

(No Model.)

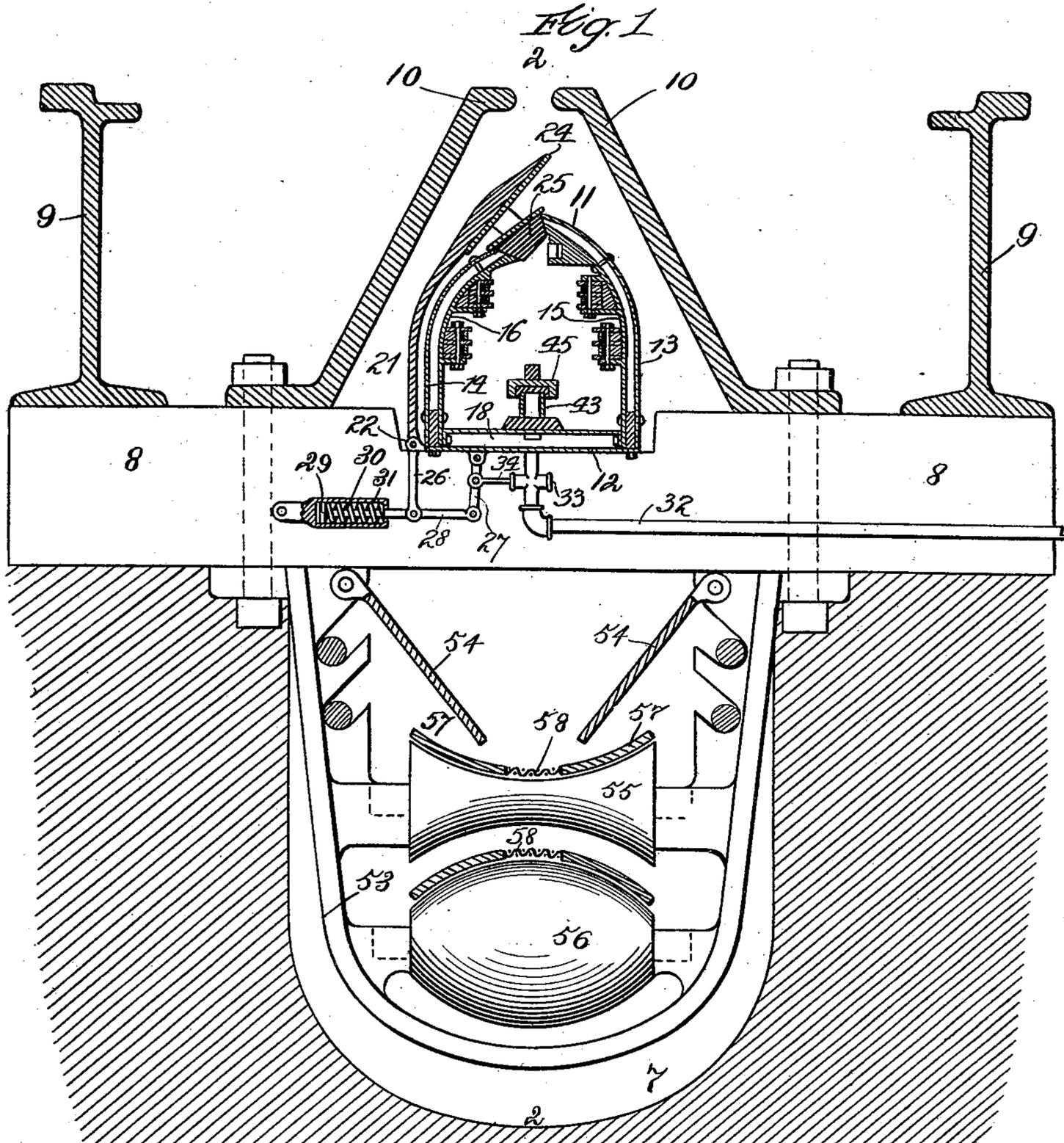
4 Sheets—Sheet 1.

E. A. MATHERS.

UNDERGROUND CONDUIT FOR ELECTRIC ROADS.

No. 528,963.

Patented Nov. 13, 1894.



Witnesses:
 Wm. J. Fleming
 Harry White

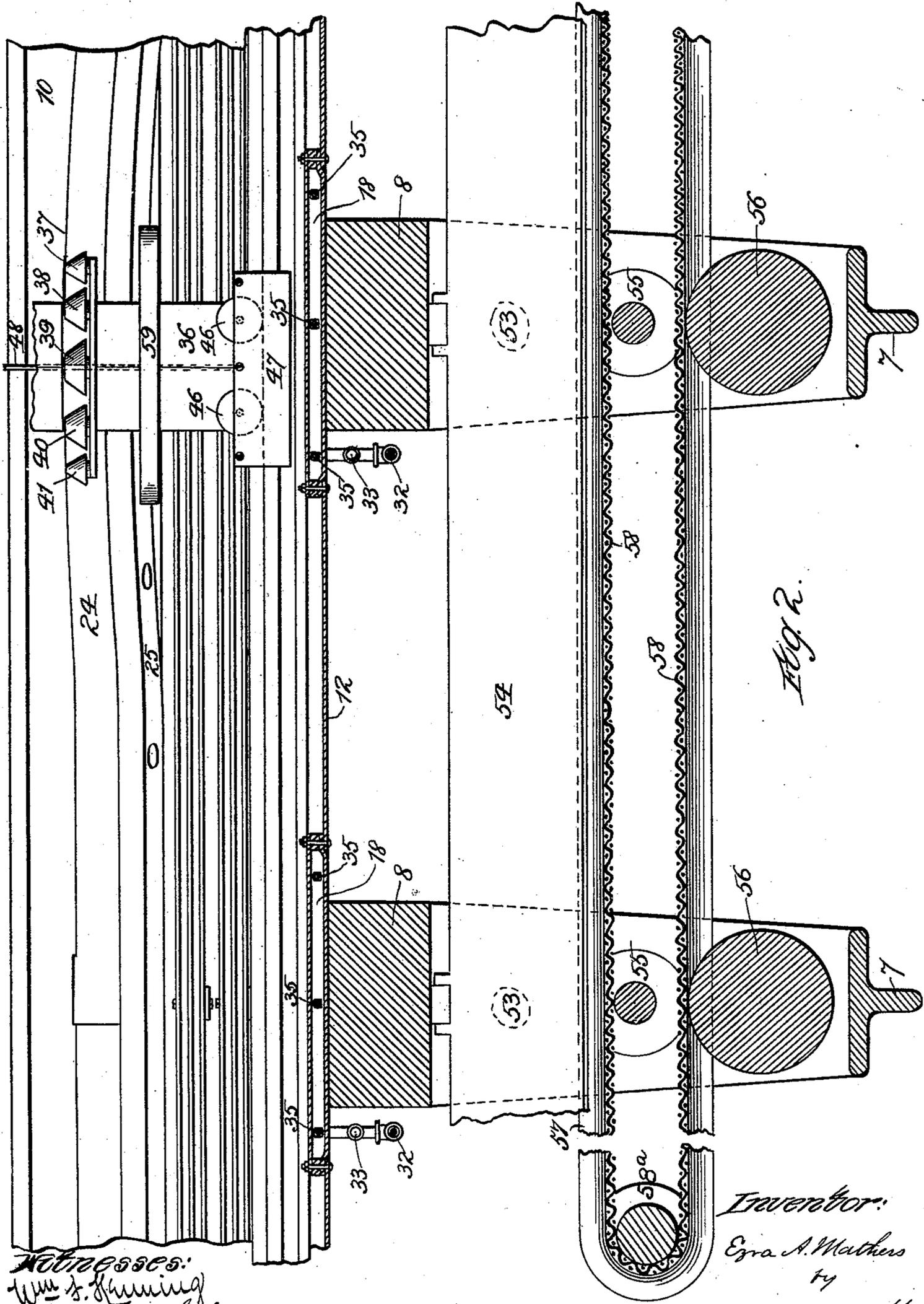
Inventor:
 Ezra A. Mathers
 by
 Bond, Adams, Pickens & Jackson
 Attys.

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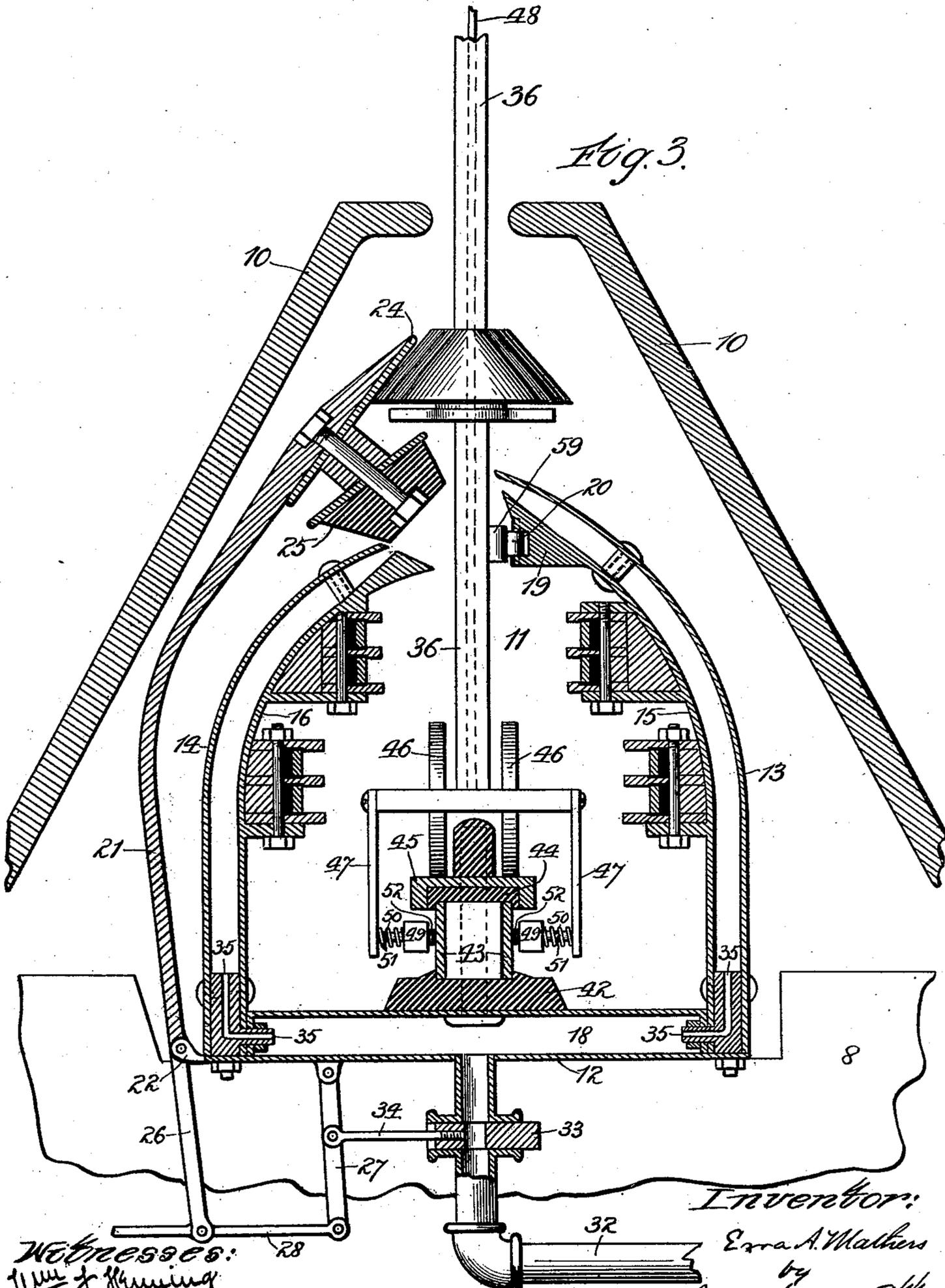
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4 Sheets—Sheet 4.

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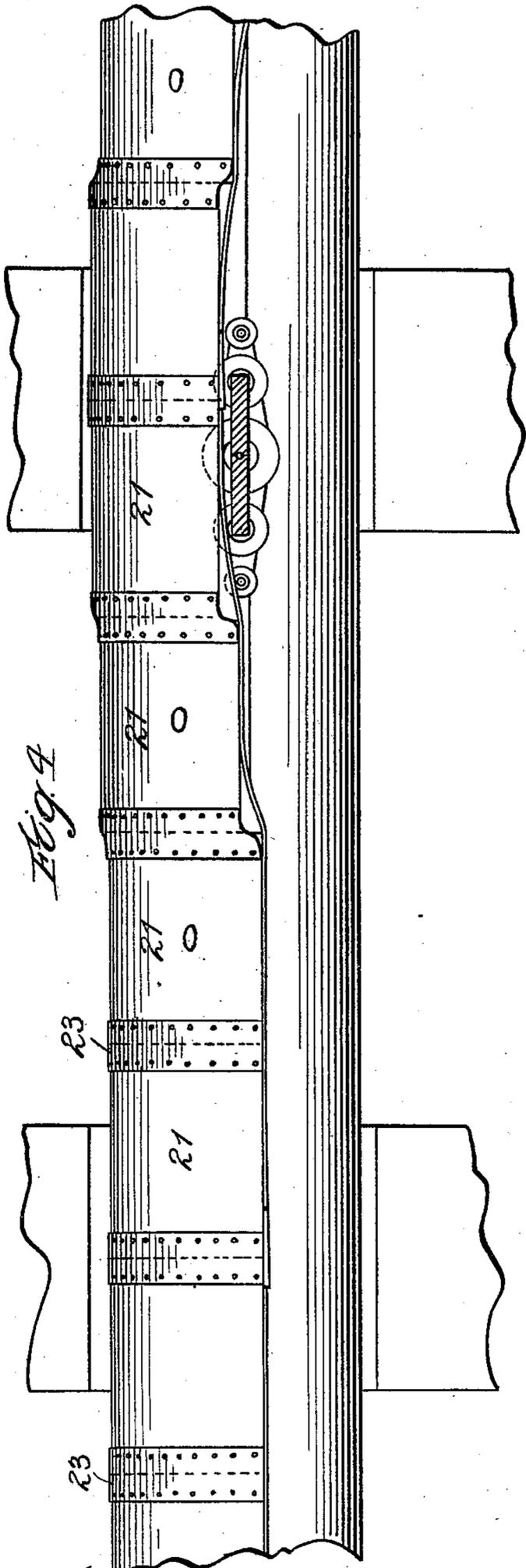


Fig. 4

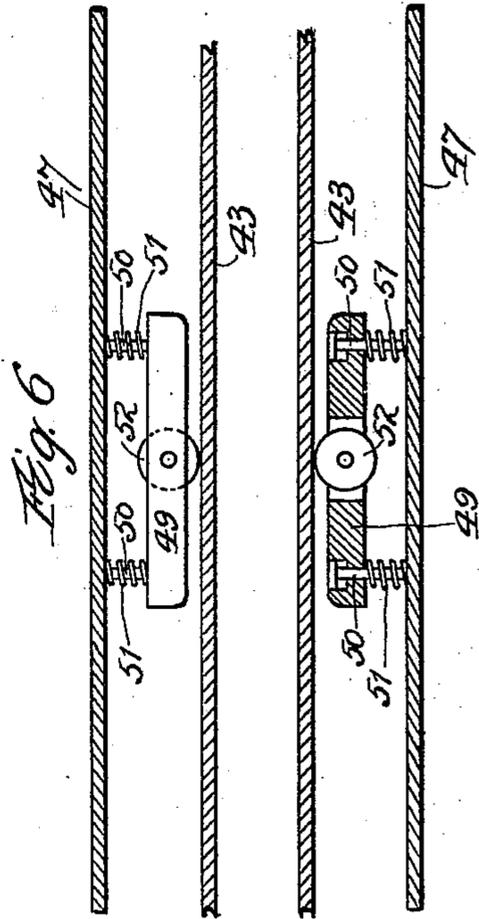


Fig. 6

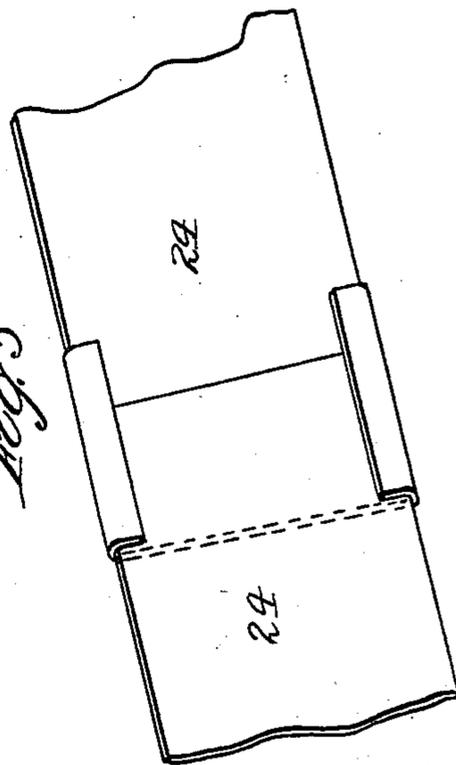


Fig. 5

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UNITED STATES PATENT OFFICE.

EZRA A. MATHERS, OF ROMEOVILLE, ILLINOIS.

UNDERGROUND CONDUIT FOR ELECTRIC ROADS.

SPECIFICATION forming part of Letters Patent No. 528,963, dated November 13, 1894.

Application filed June 12, 1894. Serial No. 514,347. (No model.)

To all whom it may concern:

Be it known that I, EZRA A. MATHERS, a citizen of the United States, residing at Romeoville, Will county, Illinois, have invented certain new and useful Improvements in Underground Conduits for Electric Roads, of which the following is a specification, reference being had to the accompanying drawings, in which—

10 Figure 1 is a vertical cross section. Fig. 2 is a vertical longitudinal section upon line 2—2 of Fig. 1. Fig. 3 is an enlarged detail, being a vertical cross section through the inner conduit. Fig. 4 is a detail, being a top
15 or plan view of the inner conduit. Fig. 5 is an enlarged detail, being a view of a portion of the bearing plates, showing the manner of connecting the same. Fig. 6 is an enlarged detail, being a horizontal longitudinal section
20 on line 6—6 of Fig. 3.

My invention relates to underground conduits for electric roads, and one of its objects is to provide an improved conduit which may be located entirely below the surface of the
25 street or ground, within which may be arranged an electric conductor or conductors through which the current may be supplied to the motors by means of a suitable trolley carried by the car and passing into such conduit from above, and being provided with
30 suitable devices to make contact with the conductor or conductors in said conduit.

Another object of my invention is to provide means for closing the inner conduit in
35 which the conductors are mounted, so as to exclude dirt, dust and water, and at the same time to provide means by which the closing devices may be opened by the trolley arm to allow its passage through said conduit.

40 Another object of my invention is to provide an inner conduit with closing devices so arranged that when opened by the passage of the trolley arm, when the outer conduit may become filled with water, water will be pre-
45 vented from entering into the inner conduit in which the inner conductors are mounted.

Another object of my invention is to provide new and improved means by which water or dirt which may enter the outer con-
50 duit may be carried away.

Another object of my invention is to pro-

vide a conduit which will be readily accessible from below for repairs, rendering it unnecessary to tear up the surface of the street for such purpose. 55

Further objects of my invention relate to certain improved details of construction which will be hereinafter described.

I accomplish all the objects of my invention as illustrated in the accompanying draw-
60 ings and as hereinafter described, and that which I regard as new will be set forth in the claims.

In the drawings 7 indicates a trench which is dug in the ground along the line of the
65 proposed railway tracks, and which is of suitable width and depth.

8 indicates ties which are placed above and across the trench 7 at the usual and appropriate intervals. 70

9 indicates car rails which are secured to the upper surfaces of the ties 8.

10 indicates plates, which are bolted or otherwise secured to the upper surface of the
75 ties 8. The plates 10 are arranged so that they incline toward one another, their upper and inner edges parallel, forming a slot through which the trolley bar passes, and forming a continuous outer conduit within
80 which the inner conduit hereinafter described is located.

11 indicates the inner conduit, which is composed of a base plate 12, outer side plates 13—14 and inner side plates 15—16. The
85 base plate 12 is bolted or otherwise secured to the upper surface of the ties, in which I prefer to cut recesses for the reception of such base plate, as shown in Figs. 1 and 3. The outer side plates 13—14 curve upward and inward from the base plate, the side
90 plates 13 being so bent as to come somewhat above the upper edges of the side plates 14 and somewhat nearer the central longitudinal plane of the inner conduit, as is best shown in Figs. 1 and 3. 95

The base plate 12 and the side plates 13—14 are arranged so as to form a continuous conduit lying within the outer conduit formed by the plates 10, open at the top in a slot formed by the space between the upper edges
100 of the plates 13—14 and directly below a slot between the upper edges of the plates 10.

The inner plates 15—16 are mounted above the bed-plate 12 and within the outer plates 13—14, and a suitable distance therefrom, and are in general parallel therewith until
 5 within a short distance of the upper edges of such plates 13—14, where they are curved upward so as to narrow the space between the outer and the inner plates, forming openings between them of suitable width. The
 10 inner plates 15—16 are so arranged with reference to the outer plates that a continuous conduit is formed with double sides.

At suitable distances from one another, and preferably over each of the conduits, are
 15 located air chambers 18 upon the top of the bed plate 12, as best shown in Figs. 2 and 3, and so constructed as to be air-tight except for the openings in the bed plate through which air is admitted, as hereinafter de-
 20 scribed, and except for the openings by which the air chambers 18 communicate with the passage between the inner and outer side plates, as hereinafter described.

The upper ends of the inner plates 15 are
 25 provided with thickened portions or shoulders 19, in which is journaled a series of rollers 20 which revolve upon vertical axes and form a bearing for the trolley bar, as hereinafter described.

21 indicates curved plates of suitable width, which are pivoted at their lower ends to ears 22 projecting from one side of the base plate 12. The plates 21 extend upward and curve inward over the outer side plates 14,
 35 and are of suitable width to permit them to be opened successively by the passage of the trolley bar, as hereinafter described. The plates 21 are connected together by flexible bands 23, which are bolted or otherwise suit-
 40 ably fastened to the plates 21.

24 indicates flexible plates of steel or other suitable material, which are bolted or otherwise secured to the upper ends of the plates 21 and upon their inner surfaces.

45 The plates 24 may be made of any suitable and convenient length. I have shown them in Fig. 4 as extending across four of the plates 21, but they may be made either longer or shorter as convenience may demand.

50 In order to insure flexibility of the plates 24 and play between them at their adjacent ends, I connect them in the manner shown in the detail Fig. 5, in which one of the plates is shown as having wings projecting from
 55 each side which are bent over and above the end of the next plate, so that one may slide upon the other.

25 indicates flexible strips of rubber or other suitable material which are secured
 60 upon the under side of the flexible strips 24, and are so shaped as to fit within the opening between the outer side plates 13—14 of the inner conduit and provide a continuous plug for such opening, preventing the pas-
 65 sage into the inner conduit of water, dust or dirt.

Opposite each of the air chambers 18 the plates 21 are provided with downward projecting arms 26, which arms are rigidly se-
 70 cured to or integral with the plates 21 located opposite said air chambers.

27 indicates arms pivotally mounted upon the base of the bed plate 12 below each air chamber 18.

28 indicates a rod pivotally connected with
 75 the lower ends of the arms 26—27. The outer end of the rod 28 is provided with a head 29 which bears upon a spiral spring 30 which is mounted in a casing 31. The casing 31 is pivotally mounted upon the ties 8 below each
 80 air chamber 18. The tension of the spring 30 is such as to force the lower end of the arm 26 downward, thus tending to keep the plug 25 constantly closing the opening in the
 85 top of the inner conduit.

32 indicates pipes connected with any suitable reservoir of compressed air and opening through the bed plate 12 into each of the air chambers 18.

33 indicates a valve in the pipes 32, which
 90 is connected by a rod 34 with the arm 27 and is so arranged that when the plates 21 are swung upward and outward by the passage of the trolley bar, as hereinafter described, the valve 33 may be opened, admitting com-
 95 pressed air through the pipe 32 into the air chamber 18, whence it passes by suitable openings 35 into the space between the inner and outer side plates of the inner conduit.

36 indicates a trolley bar which depends
 100 from a car in the usual manner, (and therefore not shown or described fully herein,) passing through the slot between the inclined plates 10 and through the slot or longitudinal opening in the top of the inner conduit.
 105

37—38—39—40—41 indicate conical bearing pulleys journaled upon vertical axes upon the trolley bar 36, and adapted to bear upon the flexible plates 24 as the trolley passes along. These conical bearing pulleys
 110 are so arranged that the one of greatest diameter comes in the middle and they diminish in diameter on each side of the middle bearing pulley 39. As the trolley bar is moved along by the passage of the car over-
 115 head, the bearing pulleys 37—38—39—40—41 bearing against the flexible plates 24 force it upward and outward, carrying with it the plates 21 in succession and raising the plug
 120 25 from the opening in the top of the inner conduit to permit the passage of the trolley bar. The plates 21 being made of comparatively narrow width, and the plates 24 and plug 25 being flexible, only a small portion
 125 of the slot is opened at any one time.

59 indicates a horizontal cross bar which is secured to the side of the trolley bar 36 in such a position as to bear upon the rollers 20, thus giving the trolley bar a bearing on the side opposite to the flexible plates 24 and
 130 holding it firmly so as to bear upon and open said plates.

The action of the springs 30 combines with the weight of the plates 21 to throw the plug 25 back into the opening behind the trolley bar as it passes along, as is best shown in Figs. 2, 3 and 4, where the plates 24 and plug 25 are shown as bent by the action of the conical pulleys on the trolley bar and lifting the plug 25 from a portion of the slot in front of and behind the trolley bar. At the same time, as the trolley bar passes along and opens the plates, as it comes opposite each air chamber 18 the valves 33 are successively opened, as above described, and the compressed air passes through the pipes 32 into the air chambers 18 and into the passage between the inner and outer side plates of the inner conduit, passes forcibly out between said plates at their upper edges and thereby prevents the passage into the inner conduit of any water, in case the outer conduit formed by the inclined plates 10 should become filled with water. The falling of the plates 21 from their own weight and from the action of the spring 30, as above described, closes the valves 33 successively after the passage of the trolley bar.

42 indicates a base of insulating material, which is mounted at the bottom of the inner conduit above the upper surface of the air chambers 18.

43 indicates conductors which are mounted in the insulating base 42.

44 indicates a plate of insulating material mounted above the conductors 43.

45 indicates a bearing plate supported above the insulating plate 44.

46 indicates wheels or rollers which are journaled upon the lower end of the trolley bar and bear upon the upper surface of the plate 45 which forms a track upon which they run, supporting the trolley bar.

47 indicates metallic plates which are mounted upon the lower end of the trolley bar, one upon each side thereof, and connected with a conductor 48 which leads to the motor.

49 indicates metallic blocks which are mounted upon the inner side of each of the plates 47, by means of pins 50 which are secured to the inner surface of the plates 47 and which pass through suitable openings in the blocks 49.

51 indicates spiral springs which bear upon the blocks 49 and the plates 47, tending to throw said blocks 49 inward toward the conductors 43.

52 indicates contact wheels which are mounted in the blocks 49 and bear upon the conductors 43.

53 indicates supports, which are secured to the under side of the ties 8 and depend downward into the trench 7.

54 indicates deflectors which are mounted on the supports 53 just below the ties 8 and depend downward and inward therefrom so as to form deflectors by means of which any

water or dirt which may get into the outer conduit formed by the plates 10 may be directed toward the middle of the trench 7.

55—56 indicate rollers which are journaled in the supports 53. The rollers 55 are concave and the rollers 56 are convex.

57 indicates endless belts passing over the rollers 55—56. The belts 57 are connected by a narrow strip of wire netting or other meshed material 58, and the belts 57 and the wire netting 58 form one continuous belt, the upper surface of which is given a concave shape by passing over the rollers 55—56. The belt is driven by any appropriate mechanism, as for example by a driving pulley or drum 58^a driven by the machinery in the power house located at any desired point along the line. The meshes of the netting 58 are made of suitable size to prevent the passage through them of any larger particles of solid matter, but to permit the passage through them of any water. The belt may be made of any desired length, the object being to convey as it moves along any dirt or other solid matter to convenient manholes or other openings in the trench where the dirt is deposited and from which it may be removed in any way. Any water falling through the slot between the plates 10 into the trench will pass through the meshes of the netting 58 and fall thence into the bottom of the trench 7, whence it is conveyed in any suitable manner to sewers in the street or road-way.

The manholes or other openings by which the dirt deposited by the belt may be removed, and the sewers or other means for conveying the water, together with the passages from the trench into the same, may be of any approved and well known pattern, and hence are not shown or described herein.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a slotted conduit having double sides forming air spaces opening into the slot on each side, of a flexible plug fitting the slot in said conduit and adapted to be lifted for a portion of its length from said slot by the passage through said slot of a trolley bar, and to close behind said trolley bar as it passes, pipes adapted to convey compressed air and communicating with said air spaces, and mechanism operated by the lifting of said plug to permit the compressed air to flow from said pipes into said air spaces as said plug is lifted, substantially as described.

2. The combination with a slotted conduit having double sides forming air spaces opening into the slot on each side, of plates pivoted at one side of said slotted conduit, a flexible plug mounted upon said plates, extending throughout the length of said conduit and adapted to fit into and close said slot, a trolley bar extending downward through said slot and adapted to bear against said plates successively in its passage through said

slot and to raise them successively, whereby said plug is lifted from said slot for a portion of its length by the passage of said trolley bar, said plates being adapted when relieved from the pressure of said trolley bar to fall back and force said plug again into said slot, pipes adapted to convey compressed air and communicating with said air spaces, and mechanism operated by the lifting of said plug to permit compressed air to flow through said pipes into said air spaces as said plates are lifted and to shut off the passage of such compressed air when said plates fall again into place, substantially as described.

3. The combination with a slotted conduit having double sides forming air spaces opening into the slot on each side thereof, plates pivoted at one side of said slotted conduit, a flexible plug mounted on said plates and adapted to fit into the slot in said conduit throughout its length, and a flexible bearing plate mounted on said plates, of a trolley bar adapted to pass downward through said slot in said conduit, conical rollers mounted upon said trolley bar and adapted to bear against said flexible plate, whereby said plates may be successively raised and said flexible plug lifted from said conduit throughout a portion of its length by the passage of said trolley bar, mechanism adapted to throw said plates and plug back as said trolley bar passes, pipes adapted to convey compressed air and connecting with said air spaces, and mechanism operated by the passage of said trolley bar to permit compressed air to flow through said pipes into said air spaces as said plug is lifted by the passage of the trolley bar, substantially as described.

4. The combination with an outer slotted conduit, an inner slotted conduit having double sides forming air spaces opening into the slot of said inner conduit on each side, plates pivoted upon one side of said inner conduit, a flexible plug mounted upon said plates, extending the length of said conduit and adapted to fit into and close the slot therein, and a trolley bar adapted to pass through said slots into said inner conduit and

to bear against said plates successively as it passes along said conduits, whereby said flexible plug is lifted for a portion of its length from said slot, of air chambers in said inner conduit opening into said air spaces between the sides thereof, pipes adapted to convey compressed air and opening into said air chambers, valves in said pipes, and mechanism connecting said valves with said plates, whereby said valves are opened to permit the passage of air into said air chambers as said plates are raised, and closed as said plates fall back, substantially as described.

5. The combination with a conduit adapted to contain electrical conductors and wires, of a trench below said conduit, supports mounted below said conduit in said trench, rollers journaled in said supports, a belt carried upon said rollers, and mechanism for moving said belt, substantially as described.

6. The combination with a conduit adapted to contain electrical conductors and wires, of a trench below said conduit, supports mounted below said conduit in said trench, rollers journaled in said supports, a belt carried upon said rollers and having open network in the middle thereof extending throughout its entire length, and mechanism for moving said belt, substantially as described.

7. The combination with a conduit adapted to contain electrical conductors and wires, of a trench below said conduit, supports mounted below said conduit in said trench, pairs of rollers mounted one above the other, the upper rollers being concave and the lower rollers being convex, a belt carried upon said rollers and having open network in the middle thereof extending throughout its entire length, mechanism for moving said belt, and deflecting plates mounted in said trench above said belt and adapted to throw dirt or other matter falling into said conduit upon said belt, substantially as described.

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Witnesses:

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