(No Model.)

2 Sheets—Sheet 1.

H. M. LANE.

GRIP CABLE RAILWAY.

No. 344,533. Patented June 29, 1886.

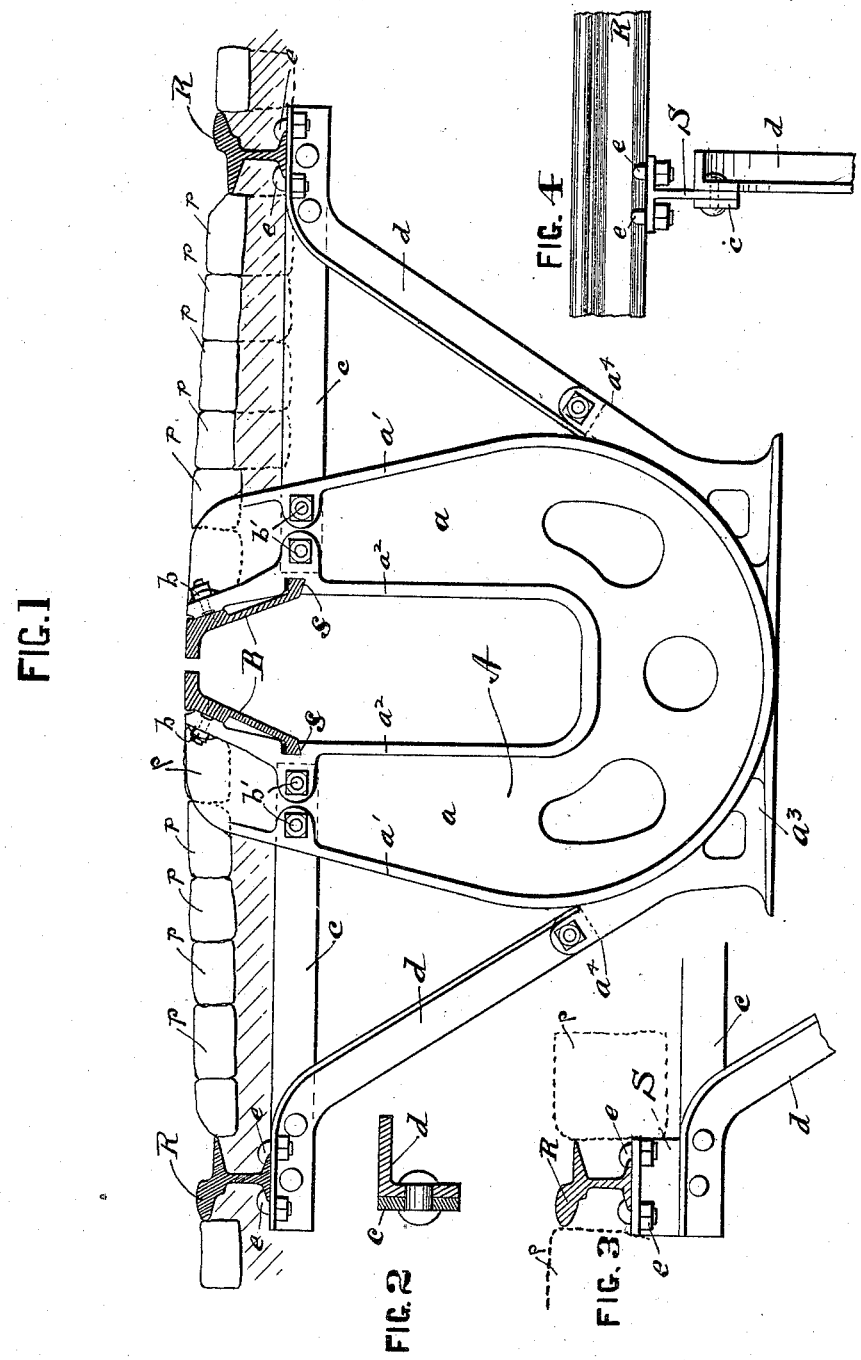

FIG. 1

FIG. 4

FIG. 2

FIG. 3

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 5

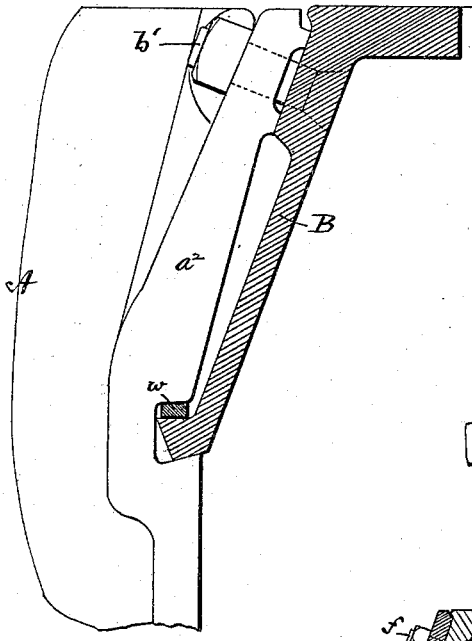


FIG. 6

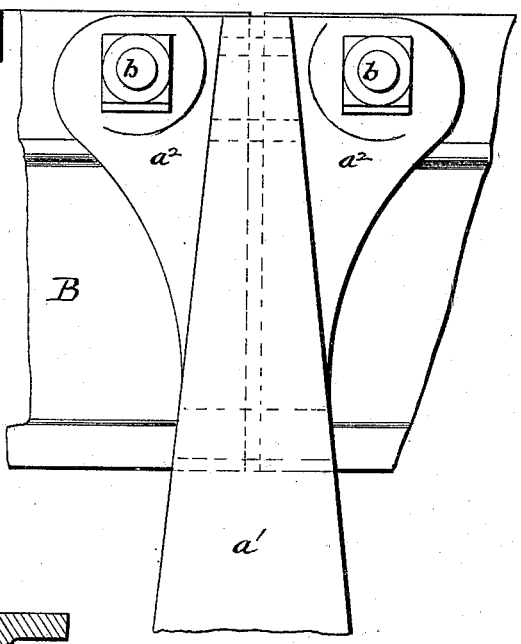


FIG. 7

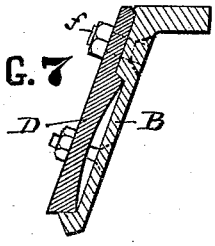
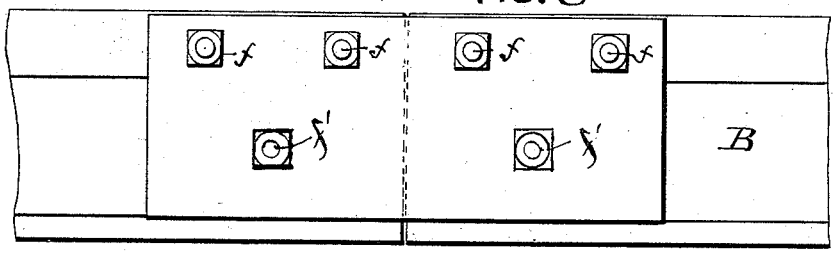


FIG. 8



WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY M. LANE, OF NORWOOD, OHIO.

GRIP-CABLE RAILWAY.

SPECIFICATION forming part of Letters Patent No. 344,533, dated June 29, 1886.

Application filed March 10, 1885. Renewed May 1, 1886. Serial No. 200,888. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. LANE, a citizen of the United States, residing at Norwood, Hamilton county, Ohio, have invented new and useful Improvements in Grip-Cable Railways, of which the following is a specification.

My invention relates to improvements in the construction of retaining-yokes and of slot-rails for cable railways, its object being to secure a more rigid and perfect alignment of the slot-rails, both as to the lineal jointures and as to the slot or opening between opposite rails through which the grip-shank of the car passes.

My invention has more particular application to those cable-tunnels whose upper portion is formed by two slot-rails held in place by yokes arranged at suitable intervals, the rails being spaced apart at the roadway-surface by the width of the desired opening in which the grip-shank travels. In this construction it is obvious that as the upper horizontal flanges of the slot-rails constitute a portion of the roadway traversed by loaded vehicles a heavy strain is constantly imposed upon the joints, tending to impair not only the lineal alignment of the tunnel, but also the uniformity of the slot-opening, both of which it is absolutely necessary to preserve intact. Moreover, as heretofore constructed, besides being generally imperfect and inefficient in these particulars, the ordinary yokes offer certain obstructions to the proper paving of the street, and the construction is unnecessarily expensive.

These objections are overcome in my improvements, which consist, first, in the construction of a retaining-yoke adapted to receive and maintain the slot-rails with great rigidity, (and serve, also, as a lineal jointure, when desired,) by the use of countersunk bolts and wedges offering no obstruction interiorly; second, in the combination therewith of a system of brackets affording a secure support for the tram-rails in such relation to the roadway as not to obstruct the paving, and which enables me to dispense with other cross ties or stringers; and, third, in the construction of the slot-rail, so as to insure its firm retention in the yoke, and also to permit the more rigid and secure fastening at lineal joints when occurring independently of the yokes by a correspondingly-formed splice-bar, all as hereinafter more fully described.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which Figure 1 is a front elevation of the yoke and connecting-brackets with cross-sections of the slot and tram rails; Fig. 2, a detail cross-section of the bracket-joint beneath the tram-rails; Figs. 3 and 4, a detail side and end elevation of a slight modification in which a rail "chair" is employed to elevate the tram-rail; Fig. 5, an enlarged partial front elevation of one of the yoke-jaws, with cross-section of the slot-rail secured in position; Fig. 6, a partial side elevation of the yoke and of the slot-rail secured in position; Fig. 7, a cross-section of the slot-rail through its splice-joint; and Fig. 8, a side elevation of the splice-joint and contiguous slot-rails.

Referring now to the drawings, in which the parts herein described are indicated by letters of reference, A designates the yoke proper, made substantially in U form, narrowed at the top to conform to the angle and slope of the slot-rails B, which are secured centrally within and between the upper extremities of the yoke by bolts *b*, and resting at the bottom in horizontal open slots *c*, formed in the inner faces of the yoke-jaws. The yoke is formed as a web or plate, *a*, whose plane of greatest dimension is perpendicular to the longitudinal axis of the cable-tunnel, terminating in flanges or ribs perpendicular to the web, as indicated in Fig. 6. The flanges are of about equal thickness and strength throughout, following the outer and inner contours of the yoke, excepting that the inner flange, a^2, is increased in width at each upper extremity to afford space for two bolts, *b*—one at each side of the web—for securing the slot-rail B, while the outer flange, a', is narrowed and merged in the web at the top, to give space for paving-blocks *p* at each side of the web. At all other points the flanges are of full width and thickness, and equally capable of resisting both tensile and compressive strains.

The yoke A is provided with an external foot or base, a^3, of sufficient horizontal dimensions to give a secure rest for the yoke in the earth. Attached externally to the yoke at each side are two brackets, each consisting of

a rectangular tie-bar, *c*, having its greatest width in a vertical plane, secured firmly by bolts *b' b'* to the body of the yoke at one side, which may be arranged sufficiently below the surface of the roadway to clear the paving-blocks *p*, or occupy an intermediate position between the adjacent rows of paving-blocks, and a brace or strut, *d*, formed of angle-iron, supported by and bolted at its lower end to a projection, a^4, of the base, and extending at an outer angle to near the outer end of the tie *c*, where it is bent to a corresponding horizontal position, and securely riveted, as shown in Figs. 1 and 2. The lateral flange of the strut *d* projects over and affords a "thrust" bearing for the brace against the projection a^4, while the web rests flatwise against the side of the projection and receives the bolt-connection. The tram-rails R rest upon the two brackets, near their outer extremities, being secured by hook-bolts *e*, passing through the horizontal flange of the angle-iron *d*. If the rail is not of sufficient height alone, a shoe, S, consisting of a short section of angle or T iron, is riveted between the tie-bar *c* and brace *d* at their horizontal meeting-joint, as shown in Figs. 3 and 4, upon which the rail is secured in the manner described, and as indicated in the figures.

It will be seen from this construction that any vertical strain upon the slot-rails is received by the yoke in its plane of greatest dimension—that is, of its web—and that its resisting power is materially aided by its flanges, the inner of which is subjected to compressive and the outer to tensile strain, while the weight upon the tram-rails R is, by means of the brackets, brought to bear upon the yoke in the opposite direction. The advantage, therefore, of having the flanges equally capable of resisting both compressive and tensile strains will be apparent.

It should be mentioned that the web of the yoke is suitably thickened at the point of junction with the horizontal brace *c* to counterbalance any weakening caused by the bolt-holes for the bolts *b'*, and is generally thickened at its upper extremity to insure its strength in holding the slot-rails. It should also be mentioned that the web of the yoke is widest at its lower portion, where breaking-strains are greatest. As thus constructed, the yoke and its brackets may be finished complete at the place of manufacture, and placed in position completed for the attachment of the slot-rails and tram-rails.

In describing the construction of the slot-rails B with reference to their attachment to the yoke, it should be explained that hitherto slot-rails of this description (commonly called "Z-irons,") have been constructed of substantially uniform thickness and plane surfaces throughout, with a comparatively wide flange at the bottom, which usually constitutes its sole bearing upon the yoke. In former constructions the slot-rail generally rests and is secured by bolts through its bottom flange upon the top of the yoke, the vertical strains—tending to decrease the slot-opening, and caused by the wedging action of paving-blocks, weight of vehicles, the action of frost, &c.—being resisted by an independent tie-bar extending outward and downward from near the top of the slot-rail, and connecting with a brace extending outward and upward from the yoke below, or to the stringer and cross-tie of the track-rail. Another construction depresses the tunnel proper, and extends the yoke entirely above and over the same, the slot being at one side of the center and entirely above and independent of the tunnel, the yoke in such case extending up to the roadway, and taking all the strain of vehicles, &c., upon its bent angles, and the whole involving an independent tunnel-casing, a large excavation, and more expensive and cumbrous castings, and a longer grip-shank, on account of the waste space involved.

It will be observed that in my improvement the yoke is extended upward in two symmetrical jaws, and a union with the slot-rail is made near the upper angle of the slot-rail, the lower flange of which is omitted, and there is formed instead a short foot of wedge form in cross-section, widening outwardly, which rests within the open slot S of the yoke, extended horizontally through the inner rib. Moreover, I thicken the slot-rail at the upper portion, thereby giving additional resisting-strength at its upper angle and point of attachment to the yoke, the surplus metal being removed from the body of the web below and immediately contiguous to its foot, the change of form thus occasioning no increase of weight or of cost.

The bolts *b*, by which the slot-rail is attached to the yoke, are countersunk from within in the slot-rails, flush with the inner surface, and thus form no obstruction whatever within the tunnel.

The slot S in the yoke in which the foot of the slot-rail enters being of the same depth as the width of the foot of the slot-rail, the space between the lower ends of the slot-rails within is practically the width between the jaws of the yoke. The slot S is also of wedge form, corresponding with the foot of the slot-rail, and the latter is held by a bar or wedge, *a*, driven into the slot above the foot of the slot-rail, forming a perfectly secure and inexpensive fastening, the wedge form of the foot and slot tending to keep the parts securely in position against withdrawal, as clearly shown in Fig. 5.

The thickening of the slot-rail above, as already described, prevents weakening of the rail by boring the bolt-holes. It will be observed that by this construction I obtain all possible strength from the yoke to resist the tendency of the use of the roadway to close the slot-rail opening, and at the same time utilize the slot-rails as the roof of the tunnel, thereby elevating the entire tunnel. Also, by the system of brackets, and the use of vertically-webbed rails, (the yokes being arranged

about five feet apart,) I am enabled to utilize the yokes as the joint supports for contiguous rails, as indicated by dotted lines in Fig. 1, thereby avoiding the necessity of other cross-ties and stringers for the track-rails, and generally the use of splice-bars for the slot rails. The described construction of the slot-rails, however, affords an opportunity for a much better lineal jointure of contiguous rails than formerly, where such is required independently of the yokes, as will be understood from the following description and a reference to Figs. 7 and 8, representing such lineal jointure of contiguous slot-rails. Heretofore such jointure was formed by a flat plate placed against the outside or flat web of the rail and held by bolts. In such case the vertical strains upon the joint by the passage of loaded teams over the surface, &c., were necessarily brought to bear upon the bolts alone with a very considerable shearing force. My improved construction of the rail enables me to use a splice-bar or plate, D, having its inner surface formed with a re-enforce or thickened portion exactly fitting between the shoulders of the slot-rail, formed by the upper thickened portion of the same and its foot. The upper fastening-bolts, *f*, in such case are passed through the thickened portion of the slot-rail only, and are countersunk from within in the manner already described, and the lower bolts, *f*, are passed through near the neutral axis of the slot-rail and countersunk in the same manner. Thus the function of the fastening-bolts is principally to hold the splice-bar against the slot-rail, while the strains are taken chiefly by the shoulders, already described, forming a more secure fastening than formerly.

The advantages of the structure as a whole are important in materially lessening the cost of construction and maintenance of cable railways, and insuring permanency and efficiency. In addition to those specifically mentioned or indicated hereinbefore, it will be apparent that the yoke and brackets, as a homogeneous structure, can be made complete and ready for placing immediately in position without any fitting or attention on the ground. Consequently they may be interchanged and replaced with facility at any time. Again, the tie-rod *c* being arranged in the manner described and secured rigidly to the main body of the yoke, offers no obstruction to paving, and is practically beyond the reach of any injury or strains from weight upon the roadway. Again, the yoke and brackets together constituting the support for the track-rails, whereby the entire track-system is practically supported upon the yoke as a base, the tunnel slot and trackway are always maintained in proper relative alignment, thereby materially lessening the wear and injury of the grip mechanism ordinarily caused by the settling of the track or tunnel independently of each other. Again, by the elevation of the tunnel and the complete utilization of the entire space between the slot-rails with perfectly plain surfaces, unbroken even by bolt-heads, I am able to shorten the grip-shank and employ lighter and less expensive grip mechanism by elevating the cable nearer to the point of attachment on the cars.

I do not herein claim, broadly, a bracket consisting of horizontal and diagonal braces attached to the yoke, a bracket having been heretofore known in which the horizontal tie is formed of angle-iron and the diagonal brace of ordinary bar-iron. This construction, however, I not only disclaim but distinctly avoid, for the reasons which are fully apparent from my specification.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A yoke for grip-cable railways, of U form, in combination with two similar slot-rails having webs obtusely inclined to the slot-flanges, said rails being secured wholly within and between the jaws of the yoke, and constituting a symmetrical angle-arched roof of the tunnel extending outward below to the full width of the jaw-opening, substantially as set forth.

2. A cast yoke for cable railways, in U form, consisting of a web terminated marginally by flanges extended perpendicularly to the web, the inner flange being widened near the upper extremity of the yoke-jaws into lugs for the bolt attachment of the slot-rails at each side of the web, and the outer flange being merged in a thickening of the web at and near the upper extremeties of the yoke-jaws, substantially as set forth.

3. A cast yoke for cable railways, consisting, essentially, of a U-web in the cross-plane of the slot-rails, bounded inwardly by a flange extended in the lineal plane of the slot-rails, said flange provided with a suitable bottom support for and being of sufficient width to afford bolt attachments for contiguous slot-rails, forming a firm support and splice-joint for the same, as set forth.

4. A cast yoke for cable railways, in U form, having corresponding open horizontal slots in its interior faces for the reception of the foot of the slot-rails, substantially as set forth.

5. In cable railways, the combination of a U-formed yoke provided with corresponding open wedge-shaped slots in its inner faces, in combination with Z-irons constituting the slot-rails having wedge-shaped feet adapted to enter and be secured in the slots by wedges, the rails being bolted above to the jaws of the yoke, substantially as set forth.

6. In cable railways, in combination with a rigid cast yoke adapted to hold the slot-rails between its upper extremities, a side bracket consisting of a horizontal tie-bar, arranged as shown, secured to the body of the yoke and extending outward beneath the track-rail, and a strut or brace of angle-iron secured to and having also a thrust-bearing against the lower part of the yoke, and extending thence and

rigidly secured to the end of the tie-bar in a corresponding horizontal position, substantially as set forth.

7. In combination with the bracket-supports secured upon the yoke, the chair S, consisting of a section of angle or T iron, secured between the tie and brace by the connecting-rivets for elevating and supporting the track-rail.

8. The slot-rail B, as constructed for cable-railway tunnels, with the upper portion of its web thickened, and the neutral portion of the web-thinner, forming an external shallow groove bounded by the foot of the rail, and the shoulder formed by the thickened portion, substantially as set forth.

9. In cable-railway-tunnel systems, the combination of the slot-rail constructed with an external shallow groove, and a splice-bar adapted to fit such groove to form a splice-joint, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRY M. LANE.

Witnesses:
L. M. HOSEA,
ABRAM MAY.