No. 776,994. PATENTED DEC. 6, 1904.

D. BRENNAN, Jr.

TRACTION TRAIN.

APPLICATION FILED JUNE 15, 1904.

NO MODEL. 4 SHEETS—SHEET 1.

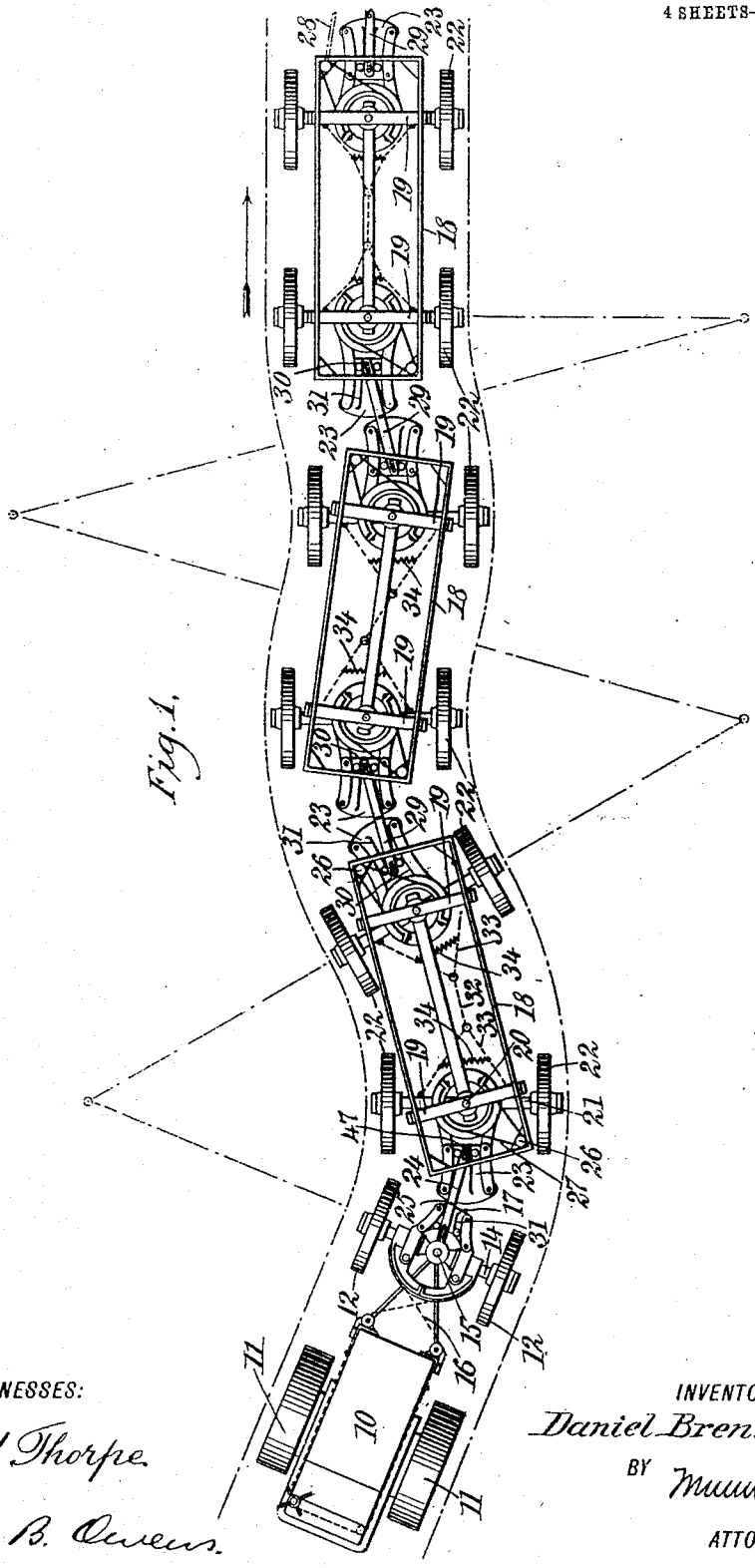

Fig. 1.

WITNESSES:

Edward Thorpe.

Isaac B. Owens.

INVENTOR

Daniel Brennan Jr.

BY Munn & Co

ATTORNEYS

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.

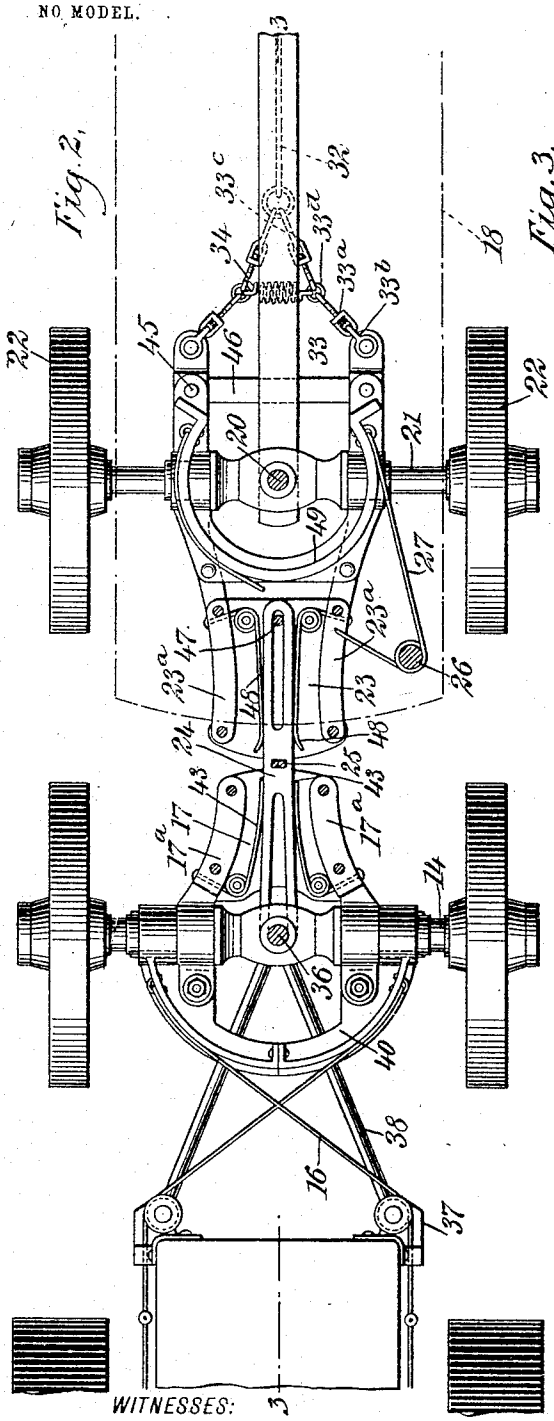
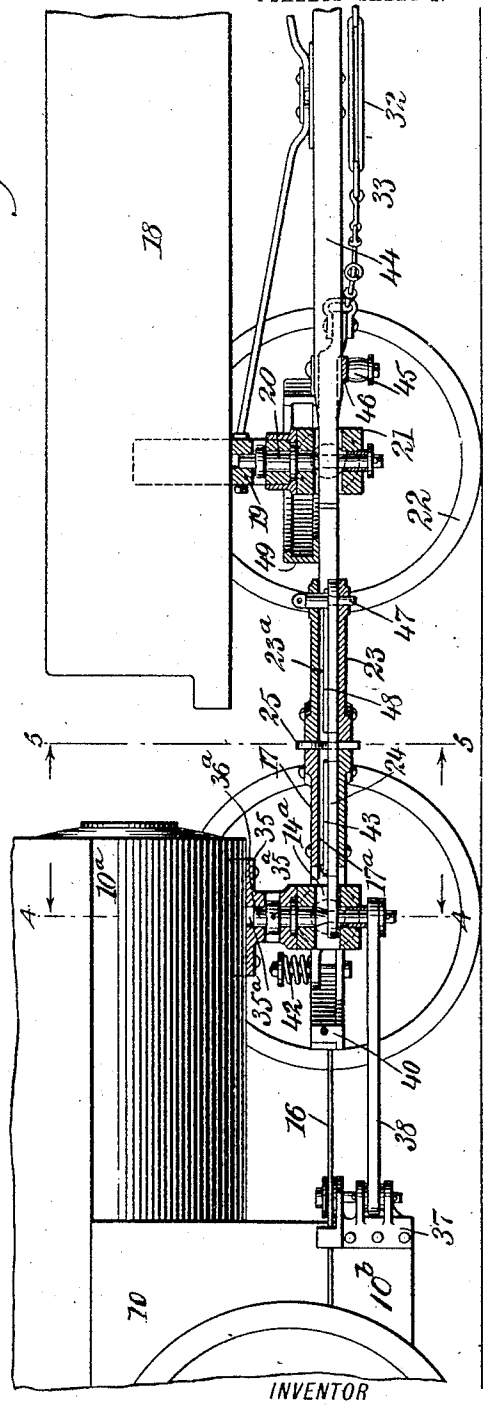


Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 4.

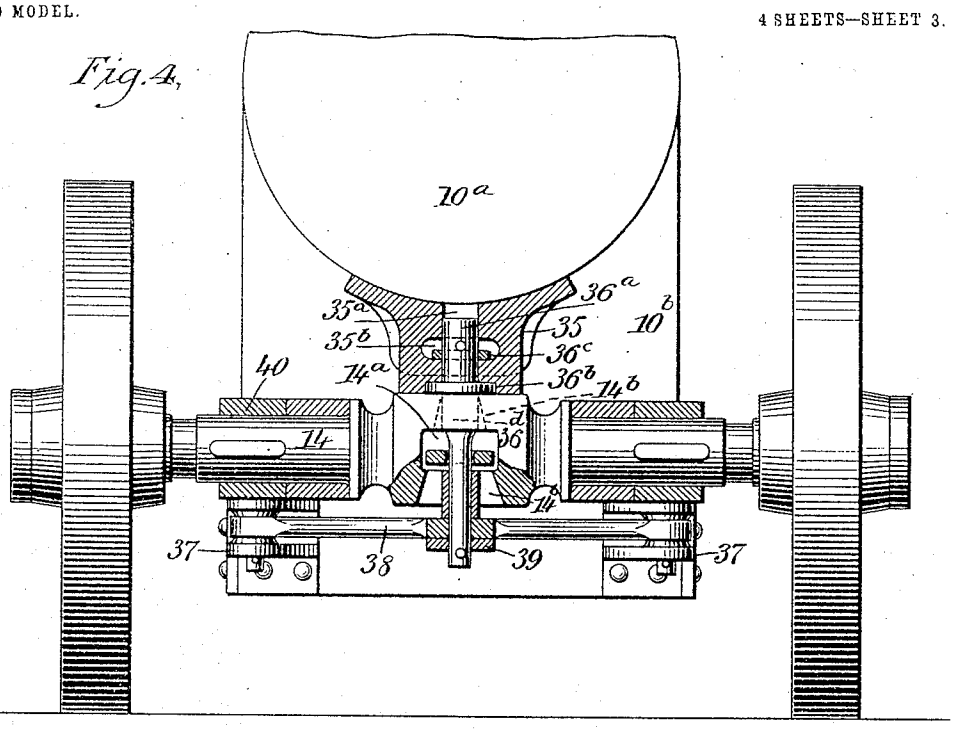
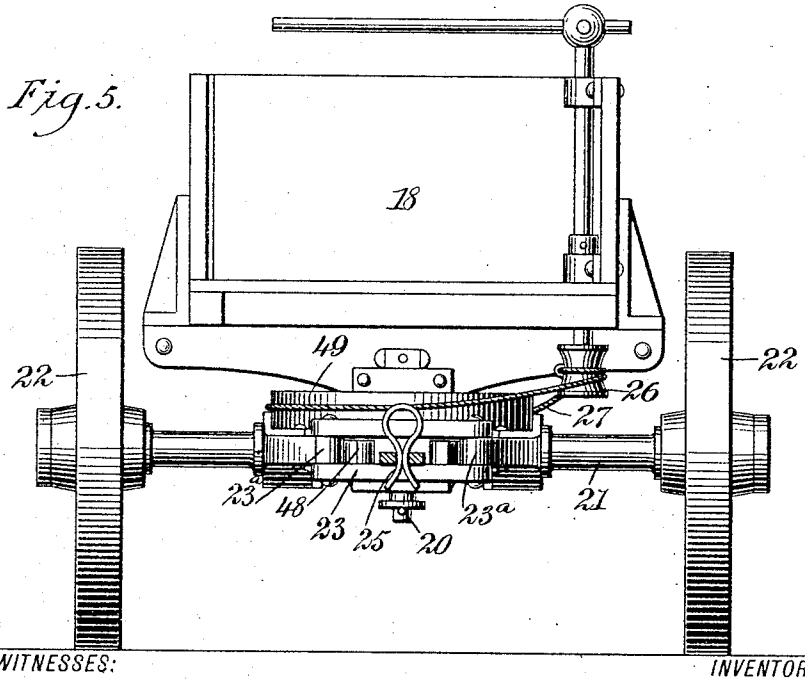


Fig. 5.



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NO MODEL.

4 SHEETS—SHEET 4.

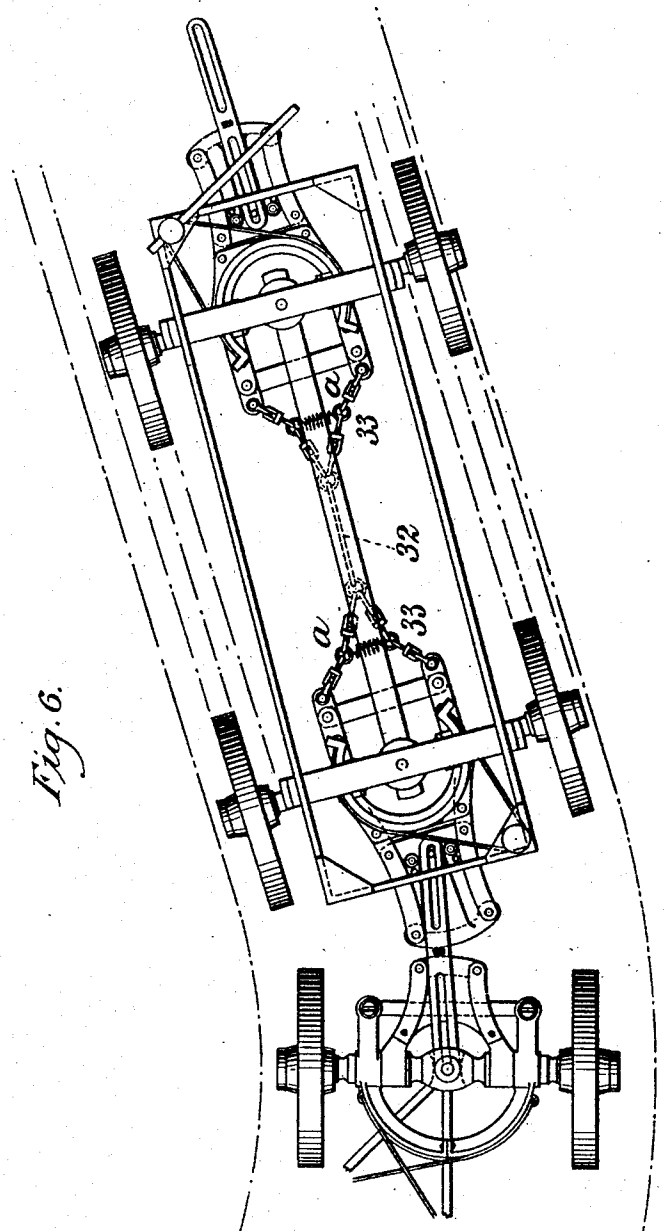

Fig. 6.

WITNESSES:

Edward Thorpe.

Isaac B. Owens.

INVENTOR

Daniel Brennan Jr.

BY Munn & Co

ATTORNEYS

No. 776,994 Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

DANIEL BRENNAN, JR., OF HAVERSTRAW, NEW YORK.

TRACTION-TRAIN.

SPECIFICATION forming part of Letters Patent No. 776,994, dated December 6, 1904.

Application filed June 15, 1904. Serial No. 212,634. (No model.)

To all whom it may concern:

Be it known that I, DANIEL BRENNAN, Jr., a citizen of the United States, and a resident of Haverstraw, in the county of Rockland and State of New York, have invented a new and Improved Traction-Train, of which the following is a full, clear, and exact description.

The invention relates to an organism of elements in an engine and one or more wagons or vehicles, enabling the engine to propel the vehicles in either direction and the entire train to be guided as desired.

The invention also relates to certain special features of construction and arrangement of parts for attaining the end referred to.

It has been proposed heretofore to provide a traction-train—*i. e.*, an arrangement of engines and wagons in such a way that the train may be propelled forward or backward and steered. The steering, however, has been imperfectly attained, since with the mechanism heretofore devised the train was forced to approach and leave a curve on tangents, the running from one curve directly into a reverse curve being impossible without skidding the wheels, which of course is not practicable, especially in the heavy work to which my invention is particularly adapted. By the arrangement which I have provided the control of the train is perfect, the steering being possible either from the end wagon or from the engine itself and the train being movable either forward or backward, respectively, by the pushing and pulling actions of the engine. I attain this result by providing the engine with an axle arranged to swing to steer the engine and the swinging axle carrying with it an outwardly-projecting member adapted to have pivotal connection with the adjacent wagon. The wagons are provided with swinging axles to enable them to be steered, and said wagons having such interconnection as will cause the one to follow the movement of the wagon preceding it and the whole being controlled by the operator, who imparts initial steering action to one of the wagons or to the traction-engine, as the case may be. By this mechanism the train may be advanced either forward or backward and the whole of the elements of the train caused to follow the various turns and other movements of the leading wagon or engine, according to whether the engine is operating the train by pushing or pulling thereon.

Reference is had to the accompanying drawings, which illustrate as an example one embodiment of my invention, in which drawings like figures of reference indicate like parts in the several views, and in which—

Figure 1 is a diagrammatic plan view showing one traction-engine and three wagons and illustrating a possible position of the train in which the engine is pushing the wagons and is approaching a curve, the first wagon on the curve, the second wagon in reversing position—that is, with the wheels of one axle running in an arc reverse to the arc in which the wheels of the other axle are running—and the third wagon running in a straight line. Fig. 2 is an enlarged plan view showing the forward portion of the running-gear of the traction-engine and illustrating the swinging axle and also showing the running-gear at one end of one of the cars or wagons. Fig. 3 is an enlarged side elevation showing the front part of the traction-engine and one end of one of the wagons with the traction-engine-steering axle and the axles of the wagon in section on the line 3 3 in Fig. 2 to show the details of the preferred equipment. Fig. 4 is a fragmentary front elevation of the traction-engine boiler with the bolster, axle, and adjacent parts in transverse section on the line 4 4 in Fig. 3. Fig. 5 is a front elevation, with parts in section, on the line 5 5 of Fig. 3, of one of the wagons, showing the swinging axle and the connected parts; and Fig. 6 is a plan view showing the manner of preventing the wagon-wheels from tracking.

Referring particularly to Fig. 1, 10 indicates the body of the traction-engine, having its traction-wheels 11 mounted on a non-swinging axle, as usual. The steering or pilot wheels 12 are mounted on an axle 14, which swings around a king-bolt 15. The swinging movement of the axle 12 is controlled by steering mechanism 16, which may form desired. Connected with said buffer 17, which swings with the wagon-bodies 18 are provided w

19, connected by king-bolts 20 with swinging axles 21, carrying the supporting-wheels 22 of the wagons. Said swinging axles 21 also carry to swing therewith buffers 23. The traction-engine is coupled to the adjacent wagon by a link 24, pivoted at one end to the king-bolt 15 and at the other end to a pin 47, mounted on the buffer 23 adjacent to the traction-engine. The adjacent faces of the buffers 17 and 23 are convex, and working between these convex faces are buffer members 25, which are supported from the links 24. Each wagon is provided at each end with a hand-operated steering mechanism, here shown as composed of drums 26, mounted on diagonal corners of the wagon-bodies and connected by chains 27 with the corresponding axles. The drums 26 may be provided with any desired devices for facilitating their operation—for instance, with the movable hand-spikes 28, as shown at the front end of the train in Fig. 1, so that these hand-spikes may be applied to any wagon when necessary. The wagons are connected together by links 29, the ends of which are pivotally connected with the buffers 23 by pins 30. Attached both to the buffers 17 and 23 are springs 31, which are two for each buffer, and bear, respectively, on the opposite sides of the adjacent links 24 and 29, tending yieldingly to hold the links in true longitudinal position. The axles of each wagon have a peculiar connection with each other, this connection allowing the axles to swing toward each other at one end, so as to lie both radial from a certain center or to swing out of parallelism with their bolsters, but retaining parallelism with each other. This connection allowing the above-described peculiar movement of the axles in its preferred form comprises an intermediate part 32, the ends of which are connected with branched end parts 33, the arms of the branches being attached to their respective axles at opposite sides of the king-bolt thereof and said arms being drawn together by retractile springs 34, engaged with the arms, as shown. The springs 34 tend to throw the axles and their connections into the position shown at the front end of the train in Fig. 1, and the peculiar connection enables the axles to swing into radial position, as shown, with respect to the rear wagon in Fig. 1 or to swing out of parallelism with the bolsters, but retaining their parallelism, so that the axles turn in reversed arcs, the centers thereof being on opposite sides of the train.

In the practical operation of the train thus equipped, assuming the parts to be in the position shown in the diagram in Fig. 1 and that [illegible]gine is pushing the train in the direc[illegible]he arrow applied to said view, the [illegible]ear of the front axle of the front [illegible]uld have hand-spikes 28 or other [illegible]eans applied thereto to facilitate [illegible]o that the steersman of the train may place the necessary stress on the forwardmost axle thereof. The steersman cants or cranks this forwardmost axle in one direction or another, according to the direction in which he desires to have the train move, and the front wagon will turn to one side or another, according to the strain placed on this front axle and the direction of said strain. The other wagons following the first will successively take the positions of the first wagon. Consequently the entire train will turn, following the direction of the front wagon. The turning movements of the following wagons and engine are due to the connections between the axles of each wagon, the peculiar connections between the wagons, and the peculiar connections between the engine and the adjacent wagon.

Referring to Fig. 1, it will be observed that the front wagon is running straight and that owing to the link 29 and buffers 23 the front wagon is exerting a strain upon the front axle of the second wagon, causing that axle to curve into the straight line being traveled by the first wagon. The flexible connections between the two axles of the second wagon will simultaneously tend to swing the rear axle of the second wagon, causing it to curve into the curve being taken by the front axle of the second wagon, the axles of the second wagon at the period indicated in the view turning, as before explained, in distinct curves reversed to each other. As the rear axle of the second wagon changes its inclination to the bolster, as above explained, the front axle of the third wagon will by the action of the link 29 and buffers 23 be turned to follow the curves of the second wagon, and the rear axle of the third wagon will by the connection between the axles of this wagon be turned also to follow the various curves executed by the preceding wagons, and, finally, the rear axle of the third wagon through the link 24 and buffers 23 and 17 will cause the swinging axle of the traction-engine to change its inclination and run into the first curve indicated on the diagram. These various swinging movements of the axles are brought about by the combined influence of the steersman on the front wagon and the pushing action of the engine-buffer 17, this buffer exerting on the convex face of the coacting buffer 23 a strain in a direction corresponding to the inclination of the engine-axle at the time. In case the engine is drawing the train behind it the steering is done through the engine-axle 14, and the buffer 17 and link 24 then act to impart the various guiding movements to the following wagons, as well as to impart the power for moving the train. In that case the train may be made to take all of the curves as are indicated in Fig. 1, in which figure, however, the engine is supposed to be pushing rather than pulling.

The various details of the construction and arrangement of the wagons and engine run-

ning-gears are not essential to my invention. A great latitude of variation may be resorted to without departing from the principle of operation above explained. In Figs. 2 to 5, however, I have shown the preferred arrangement of these details of construction, and they may be particularly described as follows:

As best shown in Figs. 2, 3, and 4, the boiler 10^a of the traction-engine has a metallic bolster-block 35 fastened to the under side thereof at the front of the engine. The bolster-block is formed with a vertical passage 35^a, crossed by a horizontal passage 35^b, in which fits the round upper end 36^a of the engine king-bolt. Said king-bolt is held against vertical movement by a flange 36^b, bearing on the under side of the bolster-block 35, and a pin and collar 36^c, lying in the recess 35^b and fastened to the king-bolt. The front axle 14 of the traction-engine is formed with a horizontal passage 14^a, passing longitudinally of the engine, and a vertical passage 14^b, the latter passage flaring downward from the broken lines in Fig. 4. The king-bolt has a square part 36^d below the flange 36^b, lying in the upper part of the passage 14^b of the axle 14. Below the squared portion 36^d the king-bolt is round, and the bolt is of sufficient length to project completely through the axle and downward a short distance below the same. Fastened to the front corners of the fire-box 10^b of the traction-engine are brackets 37, (best shown in Figs. 2 and 4,) to which brackets are joined the limbs of a **V**-shaped brace 38, this brace projecting forward and having connection with the lower extremity of the king-bolt. The said connection is made secure by a collar and pin 39, attached to the lower extremity of said bolt. It will therefore be seen that the axle 14 is mounted under the engine-boiler so as to allow the axle to swing freely, as before explained, and also to allow a slight vertical rocking of the axle with respect to the boiler and king-bolt, thus compensating for unevenness of the road over which the engine may be moving.

The arms of a quadrant 40 are keyed to the axle 14, and, as best shown in Fig. 2, this quadrant lies at the rear of the axle and is engaged with any suitable steering-gear 16 for imparting to the axle its characteristic swinging movement. The buffer 17 of the axle 14 is mounted loose thereon, but is held yieldingly connected with the quadrant 40 by means of springs and lugs 42. These devices for yieldingly connecting the buffer and quadrant, and consequently the buffer and axle, may be of any type desired, numerous variations therein being obvious to skilled mechanics. The before-mentioned coupling-link 24 is entered into the cavity 14^a in the axle 14 and is pivotally joined to the king-bolt. The buffer 17 has side flanges 17^a or other equivalent stops to limit the swinging movement of the coupling-link, and springs 43 are arranged to bear between the link and the buffer on each side of the link, so as to yieldingly hold the link in true longitudinal position with respect to the engine. It will therefore be apparent that as the axle is swung under action of the gear 16 and quadrant 40 a corresponding movement will be imparted to the buffer and to the link 24, first through the action of the springs 43 and, as the limit of independent movement of the link is reached, subsequently through the action of the stops 17^a. It also may be seen that the buffer, with its link, will be held yieldingly in the plane of the quadrant 40 or allowed upon the yielding of the springs 42 to move vertically through a limited arc independently of the quadrant.

The wagon-body 18 is in no manner affected by my invention, it being of any desired form and mounted on the bolsters 19 in the usual manner. Said bolsters carry the king-bolts 20 in essentially the same manner that the engine king-bolt is mounted. The axles 21 of the wagon are horizontally recessed to receive the king-bolts and the ends of the wagon-reach 44, the reach being pivotally engaged with the king-bolts, as shown. The buffers 23 of the wagon are mounted loosely on the axles, but are held yieldingly in horizontal position by means of spring connections 45, with cross-arms 46 attached to the reach 44 near the ends thereof, as shown in Figs. 2 and 3. The coupling-links 24 and 29 are connected to the buffers 23 by means of the pins 36 or 47, and said links are allowed a swinging movement in the buffers independent thereof and limited by side stops 23^a. Springs 48 bear on opposite sides of the coupling-links, so as to yieldingly hold them in longitudinal position. The intermediate portions 32 of the flexible connection between the axles may be made up of a single link or of a number of links, as desired, and the forked end parts 33 of said connections may be made of uniform links or, as best shown in Fig. 2, they may be made up of turnbuckles 33^a, connected by rings 33^d, to which rings the springs 34 are also connected, and the turnbuckles being connected one to the intermediate part 32 of the connection through the medium of links 33^c and the other to the axles 21 or other part connected to the axles through the medium of hooks and clips 33^b. Preferably the hooks and clips 33^b are applied directly to the axles, as shown in Fig. 1, but they may with the same results be applied to the side portions of the buffers 23, as shown in Fig. 2, or in any other manner which will insure their action directly or indirectly on the axles, as explained.

The buffers are provided with quadrants 49 to serve the double function of limiting the rocking movement of the body and bolsters on the axles and also of furnishing a connection for the steering-gear 26. The steering-gear may be of any convenient sort, and, as

hereinbefore explained, two gears are preferably provided for each wagon, the drums being located on diagonally opposite corners on the wagon-bodies, as shown.

The bearing or buffer members 25 may be of any desired form and act between the opposing surfaces of the buffers to transmit the pushing strain from one to the other. Preferably these members 25 are formed of tough metal strips bent into the form essentially of a linch-pin or cotter, as shown in Fig. 5, this form enabling the members 25 to be readily placed and held in position.

In heavy hauling the tracking of the wagon-wheels is disadvantageous, inasmuch as ruts are formed in the roads and the road-beds seriously injured. It is an important feature of my invention that this tracking of the wheels may be prevented when desired without, however, interfering with the performance of the other functions of the traction-train. Fig. 6 illustrates this function, and it is attained simply by changing the relative length of the arms of each branched end portion 33 of the connections between the wagon-axles. This may be done either by lengthening one arm and shortening the other or by merely lengthening one arm. For this purpose the turnbuckles in the arms of the branches 33 are especially provided. In effecting this adjustment the lengthened arm of one branch 33 should be on the side opposite the lengthened arm of the other branch. (See Fig. 6, in which *a* indicates the lengthened arms.) It may be seen that with the adjustment an uneven strain will be placed on the axles, causing them to swing into a slightly-cranked position, but in parallelism with each other, and then the wagon-body goes slightly diagonally on its course, while the wheels run true with the course of the train, but out of track with each other to a degree dependent upon the degree of the change in the relative length of the arms of the branches 33.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider myself entitled to all such variations as may lie within the terms of my claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a traction-train, the combination of an engine having a swinging steering-axle, a buffer connected to swing therewith, a wagon having two swinging axles, connections between said axles to cause them to swing in unison, a buffer connected to swing with one of the wagon-axles, the said buffers being adapted to coact, and a connection between the engine and wagon.

2. In a traction-train, the combination of an engine having a swinging steering-axle, a buffer connected to swing therewith, a wagon having two swinging axles, connections between said axles to cause them to swing in unison, a buffer connected to swing with one of the wagon-axles, the said buffers being adapted to coact, and connections between the engine and wagon, the said connection comprising a coupling-link pivotally engaged with the wagon-buffer and pivotally engaged with the traction-engine at a point coincident to the axis of the swinging movement of the said steering-axle.

3. In a traction-train, the combination of an engine having a swinging steering-axle, a buffer connected to swing therewith, a wagon having two swinging axles, connections between said axles to cause them to swing in unison, a buffer connected to swing with one of the wagon-axles, the said buffers being adapted to coact, a connection between the engine and wagon, and means acting yieldingly to hold the coupling-link in position longitudinal of the traction-train.

4. In a traction-train, the combination of an engine having a swinging steering-axle, a buffer connected to swing with the axle, a wagon having two swinging axles, a connection between the axles causing them to swing in unison, and connections between the engine and one of the axles of the wagon, the said buffer of the engine engaging a part of the wagon to exert its action on the axles thereof.

5. In a traction-train, the combination of an engine having a swinging steering-axle, a buffer connected to swing with the axle, a wagon having a swinging axle, and connections between the engine and a part of the wagon in connection with the axle, the said engine-buffer being adapted to engage a part of the wagon to exert its action on the axles thereof.

6. In a traction-train the combination of a traction-engine having a steering-axle arranged to swing, a buffer connected to swing with the axle, a wagon having a swinging axle, a buffer connected to swing therewith, said buffers coacting with each other, a coupling-link joining the engine and wagon and extending across the buffers, and a member connected with the link and lying between the adjacent faces of the buffers.

7. In a traction-train, the combination of two wagons each having a swinging axle, a buffer attached to each axle to swing therewith, and a connecting-link joining the wagons, the buffers having limited swinging movement independent of the link, whereby to allow the axles limited cranking movement on converging lines and limited cranking movement on parallel lines.

8. In a traction-train, the combination of two wagons each having a swinging axle, and a connection between said axles allowing the axles a limited cranking movement on converging lines, and a limited cranking movement on parallel lines.

9. In a traction-train, the combination of a

traction-engine having a swinging axle, a wagon also having a swinging axle, and a connection between the axles allowing them a limited cranking movement on converging lines, and a limited cranking movement on parallel lines.

10. A traction-engine adapted for use in a traction-train, comprising in combination with the framing of the engine, of a steering-axle mounted thereon to swing around a vertical axis to steer the engine, a steering-gear in connection with said axle to swing the same, and a buffer mounted on and supported by the axle and swinging therewith from one side to the other of the longitudinal center of the engine for the purpose specified.

11. A traction-engine adapted for use in a traction-train, comprising the combination of a steering-axle arranged to swing, a steering-gear in connection with the axle, a buffer mounted on the axle to turn around the axial center thereof and to swing with the axle, and means for yieldingly holding the buffer against said turning movement.

12. A traction-engine adapted for use in a traction-train, and comprising the combination of a steering-axle arranged to swing, a quadrant keyed to the axle and located at the rear or inner side thereof, means for imparting to the quadrant a steering action, an engine-buffer mounted to turn vertically on the axle and to swing therewith, and a yielding connection between the buffer and quadrant, for the purpose specified.

13. A traction-engine adapted for use in a traction-train and comprising the combination of a steering-axle arranged to swing, a buffer connected with the axle to swing therewith, said buffer having side stops spaced from each other for the purpose specified, and a steering-gear in connection with the axle.

14. A traction-engine adapted for use in a traction-train and comprising a steering-axle arranged to swing, a steering-gear in connection with the axle, a buffer connected to swing with the axle, a coupling-link pivotally mounted on the engine adjacent to the buffer, and means for yieldingly holding the link in position longitudinal of the engine.

15. A traction-engine adapted for use in a traction-train comprising the combination of a steering-axle arranged to swing, a steering-gear in connection with the axle, a buffer connected to swing with the axle and having side stops spaced from each other, a pivoted coupling-link lying between the said stops, and means for yieldingly holding said link in central position.

16. A wagon adapted for use in a traction-train and comprising the combination with a body, of swinging axles, and a connection between the axles, the connection having an intermediate part, and branching end parts joined to the intermediate part and having their limbs joined to the axles at opposite sides of the pivots thereof.

17. A wagon adapted for use in a traction-train, and comprising the combination with a body, of swinging axles, and a connection between the axles, the connection having an intermediate part, branching end parts joined to the intermediate part and having their limbs joined to the axles at opposite sides of the pivots thereof, and retractile springs acting between said limbs of the end parts of the connection.

18. A wagon adapted for use in a traction-train, and comprising the combination with a body, of swinging axles, and a connection between the axles, the connection having portions joined to the axles at opposite sides of the pivots thereof, said connections serving to permit the axles a limited cranking movement on converging lines, and a limited cranking movement on parallel lines.

19. A wagon adapted for use in a traction-train, and comprising the combination with a wagon-body, of swinging axles, and a connection between said axles allowing the axles a limited cranking movement on converging lines and a limited cranking movement on parallel lines.

20. A wagon adapted for use in a traction-train, comprising the combination with the wagon-body of a swinging axle mounted under the same, a buffer connected to swing with the axle and having a convex outer or buffing edge, and a link pivotally mounted on the buffer and arranged to swing over the face thereof.

21. A wagon adapted for use in a traction-train, and comprising the combination with a body, of a swinging axle, and a buffer connected to swing with the axle, the buffer having side stops spaced from each other.

22. A wagon adapted for use in a traction-train, comprising the combination with a body, of a swinging axle, a buffer connected to swing therewith and having side stops spaced from each other, and a pivoted coupling-link lying between the side stops.

23. A wagon adapted for use in a traction-train, comprising the combination with a body, of a swinging axle, a buffer connected to swing therewith and having side stops spaced from each other, a pivoted coupling-link lying between the side stops, and means yieldingly holding the link in longitudinal position.

24. A wagon adapted for use in a traction-train, and comprising the combination with the wagon-body, of swinging axles and a connection between the said axles allowing them a limited cranking movement on converging lines and a limited cranking movement on parallel lines, and the connections being adjustable to place a strain on the axles causing them to assume a position throwing the

wheels out of track with each other without interfering with the aforesaid cranking movement.

25. A wagon adapted for use in a traction-train, and comprising the combination with the wagon-body, of swinging axles, and means for placing a yielding cranking strain on the axles, causing the wheels to run out of track with each other.

26. A wagon adapted for use in a traction-train, and comprising the combination with a body, of swinging axles, and a connection between the axles, the connection having an intermediate part and branching end parts joined to the intermediate part and having their limbs joined to the axles at opposite sides of the pivots thereof, the limbs of said branching end parts being independently adjustable, for the purpose specified.

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

DANIEL BRENNAN, JR.

Witnesses:

ISAAC B. OWENS,

JNO. M. RITTER.