(No Model.) 5 Sheets—Sheet 1.

J. MACLACHLAN.

RAILWAY CAR.

No. 256,346. Patented Apr. 11, 1882.

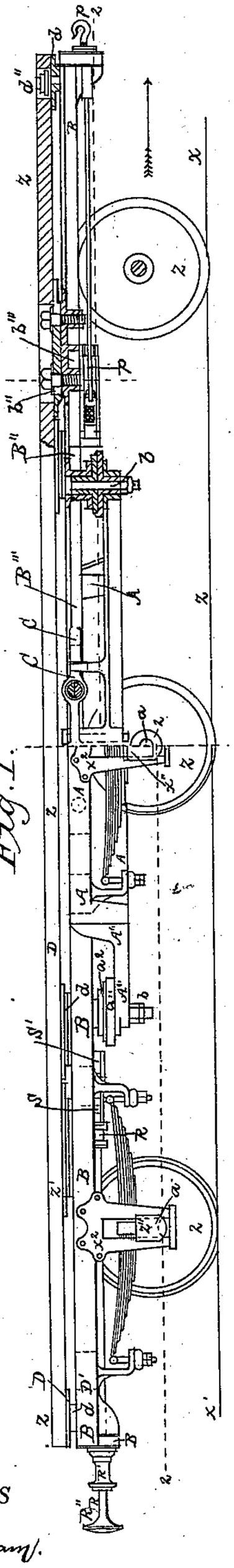

Fig. 1.

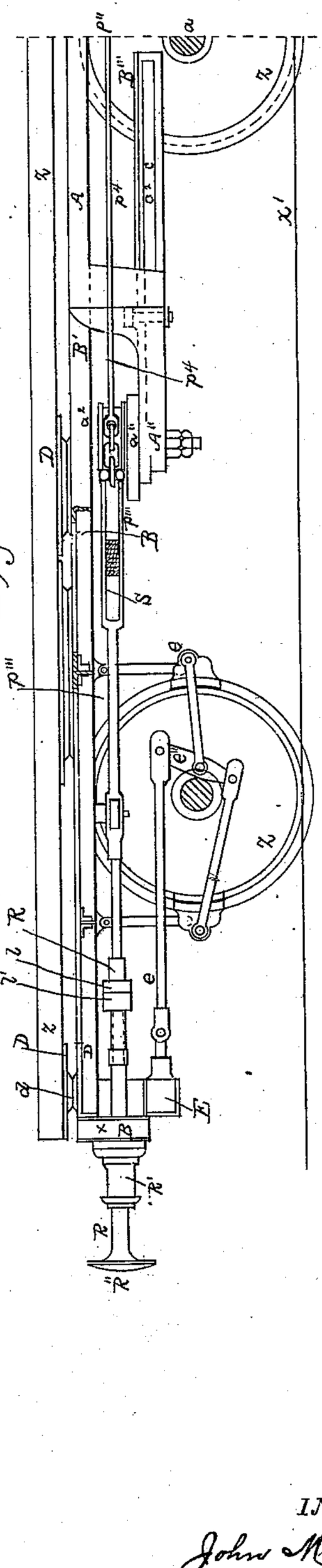

Fig. 5.

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(No Model.) 5 Sheets—Sheet 2.

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RAILWAY CAR.

No. 256,346. Patented Apr. 11, 1882.

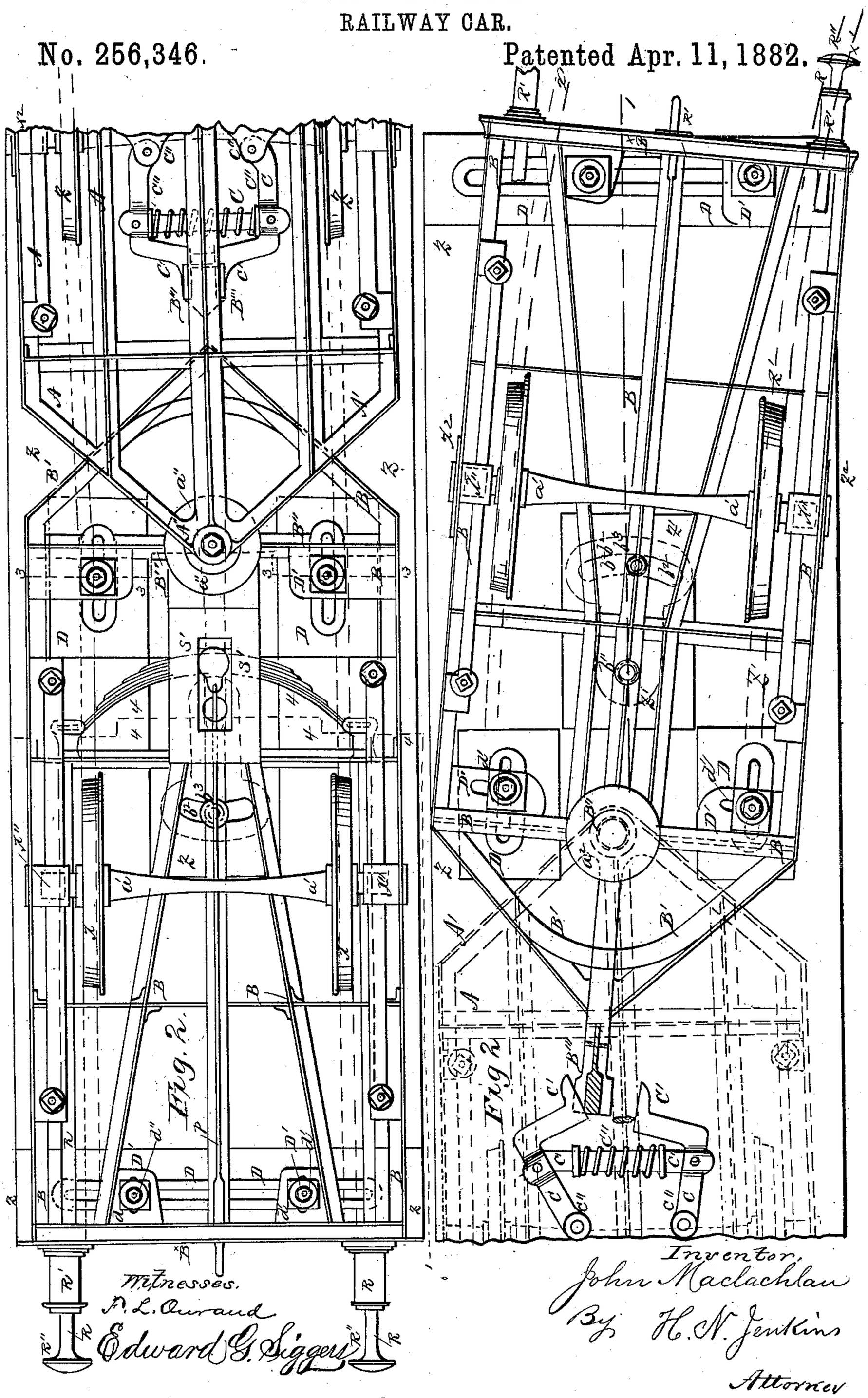

Fig. 2.

Fig 2

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RAILWAY CAR.

No. 256,346. Patented Apr. 11, 1882.

Fig. 3

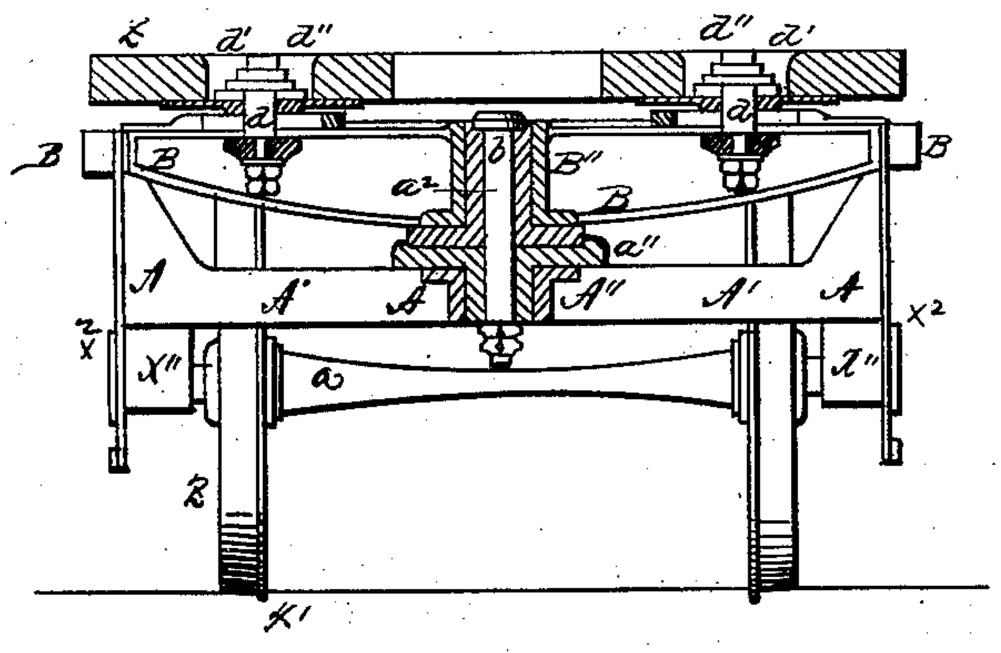
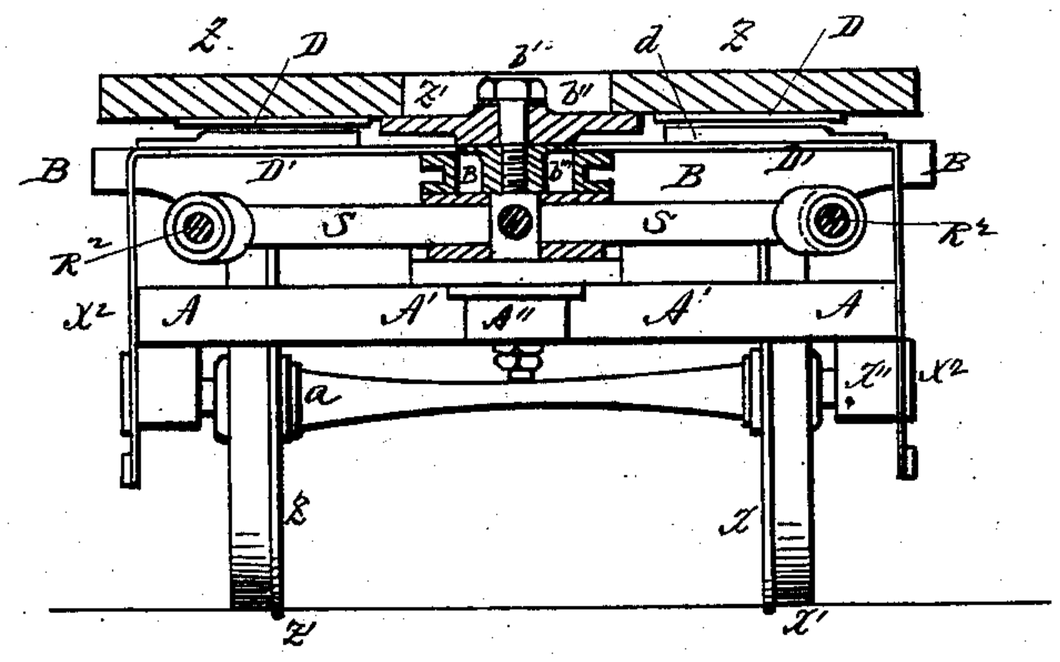


Fig. 4



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(No Model.) 5 Sheets—Sheet 4.

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RAILWAY CAR.

No. 256,346. Patented Apr. 11, 1882.

Fig. 6.

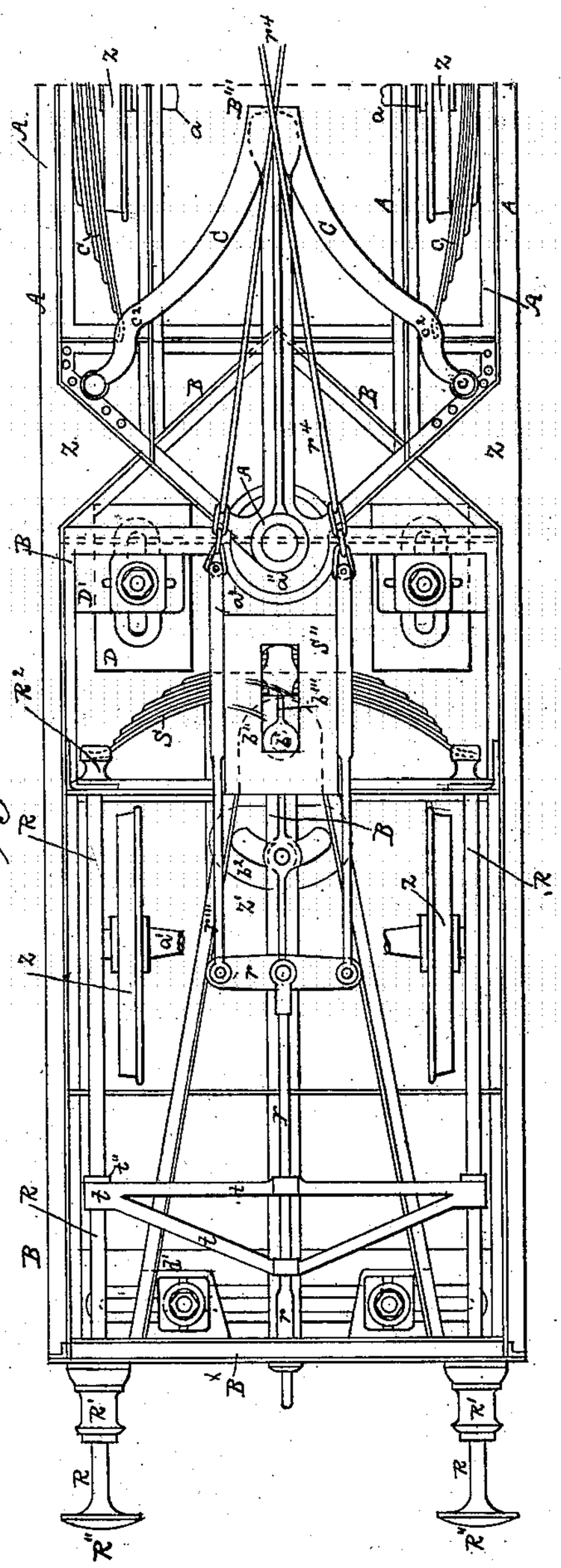
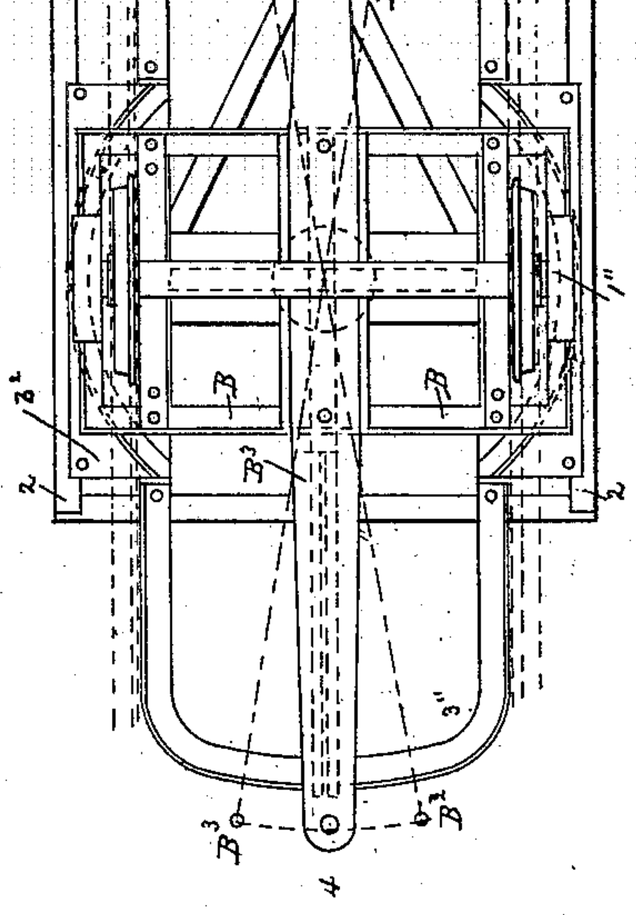


Fig. 8.



WITNESSES

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(No Model.) 5 Sheets—Sheet 5.

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RAILWAY CAR.

No. 256,346. Patented Apr. 11, 1882.

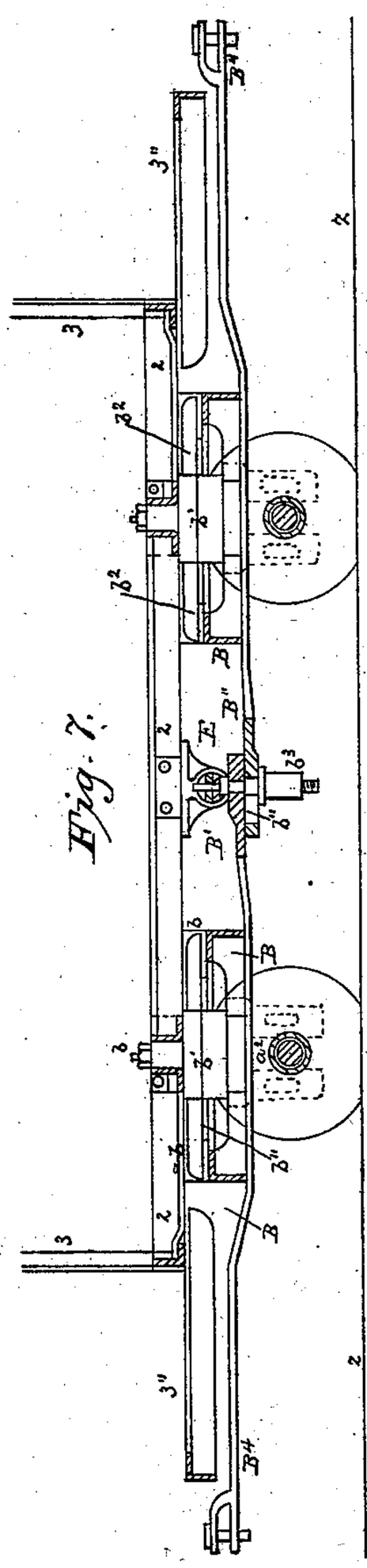

Fig. 7.

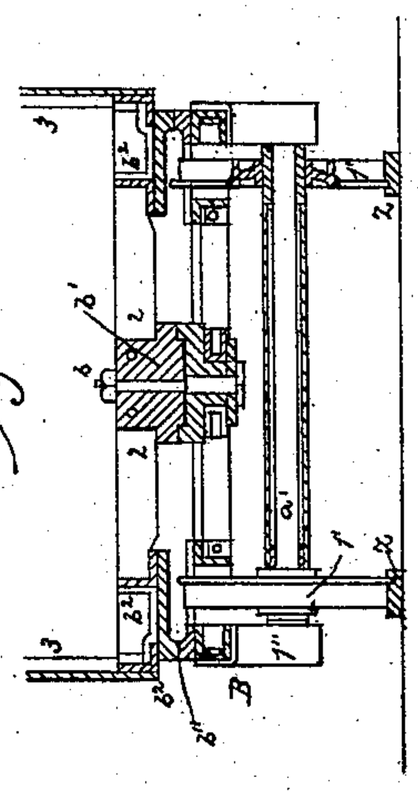

Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN MACLACHLAN, OF NEW ORLEANS, LOUISIANA.

RAILWAY-CAR.

SPECIFICATION forming part of Letters Patent No. 256,346, dated April 11, 1882.

Application filed May 14, 1881. (No model.) Patented in England June 1, 1878, and February 4, 1880.

To all whom it may concern:

Be it known that I, JOHN MACLACHLAN, a resident of the city of New Orleans, parish of Orleans, and State of Louisiana, have invented a certain new and useful Improvement in Railway-Carriages, Tramway-Cars, &c.; and I do hereby declare the following to be a full, clear, and correct description of the same, reference being had to the annexed drawings, making a part of this specification.

This invention relates to the construction of railway-carriages, tramway-cars, and other vehicles, and to improved modes and means and arrangement of mechanism specially designed for causing the axles of such carriages to assume radial or normal positions in traversing sharp curves, and enable the wheels to run in planes tangential, or nearly so, to the curves of the rails, so as to admit of long carriages turning these curves without incurring the liability of being thrown off the rails, or wearing the wheels or rails by excessive friction, which has heretofore been usual.

In order that the nature and novelty of my invention may be fully understood, I shall now proceed to describe the several figures on the drawings, which are hereto appended for that purpose, the same reference-letters indicating the same or like parts in the several figures where shown.

Figure 1 represents a side elevation, partly in section, of the trucks and under-framing of a railway car or carriage provided with my invention. Fig. 2 represents a plan view of the same, said view being broken at the middle to allow the two halves to be presented on an enlarged scale; and Figs. 3 and 4 represent transverse vertical sections taken on the lines 3 3 and 4 4 of Fig. 2.

Referring to these figures, 1 to 4, the carriage body and framing, which may be of the ordinary construction, are not shown, but only indicated by the long, lower, horizontal, rigid, or bound frame Z, which carries the whole vertical framing of the sets of passenger compartments and fittings above it, all as usual, and so not further indicated in the drawings. In this carriage and arrangement of the improvements the whole is shown as carried on six wheels, *z*, ranged in pairs, (to run on the opposite rails, *z' z'*, as usual,) one on each opposite end of three axles, a center one, *a*, and two outer ones, *a' a'*, and mounted in their bushes *z''* and horn-plates z^2, all so far much as usual, but secured at greater distances apart on a central and two under swiveling frames, A and B B, respectively, with the axles and wheels near the middle of these frames.

The central frame, A, is constructed of strong malleable iron or steel angle (L) or tee (T) bars riveted together longitudinally and transversely, and terminates at each end in an angular part, A', in which the eyes A'' of their swiveling joints are formed, and where the central axle-framing, A, is coupled to similar eyes, B'', in the adjacent angled ends, B', of the outer or end axle-frames, B B, by swivel pins, studs, or pivots *b* at each end of the central frame, A, on the central line of the carriage in its normal position—that is, as when the carriage is traversing a straight line of rails, and preferably near the mid-positions between the central axle, *a*, and the end axle, *a' a'*, and the carriage-frame Z is attached to the two outer swiveling frames, B B, by a joint-pin, *b'*, in each, placed nearly midway between the center of the outer axles, *a' a'*, and the swiveling joints *b* of the frames A B B in the longitudinal center line of the whole. The inner angular end, B', of each outer swiveling axle-frame or bogie, B B, overlaps the outer ends, A', of the central bogie-frame, A, and may have segmental bearing-surfaces between them, as shown by the dotted lines at A^x and B^x in Fig. 2, so as to give lateral and horizontal steadiness.

The joint-pins *b* are fitted into and passed through strong flanged bosses or disks *a' a²*, preferably made of steel, offering an extended bearing-surface to each other horizontally, and these disks are securely held in the eyes A'' and B'' at the ends of the frames A and B B. The inner end of each outer swiveling frame B is tapered toward the center at B', where each is formed with or terminates in a strong iron or steel bar or longitudinal arm, B''', preferably made in one forging, with the eye-piece B'' prolonged and entering between a pair of plates or flat surfaces, C', formed on the ends of oscillating levers C, jointed at their inner ends by pins at the middle part of the frame A, and these levers are pressed or held against

the terminal projecting ends or arms B''' of the outer axle-frames, B B, to keep the arms B''' and bogies B B in their normal longitudinal position by means of spiral springs *c*, surrounding short transverse rods or bars *c'*, which are jointed to the levers C, and are made to overlap each other and terminate in collars *c''*, which retain the springs in compression when either of the levers C is acted on by the axle-arms B'''; or this action might be effected by separate or duplex blade-springs or drawing-springs acting direct or through suitable levers. When the wheels *z* of either of the outer bogie or axle frames, B B, enter on a curve of the permanent way *z'*, as is shown at the right-hand side of Fig. 2, that bogie or frame B is swiveled partly round on its central joint-pin, *b*, by its axle being forced to take the normal radial position to suit the wheels, which are acted on by the curved rails *z'*, (as by cams or cam-grooves,) and the projecting inner end or arm, B''', of the front frame, B, presses back the spring disk or plate C' of the lever C bearing against it at one side, as shown, and as the carriage travels fully on the curve from the straight line the wheels of the central bogie, A, follow the rails, and the rear end axle-frame, B', also following, acts in a similar manner by its projecting arm on one of its springs to compress it, (or, if a draw-spring, to extend it,) and both axle-frames B B thus also tend to press the central frame, A, to one side, beneath the carriage-body, so as to cause the wheels of the middle frame, A, to take the curve with their axle in a radial position also; but as soon as the curve is passed and the straight line of permanent way entered the projecting arms B''' B''' on the inner ends of the frames B B are drawn into a straight line by simple traction of the moving train, but are also pressed back by the action of the springs *c* on the lever C, so as to place and keep the under frames all in one longitudinal line steadily, if the action of the rails on the wheels and axles should be insufficient or irregular. If the carriage is traversing a reverse or flattened S-curve, the one end axle-frame or bogie B is swiveled in the opposite direction from the other, so as to have the axles *a' a'* radial to the reverse curves, the opposite springs, *c*, being compressed by the action of the respective projecting arms B''' B''' of the outer frames, B B, on the ends of the levers C, between which they enter, and the central frame, A, is thus kept in its middle or mean transverse position with the wheels following the rails.

The body or upper main frame-work, Z, of the carriage is carried on the two lower end frames, B B, by means of the strong fixed pins or pivots *b' b'*, screwed in them, and passing through a short longitudinal slot, *b''*, in a strong plate, Z', secured to the carriage-body Z in the longitudinal central line of the whole, screwed or otherwise fitting into screwed eyes *b'''* in the main central parts of the lower frames, B B, on which the carriage Z bears mainly at the plate Z', these swiveling points being by preference situated nearly midway between the central line of each end axle, *a' a'*, and the center of the pins *b b*, coupling the end bogies, B B, to the central axle-frame, A. The plate centers *b' b''*, on which the carriage-body Z rests, are thus slotted to allow of the slight play or longitudinal motion of the pins *b'* in them or motion of the slots *b''* past the pins *b'*, when the frames B swivel round under the carriage Z in traversing a curve, the pins' centers *b'* being now nearer the inner ends of the slots *b''* than when the carriage-frames are all in a staight line. The carriage framing Z is further secured to the lower frames, B, partly to prevent longitudinal vibration or play of the pins *b'* in their slotted centers, by having a differential curved transverse slot, b^2, formed in each of the plates Z' of the carriage-framing Z', in which the longitudinal slots *b''* are formed, and a short way from each of the fixed center pins, *b'*, through which slots b^2 b^2 strong pins b^3 b^3 pass, and are screwed into the lower end frames, B B; and these pins b^3 b^3 are free to move in the curved slots b^2 b^2 when the frames B are swiveled round. Instead of one pin b^3 and transverse differential curved slot b^2, two pins and longitudinal curved slots outside and in the transverse line of the central pin may be used for preventing vibration or play of the carriage-body Z on its supporting swiveling frame B in its angular position; and the converse of this arrangement of pins and slots may obviously be applied for securing the upper carriage-body or main frame-work, Z, to the lower axle-frames, B B—that is, by forming longitudinal slotted centers *b'' b''* and fitting transversely-curved slots b^2 b^2 in the lower end frames, B B, and the fixed center pins, *b' b'*, and transverse moving pins b^3 b^3 in the upper frame-work, Z Z'.

By either of these improved arrangements the longitudinal center line of the carriage-body Z takes a position always tangential to the curves traversed through the swiveling pins *b' b'*, connecting the carriage Z to the swiveling frames B B, which has the effect of throwing the weight of the carriage Z as much over the outer axles as inward on the central axle, and the weight is thus equally distributed over the frames and wheels in the mean center line for the time being of the under swiveling frames. The upper carriage-body, Z, being only secured to the lower swiveling frames, B B, by the pins *b' b'* and *b'' b''* at or near the longitudinal center line, provision is made for further securing the carriage to avoid risk of its being canted on these pins or lifted off the lower frames, B B, by fitting pins or bushes *d* to the upper frame, Z, at both ends, as shown, and at convenient intermediate situations, if required, which pass through and are secured below plates D D' in both frames B Z, slotted longitudinally and transversely to allow of free play of the slide-pins when the lower frames, B, are swiveled; and the central bogie, A, may also be similarly secured or steadied to the upper carriage-frame, Z, by bearing-plates or by pins working in slotted centers.

The slide-pins *d* are preferably made in the form of sliding bushes *d'*, slightly rounded to slide in their slotted plates D D' freely, with broad rubbing-plates and washers, with india-rubber disks between them at *d'*, tightened up by a bolt, *d''*, passed through them and the sliding bush or pin *d*, and tightened up above or below the plates and rubber disks *d'* to give any desired degree of friction, with the elastic safe yielding of the india rubber to prevent breakage.

Fig. 5 on Sheet 2 is a sectional side elevation; and Fig. 6 is an inverted plan, showing part of the lower framing of a railway-carriage fitted with a modified arrangement of my improvements. In this modification the carriage-body Z is secured to the outer swiveling frames, B B, by pins *b' b'*, working in slotted centers *b'' b''*, as described in reference to Figs. 1 to 4, and the swiveling frames B B are also connected in the same manner to the central frame, A, by the joint-pins *b b;* but the long lever-arms B''' B''' on the inner ends, B', of the outer frames, B, in this example enter between long levers C, jointed to the angled ends of the central frame, C'', and which are kept or pressed in contact with the arms B''' by means of long blade-springs *c*, fixed longitudinally on each side of the frame A, but acting transversely on shoulders c^2, formed on the lever C, the resulting action of the arms B''' on the levers and springs, and vice versa, being substantially the same as described in reference to Figs. 1 to 4.

When continuous brakes *c* are fitted in combination with my improved axle-radiating carriage-frames they would be constructed, as shown in Fig. 5, to the outer swiveling frames, B B, the air-brake cylinder E being bolted to the outer ends of the swiveling frames B B of each carriage Z, so as to be moved with it and so be applied through the ordinary arrangement of rods and levers *e' e''* directly to the outer wheels, *z*, of each frame B.

In these new or improved constructions or combinations of radiating frames for railway-carriages any of the ordinary arrangements of combined or separate buffer and draw springs, with their rods and other fittings, would be applied to the end frames, B B, which for this purpose would be formed with strong ends $B^{\times}$, preferably of beams of hard wood bound to the iron framing B, through which the rods R and *r* would slide with their buffer-guide bosses and heads R' R'', and draw-hooks *r'* outside, all fitted to work at the proper height off the rails, as usual.

In Figs. 1 to 4 an ordinary arrangement of bow-blade spring S is fitted to slide in a strong guide, S', in the center of each frame B as near the inner end or swiveling eye B'' as possible to allow of good long rods. The inner end of the hook-rod *r* is secured to the center buckle of the spring S, while the pushing bosses or blocks R^2 at the inner end of the buffer-rods act on the free ends of the spring S, which thus acts jointly for both the buffers and draw-hook; but either or both of these might be fitted with separate helical or conoidal springs at the inner ends of their rods.

When it is desired to couple the draw-hook rods *r r'* at each end of these three carriage-frames A B B this may be done, as shown in Figs. 5 and 6, by connecting the inner end of each hook-rod *r* to the center of a short swing-lever, *r''*, and two rods, *r'''*, to the ends of this lever *r''*, with links or short chains at r^3 to work round the swiveling-joint disks *a'' a²* and inward between the frames B B and A, connected by the long rods r^4, crossing each other at the center over the frame A. This arrangement of continuous draw-rods would allow of the swiveling of the frames A and B B, and compensate by the reverse angling of the levers *r'' r''* and their crossing-rods r^4 r^4, and when the same bow-springs, S, were desired to answer for these draw-rods *r* and buffer-rods R the links *r''* could be made forked to pass the spring, and the rods *r*, fitted with a cross-head, *t*, with eyes at its end *t'*, sliding on the buffer-rods R, and acting through these and collars *t''*, secured on them on the spring S; but in this arrangement the draw or hook rods *r* might be fitted with the ordinary helical or conoidal draw-springs, and so dispense with the cross-head *t*. Although the frames of these oscillating under frames, A B B, of the carriage have been shown and described as constructed of wrought angle (L or T) iron or steel, it is to be understood that they may be constructed of bound wooden framing, or of composite iron and wood framing, or in any ordinary manner, and that the sunk flange-joints *a'' a²*, coupling the frames A and B B together, might be constructed in other ways to take the strain off the joint-pins *b b*, and the axles *a a'* and their boxes *z''* may be fitted to these frames A B B in other ordinary manners and with other ordinary forms of springs than the bow-blade springs shown, but in all cases so as to admit of wheels of larger diameter than is usual with ordinary carrying or four-wheeled bogie-frames.

Instead of the central under frame or bogie, A, of the carriage having a single axle, *a*, and pair of wheels *z* in the center, it may be fitted with two axles and pairs of wheels set at some slight distance apart to give greater steadiness to the central part of the carriage Z, and these axles may be made to radiate or cause the wheels to take the curves of the rails by coupling their lever-arms to one transverse bar and set of springs, as in the arrangement shown in Figs. 7, 8, and 9, Sheet 2; and by another modification the upper frame, Z, of the carriage may be formed or secured on the central frame or bogie, A, which would in this case have its ends extended and connected to the outer end swiveling frames by springs fitted on them through the joint-pins, so as to allow these end frames to swivel otherwise, substantially as hereinbefore described in reference to the first modification, in which the springs are fitted to the central frame.

Another improvement of my said invention has reference to an arrangement of the parts for swiveling and radiating the two axles of four-wheeled tramway-cars or railway-carriages for the turning of these round quick curves, and which is most suitable for long vehicles, or where the axles and wheels have to be placed far apart to give stability and steadiness to the vehicle with the least possible strain and friction in turning curves, and of which one modification or construction is shown in the longitudinal and transverse sections, and inverted or under side plan, Figs. 7, 8, and 9, respectively. Referring to these figures, this improved arrangement consists in mounting the two axles a' a' and their wheels 1′ 1′ on separate swiveling frames or bogies B B by center pins, b, and bearing-centers b' over the axles, or nearly so, and side bearing-blocks, b'' b^2, to the under side of the main or under frame, 2 2, of the tramway car or carriage 3, having the long arms B′ and B″, secured to their respective bogies B B, and connected in the center under the main frame 2 by the pin and slotted joint b^3 b''' at their inner adjacent ends, so as to radiate in turning curves to either side, and equally the leading bogie and its axle and wheels through its lever B′ or B″, as the case may be, always turning the other or trailing wheels and axle radially to the curve of the rails z they may be passing for the time being, all as shown in these figures, 7, 8, and 9, and substantially as described in reference to the end axles and wheels and their bogies, indicated by the same reference-letters, and having a connection at the center joint, b, to the under sides or edges of the main frame 2 by the two spiral or other springs E, which would always tend to keep the swiveling arms or levers B′ B″ in the straight line, and also bring them and their bogies to their true normal position after turning a curve to suit the straight line of the rails or tramway z z. When this arrangement is used for tramway-cars to be drawn by horses or a separate traction-engine the bars B′ B″ or other equivalent would be prolonged out toward or beyond the ends of the car 3, or its platform 3″ at B³, where they would be coupled by an eye or other equivalent to the traction-couplings of the horses or traction-engine beyond it, and which in turning the curve would really steer the car by one of its levers B³ round the curve by simultaneously swiveling both bogies radially as they entered the curved line; but where traction was not used, as for combined steam and passenger carriages, any ordinary arrangement of steering-gear, such as used on road steam-engines, with segmental toothed or chain wheels and pinion, which would right themselves when not in action, might be fitted in the advanced bogie with hand-wheel and spindle carried on the platform 3″, for steering the vehicle, and radially-swiveling axles and wheels in a positive manner equivalent to that described in reference to the levers B³.

The central bearings, b', round the swiveling pins b of the bogies, are formed with a hollow recessed and bearing part, the upper bearing projecting down into this cup-like part, which may contain the oil or other lubricant used for reducing the friction of this bearing, either with or without a few layers of woolen fabric $b^\times$ or other equivalent which might retain the lubricant and deliver it to the bearing-joint c c' as pressed out, and, when desired, this joint might be fitted with a spiral india-rubber or other block or circular spring, $c^\times$, round the pin, to assist in taking the strain off the bearing c' and prevent shocks or breakage of these parts.

And although only one axle a' and pair of wheels 1′ 1′ have been shown in Figs. 7, 8, and 9 as mounted on each bogie B, it is to be understood that two axles, each with its pair of wheels, might be mounted close to each other on the bogie-frame B, (as in many other bogies, such as used for railway locomotive-engines,) and so have these swiveled radially, or nearly so, to the curve of the rails by the arms B′ B″ B³, substantially as described in reference to these figures, 7 to 9.

In all these arrangements or combinations of mechanism for swiveling or radiating the axle a a' of railway and tramway vehicles, as described, it is advisable that the wheels should be capable of revolving loosely in opposite directions to save friction on them and the rails and assist the swiveling of the axles; and this has been done heretofore by allowing the one wheel 1′ or 1′ to revolve loosely by its eye on the main axle a or a'; but as this does not seem to me to be a durable or satisfactory mode, I by another improvement fix the one wheel 1′ on the main axle a', which revolves in its bearings 1″ 1″, all as usual, and fix the other or second wheel 1′, on the outer end, close up to the bearing 1″, on that side, of a hollow shaft or spindle, a^2, mounted on the inner main shaft, a', as seen particularly in Fig. 7, preferably with end bushes, a'', fitting the inner shaft, so that the center part of the hollow axle a^2 can form or be used as a box for containing grease or other lubricant, and allow the two axles a' a^2 and their wheels 1′ 1′ to turn in reverse directions while being swiveled or radiated, as described, with very little strain or friction, and yet allow both axles to revolve at the same speed without turning upon each other when the wheels are rolling, as usual, on the rails, and cause little wear and tear of the bushes a'' of the hollow axle a^2.

Having thus described the nature of my said invention and the manner of performing the same, I have to state that I do not confine myself to the precise details herein described or delineated; but

What I consider novel and original, and therefore claim as new, and desire to secure by Letters Patent, is—

1. The combination of under carriage-frame, Z, and the three lower carrying-frames, with their oscillating connecting-joints arranged on their central longitudinal line, the reacting

springs *c c'* and levers C C', and the subsidiary slotted attachments and sliding bushes, all constructed and operating substantially as and for the purpose set forth.

2. The combination of carriage-frame Z with the oscillating under frames jointed at *b b*, between the central and outer axles, an oscillating joint, *b' b²*, and connecting-frame Z to said under frames, and differential slotted cam traction-joints *b² b³*, all substantially as and for the purpose set forth.

3. The combination of carrying-frames A B C and the under frames with the actuating-levers B' B'', and the joints or connections for allowing the axles and wheels to oscillate to suit the curves of a railway-track, substantially as set forth.

4. The combination of coupling-levers B' B'' B''' with the under carrying-frames, A B C, said parts being swiveled together to allow the wheels and axles to conform to the curvature of the line of railway over which the cars are passing.

In testimony whereof I have hereunto signed my name.

JOHN MACLACHLAN.

In presence of—
M. SCHLESINGER,
J. C. HUBBELL.