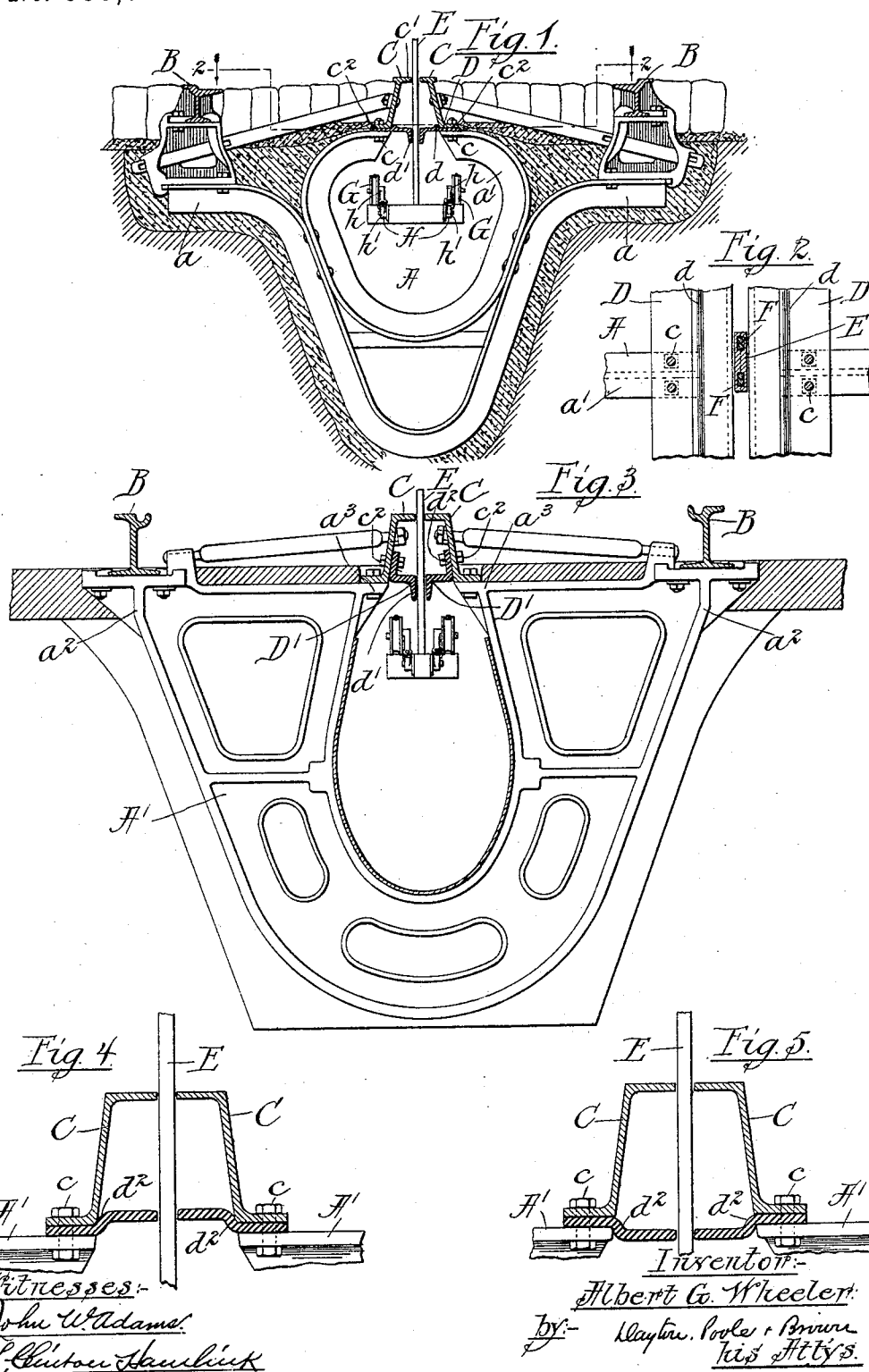


A. G. WHEELER.  
UNDERGROUND RAILWAY CONDUIT.

Patented June 1, 1897.



# UNITED STATES PATENT OFFICE.

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## UNDERGROUND RAILWAY-CONDUIT.

SPECIFICATION forming part of Letters Patent No. 583,524, dated June 1, 1897.

Application filed March 5, 1896. Serial No. 581,876. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT G. WHEELER, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Underground Railway-Conduits; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in underground conduits for the supply wires or conductors of electric railways, and more especially to conduits which are provided with a longitudinal slot through which passes a supporting-bar, which is attached to the car and supports at its lower end a traveling contact device moving in contact with the conductor or conductors within the conduit.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the operation of electric railways having a slotted conduit and conductors supported therein, together with a supporting-bar for traveling contact devices attached to each car or car-truck, it has been found that injuries to the conductors and supporting-insulators thereof are very liable to occur by means of quick and sudden lateral movements of the car or truck, which tend to throw the supporting-bar for the contact devices out of its vertical position and to thereby throw undue strain upon the conductors within the conduit and subject the same to violent shocks and blows. This may be better understood from consideration of the following facts:

The wires or conducting-strips are located within the conduit parallel with the slot thereof and are supported by insulators which act to prevent displacement of the said wires or strips and to withstand the lateral strains thereon. The carrying or supporting bar, which is attached to the car, passes downwardly through the slot of the conduit and at its lower end is provided with trolleys or other contact devices having movable connection with the carrying-bar and which

bears against the conductor or conductors. The said supporting-bar is movably connected with the car-body to provide for the lateral movement of said car-body with relation to the slot of the conduit, such movable connection commonly being such as to enable the bar to slide sidewise on the car body or truck, as shown, for instance, in the prior patent to John C. Love, No. 511,343, dated December 26, 1893. In whatever way the bar is connected with the car, however, inasmuch as the said bar is confined from lateral movement by the side walls of the slot engaging the bar at one point only, lateral movement of the car will tend to throw the bar into an inclined position or forcibly oscillate the same. Moreover, when the bar is adapted to slide sidewise on the car or truck sudden and violent movements of the car will similarly oscillate the bar, because the bar cannot slide quickly enough on the car to prevent quick sidewise motion being transmitted thereto, and it follows that the upper end of the bar will be thrown or moved sidewise with the car and its lower end thereby swung laterally or oscillated. In other words, by the engagement of the bar with the conduit-slot the latter acts as a fulcrum about which the bar is swung or moved, in the manner of a lever, through the quick or jerky lateral movements of the car acting at its upper end, thus giving quick and violent oscillations to the lower end of the bar, with the obvious result of bringing sudden and severe strains on the conductors and their insulators. Moreover, such strains would result, even if ample provision for lateral vibration or movement of the trolley wheels or pulleys with relation to the arm be provided for, (as by the construction shown in J. C. Love's patent, No. 511,343, of December 26, 1893,) because the shifting of the pulleys relatively to the bar could not take place promptly enough to prevent quick oscillatory motions of the bar being transmitted to the trolley-wheels or contact-pieces.

To avoid the objections stated, I propose to place within the slotted conduit below the bars or "slot-rails," which form the slot in the top of the conduit, two guide-rails, which

constitute a secondary guide-slot for the supporting-bar of the carrying devices. Such guide-rails serve to maintain the said bar at all times substantially in a vertical position and to prevent oscillatory motion of the bar under lateral shocks and blows which arise from the sudden lateral movements or lurching of the car, and which, in the absence of such guide-rails, would be transmitted to the conductors and insulators within the conduit, as hereinbefore set forth.

In prior patents granted to John C. Love December 26, 1893, is shown a slotted conduit having slot-rails, which are provided with depending flanges adjacent to the slot, which flanges are practically parallel with each other and serve to prevent water dripping through the slot from falling upon the conductors, and also in a measure operate to prevent any considerable deflection of the bar from its upright position, so that said flange to a certain extent performs the function of the secondary guide-rails above described. Such flanges, however, do not possess all of the advantages of the secondary guide-rails hereinbefore referred to, for the reason that they cannot be extended downward far enough to secure the best results without making them unduly deep and heavy, and, moreover, they cannot be well made of sufficient strength, especially if very deep, to properly hold the supporting-bar from lateral deflection under the severe strains to which the said bar is subjected. Moreover, the said slot-rails shown in said patent to Love can only be made in new constructions, where the yoke is especially designed to support it, while the secondary guide-rails herein described may be placed in conduits already built with any other form of slot-rails to afford a guide-slot to hold the supporting-bar from lateral movement and thereby prevent blows on the bar from breaking the insulations or supports for the conductor-bars.

A construction embodying the features of separate guide-rails, as above described, is therefore of special value in converting a cable-road conduit into a conduit for electric railways, for the reason that such rails can be easily inserted and secured in place within a cable-conduit as ordinarily constructed without rebuilding the conduit or doing any considerable work therein.

In the accompanying drawings, illustrating my invention as applied to a conduit originally designed for a cable-road, Figure 1 is a sectional view of a conduit of that kind having a wrought-metal yoke. Fig. 2 is a detail section thereof, taken on line 2 2 of Fig. 1. Fig. 3 is a similar sectional view of a conduit provided with cast-metal yokes. Fig. 4 is a view in cross-section of the slot-rails and guide-rails of a conduit, showing a modified form of the latter. Fig. 5 is a similar detail sectional view showing another modification of the same.

As shown in said drawings, Figs. 1 and 2, A indicates one of the yokes of a conduit, in this instance made of wrought metal and consisting of an outer bent beam *a*, on the ends of which the track-rails B B are supported, and an inner bent beam *a'*, the upper ends of which are turned inwardly and support the slot-rails C, which are secured to the ends of the said beam by bolts *c*.

The slot-rails C are shown as made of the usual form and having a central main part or web which is inclined downwardly and outwardly from the perpendicular, an upper flange *c'*, which forms part of the surface of the roadway, and a lower flange *c''*, which rests on the upper ends of the yokes. The bolts *c* are shown as inserted in the usual manner through the lower flanges *c''* of the rails and through the flanges of the beam *a'* of the yoke.

DD indicate guide-rails, which are attached to the conduit below and parallel with the upper flanges of the slot-rails and which form a secondary guide-slot at a considerable distance below the main slot of the conduit. As shown in said Figs. 1 and 2, each guide-rail D consists of a relatively wide and flat plate arranged horizontally and having its outer marginal part inserted between the slot-rails C and the top of the yoke and secured in place by the same bolts *c* by which the slot-rail C is secured to the yoke, the guide-rail being provided with suitable bolt-apertures, through which said bolts pass. The rail D is shown as provided with a rib *d* on its top surface, which is located in position to bear against the inner surface of the slot-rail and thus form a bearing surface or shoulder to aid in holding the plate in place and to prevent excessive lateral strain from coming on the holding-bolts. Such rib also serves as a guide in inserting the guide-rails to insure their being accurately placed in the first instance. The guide-rail D is also shown as provided with a depending flange *d'* at its inner end, which serves the purpose of presenting a relatively broad or wide surface for contact with the trolley-supporting arm to prevent excessive wear on or cutting of the same. Said flange also serves to insure that any water reaching the guide-rails from the slot above them shall drop from the inner edge of the same directly to the bottom of the tunnel or conduit and thus avoid the liability of water running backwardly on the under surface of the guide-rail and dripping on the conductors or insulators.

E indicates an upright supporting-arm which is attached to the car-truck or car and extends downwardly through the conduit-slot into the interior of the same, and which carries the traveling contact devices by which current is taken from the conducting-strips or line-wires F F within the conduit. As herein shown, the said arm carries two grooved wheels or trolleys G, which are supported by pivoted arms H, connected with the lower end

of the carrying-bar, and which are lifted by suitable springs to hold the trolleys in contact with the conductors. Each of the arms H consists of two parts or sections  $h h'$ , which are

5 joined by a transverse pivot arranged in a vertical plane, so as to give oscillatory movement of the trolleys toward and from the supporting-bar in the manner described in said Love patent, No. 511,343, hereinbefore referred to.

10 The presence of the lower or guide rails DD, forming a guide-slot for the trolley-supporting arms, as above described, obviously prevents any considerable oscillatory movement in the said bar, with the result of avoid-

15 ing rapid or sudden lateral movements or vibrations of the lower end of the bar and the contact devices thereon and the avoidance of sudden and violent strains or blows on the conductors, which would result from such

20 movement of the contact devices in the absence of the guide-rails, and which, when the latter are present, are received or taken by the said rails.

In Fig. 3 I have shown my invention in somewhat different form as applied to a conduit having cast-metal yokes. In this instance A' indicates the conduit-yokes, having arms  $a^2 a^2$ , which support the track-rails, and inwardly-extending integral arms  $a^3 a^3$ , in

30 which the slot-rails C are supported. Said slot-rails are in this instance substantially like those shown in Fig. 1. In this instance, also, guide-rails D' are employed, which, instead of being secured in place by the bolts

35 which fasten the slot-rails to the yokes, are secured directly to the slot-rails by means of bolts  $c^2$ , passing through holes in the central parts or webs of the slot-rails. The guide-rails D' in this instance are provided with

40 upwardly-extending flanges  $d^2$ , which rest against the inner surface of the slot-rails, and through which said bolts  $c^2$  pass, the slot-rails being otherwise constructed as hereinbefore described—that is to say, being located

45 considerably below the level of the top flanges of the slot-rails and having depending flanges  $d'$  at their inner margins for the purposes hereinbefore stated.

In Figs. 4 and 5 I have shown guide-rails, which are secured by insertion between the slot-rails and the yokes and are held in place by the bolts  $c$ , as shown in Fig. 1. Said Figs. 4 and 5 illustrate the possibility of locating the free edges of the guide-rails in any desired vertical position or distance from the slot-rails by making bends  $d^2$  in the central parts of the guide-rails, so as to throw their free or working edges either above or below

50 their parts which are secured to the yokes. When such central bends  $d^2$  are present, they obviously may serve the same purpose as the flange  $d$ , (shown in Figs. 1 and 2)—that is to say, they may be utilized as shoulders by which the guide-rails may be more easily

65 placed in position in assembling the parts

and more firmly held in position against lateral strains coming thereon:

All forms of the guide-rails illustrated may be secured in place without requiring any internal work on the conduit itself and by merely removing the slot-rails. In the construction wherein the guide-rails are held by the same bolts which secure the slot-rails in place it is merely necessary to remove the slot-rails and place beneath them guide-rails provided with properly-spaced bolt-holes and then replace the holding-bolts so as to secure both rails to the yokes. In this construction no change of any kind is required either in the conduit itself or in the slot-rails. In the construction illustrated in Fig. 3 it is only necessary to remove the pavement sufficiently to punch or bore bolt-holes in the old slot-rails and attach the guide-rails thereto. Such attachment of the guide-rails may be accomplished with little trouble, and thus cause no delay to traffic in a cable or an electric road while making such necessary changes.

A guide-rail secured in a conduit below the slot-rail thereof so as to form a separate guide-slot, while performing generally the same functions as the flanges of the slot-rail of conduits for electric railways of the kind shown in the said Love prior patents, has several advantages over such flanges. One of such advantages is that by the use of such guide-rails guiding-surfaces for the supporting-bar may be located at any point desired, and in a position much lower than is practicable by the use of depending flanges on the slot-rails, without making the latter unduly massive and heavy, thereby making it practical to locate the lower guide-slot at any distance below the upper slot that may be found desirable to secure the best results in preventing vibratory or oscillatory movement of the said bar.

Another advantage gained by the construction described is that by the use of separate guide-rails the supporting-bar is engaged by the guide-rails at two separate points only, thus avoiding the friction that will arise from contact of the same with a wide or deep flange.

Another and very important advantage of the invention as applied to conduits already constructed for cable-railways is that the change of construction to afford double and vertically-separated guides for the supporting-bar may be easily and quickly made at a very slight expense.

I claim as my invention—

1. A slotted conduit comprising slot-rails, supports to which the same are bolted, and guide-rails which are secured to the slot-rail supports by being inserted between said slot-rails and their supports, substantially as described.

2. A slotted conduit comprising transverse yokes, slot-rails bolted to the same, and

guide-rails attached to the yokes below and parallel with the slot-rails, and forming a guide-slot beneath said slot formed by the slot-rails, substantially as described.

- 5 3. A slotted conduit comprising transverse yokes, slot-rails bolted to the same, and guide-rails which are secured in place by being inserted between the slot-rails and the yokes, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALBERT G. WHEELER.

Witnesses:

E. MCD. HAWKES,  
JOHN MCGRAIL.