July 21, 1936. R. R. MILLER 2,048,215

GRAVITY COASTER

Filed April 6, 1934 4 Sheets-Sheet 1

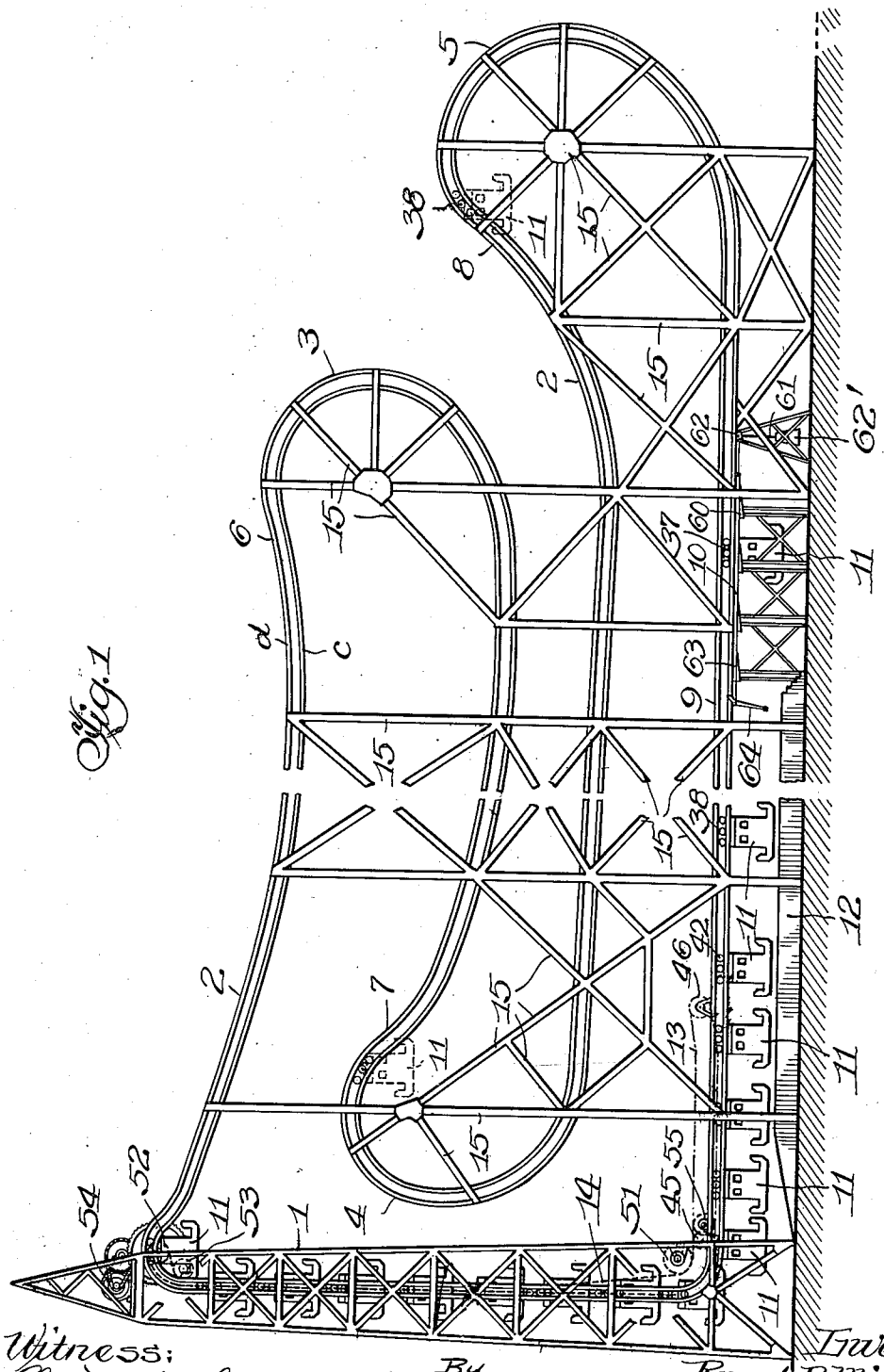

Fig. 1

Witness:
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GRAVITY COASTER

Filed April 6, 1934 4 Sheets-Sheet 2

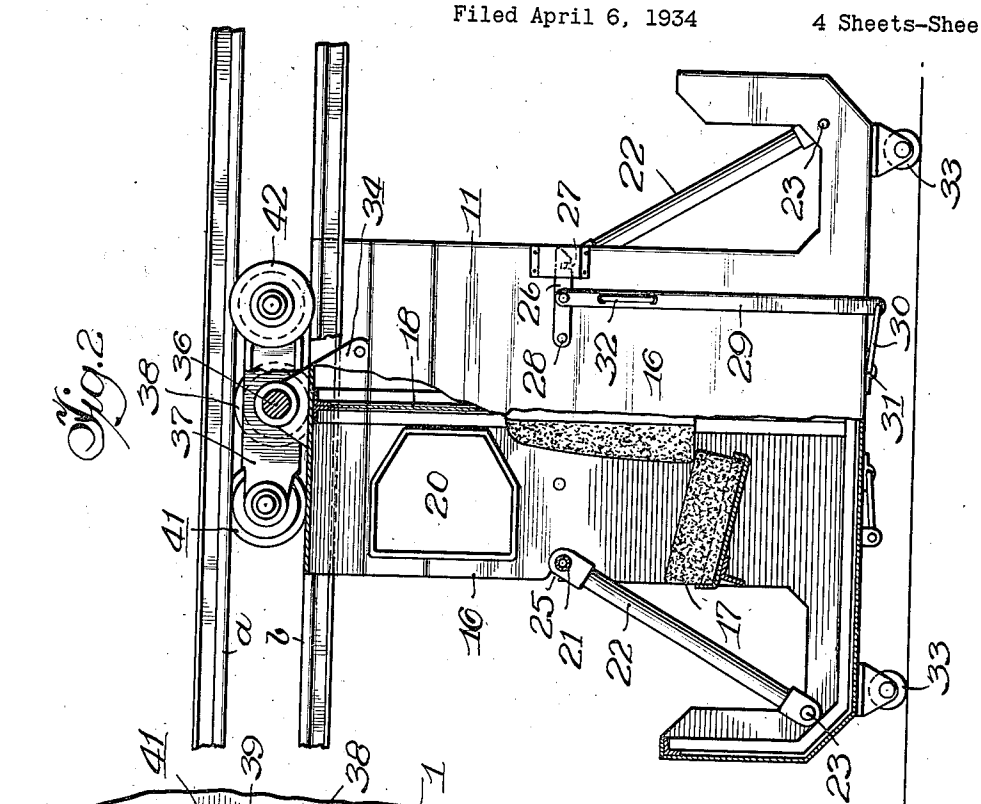

Fig. 2

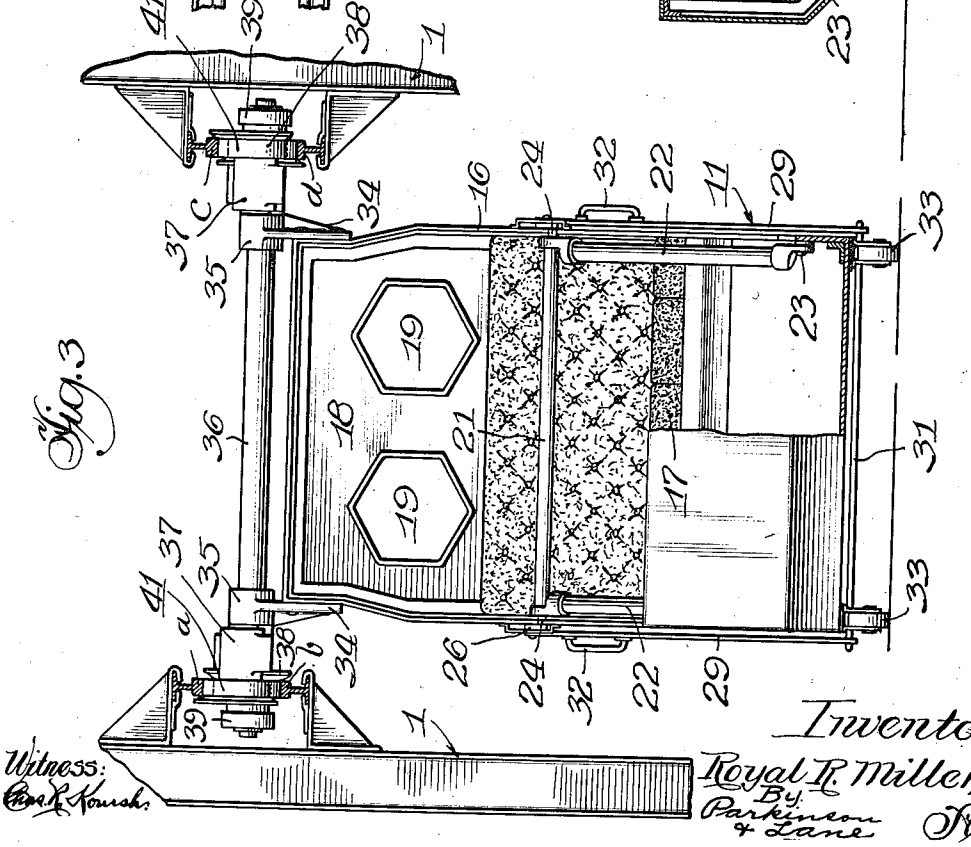

Fig. 3

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GRAVITY COASTER

Filed April 6, 1934 4 Sheets-Sheet 3

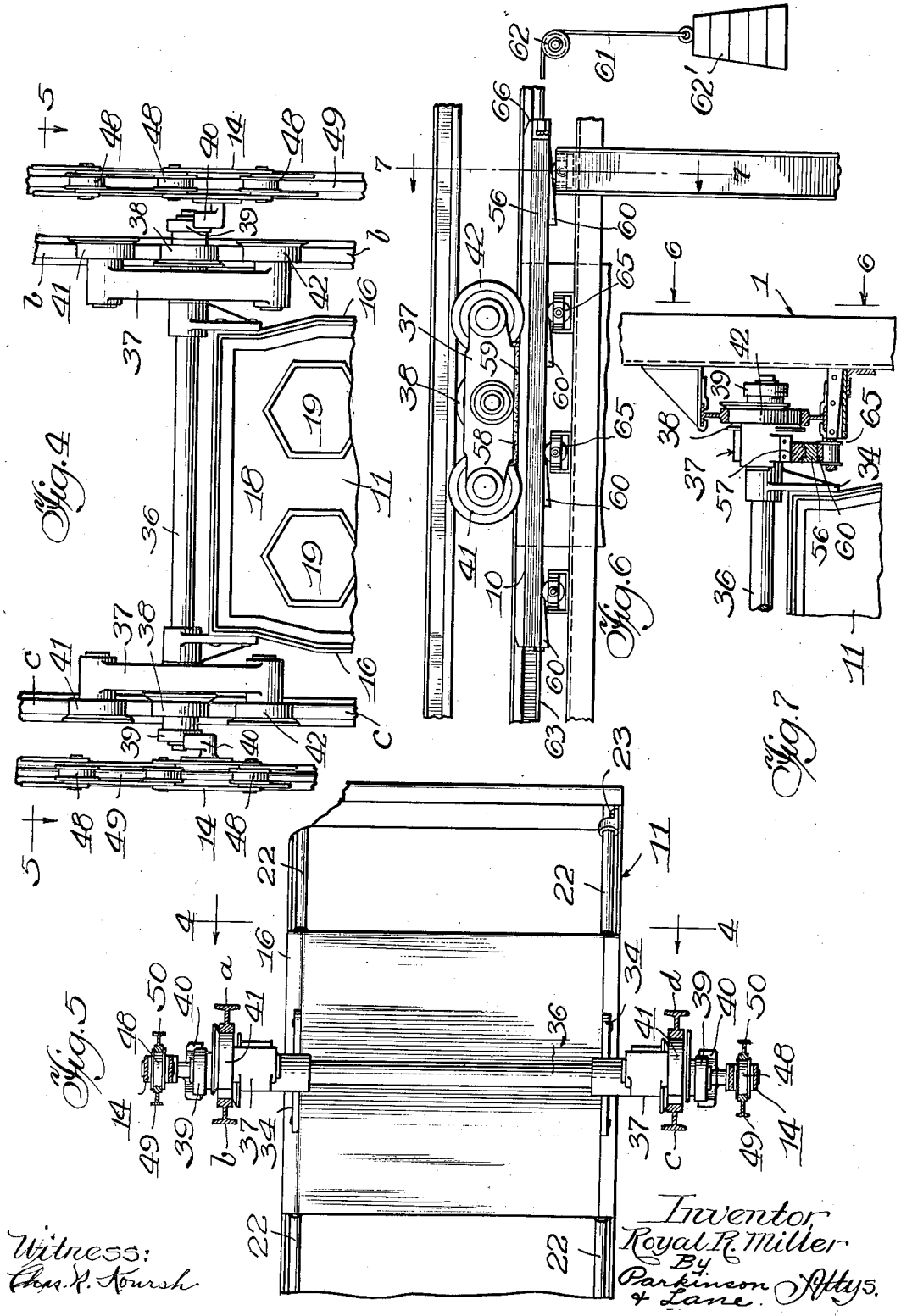

Fig. 4

Fig. 6

Fig. 7

Fig. 5

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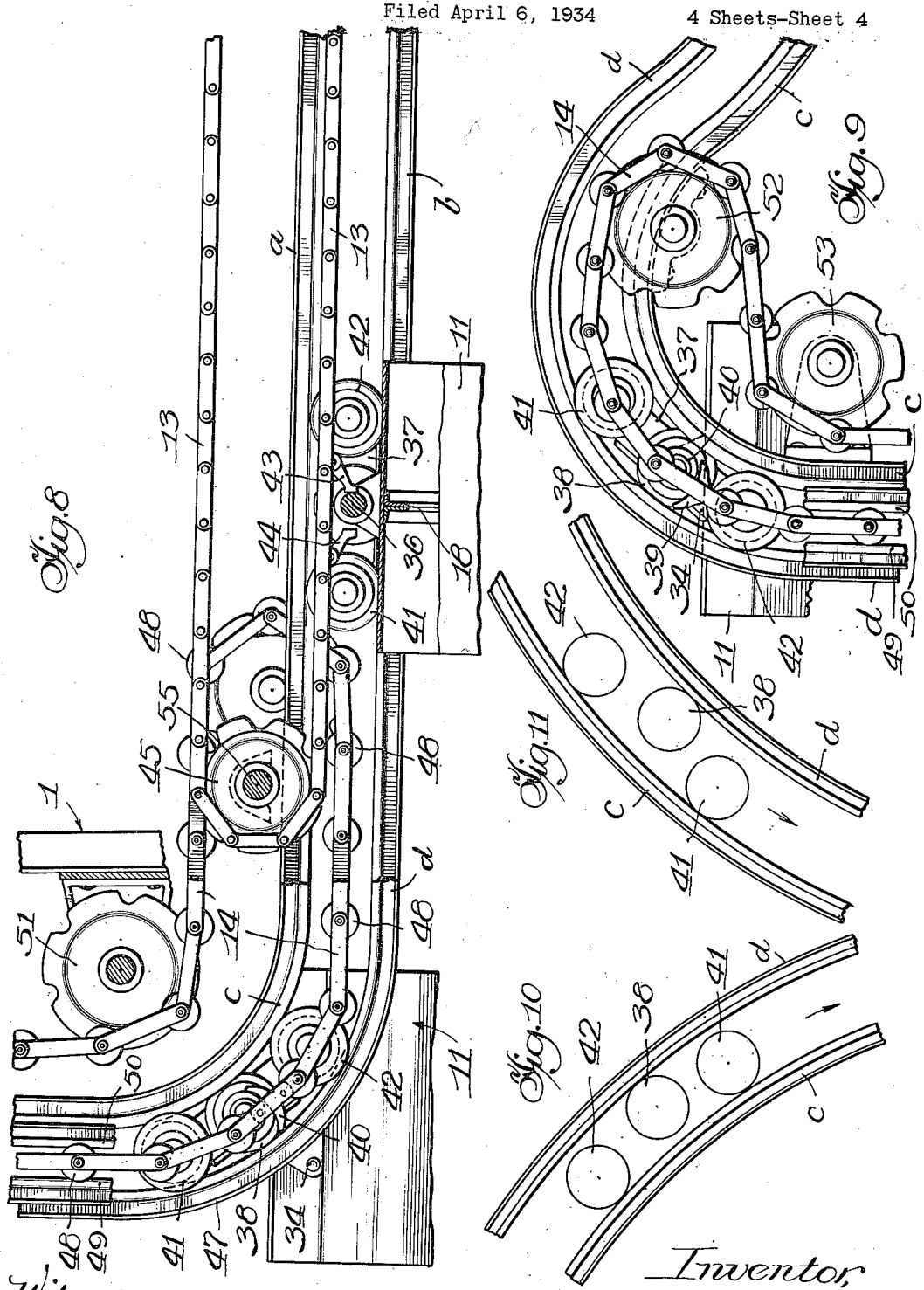
July 21, 1936. R. R. MILLER 2,048,215

GRAVITY COASTER

Filed April 6, 1934 4 Sheets-Sheet 4



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Patented July 21, 1936 2,048,215

UNITED STATES PATENT OFFICE

2,048,215

GRAVITY COASTER

Royal R. Miller, Chicago, Ill.

Application April 6, 1934, Serial No. 719,316

3 Claims. (Cl. 104—63)

This invention relates to an amusement device of the gravity coaster type in which cars are elevated by power to a predetermined height and then permitted to run by gravity down an inclined trackway having portions curved backwardly underneath itself, said curved portions merging into inclined portions terminating in upwardly sloping portions so arranged as to properly control the speed of the car prior to descending along the next curved portion.

Among the objects of the invention is to provide an amusement ride device of the gravity coaster type in which the cars each pass along a trackway having vertically curved portions to give speed to the car, and upwardly inclined portions to control said speed.

Another object is to provide means whereby gravity coaster cars are run along a trackway in a pathway curved back beneath itself in a vertical plane.

A further object is to provide a gravity coaster in which the cars follow pathways that are curved in a vertical plane first in one direction and then the other.

A still further object is to provide in a gravity coaster a trackway having a combination of vertical curves and upwardly inclined portions to give a succession of alternately speeding up and retarding movements to the cars.

A further object is to provide in a gravity coaster a drop along a vertically curved path, and an upward incline to slow up the speed acquired by the drop.

Another object is to provide a novel carrier for each of said cars so arranged as to adapt itself to the reverse curves in the trackway without cramping the car or permitting its wheels to leave the trackway.

A still further object is to provide novel braking means for mechanically slowing up any one of said cars to prevent their acquiring too great velocity.

One other object is to provide a novel construction of car and carriages for supporting the same.

Another object is to provide a novel arrangement of trackway to accommodate the reverse curvilinear movements of the car supporting carriages.

Other objects, advantages and capabilities will later more fully appear.

My invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while I have shown therein a preferred embodiment of my invention I wish it understood that the same is susceptible of modification and change without departing from the spirit of my invention.

In the drawings:—

Fig. 1 is a side elevation partly broken away, showing diagrammatically a gravity coaster embodying my invention.

Fig. 2 is a side elevation partly in section of one of the cars with its supporting carriage and showing a fragmentary portion of the trackway.

Fig. 3 is a front elevation partly in section of the car of Fig. 2.

Fig. 4 is a fragmentary front elevation with the eye looking at the vertical plane of the line 4—4 of Fig. 5 while one of the cars is being elevated to the top of the device.

Fig. 5 is a sectional view taken in a horizontal plane along the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary side elevation of a portion of the trackway with a carriage therein, and showing a braking device for slowing up and/or stopping the cars, and looking in the direction of the arrows on line 6—6 in Fig. 7.

Fig. 7 is a vertical sectional view taken on the line 7—7 of Fig. 6 and looking in the direction of the arrows.

Fig. 8 is a fragmentary detail view of a portion of the propelling means for conveying the cars from the loading platform to the tower through which they are carried up to elevated position, this view also showing the bottom portion of the car elevating means in said tower.

Fig. 9 is a fragmentary detail view of the car elevating mechanism at the top of the tower.

Fig. 10 is a fragmentary diagrammatic side elevation of a curved portion of the track, showing the relation of the carriage wheels with the track when the carriage is moving around said curved portion in a clockwise direction as viewed in Fig. 1, this view also showing the carriage in the upper part of said curved portion of the track.

Fig. 11 is a view similar to Fig. 10, but showing the relation between the carriage wheels and the track when the carriage is starting around a portion of the track curved in a counter-clockwise direction as viewed in Fig. 1, the carriage in Fig. 11 having been turned over with relation to its position shown in Fig. 10.

Referring more in detail to the drawings and more particularly to Fig. 1, it will be seen that my gravity coaster comprises in general a tower 1 and a trackway 2, which latter emerges from the top of the tower and continues in a generally downwardly inclined direction, this downward inclination being interrupted by curved portions or loops 3, 4, and 5, which curved portions or loops are so arranged that the path of the track extends backwardly underneath itself a plurality of times and is provided at spaced intervals with upwardly inclined portions 6, 7, and 8 of such degree of curvature or upward inclination as to slow down the speed of the car just prior to its passing around the next successive one of the curved portions or loops 3, 4, and 5, in order to keep the

speed of the car within proper control and safe limits.

It will also be seen in Fig. 1 that the trackway 2 after continuing around the last loop 5 extends a substantial distance in the horizontally extending portion 9, which will be of sufficient length to take care of the cars as they ride thereinto from the last loop 5. In this horizontal portion 9 of the trackway is provided braking means 10 for slowing up the speed of the cars to such a degree that they may be conveniently handled at the loading platform, which braking mechanism will be later more fully described. From the braking mechanism 10 the cars 11 pass onto the loading platform 12, where passengers from the preceding ride will be unloaded and the passengers for the next succeeding ride will be loaded.

After the car is loaded at the loading platform 12 it will be pushed forwardly (to the left as viewed in Fig. 1) until it is picked up by the endless conveying chain 13, by which it will be carried forward until it is released from the conveying chain 13 and picked up by the elevating endless chain 14. The details of these two conveying chains will be later more fully described. As soon as the car is picked up by the elevating chain 14 it is carried upwardly through the tower 1 to the top thereof, where it will be held until the preceding car has passed a sufficient distance down the trackway 2 so as to be out of the way of the next succeeding car, at which time the latter will then be released for its passage down the trackway 2.

While no attempt is made in the drawings to show the exact bracing for fixedly maintaining the trackway in position, it is generally stated that suitable bracing members 15 of any desired and appropriate design and arrangement may be used as desired and within the limits of safety. These bracing members 15 will, of course, have suitable and appropriate connection with foundation supports for rigidly holding the entire trackway in position.

As seen in Figs. 1, 2, and 3, the trackway 2 is comprised of four rails (see Fig. 3) *a*, *b*, *c*, and *d*, which are properly spaced to have proper engagement with the carriage wheels and their flanges to prevent the wheels from leaving the trackway.

The cars, as shown in Figs. 2 and 3, each have a body portion 16, provided with seats 17 suitably upholstered for the comfort of the passengers. These cars may be of any desired construction, but, as shown, are closed at the sides and open at the two ends. There is a middle partition 18 which divides the car into two compartments, and there will be seats arranged in each compartment with the backs against the partition 18 so that the passengers may have full vision in the direction in which they are facing. Openings 19 are provided in the partition so that the passengers may converse from one compartment to the other if desired, and the sides of each compartment are also provided with observation openings 20, which may or may not be covered with glass, as desired.

Each compartment is provided with a safety rail 21, which, when the car is being loaded, will be swung outwardly away from the position shown in Figs. 2 and 3, and when the car is loaded may be swung back into the position shown in Figs. 2 and 3 and locked in such position to prevent the passengers falling out. These rails 21 may be grasped by the passengers for convenience and safety as desired. As shown in Figs. 2 and 3, these safety rails 21 are secured at each end to the upper end of arms 22, which arms are each pivoted as at 23 at their bottom end to the body portion of the car to permit swinging of the safety rails into and out of position. When swung into closed position, as shown in Figs. 2 and 3, the projecting end 24 at each end of the rail 21 will pass into a notch 25 formed in the body portion of the car, after which a latch member 26 having a notch 27 will be moved downwardly so that the notch 27 fits over the projecting ends 24 to lock safety rails 21 in position. Latch 26 is pivoted at 28 and intermediate of its ends has pivotal connection with a downwardly extending bar 29, which at its lower end is pivoted to link 30, which link in turn has pivotal connection at 31 with the bottom of the car.

Each of the bars 29 is provided with a handle 32 which may be grasped by the attendant when it is desired to unload the car and lift it upwardly to move notch 27 in latch 26 out of engagement with the projecting ends 24 of rail 21 to permit safety rail 21 to be swung outwardly away from the car to permit passengers to step out of the car. To give stability to the car it is provided at each of its four bottom corners with casters or rollers 33, which will contact with the floor of the loading platform 12 when the car is in loading position. These casters in conjunction with the wheels of the carriage supporting the car in the rails also facilitate the pushing of the car forward by hand after being loaded until it is picked up by the first conveying chain 13.

The carriage or carrier by which the car is supported in the trackway 2 will now be described. As seen in Figs. 2 and 3, this carriage is secured by brackets 34 rigidly to the car body, the upper portion of brackets 34 being formed with bearings 35, in which is journalled the shaft 36, the two ends of shaft 36 extending a substantial distance outwardly beyond bearings 35 and passing through the main frame members 37 of the carriage trucks, and also through each of the middle wheels 38 of the carriage and extending therebeyond to form extensions 39, which extensions are picked up by the lifting fingers 40 which are fixed to the elevating chain 14 (see Fig. 4), as will be later more fully described.

As seen in Figs. 2, 3, and 4, the carriage or carrier for the cars comprises the truck frame members 37, one on each side, on each of which are rotatably mounted three wheels 38, 41, and 42. In other words, there are three wheels on each side of the top of the car for engagement with the horizontally and laterally spaced rails of the trackway 2. The axis of rotation of the middle wheel 38 is below a straight line connecting the centers of each of wheels 41 and 42, which throws the middle wheel 38 lower than wheels 41 and 42 when the car is on the loading platform, as shown in Figs. 2 and 3, but when this carriage passes around the loops 3, 4, and 5 it will be turned over due to its wheels following the track rails, as will be readily understood. As stated, the position of these wheels as shown in Figs. 2 and 3 is that when the car is on the loading platform. As will also be readily understood, as the car is elevated through tower 1, these trucks of the carriage supporting the car will be moved upwardly in a vertical position, and when the car is started down the incline at the top of the tower these trucks will be rotated through an angle of 180° when they start down the top incline of track 2 as compared with their position when they were on the loading platform. In other words, when

the car is starting down the incline from the top of the tower the middle wheels **38** will be higher than the two wheels **41** and **42**.

As seen in the drawings, each of the wheels of the car carriage or truck is provided with marginal flanges, the flanges of each of wheels **41** and **42** engaging over the outside edge of the track rails with which they are in contact, and the marginal flange of each of the middle wheels **38** will engage over the inside of the opposite rail for that side of the track, so that in any and all positions of the car the flanges of wheels **41** and **42** will be in engagement with the outside edge of one rail and the flange of each of the middle wheels **38** will be in engagement with the inside edge of the other rail of that pair. In other words, the track rails, as explained above, are arranged in pairs, two on each side, and the space between each pair of these rails is carefully arranged so that at all times the flanges of the truck wheels will be in engagement with the rails.

Due to the truck turning over as it passes the various loops **3**, **4**, and **5** it is necessary to space the rails of each pair of tracks, to-wit, rails *a*, *b* and rails *c*, *d* farther apart or closer together to take care of the particular position of the truck at that point of the track. This will be readily understood from an inspection of Figs. 10 and 11, Fig. 10 showing the relative position of the wheels with the track members when the car is going around one of the loops in a clockwise direction and Fig. 11 showing the relation between the wheels and the track rails when the car is going around one of the loops in a counter-clockwise direction as viewed in Fig. 1. In other words, Fig. 10 represents a portion of the upper half of either one of loops **3** or **5**, while Fig. 11 shows a portion of the upper half of loop **4**.

Due to this turning over of the truck frame it will be obvious that the rails at such positions as shown in Fig. 10 must be closer together, due to the fact that the curvature of a line passing through the three wheel centers follows in a general direction the curvature of the loop of the track, while when in the position shown in Fig. 11 the curvature passing through the three wheel centers is opposed to the general curvature of the loop at that point, thus obviously necessitating in the latter instance a greater distance between the rail members on each horizontal side of the track than is necessary in the position shown in Fig. 10. The track rails when this gravity coaster is being erected will be properly spaced at all points to insure that the wheels and flanges will be in proper engagement with the rails at all points when the car reaches such point.

From the above described construction it will be seen that the car in which the passengers are riding will be pendulously suspended by axle **36** from the carriage or truck, so that the car will always hang downwardly vertically from the truck, except for such swinging movement as may be imparted to the car by its travel over the rails. It is also seen that this pendulous mounting of the car with relation to the truck permits the truck to turn over as it passes around the loops **3**, **4** and **5** and in passing upwardly through the tower **1** without disturbing the downwardly hanging vertical position of the car.

The rails *a*, *b*, *c*, and *d* of the track **2** will be suitably and rigidly secured to the supporting members **15** by brackets, braces or other construction well known in the construction of steel work, as shown in Fig. 3. These supporting and bracing members **15** will be positioned on the outside of the two sides of the trackway and there will be no cross members between the two sides of the trackway at such points where the car hangs downwardly therebetween to interfere with the progress of the car. In other words, if desired, cross braces may be used along the top side of the top stretch of the trackway between the tower and loop **33**, but not on the bottom side of the same, as the latter would interfere with the progress of the car, and the same general principle applies to all of the other portions of the trackway of the gravity coaster. In other words, cross braces may be used at such places where the same would not interfere with the progress of the car but not where such interference would occur.

Referring now to Fig. 8, which is a detail of the structure shown in the lower left-hand corner of Fig. 1, and represents the conveying mechanism with which the car is brought into engagement when it is pushed by hand or otherwise, as desired, to the left along the loading platform **12** after being loaded. When thus pushed the loaded car is moved to the horizontal conveying chain **13**, which is mounted horizontally between the two lateral sides of the track, the axle **36** being engaged by the pushing finger **43**, which is pivotally carried by the conveying chain **13** and so arranged that when it is on the lower side of this chain it either falls downwardly by gravity or is thus held by a spring so that it moves the car to the left in Fig. 1 by pushing on axle **36** and moving the truck or carriage to the left along the track rails, the roller wheels **33** also contacting with the loading platform, as explained above. Closely adjacent and opposite pushing finger **43** is another finger **44**, which is held to extend downwardly from chain **13** either by gravity or spring pressure, but is enabled to move upwardly so that it may ride over the axle **36** and then drop downwardly on the other side of the same so that the axle is between fingers **43** and **44**, finger **43** pushing the car and finger **44** holding it against undue movement should the impetus of the car be faster than the movement of the chain. As soon as these pushing fingers move the car far enough to the left in Fig. 8 to come within the influence of the elevating chain **14**, the lifting fingers **40** (see Fig. 4), which are fixedly secured to chain **14**, will move into position behind extension **39** on each end of axle **36**, and continue to move the car to the left, this continued movement ultimately carrying the car beyond the influence of fingers **43** and **44**, which latter fingers will move upwardly around the sprocket wheel **45** and return in the reverse directon along the top of the sprocket wheel **45** and back to sprocket wheel **46**, to ultimately pick up another car when the latter comes within the influence of chain **13**.

Assuming the car to now be picked up by the engagement of elevating fingers **40** with the axle extension **39**, the car will continue to move to the left in Fig. 8 and be elevated upwardly through the tower, the trackway being curved at this point as shown at **47** to extend from a horizontal to a vertical direction. The elevating fingers **40** are concave or otherwise formed with a depression on their upper face, as shown in the left-hand portion of Fig. 8, to prevent any possibility of their becoming disengaged with the axle extensions **39**, which, however, would be impossible due to the chain **14** having rollers **48** which move between guide rails **49** and **50**, which guide

rails will at the bottom of the tower follow the general curvature of the track, but these curved ends of these guide rails being omitted in Fig. 8 in order not to obstruct the view of the truck wheels and for the sake of clearness.

It will also be understood that these guide rails 49 and 50 are arranged in pairs, as seen in Fig. 5. These guide rails 49 and 50 at the top of the tower also extend around the curvature as the track rails extend laterally and outwardly from the top of the tower, but these track rails 49 and 50 have been broken off in Fig. 9 and not extended all the way up in order not to confuse the showing of the truck wheels and other parts in this view. It is obvious that these track or guide rails 49 and 50 may be extended upwardly or downwardly in either a straight or curved direction to follow the main track rails to any extent desired in order to properly confine the chain 14 to its work without undue lost motion in passing around curves.

Any suitable number of sprocket wheels 51, 52, and 53 (see Figs. 8 and 9) may be used as desired to adequately take care of the movement of chain 14, which chain and sprocket wheels may be driven by a motor 54 at the top of the tower, or any other desired motive power in any desired location as may be selected. Chain 13 may also be driven by a separate motor, if desired, or may receive its propelling power by being geared or otherwise driven from sprocket wheel 45 or its shaft 55 of chain 14. As will be understood, the flanges of rollers 48 engage each side of the guide rails 49 and 50 and eliminate any possibility of the two chains 14 (one on each side of the trackway) spreading to permit falling of the car. Such falling of the car is impossible in the construction herein described due to the engagement of the flanges of rollers 48 with the guide rails 49 and 50, as stated.

The braking mechanism 10 for stopping the car as it approaches the loading platform will now be described. This is shown in detail in Figs. 6 and 7 and consists of an elongated longitudinally slidable member 56, which carries on its upper surface a portion 57 against which frictionally engages the lower face 58 of the carriage truck frame 37, which face 58 may, if desired, be provided with a layer of anti-friction material 59 in order to prevent the lower face of the metal member 37 from becoming slick. Fixed at spaced intervals to the lower face of the elongated member 56 are the wedge members 60, of which any number with any desirable space may be used as the occasion may require. Extending from the right-hand end of elongated member 56, as viewed in Fig. 6, is a cable 61, passing over a pulley 62, and to the lower end of which cable is mounted a weight member 62', which may be so constructed that additional weights may be added to or taken therefrom to increase or decrease the weight of this member 62'. Extending from the left-hand end of the elongated member 56, as viewed in Fig. 6, is a tension rod 63 which, as seen in Fig. 1, is attached intermediate the ends of a lever 64, which lever at its upper end is pivoted to the side of the trackway or other suitable adjacent member.

The weight 62' normally tends to move the elongated member 56, as viewed in Fig. 6, to the right to force the wedge-shaped members 60 to tend to ride over the rollers 65, which are rotatably mounted in suitable frames just below the trackway 2, and this movement of the wedge member 60 over roller 65 causes the elongated member 56 to move in a vertical direction upwardly as well as moving longitudinally, and when the truck 37 moves above member 56 it will pass over the bevelled end 66 and tend to press the member 56 downwardly. The friction thus set up between the upper surface of member 56 and the lower face of the truck member 37 will in an obvious manner slow up the speed of the car. The weight 62' may be so regulated by adding or removing weight elements therefrom to give the desired braking action to the car to slow it up, and if it is desired to lessen the braking action and permit the car to move to a greater distance to the left, for instance to the loading platform, all the operator needs to do is to grasp the lever arm 64 and pull the bottom end of the same, as viewed in Fig. 1, to the right, which moves the wedge member 60 to the left against the action of weight 62' and lowers the top surface of member 56 to any degree desired. Thus the braking action may be made greater by adding more weights to the weight 62', or less by appropriate movement of the handle 64. This gives a latitude in the operation of stopping the car and the operator will soon become so experienced that he can by this mechanism stop the car to such a degree that when it comes to the loading platform it can be readily brought to a dead stop by the hand of the attendant at the desired place for loading.

Having now described my invention,

I claim:—

1. In a gravity coaster an inclined trackway having two laterally spaced sides, each of said sides comprising two rails spaced apart in a vertical plane, a carrier having three wheels on each side, each of said three wheels having flanges that engage two on one side of said side rails and one on the other, one wheel of each of said three wheels having its center of rotation out of alinement with the center of rotation of the other two, said rails of each side of the trackway being spaced apart in a vertical plane farther in one direction of curvature of the trackway than the other, whereby said flanges will always prevent said carrier from leaving the rails of the trackway as the carrier turns over.

2. In a gravity coaster an inclined trackway having two laterally spaced sides, each of said sides comprising two rails spaced apart in a vertical plane, a carrier having three wheels on each side, each of said three wheels having flanges that engage two on one side of said side rails and one on the other, one wheel of each of said three wheels having its center of rotation out of alinement with the center of rotation of the other two, said rails of each side of the trackway being spaced apart in a vertical plane farther in one direction of curvature of the trackway than the other, whereby said flanges will always prevent said carrier from leaving the rails of the trackway as the carrier turns over, the said wheels of said carrier being arranged with relation to the rails of said trackway to produce the minimum amount of friction, together with the maximum of safety.

3. In a gravity coaster provided with an inclined trackway having two laterally spaced sides, each of said sides comprising two rails spaced apart, a carrier having two sets of three overhead wheels, the wheels in each set having flanges that engage two on one side of said rails and one on the other, the center wheel having its center of rotation out of alignment with the center of rotation of the other two.

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