(No Model.) 2 Sheets—Sheet 1.

J. P. HARPER.

METHOD OF UTILIZING STATIONARY CABLES ON CABLE RAILWAYS.

No. 469,330. Patented Feb. 23, 1892.

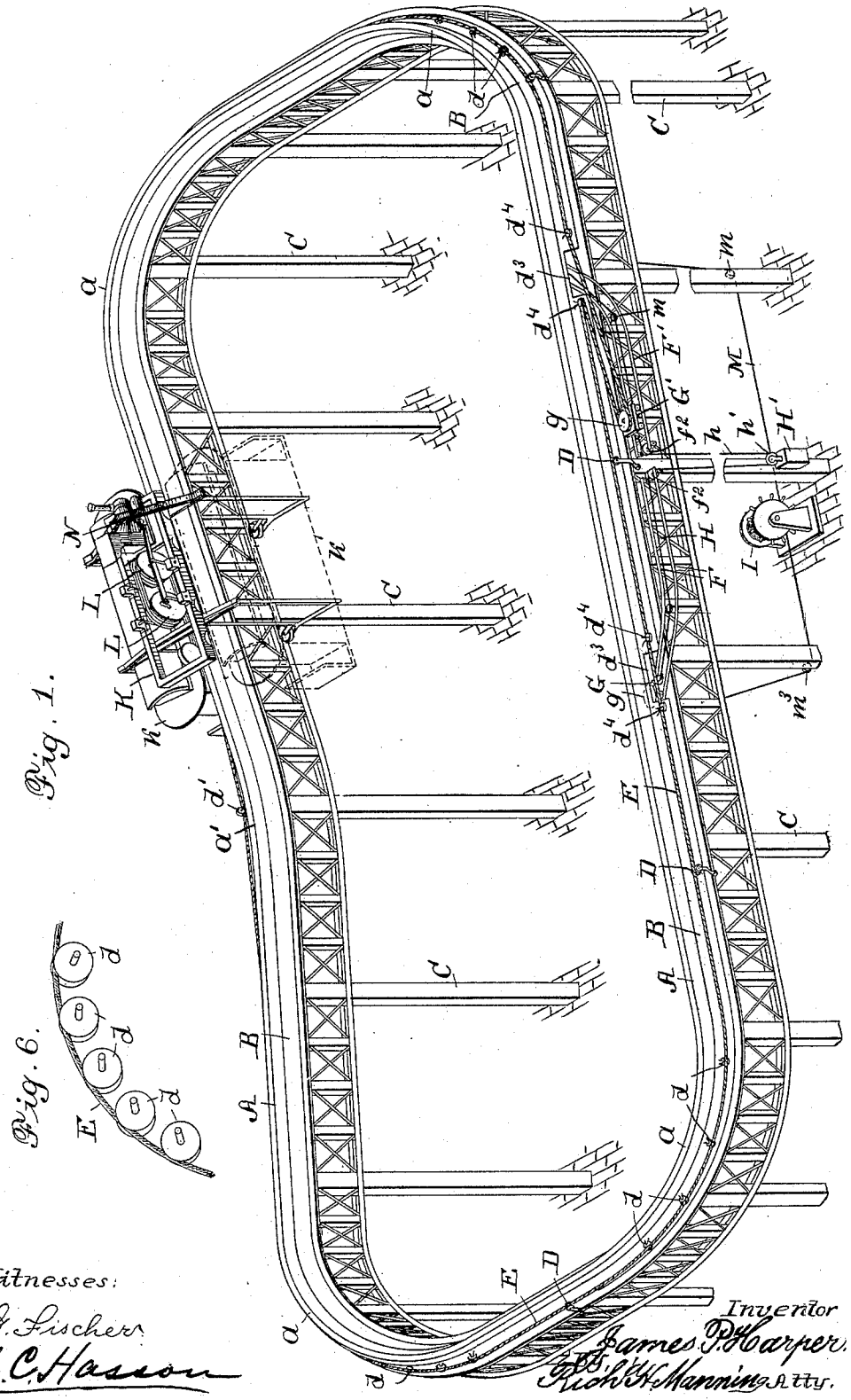

Fig. 1.

Fig. 6.

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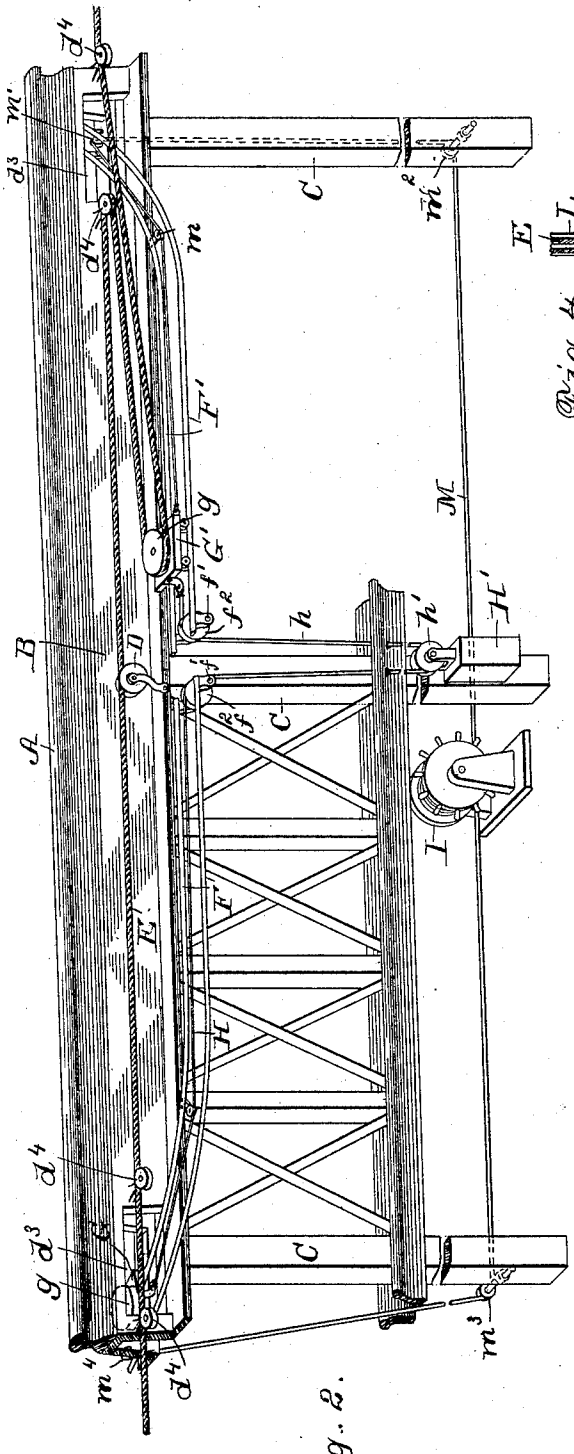

Fig. 2.

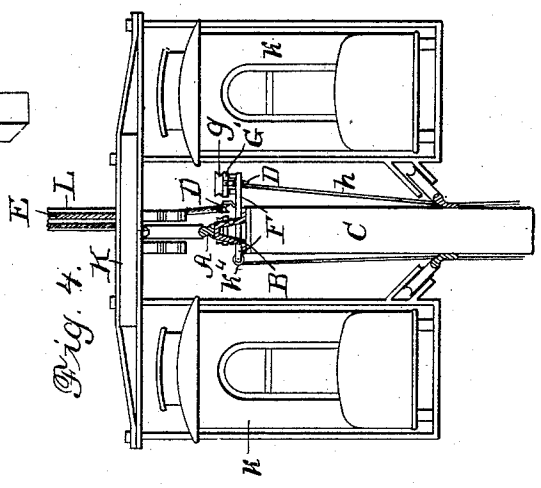

Fig. 4.

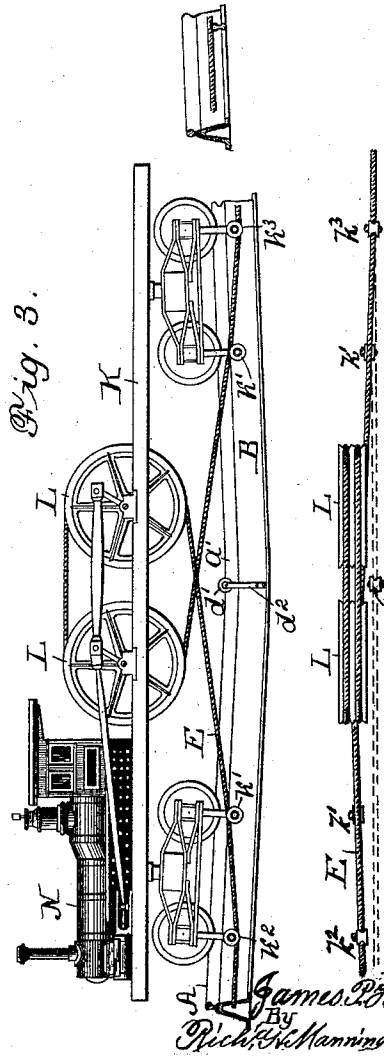

Fig. 3.

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES P. HARPER, OF KANSAS CITY, MISSOURI.

METHOD OF UTILIZING STATIONARY CABLES ON CABLE RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 469,330, dated February 23, 1892.

Application filed November 24, 1890. Serial No. 372,551. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. HARPER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Improvement in the Method of Utilizing Stationary Cables in Cable Railways; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The object of my invention is, first, to control a stationary cable utilized by a moving vehicle in such a manner that in the continuity of the cable tension may be applied reciprocally at one point or the other in the path of the vehicle; second, in cable railways in which a motor-driven vehicle is actuated by drums or sheaves in the coil of a stationary cable to control the tension of the cable thereon and increase the traction of the drums; third, in a cable railway in which the traction of motor-driven drums or sheaves is applied to the coils of a stationary cable to depress the cable at suitable points in the trackway and retain the tension of the cable in said depressions.

In the drawings, Figure 1 is a view in perspective of an elevated single track, showing a continuous track-rail in the orbit of an ellipse mounted upon the top of upright columns arranged in a single line, also showing the depression in the track, the depression-pulley, the motor-driven vehicle on the track, the stationary cable, and the tension applied to increase the traction of the cable, and also the cable deposited beneath the depression-pulley in rear of the vehicle. Fig. 2 is an enlarged detail view in perspective of the elevated track, the tension-carriage and its track, and the loop in the cable under the tension of the tension-compensating mechanism. Fig. 3 is a longitudinal side portion of the rail-chair and track in detail, showing the depression in the track, the vehicle, the motor-driven drums on the track in detail, and the stationary cable taken from its bearings and guided to the drums and from the drums guided and depressed and deposited upon its proper bearings. Fig. 4 is a transverse view of the cars, showing the track in section and the position of the tension-carriage between the car and rail-supporting chair. Fig. 5 is a plan view of the cable-drums, showing the cable and the portions of the cable extending in opposite directions diverted from a direct line to the depression-pulley. Fig. 6 is a detail view of a portion of the stationary cable describing a curve and retained in position upon inclined sheaves.

Let A in the drawings represent the endless track-rail of a single-track elevated railway. Beneath and supporting the track-rail A is a continuous flanged rail-chair B, which chair is mounted upon the upper ends of the series of vertical columns C C, arranged in a single line in the roadway.

a are the curves described in the track by the track-rail and rail-chair.

Upon the outer side portion of the continuous rail-chair B are vertical cable-supporting sheaves D D, which are arranged in a vertical position.

d d are a series of sheaves upon the outside of the curved portion *a* of the rail-chair B and attached to and inclined at an oblique angle to the said chair and arranged in a single line. (See Fig. 6.)

E is a stationary endless cable, which extends around the continuous sides of the rail-chair B and is supported by the grooved vertical sheaves D and upon the curved lines of the track and the curved rail-chair upon the obliquely-inclined sheaves *d*.

d' is a depression-pulley on the upper end portion of the stationary arm d^2, attached to the outer side portion of the rail-chair B. (See Fig. 3.)

d^3 d^3 are transverse carriage ways or openings in the rail-chair B.

F F are track-rails extending through one of the transverse openings d^3 in the rail-chair B. F' F' are similar tracks extending through the other opening d^3 in the rail-chair B.

G G' are tension-sheave carriages on the respective track-rails F F and F' F'.

g is a horizontal sheave upon the top of each one of the tension-carriages G G'.

d^4 d^4 are bearing pulleys on both sides of each of the transverse openings d^3 d^3.

f' f' are transverse supports or rods on the respective adjacent ends of the track-rails F F F' F'.

f^2 are vertical pulleys on the rods f' between the respective track-rails.

H is a rope connected at one end with the carriage G and extending over sheave f^2 on the tracks F F, and connected with the carriage G' on the other tracks F' F' at the other end.

h is a loop in the rope H, carrying a sheave h'.

H' is a weight attached to the sheave h'.

I is a windlass beneath the rail-chair B.

M is a cable attached at one end to the carriage G' and extending over the sheave m on the track-rails F', through the opening d^3 in the rail-chair B, over the sheave m' on the end of the tracks F' on the other side of the rail-chair, thence over the pulley m^2 on the column C, and thence coiled around the windlass I and the other end passed over the pulley m^3 on another column C, and thence over the pulley m^4 on the end of the track-rails F F, and attached to the other carriage G on said track F F.

K is a vehicle on the track-rail A, and k k are passenger-coaches on both sides of the track-rail A, suspended from the vehicle K.

L L are grooved rotating drums upon the vehicle K, within the coil of the endless cable E.

N is the motor upon the car, actuating the drums L L.

k' k' are cable-supporting traveling sheaves upon the vehicle in the path of the cable E.

k^2 is a cable-depressing pulley at the forward end of the vehicle, and k^3 is a cable depressing and diverting pulley at the rear end of the vehicle, arranged obliquely in position to the drums L L.

The stationary endless cable E, which is the medium for the propulsion of motor-driven vehicles, extends entirely around the endless track A and is wound one or more times around the drums L L upon the vehicle K.

The windlass I is rotated so as to give the carriage G' the requisite length of rope M to extend through the opening in the rail-chair B and a suitable distance upon the track-rails F' F'. A weight H' of sufficient power is applied to the sheave h' in the loop h of the cable H, and this weight draws the cable E between the sheaves d^4 d^4 and through the opening d^3, and a loop is formed in the cable, and the slack in the entire cable is taken up and the tension applied. The power from the motor N on the vehicle K is transmitted to the drums L L, and as the tension upon the cable is then acting equally upon all portions of the cable and upon the coils or those portions which entend to and around the drums L L the traction of the drums communicates the motion to the wheels of the vehicle.

For the purpose of illustration in Figs. 1 and 3 a portion of the track structure is shown lower in position or depressed at one point in the line of the track, toward which depressed point the track-rail is inclined downwardly from opposite directions. In similar cases, wherever in the continuity of the track in cable railways a portion of the track is lower at one point than at another, the tension upon the cable will cause the cable to rise above the depression and describe a straight line. To obviate this I secure fixedly at each depressed point in the track a depression-pulley d', which is attached to the outer side portion of the stationary arm d^2, which arm is attached to the outer side portion of the rail-chair B and in a position directly above the stationary cable E and also at one side of the path of the traveling pulley k^7 on the vehicle, the purpose being to retain the cable uniformly in line with the track-rail at depressed grade points.

Upon the approach of the vehicle to a position near one of the tracks of a tension-carriage and a loop in the cable E, which is formed in the act of taking up the slack in the cable, the drum I is rotated, so as to wind the rope M and draw the carriage G', bearing the loop in the cable E, through the opening d^3 in the rail-chair and to a position upon the other side of the rail-chair B, thus releasing the slack in the cable E, and to compensate for this movement of one of the tension-carriages the other carriage at the other point in the continuity of the cable is drawn by the weight H' through the opening d^3 provided therefor in the rail-chair B, and the slack in the cable E is instantaneously taken up and the tension upon the cable exerted with the same degree of force as at the point of release. The vehicle K now moves along the track A to a point between the separate tension-carriages G G'. The windlass I is then rotated in an opposite direction, so as to draw the tension-carriage G through the opening d^3 in the rail-chair, and to release the slack or loop in the cable in the path of the vehicle and in the same movement of the windlass a reciprocal movement of the other tension-carriage G', subject to the operation of the tension-weight H', follows, and under the tension of the said weight H' the slack in the cable is taken up and the tension communicated to the entire cable, thus leaving the track and cable clear. The vehicle moves past the releasing tension-carriage, and the traction of the drums, which under the mere weight of the cable without tension would be insufficient to propel the vehicle, is thus made adequate to any resisting load upon the said vehicle.

At the point a' of the depression in the track the cable E is retained under the tension heretofore described. The depression-pulley k^3 upon the forward end of the vehicle depresses the cable below the position of the depression-pulley d' upon the rail-chair B, and upon the approach of said traveling pulley k^2 toward the pulley d' the cable E is released from the said depression-pulley, and its tension is maintained between the front and rear depression-pulleys, which counteracts the up-

ward tendency toward a position in line with the horizontal portions of the track-rail. The vehicle then moves past the depression-pulley d', and the pulley k^3 on the vehicle depresses and diverts the cable, which is paid out over said pulley from the drums to a position beneath the said depression-pulley, and as the distance increases between said pulley and the vehicle the upward movement of the cable is retarded by the said depression-pulley d'.

I have shown the method of utilizing the stationary cable upon an elevated railway and applied to a single rail. I may, however, make the same application of the method to railways having one or more track-rails or in surface railways with equal facility. In place of the weight H' a spring of corresponding power may be used.

In passing around curves a in the track the inclination of the cable-supporting sheaves is sufficient to retain the cable under the tension sufficient to afford the traction to the drums upon the vehicle, as well as to resist the force of gravity.

My invention is also applicable to all railways in which a cable-grasping motor is applied to a stationary cable to propel a vehicle and in which the tension of the cable is a prerequisite, and this tension may be applied within close or at remote distances and in the continuity of the cable with traveling sheaves as frequently as needed.

The cable, instead of being endless, may, however, be extended in one length and secured at both ends and the same results attained as with an endless cable.

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

1. The method of controlling stationary cables for the service of traction-vehicles in cable railways, consisting in arranging the cable in loops at separate points in the continuity of the cable, applying tension to the said loops reciprocally, and taking up the slack in the cable alternately in front and rear of the passing vehicle.

2. The method of controlling stationary cables for the service of the drums in drum-carrying vehicles in cable railways, consisting in coiling a part of the cable around the drums, arranging the cable in loops at separate points in the continuity of the cable, applying tension to said loops reciprocally, and taking up the slack in the cable alternately in front and rear of the vehicle.

3. The method of controlling stationary cables under tension in the path of movable drum-carrying vehicles in railway-track depressions, consisting in coiling a part of the cable around the drums upon the vehicle, removably securing the cable at the point of depression upon the side of the track, supporting the cable at a point in advance of the drums, and depressing the cable in advance of its point of support upon the vehicle and below the point of retention of the cable upon the side of the track at depressed grade points.

4. The method of controlling stationary cables under tension on the path of drum-carrying vehicles in cable railways, consisting in coiling a part of the cable around the drums upon the vehicle, removably securing the cable at the point of depression upon the side of the track and supporting the cable between the drums and the said point of depression of the cable upon the side of the track, depressing the cable between its support on the vehicle and the said point of depression of the cable upon the track, and diverting the cable obliquely from the drum upon the vehicle to the said securing-point upon the side of the track.

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