(No Model.)

A. HAMAN.

ENDLESS CABLE GRIP, &c.

No. 287,377. Patented Oct. 23, 1883.

Fig. 3.

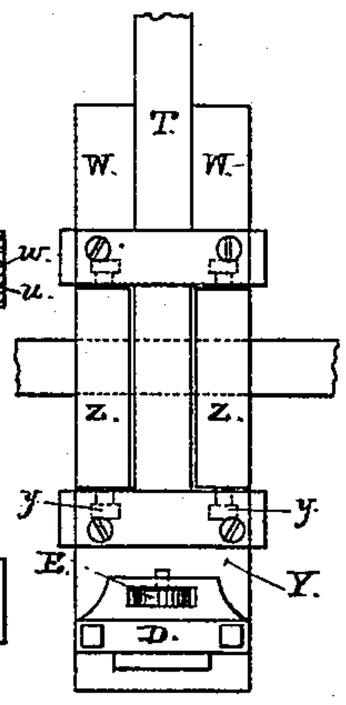


Fig. 4.

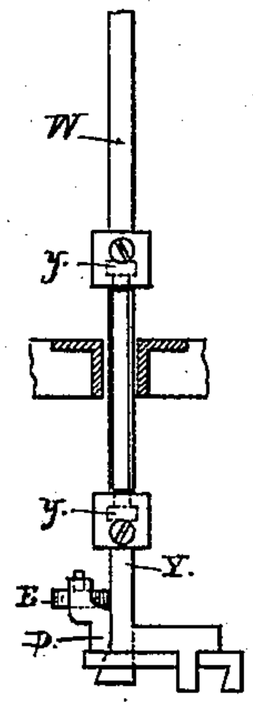


Fig. 5.

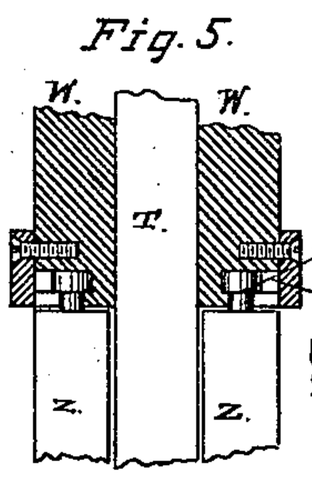


Fig. 6.

Fig. 1.

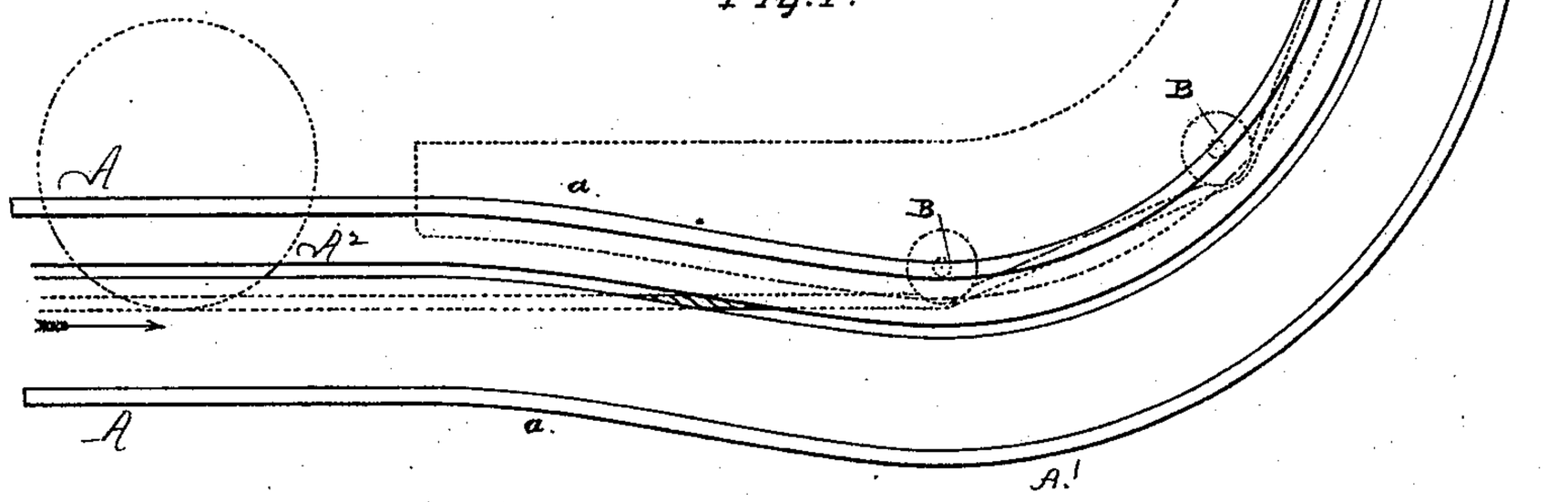


Fig. 2.

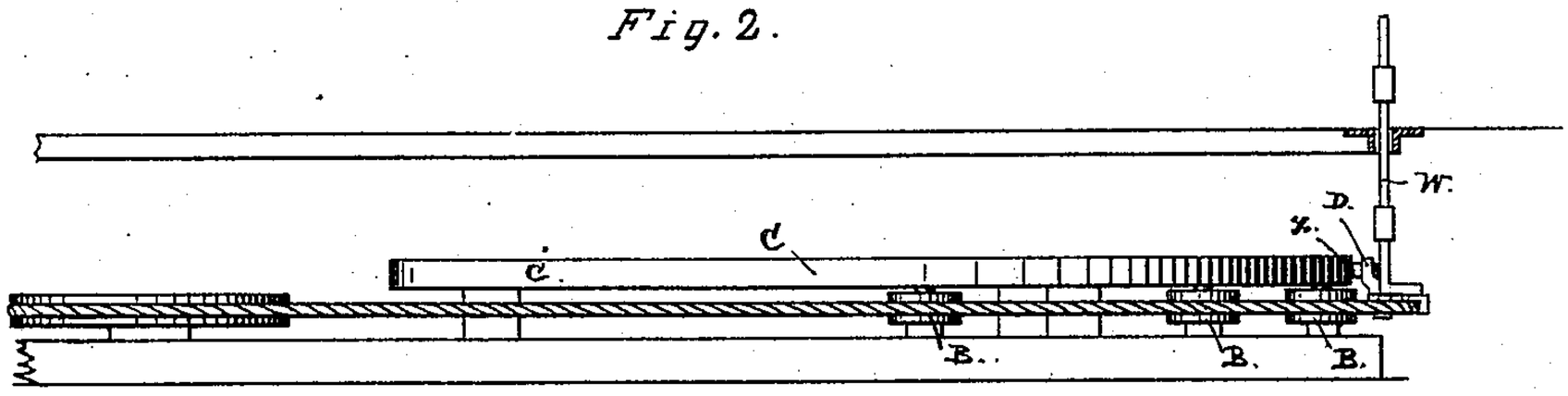
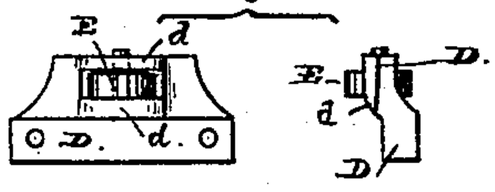


Fig. 7.



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UNITED STATES PATENT OFFICE.

AIKEN HAMAN, OF SAN FRANCISCO, CALIFORNIA.

ENDLESS-CABLE GRIP, &c.

SPECIFICATION forming part of Letters Patent No. 287,377, dated October 23, 1883.

Application filed March 3, 1882. (No model.) Patented in England May 17, 1883, No. 1,415, and in France July 17, 1883, No. 144,209.

To all whom it may concern:

Be it known that I, AIKEN HAMAN, a citizen of the United States, residing in the city and county of San Francisco, State of California, have made and invented certain new and useful Improvements in Curves for Cable Railways; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings.

My invention relates to the construction of curves or changes of direction in cable railways for carrying the roadway around corners and in directions at an angle with the principal part of the road, and to novel means, mechanism, or devices for carrying and operating the propelling-cable around curves, whereby separate propelling agents are dispensed with at these curves, and connection of carriages with propelling-cable is maintained on the curve as well as at the straight portions of the way.

It relates, also, to certain novel construction of gripping devices, all of which will be fully set forth hereinafter.

The following description fully explains the nature of my said invention, and the manner in which I proceed to construct, apply, use, and operate the same.

The accompanying drawings herein referred to show, in Figure 1, a plan or top view of the part of the cable road where a change in the direction of the track is made at right angles, only one track and slot being shown. Fig. 2 is an elevation of Fig. 1, the tunnel or underground structure not being shown. Fig. 3 is a back view of the gripper shank and lower part of the frame below the slot. Fig. 4 is a side view taken from the right hand of Fig. 3. Fig. 5 is an enlarged detail view of the shank and its frame, showing the manner of connecting the swivel-sections. Fig. 6 is a horizontal cross-section, and Fig. 7 is a detail of the bearing-roller attachment.

In constructing the track I lay out a curved portion of railway-track by joining the straight portions of the track to the terminals of the curved portion with or by means of an outward turn or reverse curve. In doing this I first carry the straight portions of the track to such points that, if joined together by a segment of a circle, would give a curved track with the straight portions tangent to it. With the radius of the circle of which the above-mentioned segment forms a part I lay out a curve exactly midway between the terminals of the two straight portions of the track, and also place this curve somewhat farther out beyond the position it would otherwise have, or so that the two straight portions, if produced to meet the curve, would not be tangent to it, but would fall inside the curve. In the gap or interval then existing betweed the terminals of the straight track and the curve, I proceed to lay out an outward curve to join the terminals of the straight and curved portions at each end. This reverse curve is an outward turn or bend of the straight track to meet and run smoothly into the curve, and the track, when completed, will take the form represented in Fig. 1 of the drawings, where A A are the straight rails, A′ A′ the curve, and *a a* the outward turns or curved terminals of the straight to join the curved track. Both rails of a track are laid out in this manner, the radii or measurements of the inner rail being properly reduced, of course, to bring the two rails parallel at all points. Tracks alone have heretofore been laid out in this manner, as may be seen in the elevated railways in New York city. The advantage of this construction is that the outward sway or movement of a carriage or train in its travel, where change of motion from a straight to a curved direction takes place at a curve, is counteracted or greatly modified, and curves of small radius can be turned with a smoothness of movement not heretofore attained and without reducing the speed of the carriage or train. For this reason this construction is particularly adapted to curves and acute changes of direction in roads where an endless cable is the motive agent, as the carriage can travel with safety at the same velocity upon the curve as on the straight track without producing excessive strain upon the cable and the gripping mechanism connecting the carriage to the cable. The same construction I apply to an endless-cable roadway by making the gripper-slot or continuous aper-

ture in the top of the cable tunnel or channel of the same curvature as the rails—*i. e.*, with a main curve portion and reverse curve terminals to join the straight end portions of the slot to the curve. This is seen in Fig. 1 of the drawings, where A A A′ A′ are the rails, and A^2 the slot.

Combined with the curved portion of the track and cable tube or channel of the cable road is a fixed guide rail or surface to control the position of the cable-gripping device at all points in its movement around the curve, and a cable-carrying sheave or set of sheaves so placed and disposed with respect to this fixed guide-rail that the draft or line of travel and the pull or strain of the cable while in the grasp of the gripping device are brought close to and as nearly as practicable in horizontal line with the point of contact and pressure of the gripping device against and upon the stationary guide-surface. This construction I carry out and apply as follows: At the part of the tube where the curve is situated I form a chamber by extending the sides of the tube to give sufficient room for a set of large cable-carrying sheaves or flanged pulleys. These sheaves are placed in suitable frame-work and bearing-blocks, and they are set at regular distances apart around the curve, so that the cable is supported and brought out to run just inside of the line of the slot, and also follow the general direction of the curve. Then immediately over these sheaves I place a single guide-rail or horizontal plate the perpendicular edge or face of which follows and takes the same curvature as the slot at all points. This edge presents a fixed surface, against which the lower part of the gripper travels. It is so placed with respect to the gripper and the line of the cable, when seized in the gripper-jaws, that it prevents the lower end of the gripper from being drawn in by the lateral strain and force of the cable, and keeps the shank or frame of the gripper as nearly as possible vertical while running through the curve. This position also of the sheaves and the fixed rail is determined by the character of the gripping device employed, for if the gripper used is of the L-shaped construction—*i. e.*, one having the gripping-jaw situated in a foot or horizontal extension of the shank or frame to take the cable at one side—it is necessary to set the sheaves and rail farther back within the line of the curve than will be required for grips of the kind that take the rope either directly from above or more nearly in line with the gripper-shank. The rail is then fixed upon the frame-work of the sheaves, to follow the level or grade of the road as well as the curvature of the slot. Small pulleys or rollers on horizontal axles are placed at points between the large sheaves, to receive and support the cable after the gripper has passed. At the point where the gripper-shank below the slot would come in contact with the guide-rail if permitted to bear against it, I fix a small traction-roller with its vertical face long enough to accommodate itself to the play of the gripper up and down in the slot and keep the contact with the guiding-edge of the rail. Its position is then as close as possible to the line of draft of the cable. This roller E is mounted in a block or bracket-piece, D, upon which there are two lugs, *d d*, with sockets for the ends of the roller E, and it is secured to the gripper by means of screws or bolts. The portion of the bracket-piece D which carries the roller E is offset from the portion which is to be screwed upon the gripper, so as to hold the roller out for contact with the rail. The bracket-piece, being secured to the gripper in a detachable manner by screws or bolts, may be applied to any gripper. If the line of road has several curves or changes to be made in opposite direction, the gripper will have rollers on both sides of the shank or frame.

The parts or devices working in this manner together serve to carry the gripper-arm in a curved slot with so small an amount of friction and strain that curves of small radius can be turned with facility, and cars can be propelled by the cable alone without any auxiliary.

The improvement is applicable to roadways already constructed where the tunnel is shallow or of small diameter, and the cable works close to the surface. No increased depth of excavation below the surface of the track is required for the guiding-plate C and the cable-sheaves, and no change in the form and construction of the gripper-shank is necessary to apply the roller.

For use in certain constructions of road, when it may be required to turn a curve of small radius, I provide a novel form of gripper-shank, by which the first width of the shank may be retained, and yet be caused to work through the curved portion of the slot without binding or creating excessive friction. This construction I have shown in Figs. 3, 4, and 5, where W may represent the part of the gripper-shank that is situated above the track, Y the portion working beneath and carrying the gripper-jaws, and Z the intermediate portion traveling in the slot. T is the vertical bar that is connected with the hand-wheel or lever above, to operate the jaws. Instead of making this frame or shank of the grip continuous bars, as heretofore, I now construct it of these three portions, the middle one, T, being connected to the adjacent two sections, W Z, above and below by a swivel-joint, so that while firmly connecting the lower to the upper portion these intermediate sections, Z Z, can turn about the points Y and take an angular position as the shank moves around the curve, and thus keep in line with it. At the straight portion of the slot, also, these sections will be brought into line, as before, and in such position that the portion of the shank working in the slot will conform to the direction or curvature of the same and move smoothly along in the

slot. In constructing this part of the gripper-shank I provide in the ends of the sections W Y slots or recesses V, to receive and give bearings for the end of the swivel-section Z. The sections Z Z are made with a cylindrical part, *w*, to work with bearings *u*, and also with an offset under the head *w*, to secure the section against vertical displacement.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a cable railway, the main curve of the track and slot, in combination with the guide-rail beneath, and the cable-carrying sheaves for carrying the cable around the curve, and a grip, as set forth.

2. The combination, with the curved track and gripper-slot, of the terminal reverse curves, the curved guide-rail, and cable-carrying sheaves, substantially as described, to operate as and for the purpose set forth.

3. The block or bracket-piece D, adapted to be secured to the lower part of a gripper-shank, and having an offset portion, with or without the bearing-roller E, substantially as described.

4. A shank or frame for endless-cable grips adapted to turn curves, having the fixed portions or sections W Y and the intermediate swiveled section Z, as and for the purpose set forth.

5. The combination, in a gripping device for endless-cable railways, of the bar T, the fixed sections W Y, and the swiveled section Z, connected together to operate as and for the purpose set forth.

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