5 Sheets—Sheet 1.

D. K. CARTTER.

Car-Truck for Street-Railway.

No. 211,220. **Patented Jan. 7, 1879.**

Fig. 1.

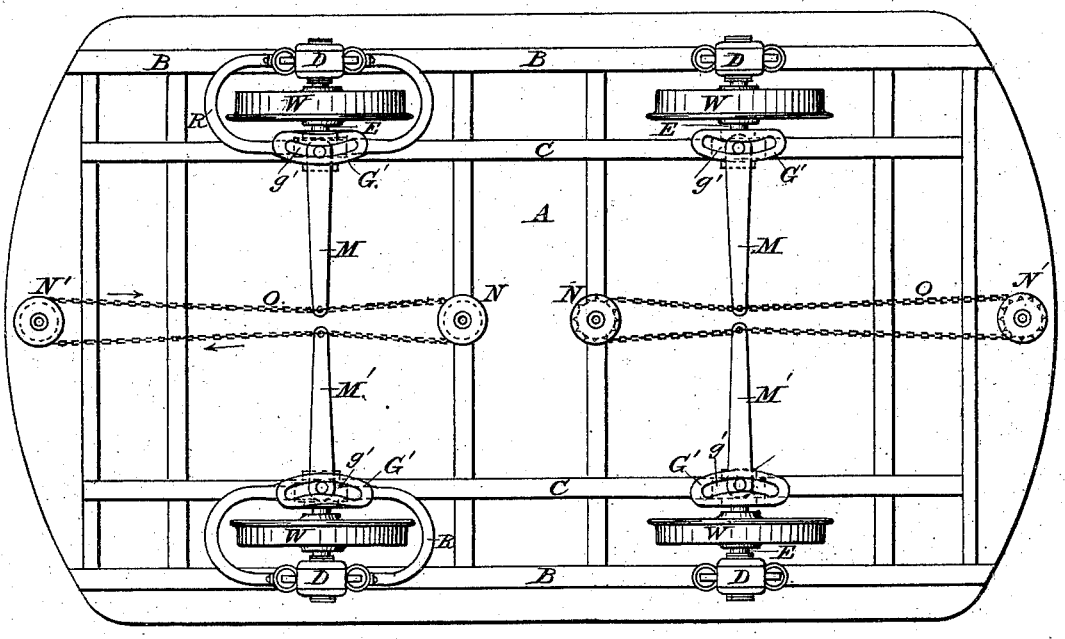
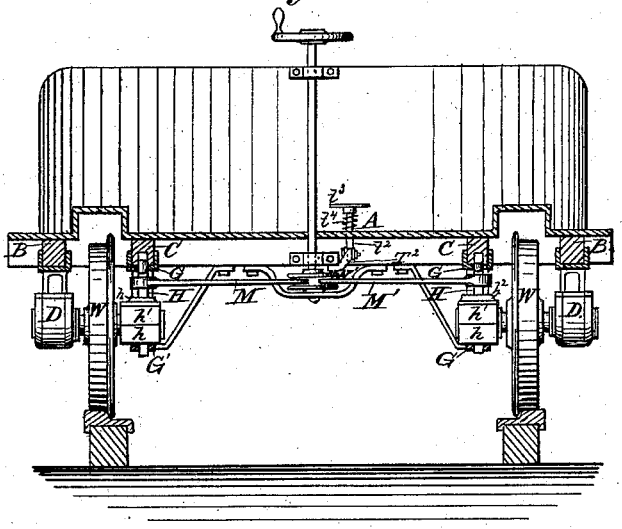


Fig. 2.



Witnesses:
Albert H. Norris.
T. C. Brecht.

Inventor:
David K. Carttter,
By James L. Norris.
Attorney.

5 Sheets—Sheet 2.

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Fig. 3.

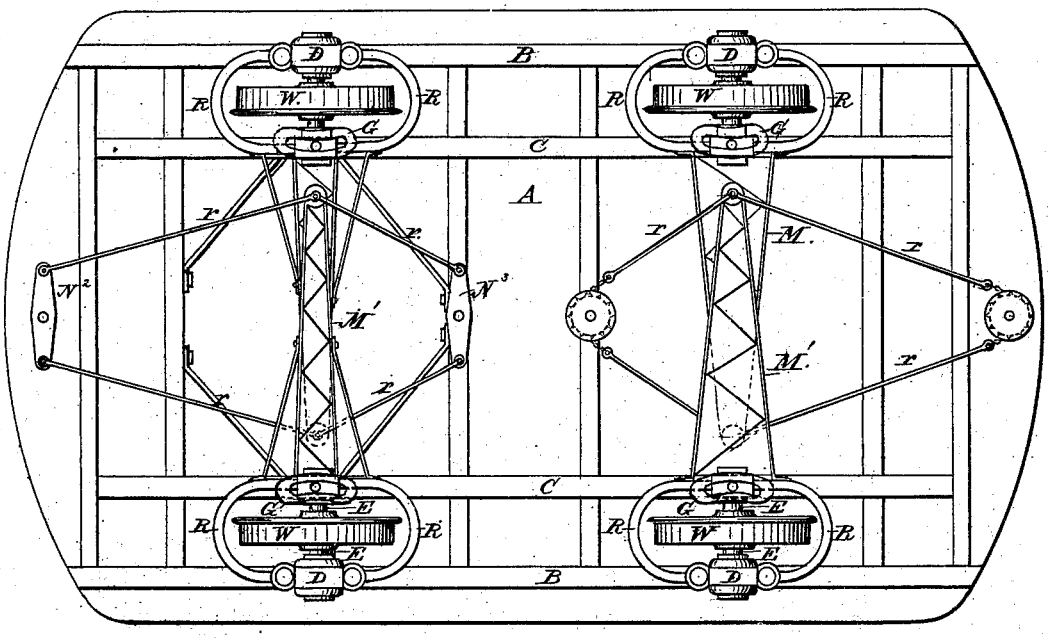


Fig. 4.

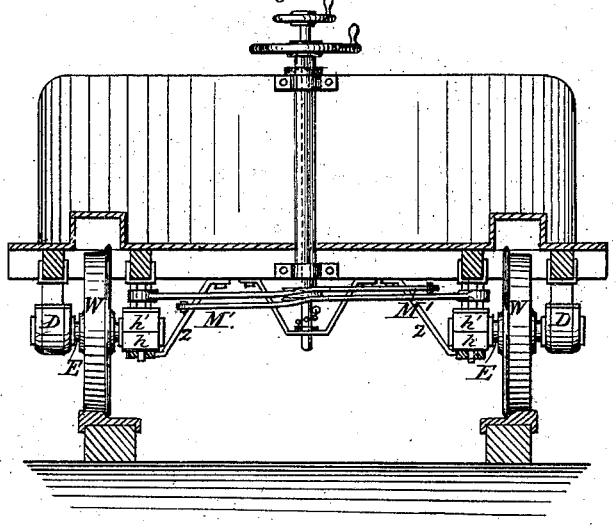
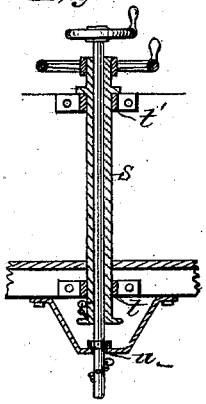


Fig. 4ª.



Witnesses:

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Albert H. Norris.

Inventor:

David K. Cartter,

By. James L. Norris.

Attorney.

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Fig. 5.

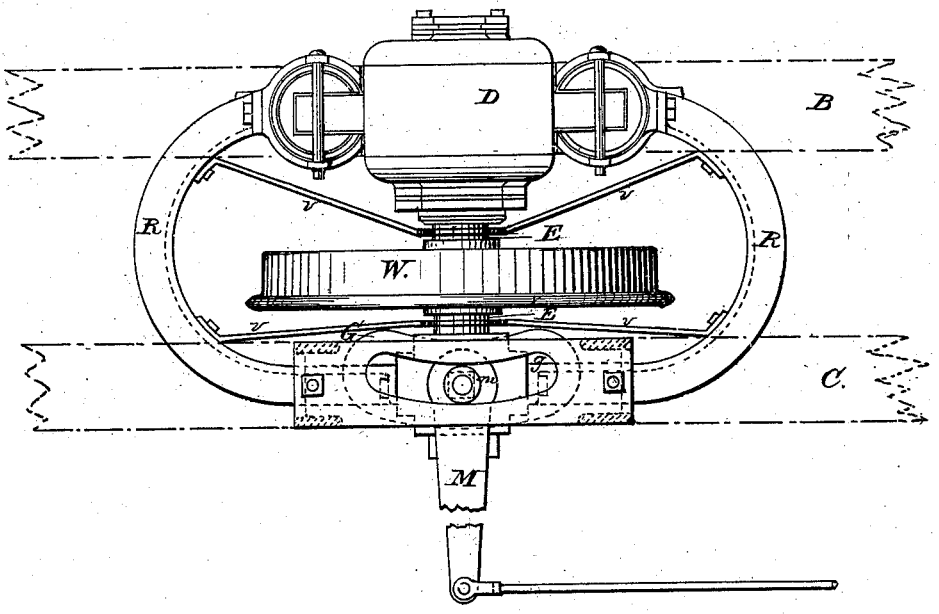
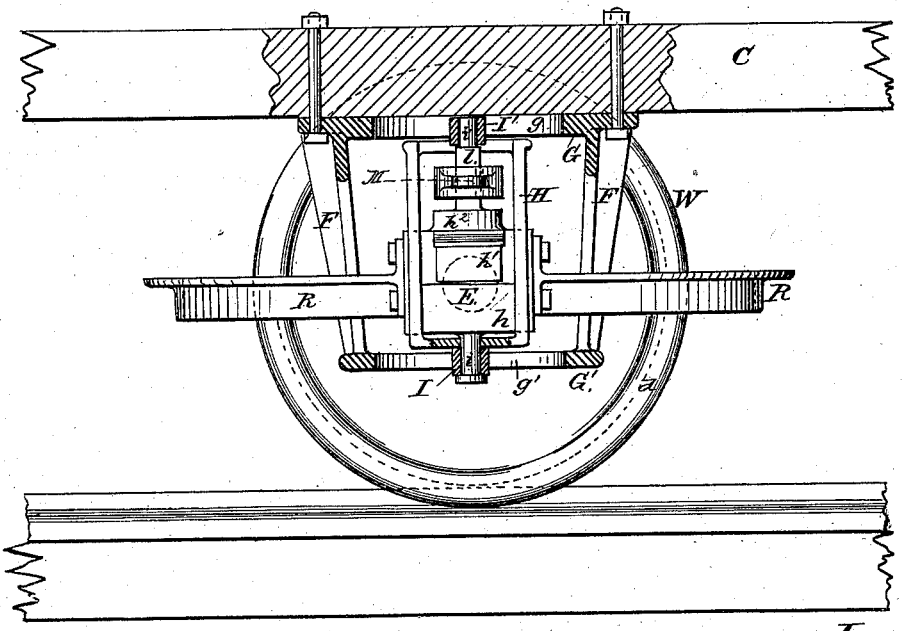


Fig. 6.



Witnesses:

T. C. Brecht.

Albert H. Norris.

Inventor:

David K. Carttter,

By James L. Norris,

Attorney.

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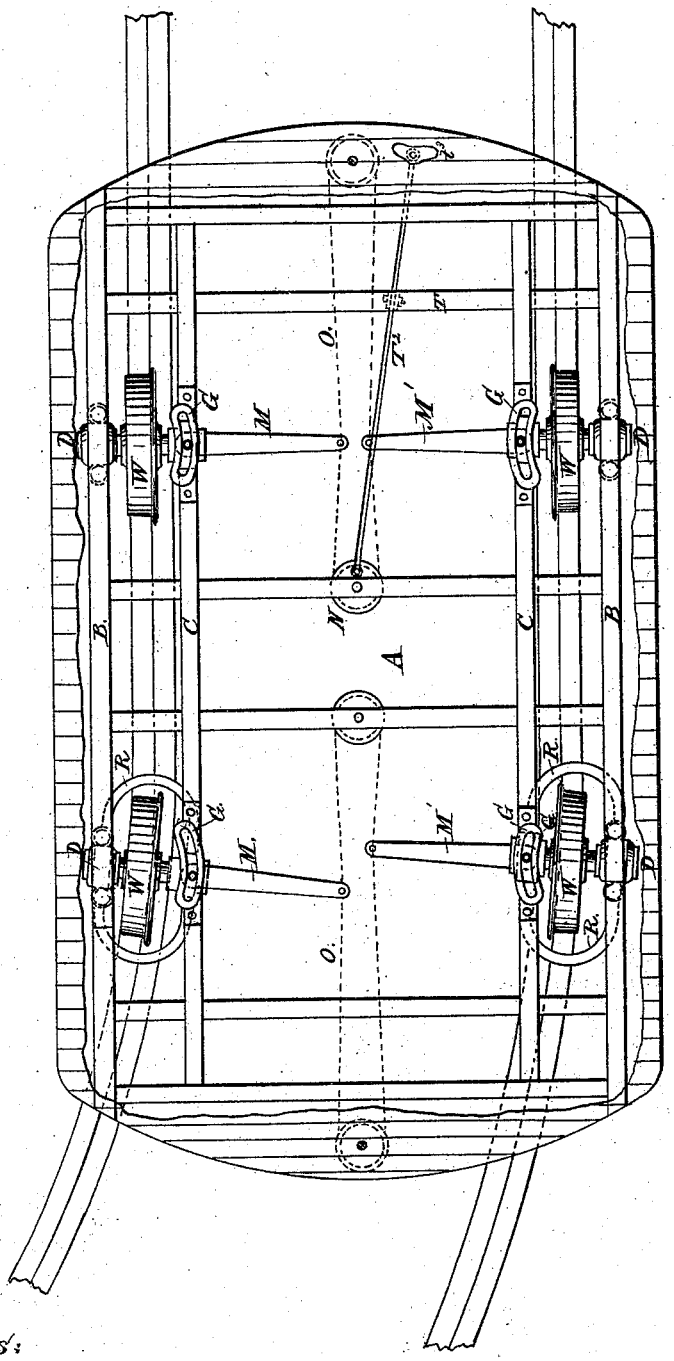
Fig. 2.



Witnesses:
T. C. Brecht
Albert H. Norris.

Inventor:
David K. Carttter.
By James L. Norris.
Attorney.

5 Sheets—Sheet 5.

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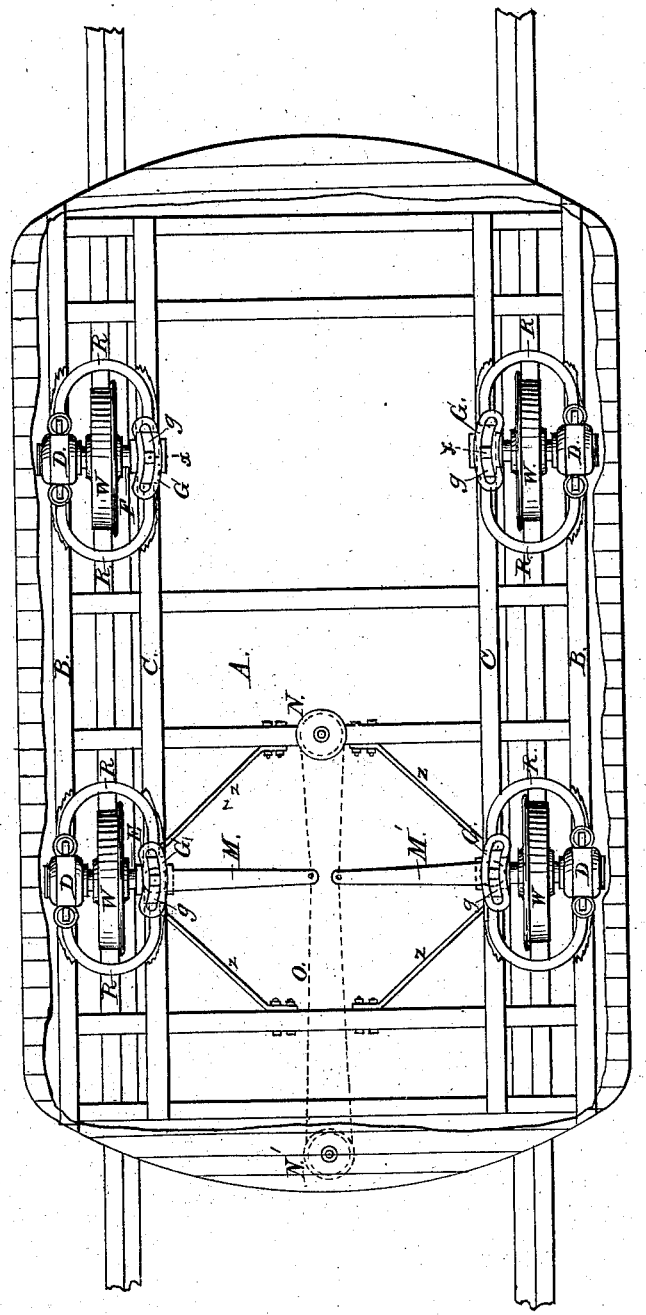
Fig. 8.



Witnesses:
T. C. Brecht
Albert H. C. Norris.

Inventor:
David K. Cartter,
By James L. Norris.
Attorney.

UNITED STATES PATENT OFFICE.

DAVID K. CARTTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN CAR-TRUCKS FOR STREET-RAILWAYS.

Specification forming part of Letters Patent No. **211,220**, dated January 7, 1879; application filed November 18, 1878.

To all whom it may concern:

Be it known that I, DAVID K. CARTTER, of Washington, in the county of Washington and District of Columbia, have invented certain new and useful Improvements in Car-Trucks for Street-Railways, of which the following is a specification:

My invention relates to that class of car-trucks especially adapted for use on street-railways, and wherein the wheels are secured to independent axles, arranged to turn and permit the wheels to follow curves of the track.

The object of my invention is to facilitate the turning of street-railway cars in following curves of the track, to prevent wear of the rails on curves, to reduce the strain on the superstructure of railway-cars, and to relieve the horses from the necessity of extra effort in pulling cars around curves.

To this end it consists, first, in providing each wheel of a railway-car with an independent axle having its outer end journaled in a swiveling box and its inner end journaled in a box mounted in curved guides, and movable therein in an arc of a circle, of which the axle is a radius, said inner box being provided with and operated by an arm extending inward, and distinct from the axle, whereby an even movement is secured for the axle in adjustment; second, in the combination, in a street-railway car, of wheels provided with independent axles having their outer ends mounted in swiveling bearings under opposite sides of the same end of the car, angularly-adjustable bearings, supporting the inner ends of said axles, arms secured to and projecting inwardly from said angularly-adjustable bearings, links connected to the inner ends of said arms, and with a common operating device, adapted for operation from the car-platform, whereby the position of the wheels is placed directly under control of the driver, and a leverage is afforded, which renders their adjustment rapid and easy; third, in the combination of the adjustable axles of a railway-car, a hollow shaft mounted in suitable bearings on the frame-work of the car, and connected with said axles by intermediate devices, and a shaft mounted within said hollow shaft and projecting beyond the ends thereof, and connected by intermediate devices with the brakes of the car.

Both the hollow shaft and the inner brake-shaft are provided with suitable hand wheels or levers, whereby they may be rotated independently of each other, as necessity requires, all as hereinafter more particularly described.

There have been various inventions made for the purpose of obviating the well-known difficulties attendant upon turning curves with cars on street-railways. For instance, the axles have been divided, in order that the wheels upon the outer curved rails may be permitted to rotate faster than those upon the inner curves, and thus prevent the sliding of the wheels that occurs when continuous axles are used. This, however, does not diminish the wear of the inner edges of the rails and the wheel-flanges.

Continuous axles have been arranged to swivel at their centers, and provided with sliding boxes, the front and rear axles being connected by diagonal links, and the front axle being so connected with the pole or tongue that as soon as the horses begin to turn a curve both axles are turned obliquely with respect to the car-frame. This arrangement is objectionable, because the rear wheels are often caused to assume an oblique position on straight track, and when the front wheels only are on a curve. Cars have also been mounted on swiveling truck-frames the wheels of which have had continuous axles; but this, as will be readily understood, could not prevent the grinding of the rails, as in all cases where continuous axles are used the impossibility of the outer wheels traversing by revolution the greater arc formed by the outer rails in the same time in which the other wheels traverse the less arc of the inner rails causes the wheels to assume oblique positions, the reverse of what they should, and thus the flanges are brought against the inner edges of the rails, and both rails and flanges worn away. In none of the trucks having continuous axles, or even divided axles, the axes of which always coincide, do the wheels, in turning curves, so conform to the necessary direction of the pull of the horses as to pre-

vent grinding, sliding of the wheels, and over-exertion on the part of the horses, the lashing of which to urge them forward at such times is a common sight on street-railways.

There have, however, been car-trucks constructed in which the axle of each wheel has been adjustable obliquely independently of that of the opposite wheel, so that two opposite wheels would at the same time conform to the direction of the draft. In one such truck the axle of each fore wheel is connected by a link with the diagonally-opposite hind wheel, and the hind-wheel axles by other links connected with a forward equal-armed lever pivoted to the truck-frame, and this equal-armed lever is provided with a rigid forward-projecting arm, rigidly secured to the axle of a pair of guide-wheels, which travel in front of the truck. This contrivance necessitates an extra pair of wheels, which have a continuous axle, and are themselves objectionable, on account of grinding the rails, and they, besides, communicate oblique movement to all the truck-wheels at once, while it is desirable the fore wheels should begin to turn first, and often while the hind wheels are on straight track.

In another truck the independent axle of each wheel is provided at each end with an angularly-sliding bearing, and the fore and hind wheels are so connected as to be adjusted simultaneously through connection with the draw-bar or tongue of the car.

A truck has also been invented in which such wheel has an independent axle mounted in a swiveling bearing at its outer end and a sliding bearing at its inner end, the sliding bearing being connected by a link or rod directly with an operating device in front; but in this arrangement the driver has no leverage to facilitate the adjustment of the axles.

I will now proceed to describe my invention and point out its distinguishing features with respect to the state of the art, as hereinbefore set forth.

In the accompanying drawings, Figure 1 is a view of the bottom of a double-end car provided with trucks according to my invention. Fig. 2 is a section of the car immediately behind the dash-board, the wheels and arms being in full lines. Fig. 3 illustrates modifications of the devices for adjusting the wheels. Fig. 4 is a section similar to Fig. 2. Fig. 4^a is a sectional view, in detail, of the wheel-adjusting and brake-operating shafts. Fig. 5 is a detail top view, showing a single wheel and axle and the bearings. Fig. 6 is an inner-side view of the same. Fig. 7 shows a platform-car just entering a curve of the track. Fig. 8 is a bottom view of a car which travels with the same end always front.

The letter A indicates the bottom of the car. B is the outer lower frame-beam, and C an inner beam. D indicates what are commonly known as "Dotterer boxes," located under and secured to the outer frame, B, as the bearing-boxes of the outer ends of the independent axles E of the wheels. Under the inner beams, C, are secured pendent frames F, each having a top and a bottom plate, G G′, in which are formed coincident curved slots g g'. The upper plate, G, of each of these frames is bolted snugly to the under side of one of the inner beams, C.

H indicates bearing-box frames, which support the bearings h h^1, arranged to move vertically therein. The lower bearings, h, are each provided with journals i, upon which are mounted friction-rollers I, which fit and travel in the lower curved slots, g'.

The upward projections, h^2, which are cast upon the top bearings, h^1, are each provided with upward-extending arms l, terminating in journals, upon which are friction-rollers I′, Fig. 6, which fit and travel in the upper curved slots, g'. The intermediate portions of the arms l are squared to fit into sockets m m the ends of arms M, which extend toward the longitudinal center line of the bottom of the car.

Now, it will be seen that when the inner ends of the arms M are moved either way toward the ends of the car, the Dotterer boxes act as fulcrum-pivots, and the axles E are moved to positions oblique with respect to the car-frame, and the wheels may be thus set to correspond with the curves of the railway-track, the arms of opposite wheels being moved in opposite directions of course. In effecting this movement of the arms I use the following-described devices: N indicates sheave sprocket-pulleys mounted on suitable journals under cross-beams near the middle of the car, between the pairs of wheels, and N^1 designates pulleys secured to the lower ends of hollow shafts S, which surround the brake-shafts Q′ and project below the car-platforms. O is an endless chain, passing around and having its links fitting over the teeth of the sprocket-pulleys N N^1. The inner ends of arms M of two opposite axles are secured, respectively, to the opposite strands of this chain, so that when the hollow shaft S and pulley N are turned one strand of the chain will move toward the middle and the other toward the front of the car, as indicated by the arrows, Fig. 1, thus pulling the ends of the two attached arms M in opposite directions, and throwing the wheels W into oblique positions with respect to the car-frame, but preserving parallel planes with respect to each other.

In the modification shown in Fig. 3 the ends of curved arms R are shown secured to opposite sides of the Dotterer box, and their opposite ends to the inner angularly-adjustable bearing-box frame. The levers or arms M′ are secured to these arms R, and extending inward lap each other, thus providing greater leverage for adjusting the wheels. On one end of the car shown in this figure, instead of the pulley and chain, equal-armed levers N^2 N^3 are used, and their opposite ends are respectively connected with the ends of the levers M′ by

iron rods *r*. On the other end of the car sprocket-pulleys are used, both at the end and in the middle of the car, and the rods *r* terminate in chains which pass around said pulleys. The end pulleys and levers may, however, both be dispensed with, and the chains attached to rods or leading direct from the arms of the axles may be secured directly to the hollow shaft and operated by being wound thereon, as is the ordinary brake-chain.

Fig. 4 illustrates an arrangement similar to Fig. 1, except that the arms M′ are prolonged and lap each other to afford more leverage.

In Figs. 5 and 6 the levers M are secured to the angularly-adjustable bearings in the same manner as shown in Fig. 1.

In some cases it may be desirable to brace the supports of the bearings against endwise thrust of the axles, and in Figs. 5 and 8 supplementary braces *v v* are shown, connecting and bolted to the opposite curved arms R, for the purpose of opposing the outward thrust. These braces are provided at their middles with eyes, which embrace the axles on the outer side of the wheel and the end of the hub or collar thereof, but without touching, ordinarily, either the axle or hub. If, however, from lurching of the car, the axles should have an undue outward endwise thrust, its movement will be opposed by the braces *v*, and the bearing-support thus relieved of over-strain in a lateral direction outward.

In Fig. 8, braces *z* are bolted to and extend from the opposite ends of the lower curved plates, G′, upward and inward to cross-beams of the car-frame, and are bolted to said beams. These braces support the pendent frames F against inward thrust of the axles.

In Fig. 7 is shown a top view of a platform-car entering a curve, the flooring of the platform being broken away in order to show the position of the forward wheels, which are on the curve, and the rear wheels being on straight track.

The car shown in Fig. 8 is one which has but one platform, and always travels with the same end foremost. In such a car there is no necessity for devices for turning the rear wheels; but they are mounted in all respects similarly to the front wheels, omitting the inward-extending levers and adjusting devices.

When what is known as the "double-end" car (shown in Fig. 1) is used, the rear wheels for the time being are left free—that is, the hollow shaft which operates these wheels is allowed to turn as it will as the rear wheels conform themselves to the curves upon which they are drawn.

Referring to Fig. 4ª, which represents a detail, partly in section, of the shafts for operating the wheels and brakes, S indicates the hollow shaft. This shaft is mounted in a bearing, *t*, under the platform, and an upper bearing, t^1, supported by the dash-board. The lower end of the brake-shaft is mounted in a bearing, *u*, below that of the hollow shaft, but needs no upper bearing other than the hollow shaft, within which it is arranged. The hollow shaft is here shown as having the axle-operating chains attached directly thereto without the intervention of a pulley.

To a cross-beam, T, under the floor of the car, as shown in Fig. 7, is pivoted a lever, T^2, arranged to oscillate vertically. The rearwardly-extending arm of this terminates immediately over the pulley N, and is provided with a downwardly-projecting pin, which takes into a hole in the flat upper face of the pulley, and prevents it from turning when the wheels are set straight. The forwardly-projecting arm T^2 terminates under the front part of the car-platform, and has pivoted to it one end of a rod, t^2, which extends upward through a hole in the platform, as shown in Fig. 2, and is provided with a transverse foot-piece, t^3, at its top. Between this front piece and the platform is a spiral spring, t^4, having one end against the platform and the other against the lower surface of the foot-piece, keeping said foot-piece and the forward end of the lever T^2 elevated and the rear end thereof depressed, so that the pin on said rear end will take into the hole in the pulley; or a spring of any suitable kind for performing the same function may be arranged at any convenient point.

When the car is about to enter a curve of the track the driver places his foot upon the foot-piece t^3, depresses it, and so releases pulley N. He may then turn the hollow shaft to adjust the wheels, as desired, and when the car passes the curve and comes again upon straight track he releases the foot-piece, the spring elevates it, forcing down the rear end of the lever, the pin of which enters the hole in pulley N, securing the wheels in proper position to travel on straight track.

It is obvious that the retaining device above described may be applied to the equal-armed lever as well as the pulley.

By my above-described invention it will be seen that the forward wheels of a car may be easily adapted to follow smoothly and without grinding of rails any curve which the track may make, as the degree of obliquity in the adjustment of the wheels is always under the control of the driver, who may turn the adjusting-shaft more or less, as occasion requires. The adjustment of the wheels is easily effected, as there is no sliding friction, the friction-rollers I I′ of the angularly-adjustable bearings giving said bearings a smooth rolling friction, which prevents wear of the curved guides.

By the arrangement of the brake and wheel operating shafts I economize space on the platform, and bring both the said devices into positions convenient to the driver.

In addition to the other advantages of my improvement it will be seen that in case of jumping from the track a car may be so guided as to effect its ready replacement, the driver adjusting the forward wheels so as to cause them to mount the rails and assume a

proper position thereon. With the old truck, when a car gets off the track a long distance is frequently traveled, the passengers subjected to great discomfort from jolting, and the car-frame greatly strained before it can be hauled upon the rails again, and, indeed, it often happens that the replacement of the car must be effected by lifting it bodily, or by the use of an inclined separate track-section.

Having now described my invention, I claim—

1. The combination, with the independent single-wheel axles of a railway-car, of swiveling bearings supporting the outer ends of said axles, angularly-adjustable bearings supporting the inner ends of said axles, and curved guides forming arcs of circles, of which the axles are the radii, and supporting the said angularly-adjustable bearings, said angularly-adjustable bearings being provided with and operated by arms extending inwardly and distinct from the axles, substantially as described.

2. In a street-railway car, the combination of wheels provided with independent axles having their outer ends mounted in swiveling bearings under opposite sides of the same end of the car, angularly-adjustable bearings supporting the inner ends of said axles, arms secured to and projecting inwardly from said angularly-adjustable bearings, links connected to the inner ends of said arms, and with a common operating device adapted for operation from the car-platform, substantially as described.

3. The combination of the wheels and axles, the swiveling outer bearings, the inner bearings having the upper and lower journals, *i i'*, and friction-rollers thereon, the pendent frames F, having the upper and lower plates with curved slots therein, the arms projecting inwardly from said inner bearings, and suitable devices for operating said arms, substantially as described.

4. The combination of the adjustable axles of a railway-car, a hollow shaft mounted in suitable bearings on the frame-work of said car and connected with the axles by intermediate devices, and a shaft mounted within said hollow shaft and projecting beyond the ends thereof, and connected by intermediate devices with the brakes of the car, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

D. K. CARTTER.

Witnesses:

JAMES L. NORRIS,

ALBERT H. NORRIS.