(No Model.) 3 Sheets—Sheet 1.

C. H. BARROWS.

SYSTEM OF RAPID TRANSPORTATION.

No. 403,505. Patented May 21, 1889.

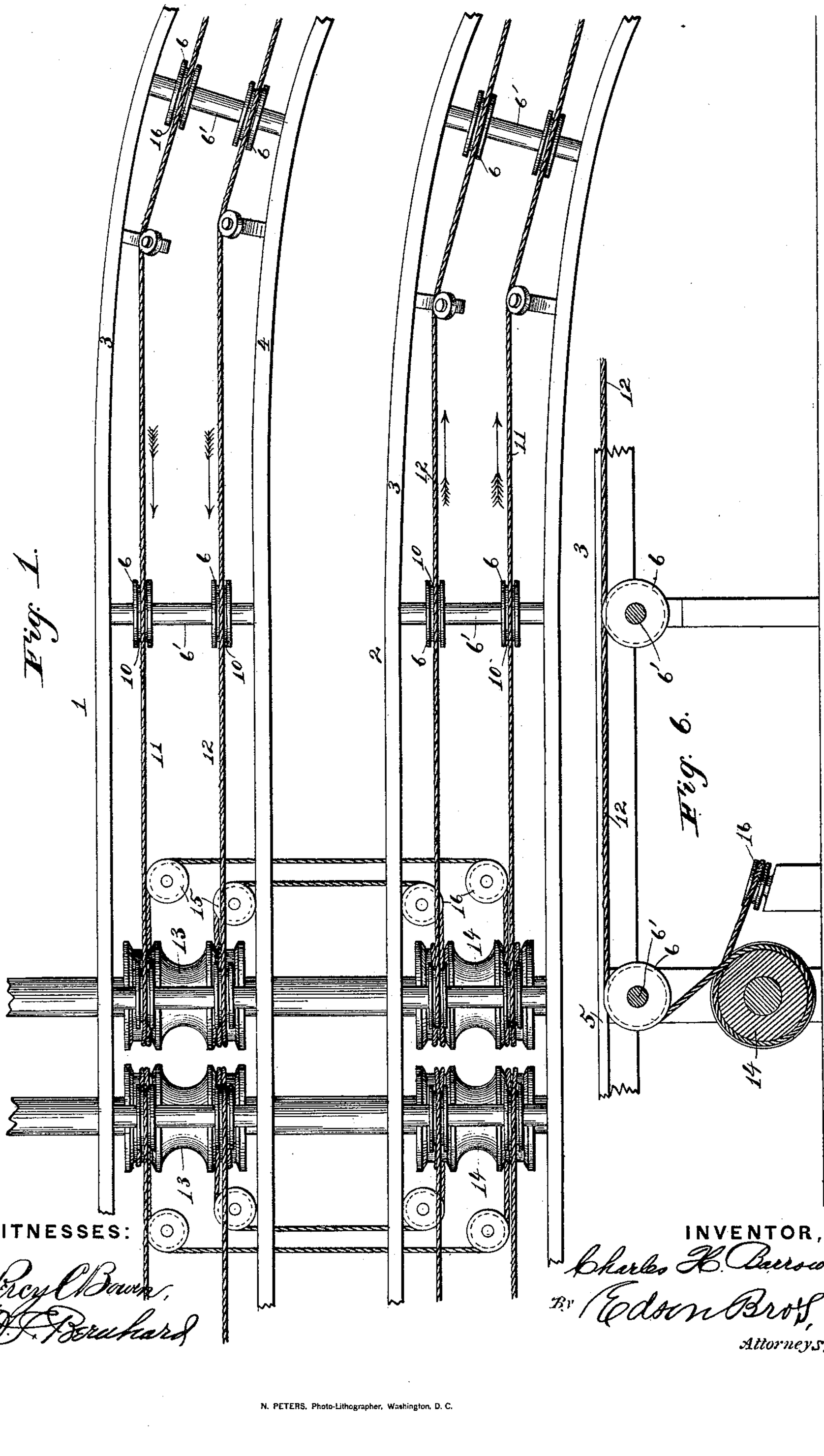

Fig. 1.

Fig. 6.

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Fig. 2.

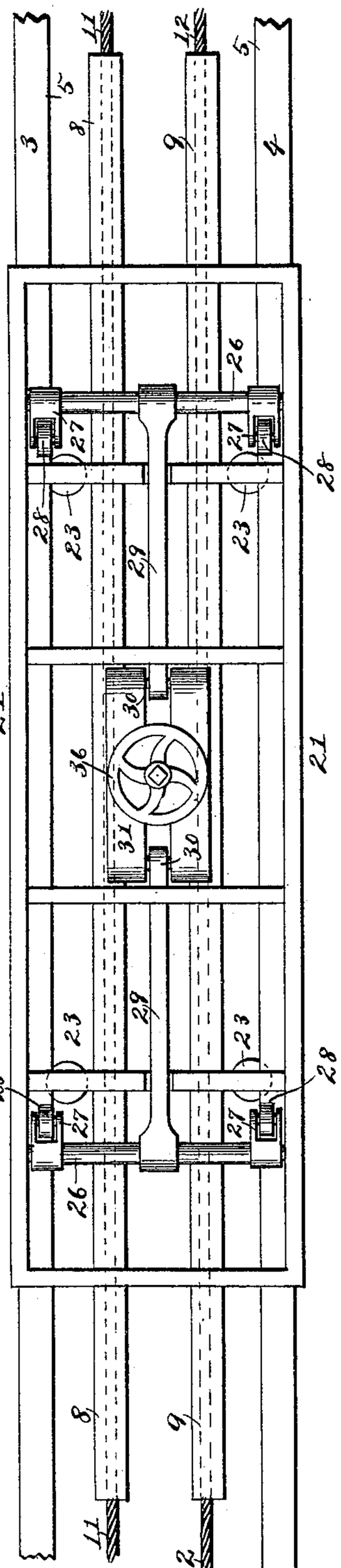

Fig. 5.

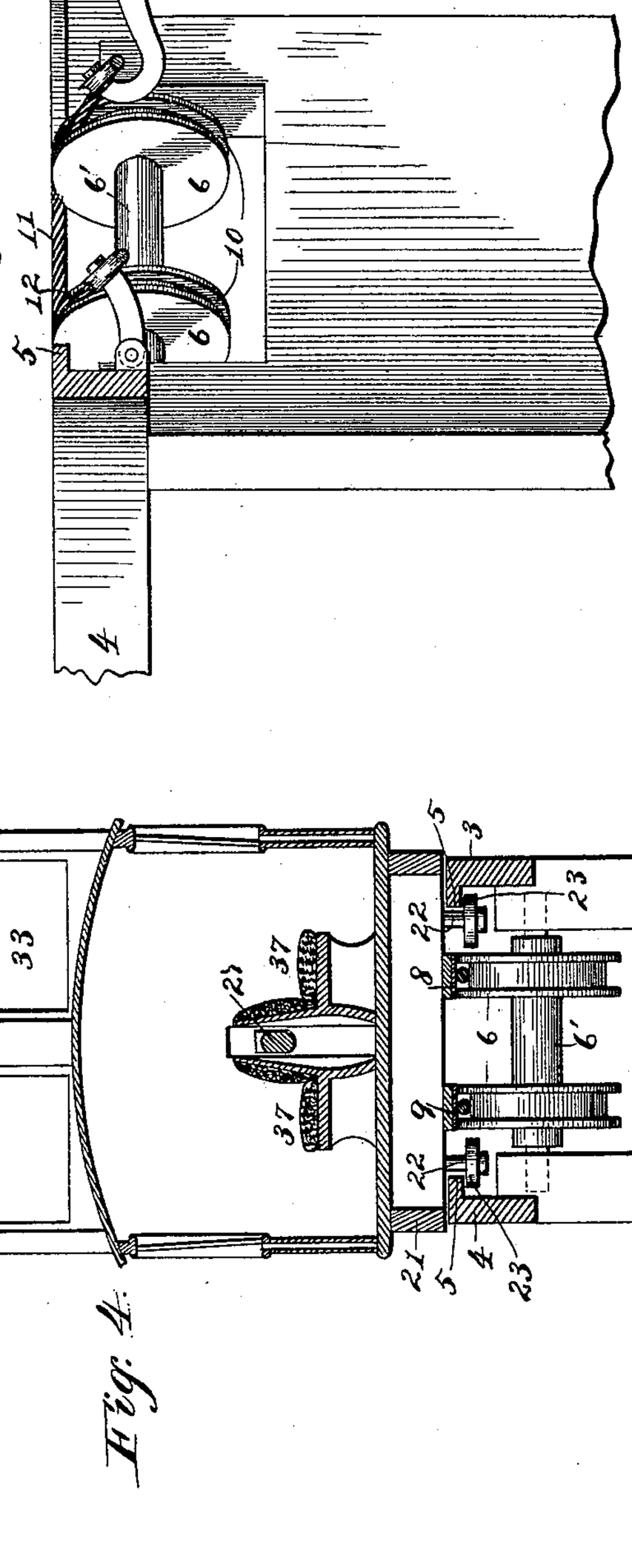

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

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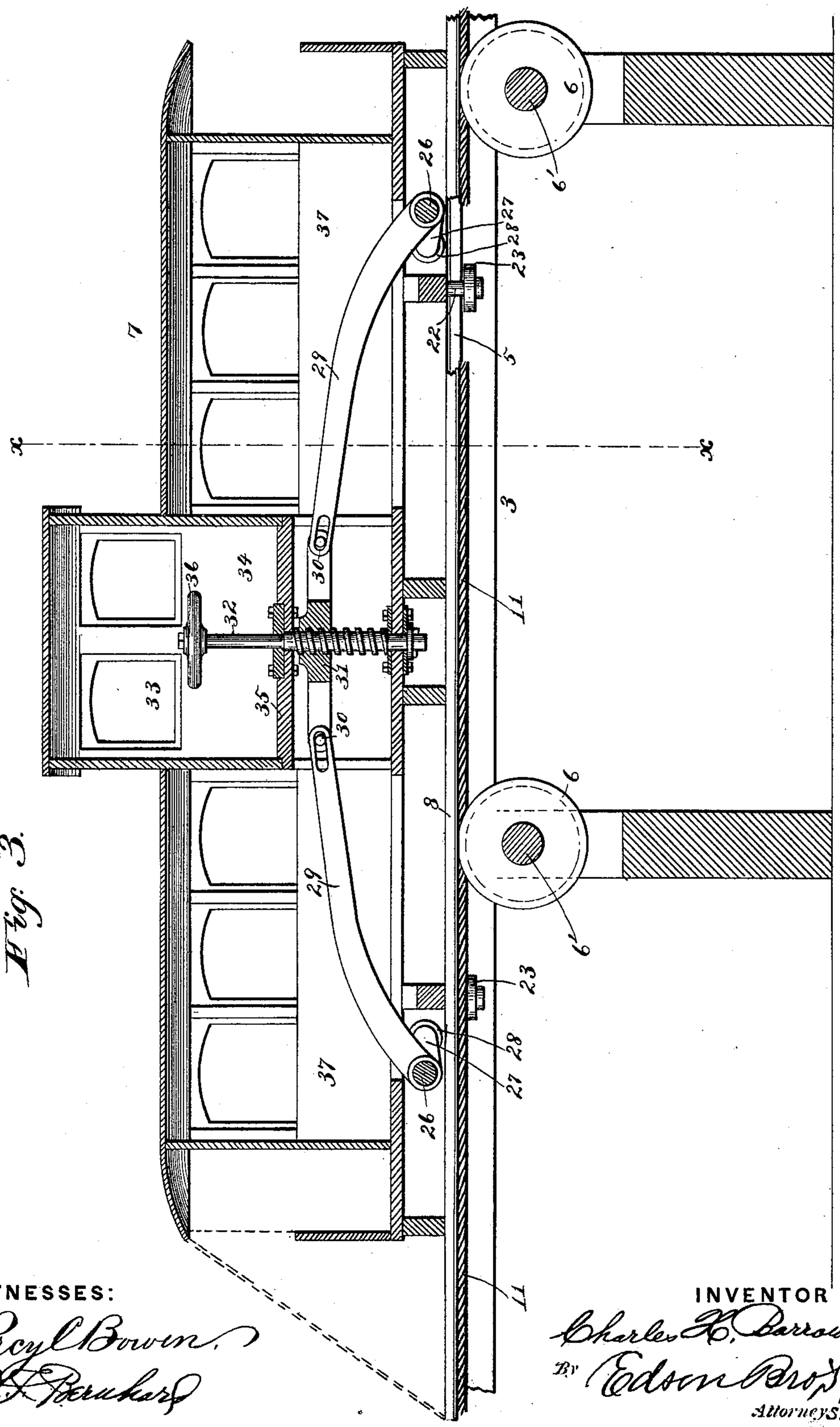

Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES H. BARROWS, OF WILLIMANTIC, CONNECTICUT.

SYSTEM OF RAPID TRANSPORTATION.

SPECIFICATION forming part of Letters Patent No. 403,505, dated May 21, 1889.

Application filed February 20, 1889. Serial No. 300,548. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. BARROWS, a citizen of the United States, and a resident of Willimantic, in the county of Windham and State of Connecticut, have invented certain new and useful Improvements in the System of Rapid Transportation; and I do hereby declare the following to be 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.

My invention relates to a system of rapid transportation; and it has primarily for its object to provide for the expeditious and economical transfer of passengers, freight, express, and other matter from one place or point to another.

My invention consists, primarily, of a continuous series of positively-rotated rolls, which are spaced at suitable intervals and arranged between and supported by shafts journaled in the side girders of an elevated track, and a wheelless car or carriage having means, as hereinafter described, which rest on two, three, or more of the spaced positively-driven rolls, said car resting by gravity on the positively-driven rolls and being moved endwise along the track by frictional contact with said rolls. The wheelless car is supported by the positively-rotated driving-rolls entirely independent of and out of contact with the track, and it has devices for engaging the side girders of the track for preventing lateral and vertical displacement of the car on the driving-rolls. These driving-rolls may be positively rotated by a suitable motor or by suitable connections therewith; but for the purposes of economy I have provided running cables which pass over the driving-rolls and impart rotary motion to the same by frictional contact therewith. These running cables fit snugly but not entirely in peripheral grooves formed in the driving-rolls, so that a portion of the cables and the peripheral edge of the rolls themselves are adapted to engage the runners on the wheelless car and move the latter by frictional contact between the positively-rotated driving-rolls and the runners on the car. The cables also assist the driving-rolls in supporting and propelling the car; and I have so arranged the endless cables that one set of cables answers for imparting rotary motion to a number of driving-rolls along each of the two adjoining tracks. At suitable intervals or distances along the length of each track I have provided a rotary power-drum, around which the cables are passed and by which they are moved or driven; and the length of track between two drums I term a "section," for the purpose of more readily identifying that portion of the two adjoining tracks to which one set of cables is adapted for rotating all of the driving-rolls of the two adjoining tracks. Each set of endless cables travels longitudinally in one direction along one track of the section and over the driving-rolls therein, to rotate them positively in one direction. Said cables then pass around the drum at the end of the first-mentioned track, and then laterally across from one track to the other, around the drum of the second track of the section; then in an opposite direction along the length of the second track, over the driving-rolls therein to rotate the same in an opposite direction from the rolls of the first-mentioned track; then to and around a rotary power-drum at the opposite end of the second track, and finally across from the second track back to the first track, around another power-drum thereof. To arrest the movement of the wheelless car, I lift the entire car bodily out of contact with the positively-rotated driving-rolls and the running cables by mechanism carried by and within the car. At or near opposite ends of the car I provide transverse rock-shafts, which carry friction-rolls adapted to rest upon the side girders of the track when the shafts are simultaneously depressed, thereby raising the car vertically a sufficient distance to free it from contact with the driving-rolls and running cables.

My invention further consists in the construction and arrangement of parts, as will be hereinafter fully described and claimed.

To enable others to understand my invention, I will now proceed to describe the same in connection with the accompanying drawings, in which—

Figure 1 is a plan view of two parallel sections of track, showing a series of positively-rotated driving-rolls, a set of endless power-cables, and means for moving the cables. Fig. 2 is a plan view of a portion of the frame of a

car mounted on a section of the track. Fig. 3 is a vertical longitudinal central sectional view, on an enlarged scale, through a car and a portion of the track. Fig. 4 is a vertical cross-sectional view on the line *x x* of Fig. 3. Figs. 5 and 6 are detail views of the track.

Like numerals of reference denote corresponding parts in all the figures of the drawings.

1 designates a track on which a car is adapted to travel in one direction, and 2 another adjoining track on which a car is adapted to travel in an opposite direction, these two tracks being substantially the same in the construction and arrangements of parts, so that a description of the one will answer equally as well for the other. Each track consists of two parallel side girders, 3 4, each of which has a laterally-projecting flange, 5, at its upper edge, so that the girder is inverted-L-shaped in cross-section.

At suitable intervals along each track 1 and 2, I provide a continuous series of driving and supporting rolls, 6, for propelling and supporting the wheelless car or carriage, and these driving-rolls are arranged between and supported by shafts which are suitably journaled in the side girders of the track or structure 1 and 2. The driving-rolls are spaced equidistant from each other—say at intervals of fifteen (15) feet—so that the car can engage with and rest on two, three, or more sets of driving-rolls at all times, which thus insures a secure support for the car, and secures the proper frictional contact between the positively-rotated driving-rolls and the car necessary to move the latter at the desired speed. This car or carriage, which I have designated by the numeral 7, is entirely devoid of the wheels usually employed for supporting ordinary cars on the rails of a track, whether on surface or elevated railway-lines; but, in lieu of the wheels and track commonly resorted to I provide my car with flat horizontal runners or bars 8 9, which are rigidly and securely fastened to the cars in such a manner as to rest upon two, three, or more of the series of driving-rolls, thereby supporting the car on the driving-rolls entirely independent of the track or similar structure.

The positively-rotated driving-rolls are arranged in pairs, one near each side girder of the track or structure, and the rolls of each pair are carried by a common horizontal shaft, 6′, which is journaled in suitable bearings on the track or structure. The longitudinal runners of the wheelless car are spaced laterally of each other equal to the distance between the pair of driving-rolls, so as to insure the runners having proper engagement or contact with the driving-rolls. These driving-rolls can be positively rotated by any suitable means, as by a motor and connections between the rolls and motor.

In the accompanying drawings I have shown my preferred mechanism for positively rotating the driving-rolls, which consists of two, or a pair of, parallel running cables, 11 12, which fit in peripheral grooves 10, formed in the driving-rolls, the grooves in the driving-rolls and the cables being so proportioned that a portion of the periphery of each driving-roll and the upper surface of the cable are exposed, so that the runners of the car are adapted to press the cables into the grooves of the driving-rollers to secure a firmer frictional contact between the rolls and cables when the car passes over the rolls, and at the same time secure the necessary contact between the rolls and the runners of the car. The cables also assist the rolls in supporting and propelling the car, more particularly in the spaces intervening between the rolls, and these cables are arranged in sets to travel in one direction a given length of one track and in an opposite direction on a corresponding length of the adjoining track, whereby one set of cables are adapted to rotate the driving-rolls on a given length of the two adjoining tracks, and thus promote economy and efficiency, it being understood that each set of cables are endless and are driven continuously in one direction; but as the set of cables are returned upon themselves they drive the rolls of one track in one direction and the rolls of the adjoining track in an opposite direction.

At each end of the section comprising the two adjoining tracks I arrange a pair of rotary power-drums, 13 14, one drum being provided for each track and the pair of drums for one end of the section being located laterally of each other and driven positively in opposite directions by a suitable motor or engine, which I have not deemed it necessary to illustrate.

In Fig. 1 I have shown a portion of the adjoining ends of two sections of track with the power-drums for one end of each section of the track, the drums for one section of track being entirely independent of the drums for the other section of track, and around these two sets of drums are passed two independent sets of power-cables for operating the driving-rolls which carry cars along the two sections of tracks.

The rotary power-drums are arranged below the tracks and the driving-rolls between the side girders thereof, and the cables of one set are transferred from the track of one section to the laterally-adjoining track of the same section by devices which I will now describe.

By an inspection of Figs. 1 and 6 of the drawings it will be noted that the set of cables on the track 1 move over the driving-rolls 6 toward and around the drum 13, and after being coiled one or more times around the drum the cables pass to and around horizontal or horizontally-inclined guide-pulleys 15, which are located at one side of the rotary power-drum 13 below the track. The cables are then passed laterally from one end of one section of the track 1 to the corresponding end of the laterally-adjoining track, 2,

around guide-pulleys 16, similar to the pulleys 15, then around the rotary power-drum 14, and finally along the track 2, but in an opposite direction to the direction which it traveled on the track 1 of the section, which is caused by doubling or returning the set of endless cables upon themselves. At the opposite end of the section comprising the tracks 1 and 2 the cables are again transferred laterally, this time from the track 2 to the track 1 by an arrangement of power-drums and guide-pulleys similar to that just described, and which I have not deemed it necessary to show, as it will be obvious from the foregoing description.

It will be noted that the spaced driving-rolls support the cables and are rotated positively by frictional contact with the cables, and that the car merely rests on these driving-rolls and cables, but is not connected therewith nor to the side girders of the track. The weight of the car, combined with the extended friction-surface afforded by the long horizontal runners, is sufficient to secure the necessary amount of frictional contact between the runners, the driving-rolls, and the cables for moving the car very rapidly.

It will of course be understood that the track, the driving-rolls, and power-cables are elevated above the surface of the ground when my system is employed in cities and in passing over obstructions, in which case the tracks are supported on vertical posts and are constructed or erected in the manner well known to engineers skilled in this art; but for long-distance lines, running through the country from one city or point to another, as may be used in transporting passengers, express-matter, freight, &c., the track, the driving-rolls, and cables may be arranged close to the surface of the ground or through a conduit or tunnel under the same, as may be most desired. My system is also well adapted for underground railways in cities or crowded places.

It will be understood that the set of cables and the corresponding section of track may be of any desired length—from a short distance of twenty (20) rods to a mile in length—according to the amount of traffic on that section of the track, the steepness of the grade, or other causes. When the cables are passed around curves and run upgrade, the cables will be shorter and more numerous; but when on a level surface or downgrade the cables and section can be made longer to advantage.

In long-distance lines, especially on suburban lines or those that run into the country, where sufficient downgrade occurs, the cable may be omitted entirely from the downgrade-track and used only on the upgrade-track to propel the driving-rolls and assist the latter in drawing the cars up the grade on said track. The car traveling on the downgrade-track, minus the cables, is supported entirely by the driving-rolls, which in this instance are not positively driven or rotated; but the car moves over the same by gravity and the momentum it acquires, suitable appliances being of course provided for regulating the velocity of the car and for stopping the same.

I will now proceed to describe my car or carriage and the mechanism employed for arresting its movement.

The car 7 is of a very light, but substantial and durable, construction, and at the base or lower end thereof it has a substantial longitudinal carrying-frame, 21, (see Fig. 2,) upon which the car proper is built and by which the cable engaging and braking devices are carried. This longitudinal frame 21 corresponds in width to the track, but is arranged above and supported by the driving-rolls entirely independent of the side girders thereof, and to the longitudinal frame is secured vertical shafts 22, which are spaced at suitable intervals, and carrying friction-rollers 23, which prevent the car from swaying when in rapid motion, and thus serve to assist in preserving its equilibrium and of steadying the same. These friction-rollers are arranged so as to operate beneath the overhanging flanges or ribs 5 on the rails of the track, (see Fig. 4,) and they rotate freely on their axes and prevent lateral as well as vertical displacement of the car. If desired, these friction-rollers may be hung or mounted so as to permit the car to have a limited lateral play, which is desirable in rounding curves.

It will be noted that the friction-rollers are arranged very close to the side girders of the track, so as to engage therewith, and that the power-cables and the positively-rotated driving-rolls 6, over which said cables pass, are arranged out of the path of the friction-rollers, to prevent the latter rollers from striking the driving-rolls and permit the car to move freely.

To the longitudinal carrying-frame 21 is secured the longitudinal runner-bars, which are arranged and secured to the frame in the manner described, and these longitudinal runner-bars are arranged on the lower side of the frame, so as to rest directly upon and engage with the driving-rolls and the power-cables, (see Figs. 2, 3, and 4,) so as to support the car by the rolls and cables entirely independent of the track.

The car and the longitudinal runners or bars rest by the weight or gravity thereof on two, three, or more pairs of driving-rolls and on the running cables, so as to create sufficient friction between the longitudinal bars, the driving-rolls, and the cables as to cause the car to move rapidly over and out of contact with the track, while the friction-rollers 23, which are carried by the car and engage the side body of the girders of the track, serve to prevent lateral displacement of the car.

It will be noted that the longitudinal runners or bars are not positively connected or secured to the driving-rolls or to the cables, but that the car is supported by the rolls and cables and has sufficient frictional contact

therewith to insure proper movement thereof; and in order to provide the necessary amount of surface on the runners to secure the necessary friction, I make the runners in pairs and of greater length than the body or carrying-frame of the car itself. The ends of the runner-bars are thus extended beyond the ends of the car, and when the car passes from the driving-rolls on one section of the track to the rolls on a continued aligned section of the same track the forward ends of the runners engage with the driving-rolls on the new section of track before the rear ends of the runners leave the driving-rolls on the old section of track, thus insuring the proper transfer of the car from one section of track to another aligned section of the same track.

At or near each end of the longitudinal carrying-frame of the car I arrange a transverse rock-shaft, 26, (see Figs. 2 and 3,) which are suitably journaled in the sides of said frame, and each of these rock-shafts carries a pair of arms, 27, which are arranged close to the sides of the frame immediately above the rails of the track, each of these arms having a friction-wheel, 28, journaled therein, which is adapted to impinge and ride against the side girder when the arm is depressed by the oscillation of the rock-shaft. These rock-shafts are simultaneously operated to depress or raise the arms thereof and force the rollers into engagement with or release the same from the side girders of the track by means of levers 29, which are arranged longitudinally of the car in the longitudinal center thereof. The outer ends of the levers are suitably secured to the middle of the rock-shafts, while the inner ends of said levers are pivotally connected by a slot-and-pin connection, 30, (see Fig. 3,) to a single common cross-head, 31. This cross-head 31 is arranged in a horizontal position and is adapted to be moved in a vertical plane to simultaneously raise or depress the inner ends of the longitudinal levers 29, by means of a vertical screw, 32, which is erected in the vertical center of the car and is adapted to be operated by one or more attendants stationed in a lookout-apartment, 33.

Referring more particularly to Figs. 3 and 4, the car is provided at its middle with a vertical isolated apartment, 34, which is extended at its upper portion above the top or roof of the car to provide the lookout-apartment 33, a floor, 35, being provided in the latter. Through this floor and centrally through the apartment 34 is passed the operating-screw 32, to which is fixed a hand-wheel, 36, at a suitable point intermediate of its length convenient to the attendants who are stationed in the lookout-apartment 33, and by means of which the screw-shaft can be rotated to move the cross-head vertically on the shaft and thereby oscillate the rock-shafts to depress or raise the friction-rollers into contact with or free them from engagement with the side girders of the track. When the cross-head is raised and the rock-shafts oscillated to depress the friction-rollers against the track, the car is raised bodily and supported on the track by said friction-rollers, thus lifting the longitudinal runners or bars out of engagement with the driving-rolls and cables and freeing the car from the motive power employed to move it, and thereby arrest the motion.

Should it be desired to stop the car suddenly, the screw-shaft can be rotated a sufficient number of times to raise the car sufficiently to bring the friction-rollers 23 into forcible contact against the overhanging ledge of the girders 3 4, and the friction between the track, the rollers 23, and the rollers 28, which support the car on and above the track, serves to arrest the movement of the car. To start the car again, it is only necessary to reverse the screw-shaft and lower the cross-head thereon, which elevates the rollers 28 out of engagement with the track and lowers the car, so that the longitudinal runners or bars again engage driving-rolls and power-cables.

On opposite sides of the central apartment are arranged the apartments for the accommodation of passengers, and in order to economize space the seats 37 are arranged back to back, so as to face the windows in the sides of the car, the entrances and exits from the passenger-apartments being at the ends of the car and into opposite sides of the central apartment, as is obvious. With the seats arranged in the manner shown and described, the longitudinal levers 29, intermediate of the rock-shafts and the cross-head, are arranged between the backs of the seats, so as to be out of the way and practically concealed from view. The central isolated apartment has lateral doors opening through the sides of the car and other doors opening into the passenger-apartments, so that access can be had to said central apartment both from the passenger-apartments and from the outside of the car, and baggage, &c., can be stored therein.

It will be understood that the car shown and described herein as an embodiment of my invention is particularly designed for the transportation of passengers; but it is obvious that for carrying freight, express, or mail-matter the construction thereof can be changed and varied to suit the requirements of the particular use to which the car is to be applied.

The operation of my invention is obvious from the foregoing description, taken in connection with the drawings, and therefore need not be referred to in detail here.

I am aware that other means can be employed for moving the cross-head vertically, and that changes in the form and proportion of parts and details of construction and arrangement of the mechanism herein shown and described as an embodiment of my invention can be made without departing from

the spirit or sacrificing the advantages of the same. I would therefore have it understood that I reserve the right to make such changes and alterations as fairly fall within the scope of my invention.

If desired, a storm-shield can be erected at one or both ends of the car, said shield extending in an inclined position from the extreme ends of the longitudinal runners to the top of the car, as indicated by dotted lines in Fig. 3. This inclined shield may be constructed of metal, wood, or other material, and secured to the car and runners thereof in any suitable manner.

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

1. In a system of rapid transportation, the combination of a track, a series of driving-rolls spaced at suitable intervals along the track and each having an annular groove in its periphery, a wheelless car carrying longitudinal runners which rest on the rolls to support the car solely by the rolls and adapted to be moved by frictional contact with said rolls, and the running power-cables passing through the annular grooves in said driving-rolls and arranged between the rolls and the runners when the latter rest on said rolls, substantially as and for the purpose described.

2. In a system of rapid transportation, the combination of a track, a series of positively-rotated driving-rolls spaced at suitable intervals along the track between the side girders thereof, a wheelless car, the longitudinal runners carried by the car and resting on the rolls to support the car on the rolls out of contact with the track, and friction devices carried by the car and arranged to engage the side girders of the track, substantially as and for the purpose described.

3. In a system of rapid transportation, the combination of a track, a series of positively-rotated driving-rolls spaced at suitable intervals on the track, and a car resting on and supported by the driving-rolls independently of the track and carrying devices which engage the track to prevent lateral and vertical displacement of the car, substantially as and for the purpose described.

4. In a system of rapid transportation, the combination of a track, a series of spaced driving-rolls, the running power-cables passing over said rolls to rotate the same, and a car having longitudinal runners or bars which engage with said driving-rolls by frictional contact only, substantially as and for the purpose described.

5. In a system of rapid transportation, the combination of a track, a series of spaced driving-rolls, the running power-cables, a car having the longitudinal runners or bars fixed to its lower side and resting on the driving-rolls and cables by gravity to move the same along the track independently of the latter and solely by frictional contact between said runners, the driving-rolls, and the cables, substantially as described.

6. In a system of rapid transportation, the combination of a track, the positively-rotated driving-rollers arranged between the sides of said track, the running power-cables spaced laterally of each other and passing over said driving-rolls, a car having frictional rollers adapted to engage the track, and the longitudinal runners or bars fixed to the car, on the lower side thereof, and adapted to be moved by frictional contact with the driving-rolls, substantially as and for the purpose described.

7. In a system of rapid transportation, the combination of a track, the positively-rotated driving-rolls, a car supported by the driving-rolls and capable of a limited vertical movement, substantially as described, the longitudinal runner-bars fixed to the car and adapted to have engagement with said driving-rolls, mechanism carried by the car for lifting the same vertically and disengaging the longitudinal runners from the driving-rolls, and devices on the car adapted to be forcibly pressed against the track when the car is elevated, substantially as described.

8. In a system of rapid transportation, the combination of a track, a series of positively-rotated driving-rolls spaced at suitable intervals along the track between the side girders thereof, the running power-cables passing over said rolls, a wheelless car, the longitudinal runners fixed to the bottom of the car and arranged to have contact with the driving-rolls and the power-cables, and friction-rollers carried by the car and arranged to have contact with the side girders of the track below an overhanging ledge on said girders, substantially as described.

9. In a system of rapid transportation, the combination of a track, the positively-rotated driving-rolls, a car having longitudinal runners adapted to rest on said driving-rolls, and friction-rollers carried by the car and arranged to be moved vertically by mechanism, substantially as described, to depress said rollers upon the track and elevate and support the car on the track out of contact with the driving-rolls, substantially as and for the purpose described.

10. In a system of rapid transportation, the two adjoining tracks, the driving-rolls arranged between the side girders of the track, the rotary power-drums, each arranged below one of the tracks and the driving-rolls thereof and driven in opposite directions, and a continuous endless cable passing over said driving-rolls, arranged around said drums and passing laterally from one track to the other, substantially as and for the purpose described.

11. In a system of rapid transportation, the two adjoining tracks, the driving-rolls arranged between the side girders of the tracks, the power-drums, each arranged below one of

the tracks and rotated positively in opposite directions, a pair of endless cables arranged over the driving-rolls and around said drums and passing laterally from the drum of one track to the drum of the adjoining track, and guide-rollers intermediate of the drums and located laterally thereof, as and for the purpose described.

12. In a system of rapid transportation, the two adjoining tracks, the driving-rolls supported between the same, the rotary power-drums 13 14, located at suitable intervals along the length of the track and arranged laterally with respect to each other, the endless power-cables passing over the driving-rolls and laterally of the tracks from the power-drum 13 of one track to the power-drum 14 of the adjoining track, substantially as and for the purpose described.

13. In a system of rapid transportation, the combination, with a track and a car-propelling mechanism, of a wheelless car, the rock-shafts journaled on the car and carrying friction-rollers arranged to engage the side girders of said track, and a cross-head connected with said rock-shafts to simultaneously move the latter and force the rollers thereof into engagement with the track when said cross-head is moved vertically in one direction, substantially as and for the purpose described.

14. In a system of rapid transportation, the combination, with a track and a car-propelling mechanism, of a car, the rock-shafts journaled in the car near the ends thereof and having arms which carry the friction-rollers, a vertical screw-shaft, a cross-head fitted thereon, and levers intermediate of said cross-head and the rock-shafts, substantially as and for the purpose described.

15. In a system of rapid transportation, a car having a longitudinal frame, the horizontal parallel runners fixed to said frame longitudinally thereof, rock-shafts journaled in said frame above the runners and having angular arms which carry friction-rollers, in combination with a track, the car-propelling mechanism, and mechanism carried by the car for simultaneously operating the rock-shafts to depress the rollers thereof into engagement with the track or withdraw said rollers from the same, as and for the purpose described.

16. In a system of rapid transportation, a car having a vertical central apartment provided with a lookout-chamber and the end passenger-apartments, the rock-shafts journaled in the car and carrying friction-rollers, a vertically-movable cross-head and a screw-shaft located in the central apartment, and the longitudinal levers arranged between the seats in the passenger-apartment and connected at their ends to the rock-shafts and the cross-head, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. BARROWS.

Witnesses:
JOHN M. HALL,
JAMES T. LYNCH.