3 Sheets—Sheet 1.

G. HAMBRUCH.

Car-Truck.

No. 216,792. Patented June 24, 1879.

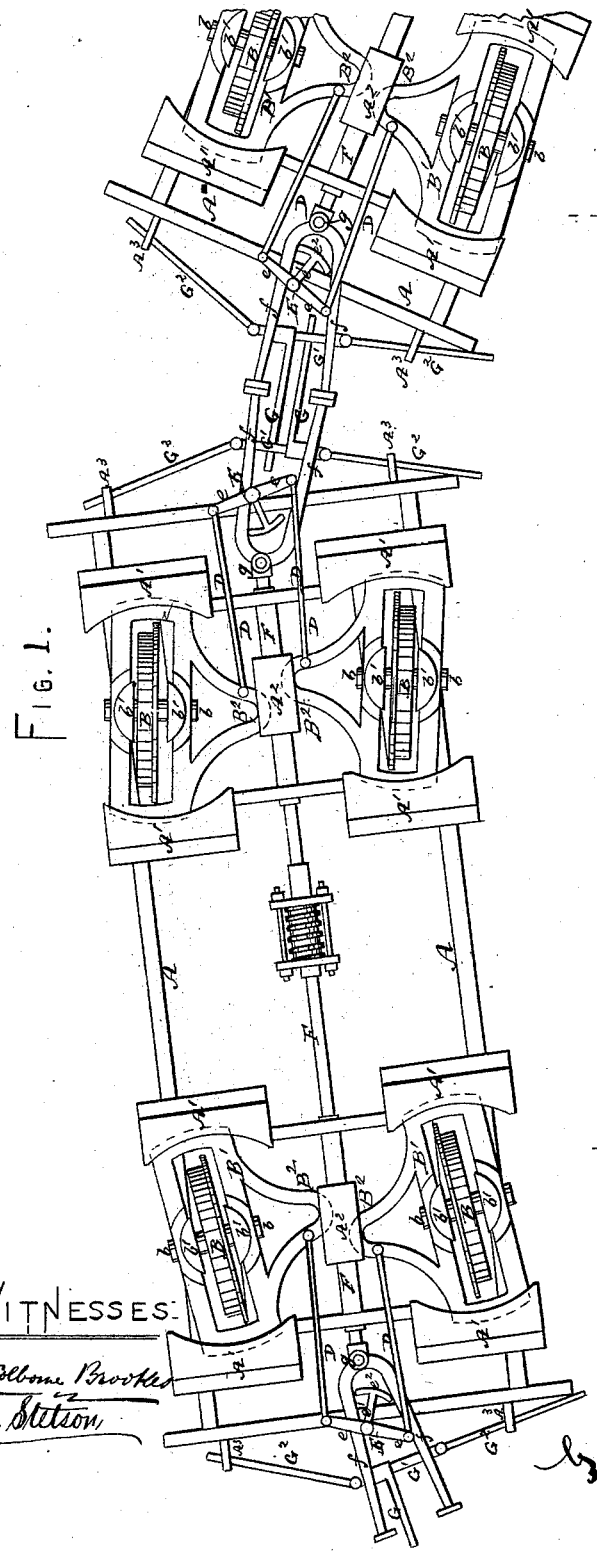


FIG. 1.

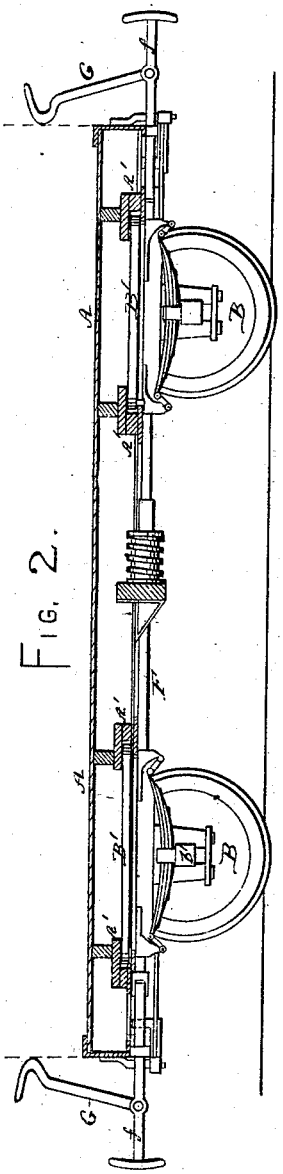


FIG. 2.

WITNESSES:

W. Osborne Brooker

C. C. Stetson

INVENTOR.

Gustav Hambruch

by his attorney

T. A. Stetson

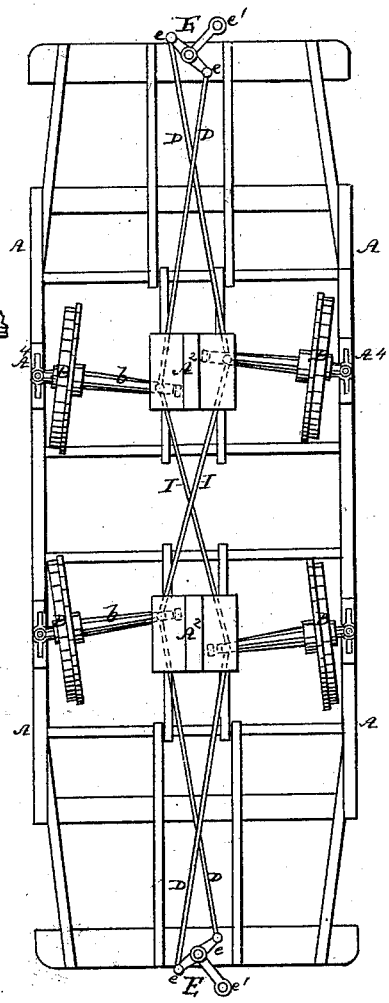
3 Sheets—Sheet 2.

G. HAMBRUCH

Car-Truck.

No. 216,792. Patented June 24, 1879.

FIG. 3.



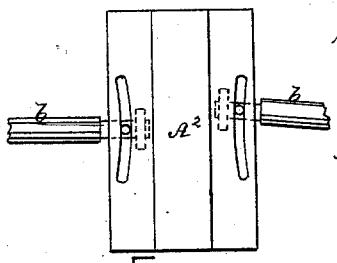


FIG. 4.

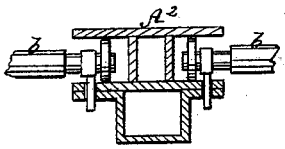
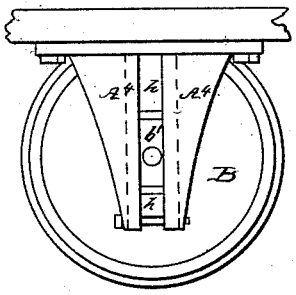


FIG. 5.

FIG. 6.



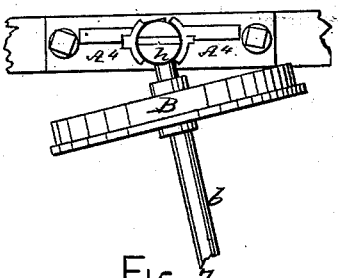


FIG. 7.

WITNESSES:

Chas. C. Stetson

E. B. Bolton

INVENTOR:

Gustav Hambruch

by his attorney

J. L. Stetson

3 Sheets—Sheet 3.

G. HAMBRUCH.

Car-Truck.

No. 216,792. Patented June 24, 1879.

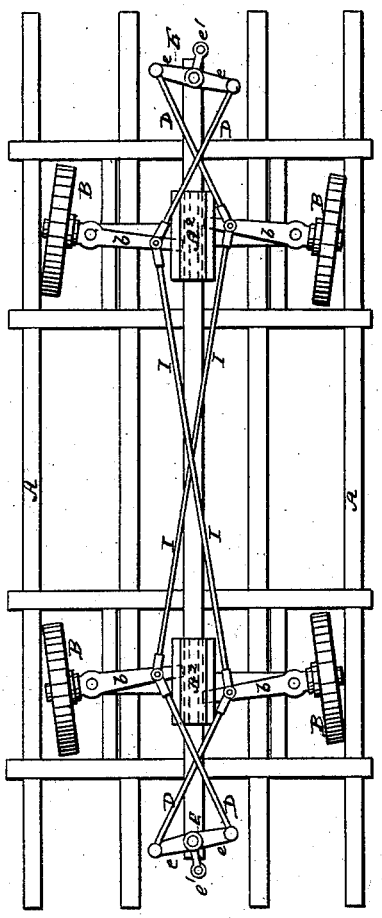


FIG. 8

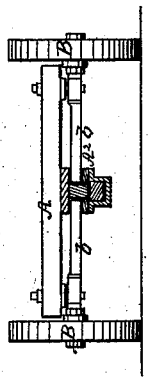


FIG. 9.

WITNESSES:

W. Colborne Brookes

Charles C. Stetson

INVENTOR:

Gustav Hambruch

by his attorney

C. C. Stetson

UNITED STATES PATENT OFFICE.

GUSTAV HAMBRUCH, OF BERLIN, PRUSSIA, GERMANY.

IMPROVEMENT IN CAR-TRUCKS.

Specification forming part of Letters Patent No. **216,792**, dated June 24, 1879; application filed March 5, 1879.

To all whom it may concern:

Be it known that I, GUSTAV HAMBRUCH, of Berlin, in the Kingdom of Prussia and Empire of Germany, engineer, have invented certain new and useful Improvements in the Means of Supporting and Operating the Wheels of Vehicles, of which the following is a specification.

I pivot each of the short axles at a point near the side of the car, and connect two or more of the short axles, so that they are compelled to make corresponding swiveling movements.

The pivots may be placed either close to the wheels, or inside or outside of the same, or in or over the center of the wheel.

According to my invention I mount each wheel of a pair on a divided or short axle, each of such axles being supported in a suitable bearing or frame at or near the side of the vehicle, while the inner end of each axle or the frame supporting it is controlled by a suitable guide or slide attached to or carried by the under frame or body of the vehicle.

The inner ends of the axles or the frames supporting them are connected to a T-shaped lever operated either by the coupling or buffing apparatus in the case of steam-cars, or the tongue or draft apparatus in horse-cars or road-vehicles.

In some cases the front and rear axles or other supporting-frames are coupled together by rods crossing each other, so that each acts on the reverse side of the vehicle at the two ends.

The following is a description of what I consider the best means of carrying out the invention in several forms.

The accompanying drawings form a part of this specification.

Figure 1 is an under-side view of the under carriage or framing of a railroad-car and part of a second with my improvements applied thereto as adapted for use on steam-railroads. Fig. 2 represents a side view, partly in section, of an under carriage with my improvements applied. Fig. 3 represents an under-side view of Figs. 4, 5, 6, and 7, parts of a street-railroad car with my improvements applied thereto. Fig. 8 represents an under-side view of a road-vehicle with my improvements applied thereto. Fig. 9 is a vertical section of Fig. 8.

In each of these views similar letters of reference are employed to indicate corresponding parts wherever they occur.

Referring to Figs. 1 and 2, A A represent the under part or floor of a railroad-car adapted for steam traffic. The wheels B are mounted on short axles *b*, each axle being supported in bearings *b'* in a frame, B^1, which is supported in segmental bearings A^1, affixed to the under side of the platform A.

The frames B^1 and axles *b* are controlled in position by the inner ends or arms of the frames B^1 being held with capability of sliding forward and backward in horizontal guides or slides A^2, affixed to the under side of the platform A.

The inner ends of the frames B^1, supporting the axles *b*, are connected by rods D to the lateral arms *e* of a three-armed lever, E, a third arm, e^1, of which is provided with a wide bearing piece or segment, e^2, received between and controlled by the arms *f* of a fork-shaped buffer, which is pivoted to the draw-bar F, as shown.

In this arrangement the front wheels of one car and the rear wheels of the next are connected together, so as to control the swiveling of each by the other.

The cars are connected or coupled together by drop-hooks G, one of which is permanently hinged to each end of a car on opposite sides of the center or draw bar F, so that they shall always match, as represented by Fig. 1, when two cars are brought together.

The draw-bars are operated by peculiarly-hinged rods G^1 G^2. The central part, G^1, of each rod is supported in bearings in the buffer. The end extensions, G^2, turn in bearings or supports A^3. The rods G^2 extend to both sides of the vehicle, in order to avoid the necessity of a man going between the vehicles in order to couple or uncouple the same.

In this arrangement the forked buffers, by their swinging or lateral movement, act on the three-armed levers E, to swing or swivel them in the opposite direction. They connect the wheels at the front of one car to the wheels at the rear of the other car when coupled together, and compel an opposite swiveling mo-

tion, the same as if they were coupled by crossed rods, as will appear farther on.

It will now be seen that the turning-points of the axles being placed in the center line of the wheels allows each wheel, together with the short axle, which is revolving in two bearings, to turn round its vertical axis without changing the place of the center of the wheel. Each wheel plays inside of a frame, to which are attached the springs, the guides, and the axle-box. The frame is attached to the car in such way that it may turn or swivel. The tail-pieces B^2 steady the position of the wheels. The draw-bar F runs along the whole car, and is fitted in the middle with an elastic buffer. On each end a buffer is arranged in the form of a fork, which is carried through a slot in the end frame, and which is pivotally connected by a hinge, *g*, with the draw-bar.

Between the forks of the buffer a hook, G, moves in a vertical plane, and can be operated by means of the rods G^1 G^2, which reach the sides of the car, and are connected in a yielding manner with the hook G.

After the cars are pushed together, touching each other with the buffers, the hooks of both cars are turned downward, each being hooked upon the opposite shaft, G^1, so that the coupling is a double one. The hooks are arranged always to the right of the center line of the car. The buffers place themselves as the cars come together, as shown.

Between the forks of each buffer is put the T-lever E, the arms e^1 of which are connected by two rods, D, with the tails B^2 of the frame B^1. In consequence of this connection, the axles of the wheels are placed always radial to the circle which the cars describe, and to which the buffer or draw-hook center line is a tangent.

The hind axle of the front car sets, therefore, the front axle of the following car by the tension of the draw-hooks, and in case of a pushing of the train, the hind axle of the pushed car sets the front axle of the drawing car by the pressure of the forked buffer-rods.

As one pair of axles is not connected with a second one of the same car, but always with the axle of the car adjacent, the distance between the axles of the same car may be made very wide, notwithstanding they can pass the smallest curves.

The coupling of the cars is very simple. The cars approach each other with raised draw-hooks G. The contact of the buffers sets themselves and the axles right. The draw-hooks G are then lowered by turning the rods G^2 G^2 and the coupling is done. Extra tightening up is not necessary, as the elastic apparatus of the draw-bar serves as a tightener.

Referring to Figs. 3 to 7, the frames B^1 are dispensed with, and each short axle *b* is supported at its outer end in a bearing, *b'*, pivoted in a stout jaw, A^4, between suitable springs *h*. The axles are similar to those above described, short, and a single one for each wheel.

The vertical axis of the turning motion is situated for each axle in the center of the bearing, outside of the corresponding wheels. The T-levers E on both ends of the car are connected by crossed connecting-rods and sleeve-shaped draw-rings with the axles, which in turn also are connected to each by two crossed connecting-rods. The whiffletree may be stiffly attached to the middle arm of the T-lever E in such manner that the turning of the former to one side will turn not only the T-lever E, but will also set the axles in a radial position. In cases where a pole is used it is attached to the T-lever E in a similar manner, so as to produce the just-mentioned effect of setting the axles.

The drawing represents a car, which may run on rails curved with seven-yard radius without a slipping of the outside wheels on the rails or the tendency of the wagon to keep the straight line.

The inner terminations of the axles revolve in boxes sliding in guides A^2, arranged on the under side of the car-body.

D D are the rods connecting the axles *b* with the arms *e* of the three-armed levers E, the arms e^1 of which, in place of being provided with the bearing-pieces e^2, (shown in Fig. 1,) are provided with means for attaching a tongue and whiffletrees.

I I are cross-links, connecting the forward right with the rear left, and forward left and rear right, short axles *b*, one with the other, so as to insure simultaneous action in turning curves, as well as at other times. These cross-links I I connect the axles of the same car in the same manner as the double buffers F in the previous arrangement connected the axles of different cars.

In the present case the front and rear axles of the same car connect, while in the previous case the front and rear axles of adjacent cars are connected.

The advantages of this system of horse-cars are, substantially, first, the possibility to run them in curves of small radius; second, the greater duration of the rails and wheel-rims, no slipping friction existing in the curves of the road; third, the gain in drawing-power.

For common roads, referring to Figs. 8 and 9, the construction and arrangement of parts are also analogous to those shown in the other figures.

Each of the short axles *b* is pivoted to the frame A, between its wheel B and the center of the vehicle.

Over each of the divided axles a cross-beam is arranged, in the ends of which the axles *b* are pivoted. The flat inner ends of these axles slide between guides fastened to the under side of the cross-beam. A perch connecting the front and the hind cross-beams, and protruding on both ends of the wagon, supports on each termination a three-armed or T lever, E. The branches *e* are connected crosswise with the ends *b* of the nearest pair of axles by means of connecting-rods, and as well the ends of the two front and the two hind axles.

The pole (not shown) is hooked into the middle arm of one of the three-armed levers, and fastened to it by a pole-pin, so as to be disconnected in a moment and refastened into the other T-lever on the other end of the wagon when required. The attachment of the pole to the middle arm of the lever E is rigid, so that its horizontal oscillation causes a similar oscillating motion of the three-armed lever, and, by means of the connecting-rods, a setting or regulating of all the axles. If the pole is turned to one side for changing the direction of the wagon, all the axles are set into a radial position, so that the center of the wagon describes a circle to which the pole is found to be a tangent.

For the purpose of allowing the wagon to run on uneven roads, one pair of the axles is made to tilt in the vertical plane by connecting it to the cross-beam by a bolt—a second one, which is fixed on the wagon-body, swinging with this cross-beam round the bolt, so the axles may turn in a vertical plane. The purchase with which the horses act upon the axles in moving the pole is a great one, 30:1, while in the now-used wagons it is only 4:1. It is, therefore, a very difficult task for the horses with a heavy load on a commonly-built wagon and on uneven roads to turn the pole into the required direction. Besides, the vibrating to and fro of the pole on rugged ground is for the horses an inconvenient—nay, dangerous—motion.

The above-described construction removes this nuisance.

A further advantage of this construction for street-wagons is the radial setting of all axles. The hind wheels will keep exactly the track of the front wheels, while the hind part of street-wagons of the common style runs inside of the curve which is described by the front wheels.

An essential merit of such wagons is the complete symmetry of their front and hind parts. Therefore the pole can be used on both parts, which is effected by the mere removing of a single bolt. This property is of great importance in narrow streets, in gateways, yards, and other places where the turning of the wagon is impossible, or, at least, difficult. Even with great traffic on a street this construction will prove very advantageous in case that the wagons should be stuck or stalled.

It may be remarked that the front wheels are as great as the hind wheels, and that their diameter is the same as that of the now existing hind wheels, by which means the traction power is diminished a great deal. The body of such carriages is more simple than that of the now used ones, as it is not necessary that the front wheels underrun the body, which can be constructed without a gab.

I claim as my invention—

1. In a vehicle, the combination, with wheels mounted each on an independent axle capable of being swiveled, of a swinging tongue or coupling turning on a pivot on the under side of the vehicle-frame at each end, and connections arranged, substantially as described, to impart to the pair of wheels nearest each tongue or coupling a rotation in a horizontal plane in the same direction thereas by the swiveling on its pivot of said tongue or coupling, substantially as set forth.

2. The combination of the draw-bar and connected spring with the swiveling buffer and a separate lever having connections to the short axles or axle-frames, the parts being so arranged that the swiveling movement imparted to the axles shall be controlled by the buffer, while the latter is allowed to move forward or be thrust inward, as herein specified.

This specification signed by me this 7th day of December, 1878.

GUSTAV HAMBRUCH.

Witnesses:
CARL T. BURRHARD,
BERTHOLD ROI.