(No Model.) 2 Sheets—Sheet 1.

W. M. MORGAN.

POWER CONVEYER FOR TRACTION VEHICLES IN CABLE RAILWAYS.

No. 454,829. Patented June 23, 1891.

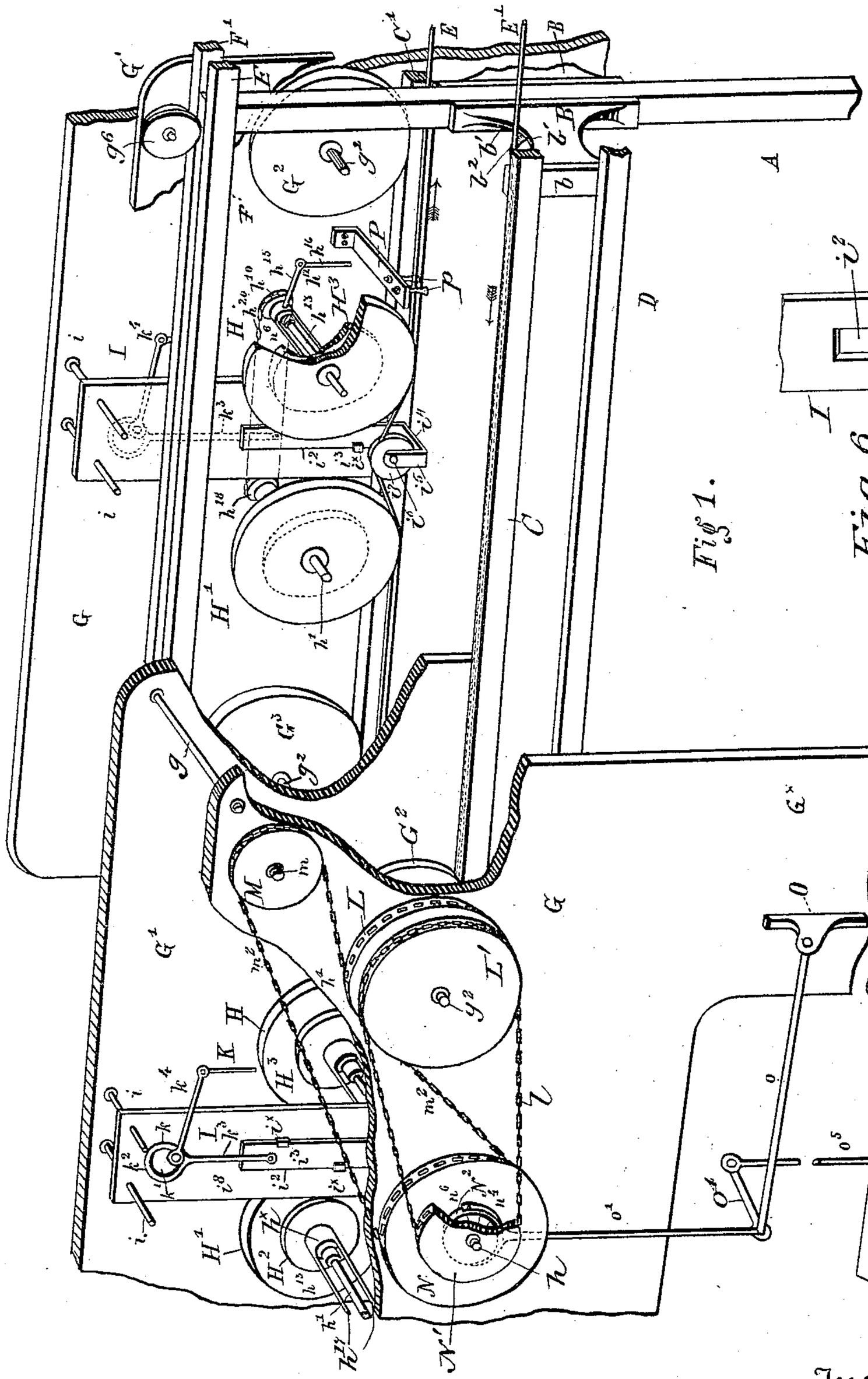

Fig. 1.

Fig. 6.

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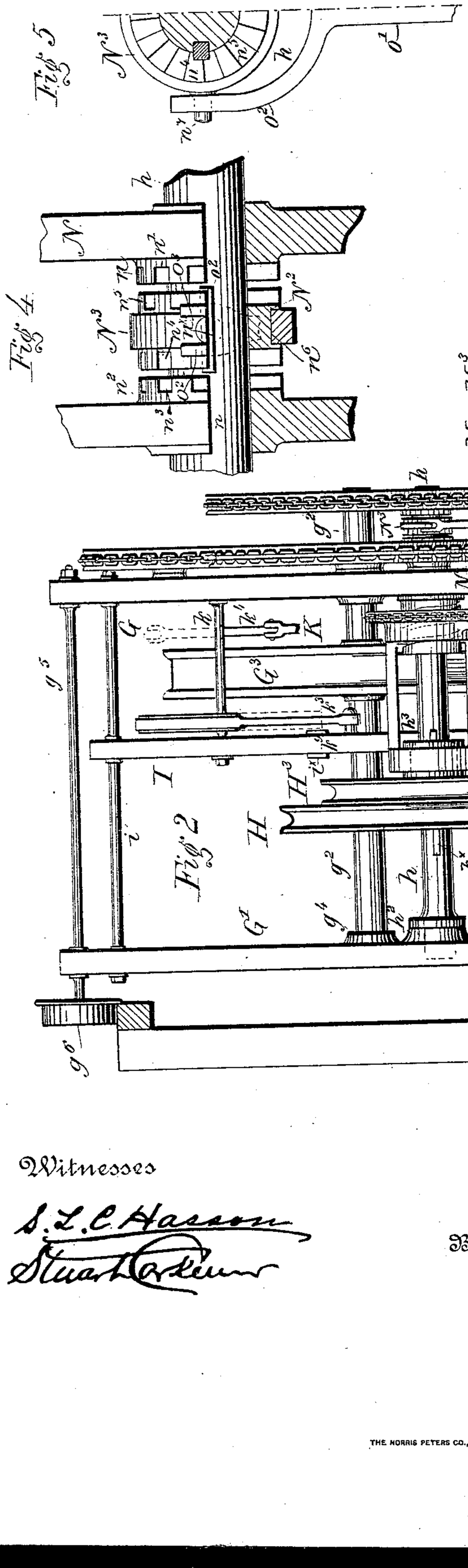

UNITED STATES PATENT OFFICE.

WAITMAN M. MORGAN, OF KANSAS CITY, MISSOURI.

POWER-CONVEYER FOR TRACTION-VEHICLES IN CABLE RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 454,829, dated June 23, 1891.

Application filed July 27, 1889. Serial No. 318,986. (No model.)

To all whom it may concern:

Be it known that I, WAITMAN M. MORGAN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Power-Conveyers for Traction-Vehicles in Cable Railways; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention has for its objects, first, to convey the uniform speed of the cable to the traction-wheels of a vehicle and enable the movement of the wheels to be actuated by and in the line of movement of the said cable; second, to enable the traction-wheels of a vehicle in power connection and actuated by and in the line of movement of the traveling cable to be reversed in movement; third, to enable the speed of the traction-wheels in power connection with and actuated by the traveling cable to be varied in gripping the cable.

In the drawings, Figure 1 is a view in perspective of a portion of an elevated cable railway, showing one of the standards in the line of its track and lateral brackets on both sides of the standards supporting the single-track rails and car-trucks mounted thereon traveling in opposite directions, from one of which trucks the car is shown suspended, the sides of one of said trucks being broken away, showing the mechanism for reversing the movements of the traction-wheels on its one outer side, and the inner side plate of the truck on the opposite side of the standard broken away, showing the speed mechanism controlling the reversing mechanism operated by and in power connection with the cable. Fig. 2 is an end view of the car-truck seen in juxtaposition to a track-supporting standard, showing the track in section and the reversing speed-changing mechanism. Fig. 3 is a view in detail of a portion of one of the transverse shafts for the cable-sheaves, showing portions of the laterally-movable sheaves, the connecting pulley and chain and the intermediate sheave-actuated cam. Fig. 4 is a detail view of a portion of the sheave-carrying shaft, showing portions of the reversing-pulleys and intermediate clutch keyed to the shaft. Fig. 5 is an end view of the reversing-clutch in detail, showing a segmental portion of the clutch with the shaft in section and one of the forked ends of the vibrating rod. Fig. 6 is a detail view of the lower end portion of the grip-supporting plate.

Similar letters of reference indicate corresponding parts in all the figures.

Referring to the drawings, A represents one vertical supporting-standard of the elevated railway broken at its lower end, the other standards of said railway being placed in line therewith. Upon both sides of the standard A, a short distance from its upper end, extending from said sides in opposite directions, are attached the track-supporting brackets B B, in which are the transverse depressions b'. To the upper vertical end portions b of brackets B B are attached on opposite sides of standard A the longitudinal track-rails C C'. To the lower vertical end portion of said brackets B B, beneath the track-rails C C', is attached the longitudinal guide-rails D. To the side of brackets B B and extending above the depression b' are attached the grooved cable-sheaves b^2, which are placed immediately between the standards A and the respective vertical end portions of brackets B B. An endless traveling cable is mounted on the sheaves b^2 b^2, one portion E' of which is traveling in one direction, as indicated by the arrow. In line with the inner side of track-rail C and upon the other side of standard A is mounted in a similar manner the other portion E of the said cable, which is traveling in an opposite direction, the ends of both portions of said cable being connected together and placed around the proper cable-propelling drum. Upon the extreme upper end portion of standard A and upon both sides of said standard are attached the horizontal guide-rails F F'.

For the purpose of suspending propelling-cars on the track-rail C C', as illustrated, a truck is made consisting of two vertical rectangular truck-plates G G', of the same length and different width, which are placed parallel with and on both sides of the track-rail C, on one side of standard A, and are arranged a

suitable distance apart. Said plates G G′ extend an equal height a short distance above the plane of the guide-rails F F′, the inner plate G′ of which is in a position close to the said guide-rail F on one side of said standard A and upon the other side of said standard close to the guide-rail F′. Said plate G′ also extends in a downward direction in the plane of the track-rail C above the depression b' in the bracket B, and the other plate G extends below the guide-rail. To the lower end portion of said plate G is rigidly attached the upper end of a depending support $G^{\times}$, the lower end of which support is connected with the top portion of a suspended car. Through the upper portions of plates G G′ are extended in a transverse direction the brace-rods g, one being shown only, which retain the said plates in a parallel relation and at a fixed distance apart. Near the ends of the respective plates G G′ in one direction and journaled at one end in the journal-box g^4, attached to the inner side of the plate G′, (see Fig. 2,) above the plane of the track C the requisite distance, is one of the traction-axles g, and in the other direction and ends of said plates G G′ in a similar box g^4 is an axle g^2, both of which axles extend through plate G, and upon which axles, between said plates G G′ and resting upon the track-rails C C′, is rigidly attached the vertical traction-wheels G^2 G^3. In a transverse relation to the sides of the plates G G′ is extended a fixed rod g^5, one end of which extends over one of the respective guide-rails F F′, and upon said end is journaled in a vertical position a flanged guide-roller g^6, which rotates upon said guide-rails and prevents lateral movement of the said plates G G′.

For the purpose of conveying the movement of the cable to one of the traction-wheels direct which is sufficient for the propulsion of the truck and car, in the respective boxes h^2 on the inner side portion of the plate G′, between the traction-wheels G^2 G^3, above the plane of the track C, are journaled the rotating shafts h h', which are parallel in position and arranged as far apart as is necessary for the proper connection to be made with the cable, the other portions of which shafts h h' extend in a transverse direction to and through the side plate G and a suitable distance beyond the outer side portion of said plate, for the purpose hereinafter described.

Upon the transverse shafts h h', in line with and directly above the traveling cable E or E′ and keyed thereto on the keys or feathers $h^{\times}$ $h^{\times}$ in said shafts, are the vertical grooved sheaves H H′. Upon the said shafts h h' and keyed thereto upon the sides of the sheaves H H′ which are toward the inner side of the plate G, and rigidly attached to said sheaves are the vertical grooved sheaves H^2 H^3, the diameters of which are less than that of the sheaves H H′. Extending from one plate G to the other plate G′, near the upper longitudinal edge of said plates, and secured at both ends to said plates between the respective vertical lines of position of shafts h h' are the rods i i, to which rods at a point nearly equidistant from the respective plates G G′ is secured the upper end of the grip-supporting plate I, the lower end portion of which plate extends in a downward direction to a point nearly in the plane of track-rail C. Through the lower end portion of plate I is made a vertical rectangular-shaped opening i^2. In the said opening i^2 is fitted a sliding plate i^3, which is retained therein by the clasps or keepers $i^{\times}$ on both sides of plate I, the lower end of which plate extends in length a suitable distance below the lower end of plate I nearly in line with the traveling cable E, and a portion i^4 of said plate i^3 is bent at right angles in the direction of the side plate G′ and extended beneath the sheaves H H′. Upon the upper side portion of the bent portion i^4 of the sliding plate i^3 is attached the bracket i^5, in which bracket, on the pivot i^6 is, mounted a sheave i^7. To the inner side of the plate G, a short distance below rods i i, is pivoted one end of a rotating rod k, the other end of which rod extends in a transverse direction to said side G and is attached to the grip-supporting plate I. Upon the rotating rod k, between the plate I and the plate G, is attached a circular plate k', which rod k extends transversely through the plate k' a short distance from the center toward its circumference. To the upper end portion of the sliding plate i^3, on the pivot i^8, is attached the lower end portion of an elevating-lever k^3, and to the other end of said lever is attached rigidly a ring k^2, which extends over the peripheral portion of the plate k'. To the rotating shaft k is rigidly attached one end of an arm k^4, the other end of which arm extends a short distance therefrom, and to said end is pivotally attached the upper end portion of a depending operating-lever K. For the purpose of moving the sheaves H′ H^2 H H^3, keyed on the respective shafts h h' in the longitudinal direction of the said shafts a hub h^3 is cast or otherwise attached to the side of the sheave H^3, which extends a short distance therefrom toward the plate G, and in the peripheral portion of which hub h^3 is made an annular groove h^4. Extending around the hub h^3 and in the groove h^4 is a loose-fitting collar h^5. Extending loosely around shaft h and attached to the inner side of the plate G is a sleeve h^6, on which is a flange h^7, which flange is attached to said plate G by the bolt h^8. In the sleeve h^6 is cut a spiral cam or groove h^9, which extends one-half of the distance circumferentially around the said sleeve. Upon sleeve h^6 is mounted a grooved pulley h^{10}, smaller in diameter than that of the sheaves H H^3, and upon the side of the pulley h^{10}, in the direction of the sheave H^3, is rigidly attached a hub h^{12}, which extends around the sleeve h^6. An equal distance apart and to the collar h^5 on the hub h^3 is attached one end of the respective con-

necting-arms h^{13} h^{13}, the other ends of which arms extend to and are rigidly attached to the hub h^{12} on the pulley h^{10}. Upon the pulley h^{10}, in frictional contact with the sleeve h^6, is fixedly attached a lug h^{14}, which enters and slides in groove h^9 in the sleeve h^6. To the side of the hub h^{12} is attached one end of an arm h^{15}, and to the other vibrating end of said arm is attached the upper end of an operating-lever h^{16}.

Upon the shaft h', which carries the sheave H' and connected with the sheave H^2 in the same manner as described in relation to the sheaves H^3, are the arms h^{17} h^{17}, which extend from an annular grooved hub $h^\times$ on the said sheave H^2 (constructed in the same manner as the hub h^3 on the shaft h) to the hub of the pulley h^{18} in the direction of the plate G, which pulley h^{18} is mounted on the spiral grooved sleeve attached to the side of the plate G, and is similar to the sleeve h^6 around the shaft h^8. Over the pulley h^{10} is passed one end of an endless chain h^{20}, the other end of which chain is passed over the pulley h^{18} on shaft h' and the two ends of the chain connected together in the usual manner. Upon the outer side portion of the plate G, and upon the end portion of the axle g^2 of the traction-wheel G^2, are rigidly attached a slight distance apart the sprocket-wheels L L', which are equal in diameter and nearly of a size of the sheaves H H'. Upon the end of the side plate G which receives the axle g^2, and near the upper longitudinal edge and vertical end portion upon the pivot m, on the outer side portion of said plate, is mounted a small sprocket or idle wheel M. Upon the end of shaft h which carries the sheave H, and upon the outer side of plate G and within a slight distance of said plate, is loosely mounted a sprocket-wheel N, which is equal in diameter to the sprocket-wheels L L'. Upon the side of the loose sprocket-wheel N other than that opposed to plate G is attached an extended hub n, (see Fig. 4,) in the side of which, in the line of diameter of shaft h, is cut a series of radial notches n' n'. Upon shaft h is also loosely mounted in line with the sprocket-wheel L' on shaft g^2, a sprocket-wheel N', the diameter of which is less than that of the wheel N. To the wheel N' on the side toward the wheel N is attached a hub n^2, in the side of which, in the line of diameter of shaft h, are a series of radial notches n^3. Keyed upon the shaft h by means of the feather $n^\times$, between the notched hubs n n^2, is a sliding clutch N^2, in one side of which are the radial notches n^4 and in the other side the radial notches n^5, which are slightly less in width than the notches n' n^3. In the clutch N^2, between the notches n^4 n^5, is made circumferentially a groove n^6, in which groove is fitted loosely an annular ring N^3. Extending in opposite directions from both sides of the looes ring N^3 are the fixed pins n^7. Upon the extension $G^\times$ of plate G, from which the car is suspended, is attached a bracket O, and rigidly attached at one end to said bracket O is a horizontal rod o, the other end of which rod extends to a point in a vertical line with and beneath the ring N^3 on the shaft h. Between the spocket-wheels N N' is extended the upper end of a laterally-vibrating rod o', which is provided with forked ends o^2 o^2. In the upper end portions of the forked ends o^2 are made the sockets o^3, which receive the pins n^7 on the ring N^3. To the end of rod o is pivotally attached a bell-crank lever o^4, and to said lever o^4 is rigidly attached the lower end of the rod o', and to the vibrating end of the lever o^4 is pivotally attached a depending operating-lever o^5, which extends within the suspended car and is operated therefrom. Over the sprocket and idle wheel M is placed one end of an endless sprocket-chain m^3, which extends beneath said wheel over the peripheral edge portion of the sprocket-wheel L, thence to and beneath the sprocket-wheel N, and over said wheel to the idle-wheel M, and the two ends are then connected together in the usual manner. Over the sprocket-wheel L' is placed one end of an endless sprocket-chain l, the other end of which chain extends to and over the sprocket-wheel N' and thence to the said wheel L', and both ends connected together in the usual manner. Upon the inner side portion of the plate G and attached at one end thereto and extending in a transverse relation in the direction of the plate G' to a point in line with the grip-roller i^7 is a plate P. Upon the extreme end of said plate P, over the cable E, is attached two depending anti-friction rollers p p, which extend on opposite sides of said cable and retain said cable in line with the said roller i^7. In the operation of the plates G G' on the track-rails C C' the grooved sheaves H H', as seen in Fig. 1, are in line with the portion E or E' of the traveling cable which is traveling in the direction of the arrows. In this position the grip-roller i^7, which has picked up the cable, is elevated by means of the lever K and the cable carried between the said sheaves H H', and the power is conveyed to said sheaves, and the movement of the sheaves is in opposite directions to that of the cable, and the degree of speed of the car is proportionate thereto.

To accelerate the speed of the traction-wheels on the track, which are traveling in the opposite direction to which the cable is moving, the sliding clutch N^3, which is normally disconnected from the sprocket-wheels N N', is operated by lever o^5 and the clutch thrown in the direction of and in connection with the small wheel N', which in turn conveys power through the chain l direct to the large wheel L' and also the traction-wheel G^2.

To reverse the movement of the car and truck and propel the same in the direction of the moving cable, the clutch is thrown from its engagement with the wheel N' and into engagement with the sprocket-wheel N, which in turn conveys power through the sprocket-chain m^2 to the small wheel M, the accelerated

speed of which is transmitted to the sprocket-wheel L on the shaft g^2 and the movement of the said wheel reversed, which acts to reverse the movement of the traction-wheel G^2. Thus it will be seen that the reversing mechanism is interchangeably connected with the power-conveying sheaves H H′, which are propelled when the grip is operated to grasp the moving cable.

The lever K is operated to lift arm k^4 on the truck, and the roller i^7 is carried below the sheaves in the position shown in dotted lines of Fig. 2. In this position of roller i^7 the lever h^{15} on the armed sleeve h^{12} is operated, which slides the sheaves H H′ in the direction of plate G′, and the small sheaves H^2 H^3 are brought in position simultaneously over the cable E, and upon the operation of the lever K to elevate the roller i^7 the cable is grasped between it and said sheaves H^2 H^3, and the speed of the car is increased.

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

1. The combination, with a vehicle having traction-wheels and with the axles of said vehicle, of a traveling cable, power-conveying shafts on said vehicle, and cable-grasping sheaves in the line of said cable on said shafts, and an oppositely-bearing cable-gripping roller upon said vehicle, wheels upon and loosely connected with said shafts and also upon and fixedly connected with said axles, gearing extending around said fixed wheels and also to and around said loose wheels and reversing the movement of one of said fixed wheels, and a normally-disconnected clutch keyed on one of said shafts between said loose wheels and engaging alternately with said loose wheels, substantially as described.

2. The combination, with a vehicle having traction-wheels and with the axles of said vehicle, of a traveling cable, power-conveying shafts on said vehicle, and cable-grasping sheaves varying in diameter in the line of said cable on said shafts, and an oppositely-bearing cable-gripping roller upon said vehicle, wheels upon and loosely connected with said shafts and also upon and fixedly connected with said axles, gearing extending around said fixed and also to and around said loose wheels and reversing the movement of said fixed wheels, and a normally-disconnected clutch keyed on said shaft between said loose wheels, substantially as described.

3. The combination, with a vehicle having traction-wheels and with the axles of said vehicle, of a traveling cable, power-conveying shafts on said vehicle, and wheels varying in diameter upon and loosely connected with said shafts, and wheels upon and fixedly connected with said axles, gearing extending around said fixed wheels and also to and around said loose wheels and reversing the movement of said fixed wheels, a clutch engaging with said loose wheels, and sheaves varying in diameter grasping said traveling cable and accelerating the speed of said vehicle, and an oppositely-bearing cable-gripping roller on said vehicle, for the purpose described.

4. In cable railways having a suitable track, the combination, with a vehicle having traction-wheels and with the axles of said vehicle, of a traveling cable, power-conveying shafts on said vehicle, and wheels upon and loosely connected with said shafts and also upon and fixedly connected with said axles, gearing around said fixed wheels and also extending to and around said loose wheels, cable-grasping sheaves keyed on said shafts, varying in diameter, and an oppositely-bearing cable-gripping roller on said vehicle, arms loosely connected with said cable-grasping sheaves, and a lever on said vehicle actuating said arms, for the purpose described.

5. In cable railways having a suitable track, the combination, with a vehicle having traction-wheels and with the axles of said vehicle, of a traveling cable, power-conveying shafts on said vehicle, and wheels upon and loosely connected with said shafts and also upon and fixedly connected with said axles, gearing extending around said fixed wheels and also to and around said loose wheels, cable-grasping sheaves provided with hubs and varying in diameter keyed on said shafts, and an oppositely-bearing cable-gripping roller on said vehicle, a cam on the side of said vehicle, and a hub having a lug engaging with said cam, a collar loosely connected with the hub upon said sheaves, having arms extending to and connected with the hub on said cam, and a lever connected with said hub, for the purpose described.

6. In power-conveying mechanism for cable railways, a truck having traction-wheels and axles, power-conveying shafts on said truck, and wheels varying in diameter on said shafts, gearing extending around said wheels on said shafts and also to and around said wheels on said axles and accelerating the speed of the traction-wheels, a traveling cable, and cable-grasping sheaves on said shafts, varying in diameter, and an oppositely-bearing cable-gripping roller on said trucks, substantially as and for the purpose described.

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