(No Model.)

8 Sheets—Sheet 1.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335.

Patented Sept. 6, 1887.

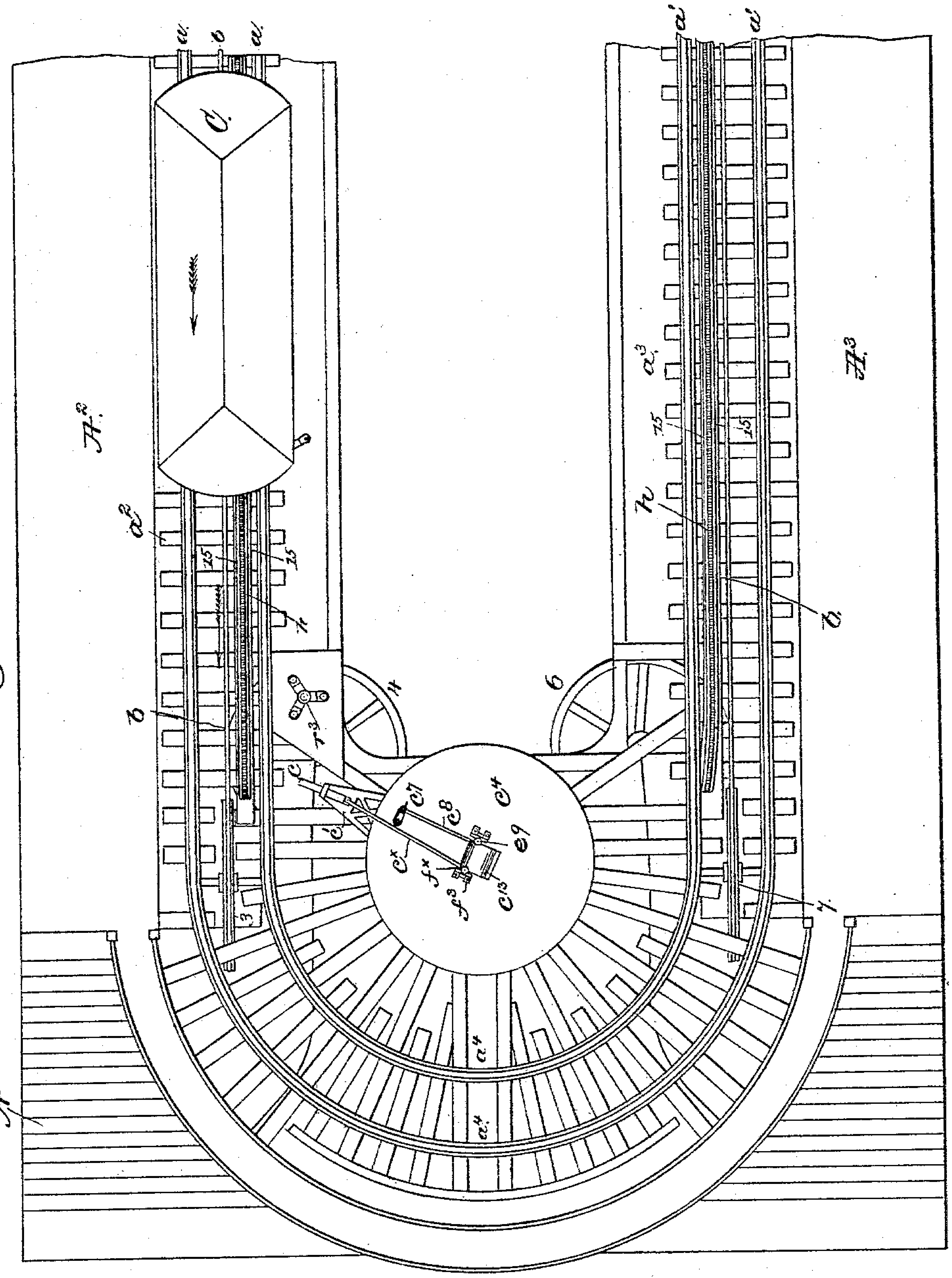


Fig. 1.

Witnesses.
John F. C. Prinkert
Fred L. Emery

Inventor.
Louis Goddu,
by Crosby & Gregory attys.

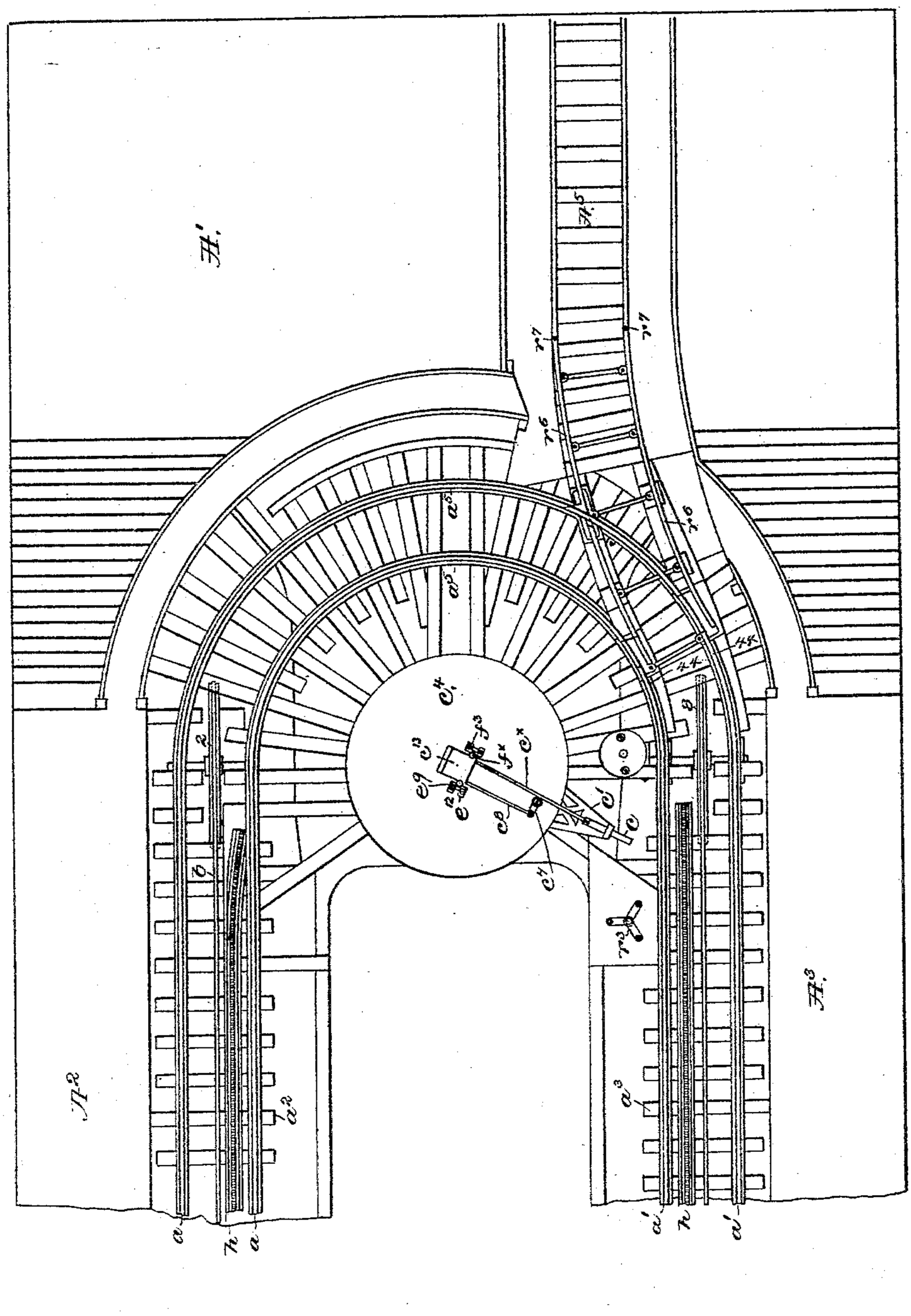
N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.



Witnesses.
John F. C. Pennekett
Fred L. Emery

Inventor.
Louis Goddu.
By Crosby & Gregory
Attys.

(No Model.) 8 Sheets—Sheet 3.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

Fig. 2a.

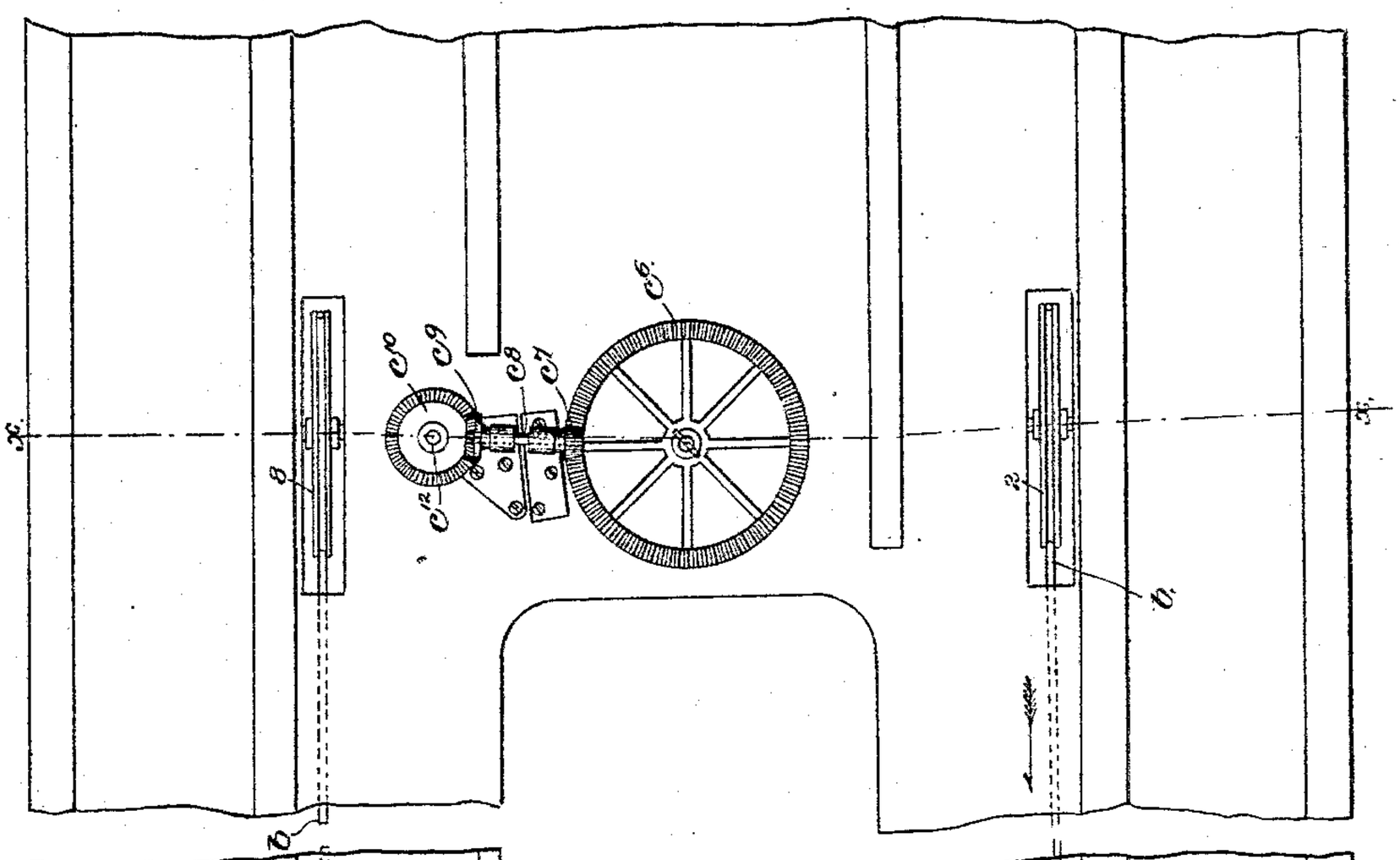


Fig. 2.

Witnesses.
John F. C. Pennington
Fred L. Emery

Inventor.
Louis Goddu.
by Crosby & Gregory Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 4.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

Fig. 3.

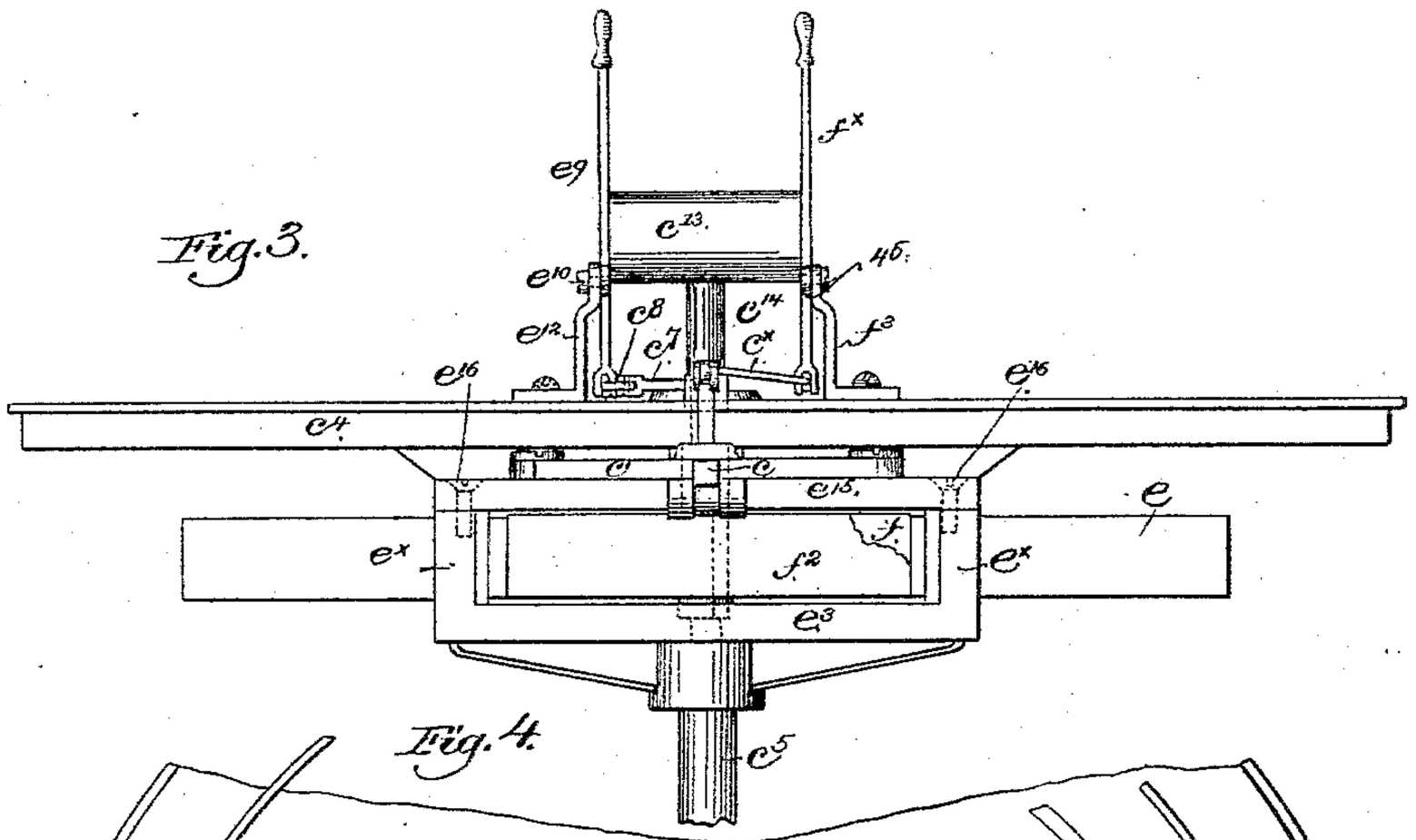


Fig. 4.

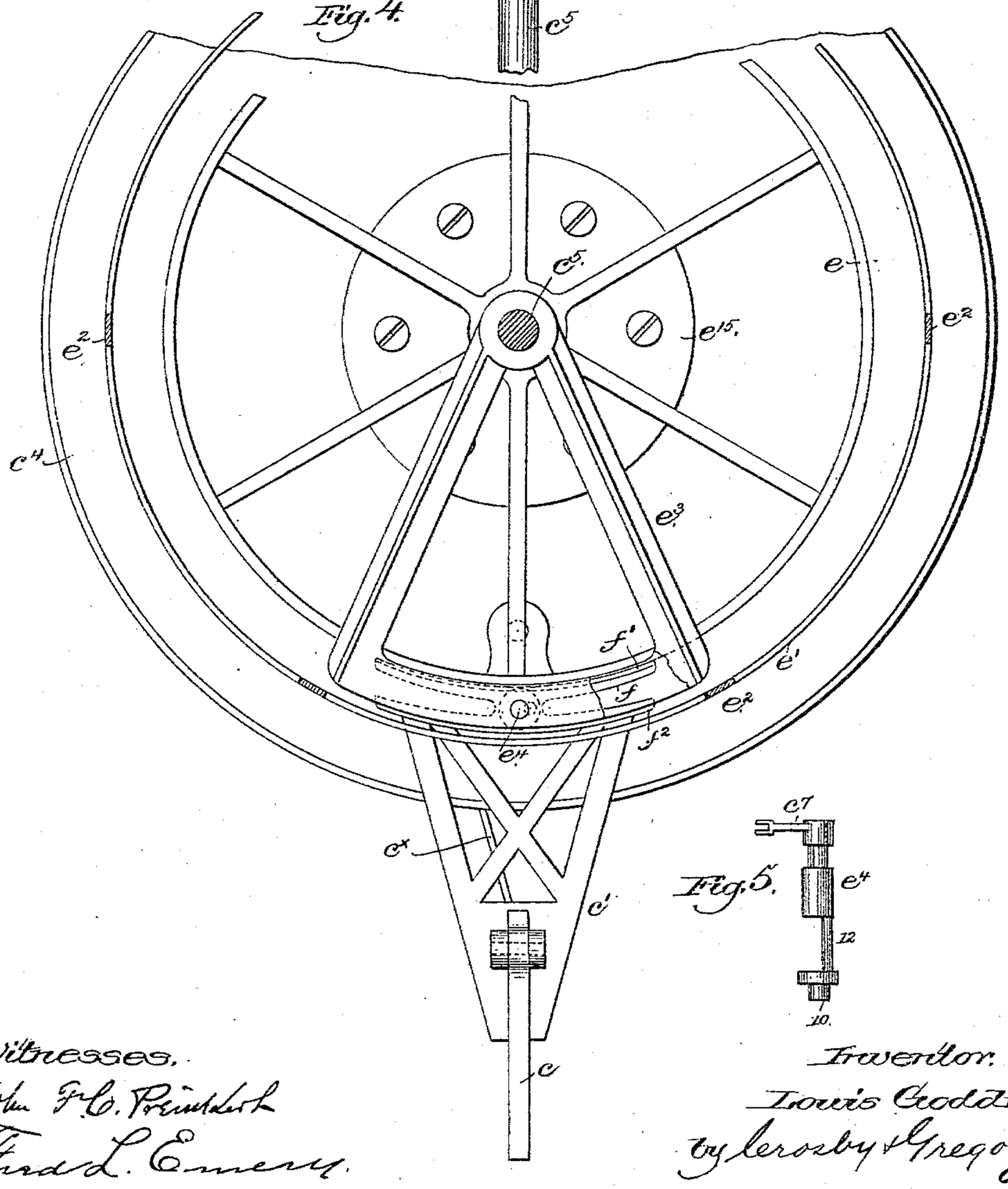


Fig. 5.

Witnesses.
John F. C. Priddeck
Fred L. Emery.

Inventor.
Louis Goddu.
by Leroy by & Gregory Attys.

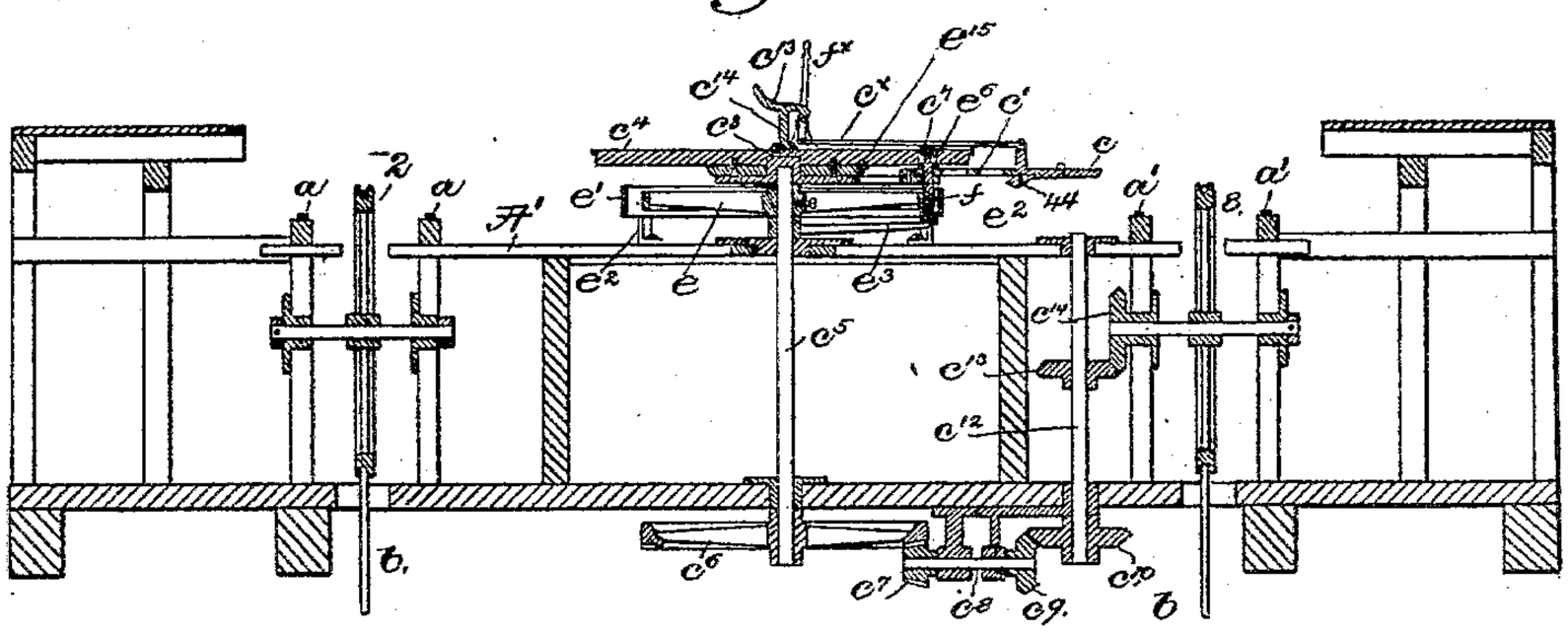
(No Model.) 8 Sheets—Sheet 5.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

Fig. 6.



Witnesses.
John F. C. Partridge
Fred K. Emery

Inventor:
By Louis Goddu.
Crosby & Gregory Attys.

(No Model.) 8 Sheets—Sheet 6.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

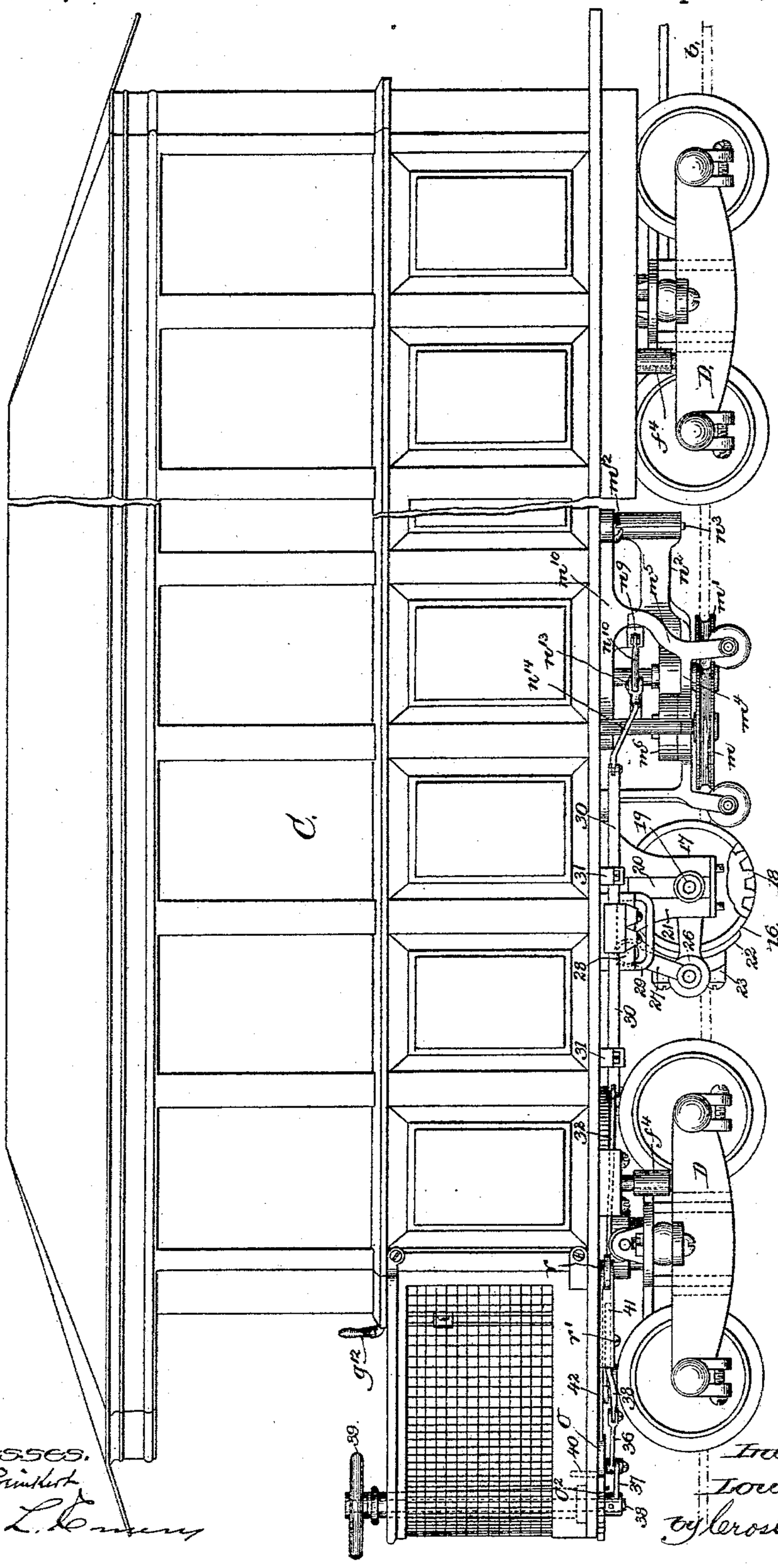


Fig. 1.

N. PETERS, Photo-Lithographer, Washington, D. C.

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L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

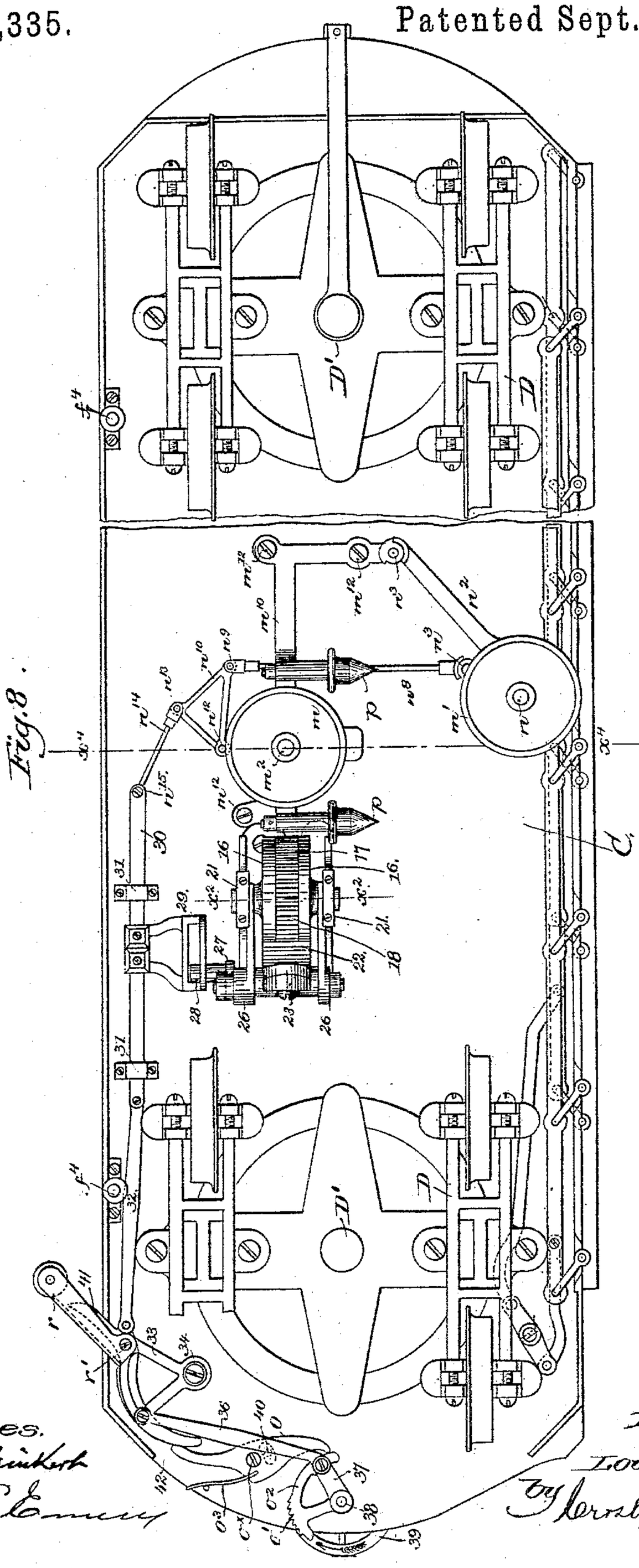


Fig. 8.

Witnesses.
John F. C. Brinkerhoff
Fred L. Emery

Inventor.
Louis Goddu.
By Dewey & Gregory Attys.

(No Model.) 8 Sheets—Sheet 8.

L. GODDU.

ENDLESS RAILWAY SYSTEM.

No. 369,335. Patented Sept. 6, 1887.

Fig. 9.

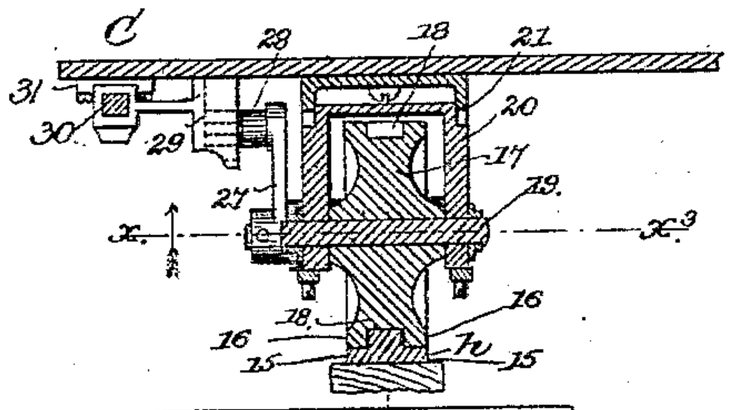


Fig 10.

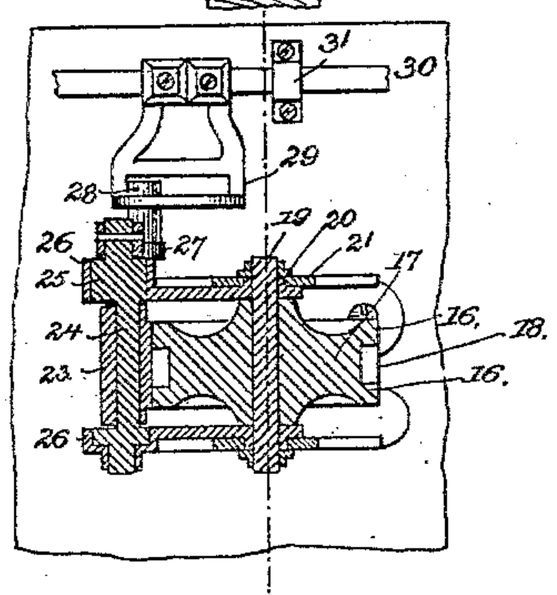


Fig. 11.

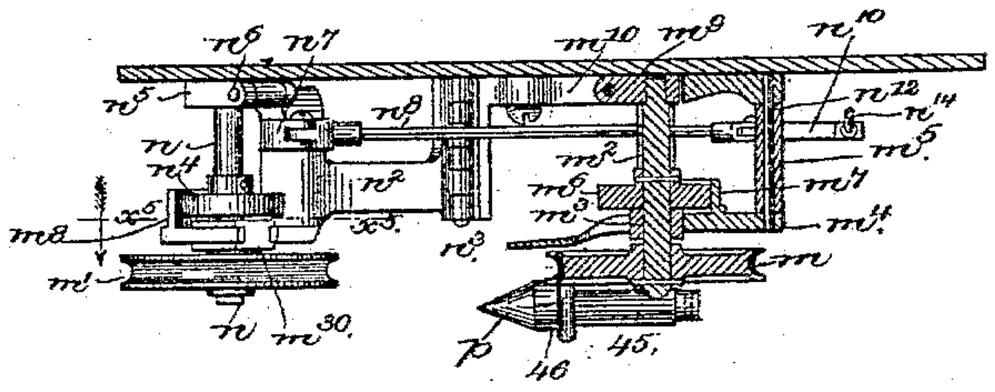
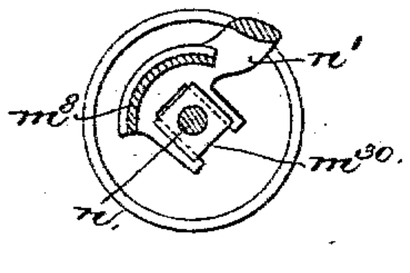


Fig 12.



Witnesses.
John F. C. Printhorst
Fred L. Emery.

Inventor:
Louis Goddu,
by Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

LOUIS GODDU, OF WINCHESTER, MASSACHUSETTS.

ENDLESS-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 369,335, dated September 6, 1887.

Application filed November 26, 1886. Serial No. 219,928. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GODDU, of Winchester, county of Middlesex, and State of Massachusetts, have invented an Improvement in Endless-Railway Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The cars crossing the suspension-bridge spanning the river between the cities of New York and Brooklyn are impelled by one endless cable driven by a powerful stationary engine located at the Brooklyn end of the bridge. The bridge has two railway-tracks or road-beds, and the cable extended over suitable sheaves—especially the part of the cable from shore to shore—is made to present two parallel lines, one moving in one and the other in the opposite direction, one line of the cable lying upon one and the other line of cable upon the other road-bed, so as to be grasped by a gripper attached to a car, the engineer on the car operating the gripper to grasp the cable whenever it is desired to start the car. The cars on their arrival at their destination at either end of the bridge are run from the main track upon side tracks, from which they are again taken to the main track at the opposite side of the bridge by donkey-engines, several of which have to be employed at each end of the bridge at considerable cost, both for machinery, maintenance, and engineers.

The side tracks and extensions required at the ends of the bridge referred to take up a large amount of space available for business purposes, which is very valuable, and with increase of patronage the addition of cars run with greater frequency demands a much larger area at the ends of the bridge for the side tracks, and the shifting of the cars from the part of the cable running in one direction across the bridge to a part of the cable running in the opposite direction is made more and more difficult, causing great delay and expense. Much difficulty has also been experienced upon the bridge referred to by the slipping of cars on the track when the grip fails to hold the cable, and the cars have consequently been impelled on the track by only their gravity, and as the grades are steep, accidents are liable at any moment, in which life and limb may be lost and great damage done to property.

My invention has for its object to dispense with the large amount of space at the ends of the bridge for the running of side tracks to receive the cars from the main tracks; also to dispense with the donkey-engines referred to. I have also added to the road-bed a safety-rack, and to the car a safety-wheel to engage the said rack when it is desired to stop the car, or whenever, for any cause, the gripping device fails to properly hold upon the cable, the said wheel and rack preventing the possibility of injury by the disengagement of a gripper from the running cable.

In accordance with the invention herein to be described, the cables remain in the present condition; but the parallel tracks of the two road-beds are connected at each end of the bridge by means of a curved or semicircular track, the radius of which is equal to one-half the distance between the contiguous rails of the two parallel road-beds, and I employ at each end of the bridge a circularly-moving transferring mechanism, somewhat like a turn-table, it having suitable appliances whereby a car arriving at one end of the straight track at one end of the bridge is released from the cable and is moved along the curved track into position over the cable along the other part of the main straight road-bed upon which the car is to return to the opposite end of the bridge.

In case the engineer fails to open the grippers before the car reaches the curve track, means have been provided for automatically releasing the gripper as the car arrives at the transferring mechanism, so that the car can be stopped for the passengers to walk out, and then an attendant controlling a car-engaging device makes the necessary connection between the car and the transferring mechanism and runs the car along the circular track connecting the two main lines of track, the trucks of the car being so constructed, as will be described, as to permit the car to be run on a track with a short circular curve of nearly one hundred and eighty degrees, the curved ends referred to as uniting the rails of the two parallel roadways forming, practically, a continuous track for the car.

The gripping mechanism and the safety mechanism are so joined mechanically that the release of the gripper operates the safety mechanism, causing the car to be held or retarded at any point at the will of the operator. If, however, it is desired to have separate levers, (one for applying the grip and releasing it, and another for actuating the brake on the safety-wheel,) it can be done, in which case the engineer would hold in one hand the grip-lever and in the other the brake-lever.

The safety-wheel which runs on the safety-rack has a self-adjusting vertical motion to enable the safety device to adapt itself to any unevenness of track.

The safety-wheel of the safety mechanism has a friction device, which co-operates with it to avoid a sudden shock when the safety device is thrown into operation should the car be running at high speed.

Co-operating with my improved gripper is a novel device called by me the "cable-supporting roll," it having a cone-shape end, the apex of which is lower than the cable where it first passes over the sheaves at the ends of the bridge, so that as the car is carried around the curve from one cable to the other the points of the supports run under the cable to be engaged, this being done while the car is in motion and coming into place on the straight track, where the cable is to be gripped to impel the car by traction.

As the car comes into position on the main straight track, the cable is gradually raised to a proper height by the conical-pointed revolving supports until the said cable arrives upon a horizontal part of the said support, preferably grooved and located in the same vertical plane as the gripper, so that the cable is always in position to be seized. I employ one revolving support in front of the gripper and one behind it, to thus more effectually keep the cable in line with the gripper and to relieve the gripper from the downward strain and weight of the cable.

As the car leaves one straight track for another by the curved track referred to, the grippers having been unlocked, the cable-support is drawn out from under the cable before it reaches that point of the track where the cable passes down about the return-sheave to take it to the other side of the track.

Maintaining the cable by the supports above the sheaves and in line with the grippers makes it possible to stop and start the car at any point along the cable. Without these supports the weight of the cable would cause it to drop on the sheaves below the grippers as soon as the hold on the cable is released, accidentally or otherwise, so that it cannot be seized again without first lifting it up in line with the gripper. By the method at present practiced, should any accident occur which would necessitate that the engineer stop the car on its passage across the bridge, or if the gripper slips its hold upon the cable, it is impossible to again start the car, and the car must consequently return by gravity or the conductor must signal for a locomotive to come and take it to the starting-point, where the cable is lifted in line with the gripper, and another attempt is then made to cross the bridge.

When the devices for operating the grippers are in their normal position, the running cable lies directly between the gripper-wheels, so that when the car is to be started the grippers have only to be brought together upon the cable by a movement of the lever or wheel employed to operate the gripper mechanism.

When it is desired to release the grippers and stop or retard the motion of the car, a movement in the opposite direction of the same lever or wheel past the normal point first releases the cable and then applies the friction to the safety-wheel, thus stopping the car at once or gradually.

To turn the car from one to the other straight roadway, I have provided a transferring device containing a carriage which is made to rotate about a vertical axis by a suitable friction device, whereby the speed at which the car is to be moved may be readily controlled.

The carriage referred to has a latch or car-engaging device under the control of the attendant, which may be made to engage a projection on the car and move it. This latch may be turned at any movement out from its engagement with the said projection on the car to leave the latter at rest, the carriage, however, continuing, if desired, to revolve, but without imparting motion to the car, and as the carriage in its revolution again moves opposite the said projection the latch may be turned into position to engage the projection and move the car around into place on the straight track.

The car will have in one side of it a series of passage-ways for the ingress and egress of the passengers, the said passage-ways being closed by doors connected to mechanism preferably adapted to be operated by the brakeman at the end of the car on the outside thereof to close or open all the doors simultaneously, the said doors and mechanism being shown and described in another application, Serial No. 238,959, filed by me May 21, 1887, the same being not herein shown and claimed.

Figures 1 and 1ª, taken together, show a plan view of, it is supposed, a railway embodying my improvements, the said two figures showing the terminals of the railway with some of the intervening parallel road-beds and tracks, a car being on one track. Figs. 2 and 2ª show, respectively, under side views of the gearing and sheaves which would show at the under side of Figs. 1 and 1ª. Fig. 3 is an enlarged elevation of part of the transferring mechanism arranged within the curved track at one end of the railway; Fig. 4, an under side view of Fig. 3, with the stationary curb added, the said figure being partially broken out to make room on the drawings for Fig. 3. Fig. 5 is a detail of the eccentric or cam shaft for

operating the clutch that is made to engage the said curb or the periphery of the carrier-wheel driven in unison with the cable, the said clutch being located between the said curb and wheel. Fig. 6 is a section of Fig. 2^a in the dotted line x. Fig. 7 is a partial elevation of the under side of the car, chiefly to show the truck and gripping and safety and brake mechanisms. Fig. 8 is an under side view of Fig. 7. Fig. 9 is a sectional detail in the line x^2, Fig. 8. Fig. 10 is a section of Fig. 9 looking up from the line x^3. Fig. 11 is a section in the line x^4, Fig. 8, looking toward the left, the car-body being, however, not inverted, as in Fig. 8. Fig. 12 is a detail looking down from the line x^5, Fig. 11.

Referring to the drawings, A (see Fig. 1) and A′, Fig. 1^a, are supposed to represent the ends of a structure, or it may be a bridge for supporting a railway system, the portions A^2 A^3, connecting the said ends, constituting what I shall call the "sides" of the structure. The structure is provided at one side, A^2, with usual rails, a, upon which may run the wheels of the trucks of a car, C, the other side, A^3, of the structure being provided with rails a' a', which, except at or near the ends A A′, are substantially parallel, the rails a a constituting one and the rails a' a' another roadway, the rails being attached in usual manner to usual ties, a^2 a^3.

The rails a a and the rails a' a' at the ends of the roadways are united by curved rails a^4 a^5, the said curved rails, together with the rails a a', forming practically an endless or continuous roadway for a car. The curved rails a^4 are parallel to each other, as are the curved rails a^5, the curves for the rails a^4 and a^5 being struck from a common center equidistant between the rails a and a', forming the inside rails of the roadway.

The endless metallic cable b, employed to impart motion to the car or cars, starts, it may be assumed, from the end A′ of the structure, where is located a suitable stationary engine (not shown) of sufficient power to keep the endless cable in constant operation at the desired speed.

The cable b is made to pass over, as herein shown, a system of sheaves, 2 3 4 5 6 7 8, the cable running from the sheave 8 back to the source of motion for the cable. The number of said sheaves arranged along the sides A^3 A^3, between the ends A′ A^2, will depend upon the length of the structure, the sheaves 2 and 8 herein shown being at one end of the structure, while the sheaves 3, 4, 5, 6, and 7 are at the opposite end of the structure, the cable passing down below the sheave 3, thence about the sheaves 4, 5, and 6, so arranged as to permit the cable b to be carried across from one side, A^2, of the structure to the opposite side, A^3, and thence up over the sheave 7.

It will be noticed that the sheaves over which the cable is extended are so placed, each with relation to the other, that part of the cable b between the rails a a runs in one direction, while the other part of the said cable parallel to it, between the rails a' a', runs in the opposite direction, the cable extended, respectively, between sheaves 2 3 and between the sheaves 7 and 8 being parallel and so located above the ties a^2 a^3 as to be readily caught by the picker p p, which co-operates with the gripping device, to be described, which, attached to the under side of the car-body and manipulated from the platform of the car by the attendant, is caused to seize the cable firmly whenever it is desired that the car move by traction on either of the tracks a a or a' a'. The structure referred to at the end A and A′ is provided with like transferring mechanism, whereby a car upon reaching the end of the straight part of the track, as a a or a' a', may be taken and caused to move about the curved track a^4 a^4, or it may be a^5 a^5, and be left upon the track a' a' or a a at the opposite side of the structure, according to the direction of movement of the car.

The transferring apparatus at opposite ends of the straight roadways are both alike, except as to the manner of driving the shaft carrying the carrier-wheels forming parts thereof, and therefore a specific description of one transferring apparatus will enable the other to be understood, and therefore I shall not specifically describe but one, using, however, like letters upon both.

Each transferring device is composed, essentially, of a latch or equivalent finger, c, which is connected or pivoted to an arm, c', extended radially from a platform or turn-table, c^4, having at its under side a hub, c^5, the hub embracing the end of a vertical shaft, c^5, which constitutes a pivot for the said turn-table. The shaft c^5 at the end A′ of the structure has an attached toothed wheel, c^6, which is engaged by a beveled pinion, c^7, on a shaft, c^8, the said shaft having a second beveled pinion, c^9, which is engaged by a beveled pinion, c^{10}, on the shaft c^{12}, in turn provided with a beveled pinion, c^{13}, engaged by a beveled pinion, c^{14}, on the axle of the shaft carrying the sheave 8.

The corresponding shaft, c^5, at the end A of the structure has a large tooth-gear, d^2, which is engaged by an intermediate gear, d', in turn engaged by a toothed pinion, d, fast upon the shaft d^3, to which is attached the sheave 5, before described as rotated by the cable b, the wheels for driving the shafts c^5 being so proportioned as to revolve the said shafts at the desired speed, the two shafts c^5 being rotated continuously.

Each shaft c^5, near its upper end, has attached to it a carrier-wheel, e, having a smooth periphery, the said wheel being surrounded at some distance from its periphery by a curb, e', sustained by feet e^2, secured by suitable screws or otherwise to the structure or some stationary part, the inner face of the said curb, annular in shape, being concentric with relation to the periphery of the carrier-wheel e.

Each shaft c^5 is provided with an arm, e^3,

which, extended therefrom to a point immediately below the space between the wheel *e* and the curb *e'*, is upturned, as at $e^{\times}$, (see Fig. 3,) the end of the said arm serving to support the foot 10 (shown separately in Fig. 5) of an eccentric or cam shaft, e^4, the said shaft near its upper end, extended upward between the said carrier-wheel and curb, taking a bearing in a plate, e^{15}, secured to the ends $e^{\times}$ of the arm e^3.

The upper end of the shaft e^4 is extended up through a hole in the platform or turn-table c^4, and has fastened to it an arm, c^7, to which (see Figs. 1 and 1ª) is joined one end of a link, c^8, the opposite end of the said link being jointed to the lower end of a hand-lever, e^9, pivoted at e^{10} on a bracket, e^{12}, secured to the platform or turn-table c^4, the said lever being near the right hand of the operator, who, in practice, will sit upon the seat c^{13}, erected upon a suitable post, c^{14}, at the top of the platform or turn-table.

The eccentric or cam shaft e^4, referred to, one at each end of the structure, has a portion, 12, which serves as a pivot for a clutch or friction device, *f*, shown as an H-shaped block of metal, (see Fig. 4,) having a concaved surface, *f'*, and a convexed surface, f^2, the said surfaces being each covered, preferably, by leather, the surface *f'* lying next the periphery of the continuously-rotating carrier-wheel *e*, while the surface f^2 rests next the interior of the stationary annular curb *c'*.

The oscillation of the shaft e^4 in one direction, by the movement of the lever e^9, will cause the clutch or friction device *f* to either bear against the periphery of the carrier-wheel *e* or against the curb *e'*, as it is desired to rotate or to leave at rest the transferring apparatus, consisting, as herein shown, of a carriage, *c'*, and a latch, *c*. When the lever e^9 is turned in the proper direction far enough to cause one of the friction-surfaces of the said clutch or friction device to bear against the periphery of the wheel *e*, the carriage *c'*, and with it the platform or turn-table, is caused to travel with wheel *e;* but the speed of the carrying-arm can be lessened by the degree of the friction between the clutch or friction device and the carrier-wheel at the will of the operator.

The latch *c*, herein shown as of elbow shape, is pivoted at 44 upon the carriage *c'*. (See Fig. 6.) This latch is connected by a link, $c^{\times}$, to a lever, $f^{\times}$, pivoted at 45 on a stand, f^3, also erected on the platform or turn-table c^4. The operator, by moving the lever $f^{\times}$ by his left hand, may cause the latch *c* to be raised to engage a suitable stud or projection, as f^4, (see Figs. 10 and 11,) attached to one of the sills of the car-body C, there being two such projections, one of which may be readily engaged by said latch when the car arrives near the end of a straight part of the roadway, the operator keeping the said latch in engagement with the said projection or car-body and the clutch or friction device pressed closely against the carrier-wheel *e* until, in the rotation of the carriage *c'*, the car is transferred from, say, the track *a* to the track *a'*, the wheels of the car-truck at such time running about the curved track, as a^4.

The transferring device having transferred the car from one to the other roadway, parallel therewith, by rolling the car around on a curved track, as a^4, the operator reverses the lever $f^{\times}$, which causes the friction-surfaces f^2 of the clutch or friction device *f* to be forced against the stationary curb *e'*, which immediately stops the rotation of the transferring mechanism, leaving it in position to be again started, by causing the clutch or friction device to grasp the carrier-wheel *e*, which is done when it is desired that the latch *c* again engage a car to transfer it, as described, from one to the other straight part of the track, or from one straight part of the cable to another straight part thereof running in the opposite direction.

The car herein shown, instead of being provided with doors at its ends, as common in ordinary street-cars and in the cars used upon the Brooklyn bridge, referred to, are provided with a series of doors, (not shown, but which are arranged along substantially the entire outer side of the car,) the said doors being connected to and operated by mechanism substantially such as shown in my application, Serial No. 238,959, filed May 21, 1887.

The car-trucks D, upon which the car-bodies are mounted, are pivoted centrally by suitable king-bolts, D', to the underside of the car-body, so that they are free to turn under the car-body and follow correctly upon the semicircular or curved track, said tracks, as to their mechanical construction and as to their connection with the car-body, being fully shown in another application, Serial No. 238,965, filed by me on May 21, 1887, to which reference may be had.

Each roadway between the tracks *a a* and *a' a'* is provided with a safety rack or rail, *h*, which, for the most part of its length, is parallel with the rails next to it, on which run the wheels of the trucks, each of the said safety racks or rails having its central portion toothed or cogged, the teeth rising above the center of the safety-rail, (see cross-section of the rail, Fig. 9,) the said safety-rail at each side of its teeth having plain portions 15 15, on which run the flanged parts 16 of the safety-wheel 17, (shown fully in Figs. 7, 9, and 10,) the said safety-wheel having a series of teeth, 18, which are constantly in mesh with the teeth of the safety rack or rail when the car is running upon a straight portion of either the tracks *a* or *a'*.

The safety-wheel 17 is free to rotate upon a stud, 19, extended through a yoke, 20, which is free to rise and fall for a limited distance in a guiding-yoke, 21, secured to the under side of the car-body, the slight vertical motion given to the said safety-wheel enabling it to adapt itself to any slight accumulation of dust or dirt in the space between the teeth of the safety-rack.

The safety-wheel 17 has co-operating with it a brake-shoe, 22, (shown best in Figs. 7 and 8,) attached to a block, 23, mounted upon the eccentric part 24 of an eccentric or cam shaft, 25, having its bearings in arms 26, (see Figs. 7 and 10,) extended from the box or yoke 21, before described, the said shaft 25 having attached to it a suitable arm, 27, which at its upper end is provided with a suitable roller or other stud, 28, which enters a slot in an arm, 29, suitably bolted (see Figs. 8 and 9) to the slide-bar 30, having suitable guides, 31, the said slide-bar being connected by a link, 32, to one end of a sector-lever, 33, pivoted at 34, the said sector-lever being in turn jointed by a link, 36, to an arm, 37, attached to the lower end of the shaft 38, the upper end of which is provided with the usual hand-wheel, which is rotated by the engineer or car-attendant whenever the brake is to be applied and the car stopped.

The safety-wheel, in engagement with the safety rack or rail, rotates freely about its stud 19, and has no effect whatever in stopping the car or checking its motion until after the brake-shoe has been forced against the said safety-wheel, which is effected by the rotation of the shaft 38 in a direction to free the links referred to, and enabling the arm 29 to be moved in a direction to so act upon the roller or other stud 28 as to cause the eccentric-shaft 25 to be turned to force the brake-shoe against the safety-wheel and lock the same, so that the safety-wheel in engagement with the safety-rack *h* stops the further movement of the car. The brake-shoe being smooth, and operating against a smooth part of the safety-wheel, prevents a too sudden shock when the car is stopped.

The end of the safety-rack *h*, at the side A^3 of the structure next the end A, is curved downwardly and inwardly, as is also the end of the safety-rack *h* at the side A^2 of the structure next the end A′, such downwardly and inwardly bent portions enabling the safety-wheels to easily and accurately run upon the said safety-tracks as a car is being transferred from one to the other track.

The gripping devices consist, essentially, of two sheaves, *m m′*, each having a suitably-grooved periphery, which in practice will receive suitable material, preferably non-metallic, capable of exerting the greatest amount of friction upon the running metallic cable *b*.

The sheave *m* is fixed to the lower end of a shaft, m^2, extended upward through a loose box, m^3, (see Fig. 11,) grooved at its sides, as clearly shown in the box m^{30} on the shaft *n*, and which will be hereinafter described, (see Fig. 12,) the said box entering a slot in a cross-piece, m^4, forming part of a hanger, m^5, attached to the under side of the car-body, (see Figs 7 and 11,) the said box being free to slide horizontally for a short distance in a line substantially at a right angle to the straight track *a* or *a′*.

The shaft m^2, above the box m^3, has fast on it a friction-wheel, m^6, which is embraced for nearly one-half its periphery by a friction-shield, m^7, (see Fig. 11,) like the friction-shield m^8, (shown in Fig. 12,) the concaved inner side of the said shields being each in practice provided with a suitable durable friction material. The upper end of the shaft m^2 enters a block, m^9, (see Fig. 11,) pivoted upon the upper part, m^{10}, of the bracket m^5, attached to the under side of the car-body by the screw m^{12}. (See Fig. 8.) The other wheel, *m′*, of the gripper is fast to the lower end of a shaft, *n*, which is extended through the box or bearing m^{30}, grooved at its sides (see Fig. 12) to embrace a forked part of a projection, *n′*, of an arm, n^2, pivoted to the part m^{10} of the bracket m^5 by a pin, n^3, the joint so formed being (see Fig. 12) such as common to bolts for doors.

The projection *n′* has a friction-shield, m^8, against which may be pressed the friction-pulley n^4, fast on the said shaft *n*, the upper end of the shaft *n* entering a box, n^5, pivoted at n^6 to a part of the arm n^2. The arm n^2 has an ear, n^7, to which is jointed a link, n^8, pivoted at n^9 to an elbow-link, n^{10}, having a long hub, (see Fig. 11,) which embraces a pin, n^{12}, of the brackets m^5 m^{10}, the elbow-lever in turn being connected by pin n^3 with the link before described.

When the operator desires to make the gripping device seize the cable between it, he turns the hand-wheel 39 (see Fig. 8) in the direction of the arrow on it, and causes the crank 37, attached to the shaft 38, to act through the link 36, sector-lever 32, slide-bar 30, link n^{14}, lever n^{10}, and link n^8 to move the arm n^2 toward and so as to carry the periphery of the wheel *m′* nearly against the wheel *m*, the two wheels gripping the cable between them. The movement described of the slide 30 to cause the gripper to seize the cable also causes the arm 29, acting on the stud 28, to effect the loosening of the brake-shoe 22 from the safety-wheel.

The operator when causing the grippers to seize the cable, as described, turns the shaft 38 until the teeth *o′* of the ratchet-toothed sector o^2 are engaged and held by the pawl *o*, pivoted at $o^\times$ and acted upon by the spring o^3, the said pawl holding the shaft in the position left by the operator and with the grippers closed powerfully against the cable. As the grippers are closed powerfully upon the cable *b*, the boxes m^3 m^{30} are forced back in the guides holding them, and the friction-wheels m^6 and n^4 are forced, respectively, against the friction-shields m^7 m^8, which latter act as obstructions to the free rotation of the wheels *m* and *m′*, and consequently the said wheels are made to cling to the running cable *b* with a force sufficient to carry the car along the track *a* or *a′*. The pawl *o* has a pin, 40, (see Figs. 7 and 8,) which is extended up through a slot in the platform of the car outside the car-body, the said pin being in a position to be knocked by the operator or engineer when it is desired to release the shaft 38 to release the grippers

from the cable, and at the same time apply the brake-shoe 22 to the safety-wheel, which also is, as has been stated, a brake for the car.

It is desirable to effect automatically the release of the grippers from the cable as the car arrives in position to be transferred from one to the other straight roadway upon the curved track joining them. To do this I have provided the car-body (see Fig. 8) with a releasing-arm, r, pivoted at r' on the sector 33, having two horns, 41 42. When the car running in the straight track a or a' arrives at the end of the said track, the said arm r, normally extended at a right angle from the car-body, meets a releasing-stud, r^3, (see Figs. 1 and 1^a,) which arrests the said arm, causing it to be turned backward toward the rear end of the car, the said arm in its movement meeting the horn 41 of the lever 33, turning it sufficiently upon its pivot 34 as to cause the horn 42 to act upon the outer end of the pawl o and effect its release from the ratchet-toothed segment o^2, which releases the hold of the grippers on the cable.

Late at night, or at hours of the day when less than the whole number of cars which the cable may run are sufficient for the passengers coming to the road, it is desirable to have a place to discharge the unnecessary cars from the continuous track referred to, and to provide for this I have provided at the end A′ a siding or storage track, A^5, the end rails, r^6, of which, pivoted at r^7, are connected together, so as to be moved in unison, so as to place their free ends next to the ends of the rails a' a', where they meet the curved rails a^5 a^5, the ends of the rails a^5 a^5 next the rails a' a' being made as a section, 44, secured to the jointed section sustaining the rails r^6, (see Fig. 1^a,) so as to be moved out of line with the rails a' a' as the rails r^6 are brought into line therewith, and vice versa.

The bracket m^5, at its lower side, has suitable bearings or sleeves, 45, to receive the shanks of the conical revolving and supporting rolls p, which run under and support the cable b as a car comes from a curved track, a^4 or a^5, upon a straight roadway, a' or a, the conical supporting-rolls being at this point lower than the cable and passing readily under and lifting the cable in line with the grooved periphery of the wheel m. The end of the projection m^4 prevents the cable from being lifted above the wheel m.

The conical supports insure the correct lifting of the cable into the plane of the periphery of and just opposite the groove in the wheel m, so that the cable will be unerringly seized squarely by the grippers when forced toward the cable.

The cable-supports are withdrawn from under the cable in the following manner: The grippers having been actuated to release the cable, when the car is to be transferred to another roadway, the conical support readily draws out from below the cable by the sidewise motion of the car on the curve just before the supporting-rolls reach the sheaves or wheels 3 and 8.

On the arrival of a car at the end of the track a or a', the grippers are released from the cable and the brake-shoe 22 is put on the safety-wheel to check and stop the car, and the operator on the car immediately throws open all the doors, thus completely opening nearly the entire outer side of the car at the outside of the endless-railway track, so that the passengers may all step out immediately, and then the operator actuates the latching of the transferring device to effect the engagement of the latch c with the car and carry it about the curved track and upon the other straight track at the opposite side of the structure, and thereafter the car is permitted to again rest for a short space of time with the side all open, so that passengers may quickly and easily enter the car through the numerous doorways. The car loaded, the doors are all closed at once, and the gripping devices are made to seize the cable and start the car, taking it to the end of the route; but the operator on the car can instantly stop the car at any moment by applying the brake-shoe 22 to the safety-wheel in engagement with the teeth of the safety-rack.

I do not desire to limit my invention to the exact form of transferring device shown, as it is obvious that the transferring device may be variously modified without departing from my invention, and I therefore state that the employment of any device located at or near the junction of the parallel roadways and the curved tracks, such device being capable of engaging the car as it arrives at one end of one roadway and, by acting against the car, rolling it along the curved track to the other roadway, is within the scope of my invention and within the meaning of the term "transferring device."

The flanges 16 of the wheel 17 run (see Fig. 9) upon the flanges at the edges of the safety-rack, and thereby the wear of the teeth of the said rack and safety-wheel is reduced and noise is diminished.

The trucks herein shown but not specifically claimed will form the subject of another application.

I claim—

1. A railway structure containing the following instrumentalities, viz: two roadways provided with rails a a and a' a', semicircular or curved tracks a^4 a^5, connecting the tracks of the said roadway, a cable-gripping mechanism attached to the car, an endless cable to be grasped by the grippers to effect the movement of the car on the tracks a a a' a', and a transferring device to engage the car on its arrival at each end of the roadways and transfer the car over the said semicircular or curved track from one to the other roadway, to be again moved by the cable running along that part of the roadway upon which the car is delivered, and with means, substantially as described, to operate the said transferring device, substantially as specified.

2. In a railway system, tracks *a a* and *a' a'*, forming two parallel roadways, a cable, sheaves to support it between the tracks of both the said roadways and to guide the said cable across the space between the said roadways, combined with two semicircular or curved tracks, a^4 a^5, connecting the ends of the tracks *a* and *a'*, and with transferring apparatus, substantially as described, actuated by the cable to move the car from one to the other of the said tracks, substantially as set forth.

3. In a railway structure, roadways having tracks *a*, *a'*, and a^4, the rotating carrier-wheel *e*, means to move it, and a transferring device, substantially as described, and a car, combined with a clutch or friction device co-operating with the said carrier to cause the said carrier to be moved at the speed at which it is desired to move the car, substantially as described.

4. In a railway structure, roadways having tracks *a*, *a'*, and a^4, the rotating carrier-wheel *e*, means to move it, and the arm and a latch or equivalent car-engaging device carried by the said arm, and a car, combined with a clutch or friction device co-operating with the said carrier to cause the said arm to be moved at the desired speed, and with annular curb arranged outside the said carrier-wheel to be acted upon by the said clutch or friction device when it is desired to hold the said arm at rest, substantially as described.

5. In a railway system, a car and a curved track, a^4, combined with a rotating transferring device having a latch to engage a car, and means, substantially as described, to operate the transferring device to move the said car about the said curved track, substantially as described.

6. In a railway system, the combination of the following instrumentalities, viz: two roadways having tracks *a a a' a'*, curved or semicircular tracks a^4 a^5, joining the ends of the said roadways, an endless cable, parts of which run between the tracks of the said roadway, a toothed safety-rack substantially parallel with the tracks *a* and *a'*, and a car provided at its under side with gripping-wheels *m m'*, and a toothed safety-wheel having friction-surfaces, a brake-shoe and transferring apparatus located at each end of the said roadways, but within the semicircular or curved rails of least radii, the said transferring apparatus containing an arm or turn-table and a car-engaging latch or projection, the same being and operating substantially as described.

7. In a railway structure, a roadway having tracks, a toothed safety-rack, *h*, a toothed safety-wheel, 17, to engage the said rack *h*, the said wheel having flanges 16, constituting friction-surfaces, a brake-shoe to engage the said friction surfaces, a slide-bar, as 30, and intermediate mechanism to actuate the said brake-shoe and force it against the flanges of the said wheel, combined with a shaft, 38, having a suitable brake-wheel, and intermediate mechanism between the said shaft and the slide-bar 30 to operate the slide-bar, as and for the purpose set forth.

8. In a railway structure, a roadway having tracks, a toothed safety-rack, a toothed safety-wheel to engage the said rack, the said wheel having friction-surfaces, a brake-shoe to engage the said friction-surfaces, a slide-bar, as 30, and intermediate mechanism to actuate the said brake-shoe and force it against the said wheel, combined with a shaft, 38, having a suitable brake-wheel, intermediate mechanism, substantially as described, to connect the said brake-wheel operatively with the said slide-bar 30, a ratchet-toothed sector, o^2, attached to the said shaft 38, a pawl, *o*, and an arm, *r*, pivoted at *r'*, the said arm being adapted to be thrown against the horn 41 of the lever 33, forming part of the said mechanism, to thereby cause the horn 42, forming part of the said lever 33, to automatically release the said pawl from engagement with the said ratchet-toothed sector, substantially as described.

9. In a railway structure, two parallel roadways provided with tracks *a a* and *a' a'*, curved tracks to connect the ends of the tracks on the parallel roadways, and cable, a car-gripping mechanism attached thereto, and cable-supports, substantially as described, to pass under and out from under the said cable, combined with sheaves 2 and 8, to support the cable at the junction, the straight and curved tracks and part of the said sheaves extending just beyond the commencement of the curved track, whereby as the car-body is moved sidewise by the action of the wheels of the car-truck on the curved track the cable-supports are moved laterally with relation to the straight part of the cable, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS GODDU.

Witnesses:
G. W. GREGORY,
F. L. EMERY.