrated the conduit-casing constructed of two pieces of metal 103 and 104, formed substantially the same as the pieces 5 and 6 of the conduit-casing 4, with the exception that there is a longitudinal depression 105 formed in the inner surface of the vertical portion 106 of the piece 103, and a depression 107 is formed in the lower surface of the piece 104 of said casing, adjacent the depression 105. These depressions 105 and 107 are to allow a strip of insulating material 108 to be located therein, which carries the main conductor 14. By the construction of these depressions, it can readily be seen by inspecting Fig. 19, that the shoulders 109 and 110, caused by the depressions 105 and 107, will prevent said insulating material from being detached from the casing until the pieces 103 and 104 have been separated, they being connected by screws or bolts, or by any other well known means.

Having described the operation in connection with the mechanical description of each part, I will now proceed to describe the same as a whole.

The car or other vehicle to which my improved trolley is connected, is constructed with the usual motor and electrical connections for operating it. The conductor 14 being charged with electricity, it will pass from said conductor through the brushes and brush-holders to the conductor which carries said brush-holders; thence through the conductor 31 and through the circuit-breaker 44 when it is in engagement with said conductor 31, and thence through the conductor 49 to the motor of the car, which will cause the car to move in the direction indicated by the arrow in Fig. 1, and the trolley-bar being connected to said car and the plow, which is connected to the trolley, it will cause said plow and trolley to move in the same direction. The plow being in advance of the trolley, it will scrape out the dirt and dust from the conduit that may have accumulated therein. The plow being pivoted to the trolley in the manner hereinbefore described, and the corners rounded, it can yield relative to the trolley, as is required when the car rounds a curve, or the conduit-casing is irregular.

What I claim is—

1. A conduit for electric railways, constructed of a casing 4 formed of two pieces of insulating material 5 and 6, the vertical projection 9 of the piece 6 constructed with a longitudinal depression 13 on its inner surface adjacent its upper end in which the conductor 14 is located, and held in position by a projection 15 carried by the piece 5 of said casing, substantially as set forth.

2. A casing forming a conduit, comprising two pieces of insulating material 5 and 6, the piece 5 formed wider than the piece 6 so that its free edge will project a distance over the free edge of said piece 6, and a downwardly pending projection 10 formed integral with the free edge of said piece 5 and having its lower edge at an angle relative the base of the casing, substantially as set forth.

3. In an electric railway, the combination with a casing forming a conduit constructed of two pieces of insulating material formed substantially as herein described and carrying the main conductor, of a trolley constructed of insulating material having a projection on one side adjacent its lower edge which projects into the conduit and constructed to slide upon the casing therein, a series of brush-holders located in suitable depressions in said projection and fulcrumed on the conductor, a brush connected to the free end of each of said brush-holders, a spring connected to the under side of each of the brush-holders, the free end of which engages the projection within the depression and holds the brushes up in contact with the conductor, a spring connected to the upper surface of each of the brush-holders, the free end of which engages the adjacent side of the brushes and prevents them from being disengaged from the conductor, and an electrical conductor located in the trolley having its

lower end in contact with the conductor upon which the brush-holders are pivoted, substantially as set forth.

4. The combination with a casing forming a conduit, of a trolley formed of insulating material, having a projection on one side adjacent its lower end, and so formed as to fit within the conduit, brush-holders located in depressions formed in said projection and fulcrumed to a conductor having its bearings in said trolley, brushes carried by said holders and means for holding them in contact with the main conductor which is located within the conduit, a conductor having its upper end attenuated located in said trolley and having its lower end in connection with the first mentioned conductor, a circuit-breaker having its lower end attenuated and carried by a device formed of insulating material, two bars connected to the upper end of said device, a bar pivoted between the upper ends of said bars and extending upward through an opening in the platform of the car, said device which carries the circuit-breaker supported by a pipe, one end of which is pivoted to an ear carried by said circuit-breaker, and the opposite end pivoted to an ear carried by the trolley-bar, substantially as set forth.

5. The combination with the herein described trolley, of a plow having a depression in its upper edge and a projection on one side, which is constructed with one end in the form of a mold-board, and said projection so constructed that it will fit within the conduit, substantially as set forth.

6. In combination with the herein described conduit-casing, of a plow having a depression in its upper edge and a projection having a chamber therein for carrying lubricant, substantially as set forth.

7. In combination with a car, of a trolley-bar having one end pivoted thereto and carried thereby and the opposite end constructed with projections and bent so as to engage the plow within the depression 40, and means for disengaging the trolley-bar from the plow, substantially as set forth.

8. The combination with the herein described underground conduit-casings 4 and 100, of a trolley 82 constructed of two portions 83 and 84 having their adjacent edges hinged together by a hinge 85, a projection 98 formed on one side adjacent the lower end of the portion 83 and a projection 99 formed on the portion 84 adjacent its lower end on the opposite side from the projection 98, a brush-holder 89 located in a depression and fulcrumed to an electrical conductor 88, which is carried by the portion 83, the brush carried by said brush-holder constructed to engage the main conductor and means for holding it in connection therewith, a brush-holder 91 located in a depression in the projection 99 and fulcrumed to an electrical conductor 90 carried by the portion 84, the brush carried by said brush-holder constructed to engage the return-conductor 92 and means for holding it

in contact therewith, a conductor 86 having  
its lower end in contact with the conductor 88,  
located in the portion 83 of said trolley, a con-  
ductor 87, having its lower end in contact with  
5 the conductor 90, located within the portion  
84 of said trolley, circuit-breakers 93 and 94  
carried by a device 95, constructed to engage  
the conductors 86 and 87, means for disen-  
gaging said circuit-breakers from said con-  
10 ductors 86 and 87, a conductor leading from  
the circuit-breaker 93 to the motor, and a con-  
ductor leading from said motor to the circuit-  
breaker 94, all arranged and combined to oper-  
ate in the manner set forth.

9. An electric railway system, comprising 15  
a traveling vehicle, a main conductor, a con-  
tinuous insulated holder for said conductor,  
a detachable trolley carried by said vehicle  
and guided by said conductor-holder, a con-  
tact carried by said trolley and suitable elec- 20  
trical connections, substantially as set forth.

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

JULIUS L. HORNIG.

Witnesses:

M. GRIFFIN,  
JNO. C. HIGDON.