

H. KAPFERER.

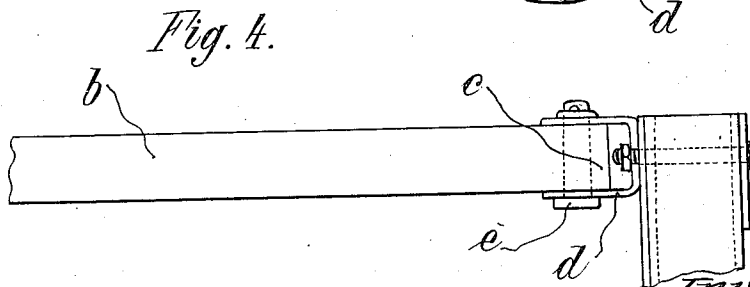
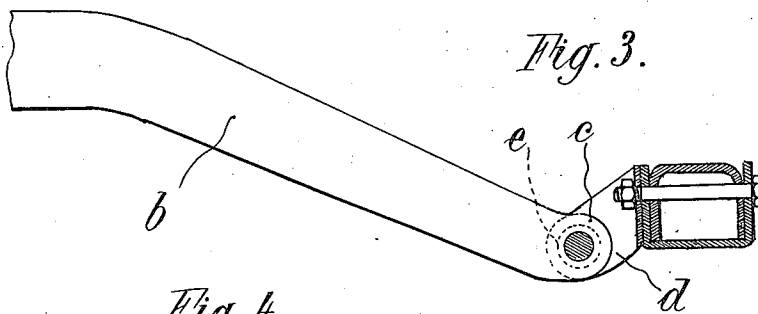
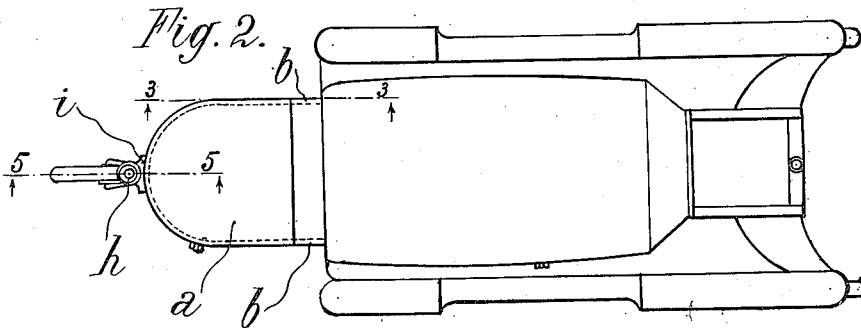
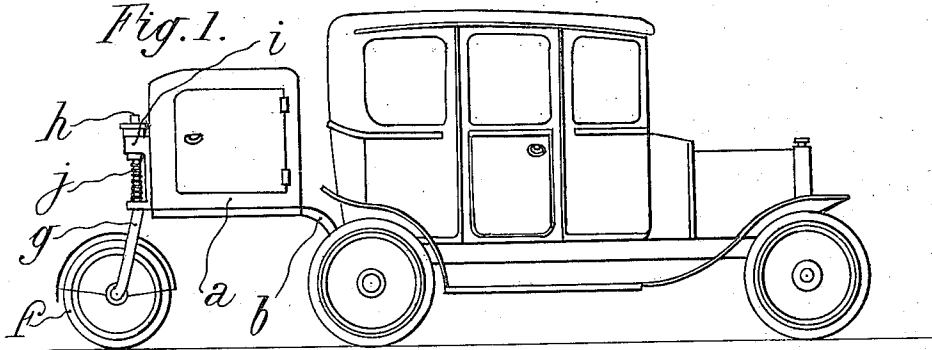
TRAILER.

APPLICATION FILED JAN. 2, 1920.

1,401,786.

Patented Dec. 27, 1921.

6 SHEETS—SHEET 1.



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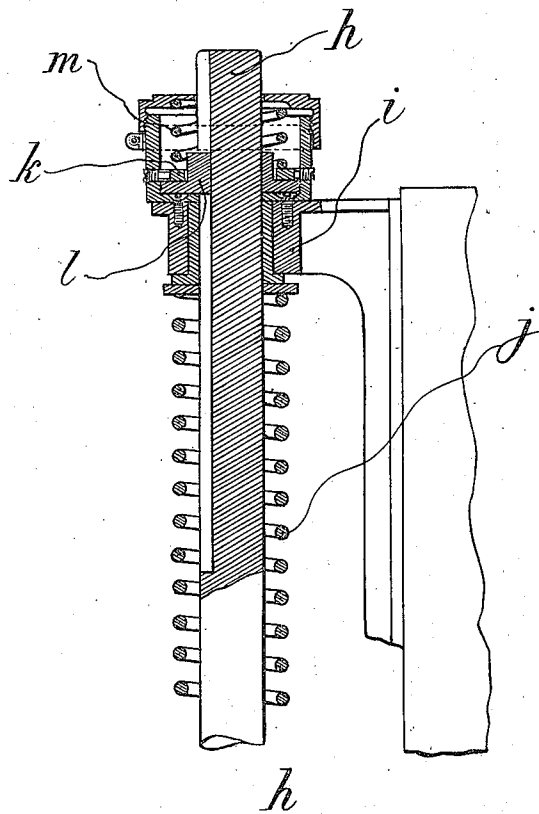
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6 SHEETS—SHEET 2.

Fig. 5.



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6 SHEETS—SHEET 3.

Fig. 6.

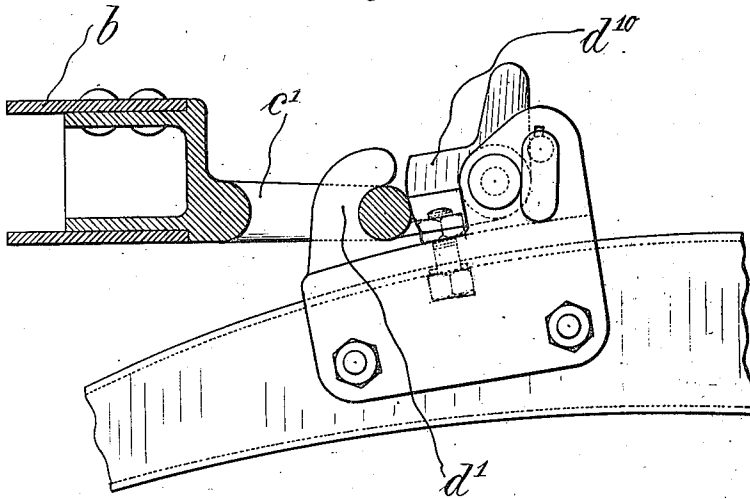
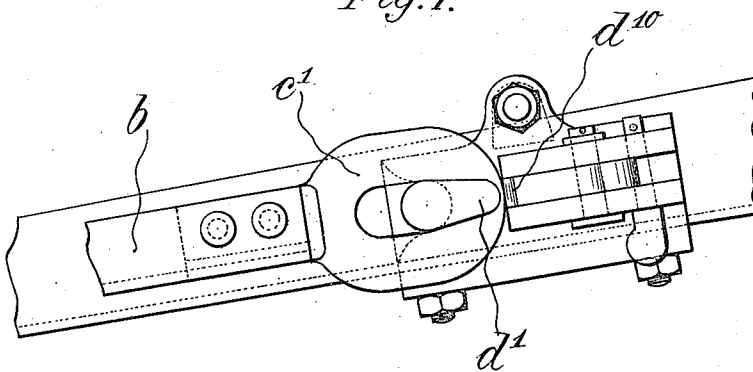


Fig. 7.



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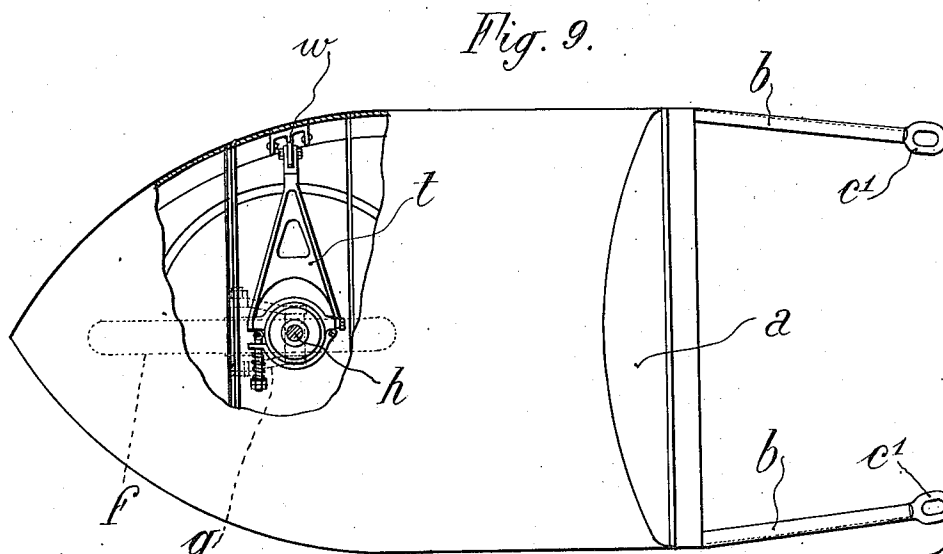
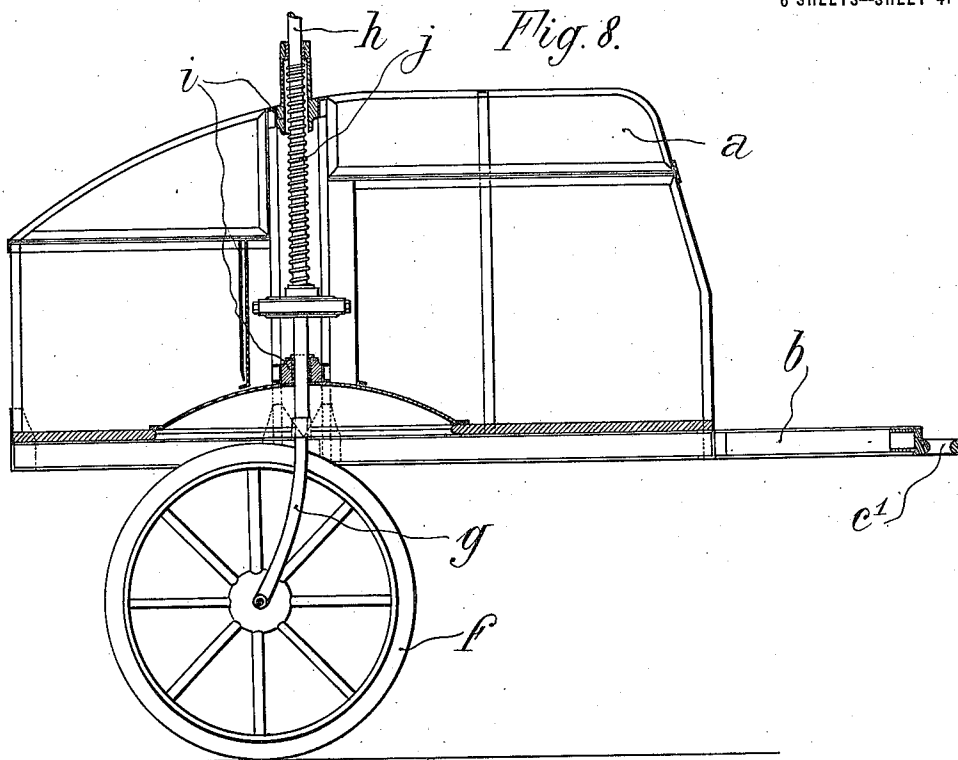
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6 SHEETS—SHEET 4.



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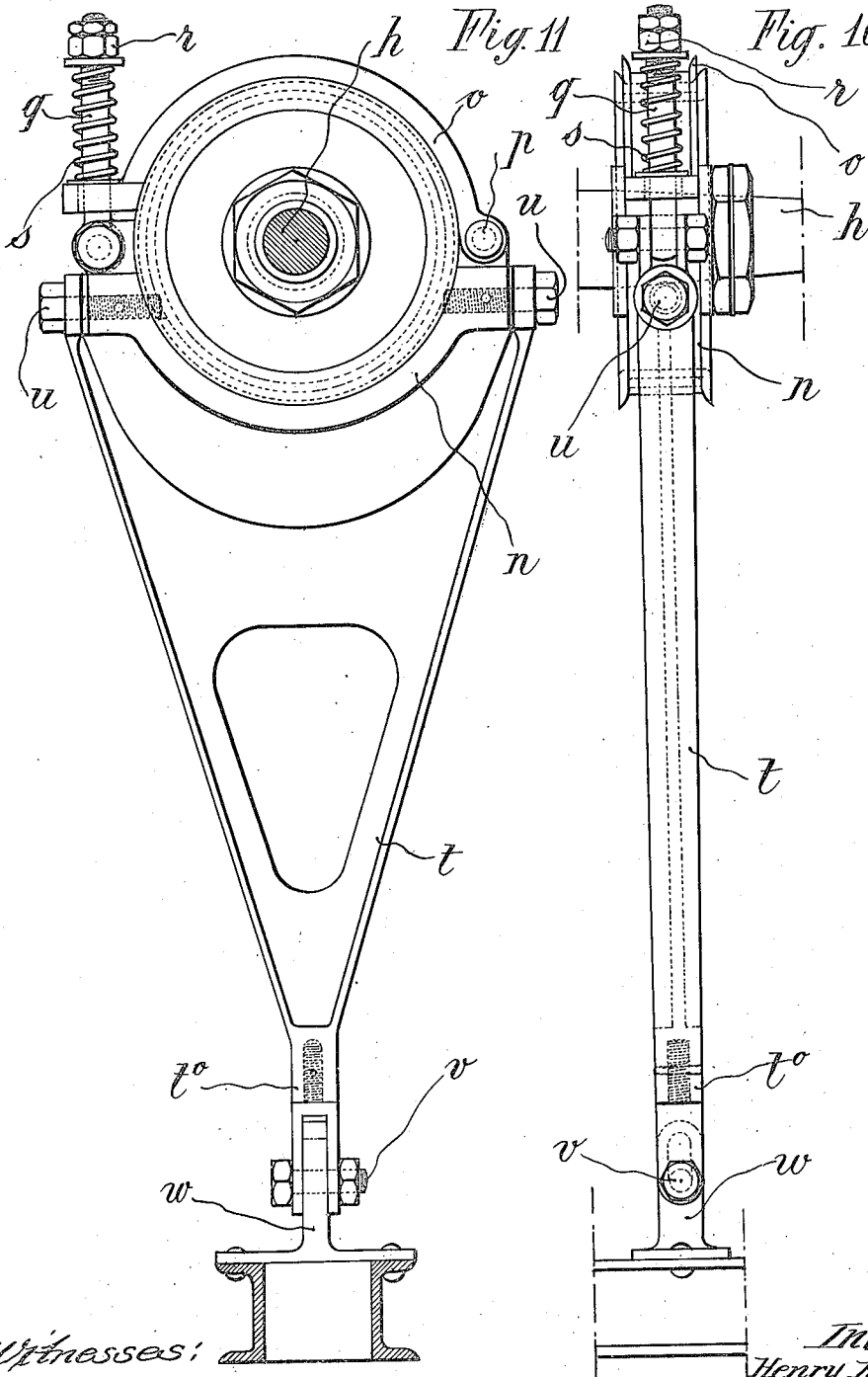
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6 SHEETS—SHEET 5.



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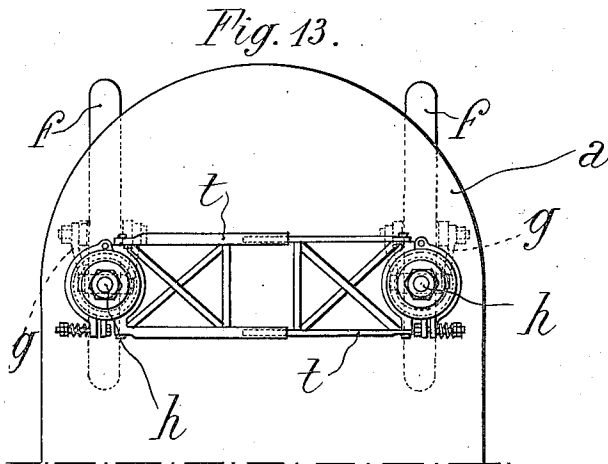
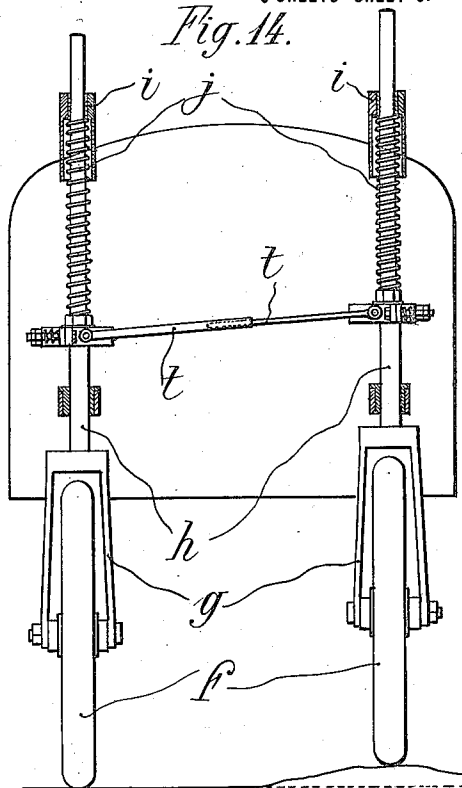
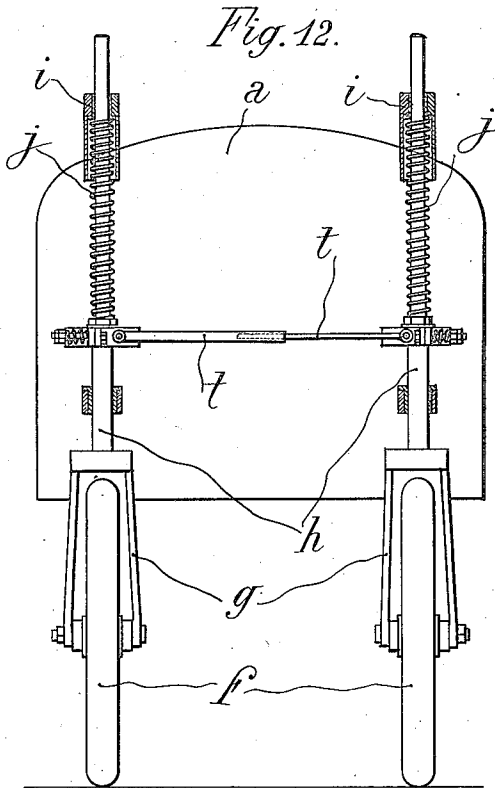
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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1,401,786.

Specification of Letters Patent. Patented Dec. 27, 1921.

Application filed January 2, 1920. Serial No. 348,999.

To all whom it may concern:

Be it known that I, HENRY KAPFERER, engineer, citizen of the French Republic, residing at Boulogne-sur-Seine, Department of Seine, France, have invented certain new and useful Improvements in Trailers, of which the following is a specification.

This invention relates to running gear which is self steering or which automatically turns in the proper direction during running, that is to say to running gear mounted upon a pivot of such a nature that the point of contact between the rolling element and the surface upon which it rolls is not in the prolongation of the pivotal axis.

The invention refers more particularly to running gear of the class in question intended for use with vehicles running upon the ground, as the said gear is most adaptable for that class of vehicles, but it is not to be deemed to be confined to this application.

The principal object of this invention is to construct a gear of the character indicated which will obviate danger which might result from having a supporting wheel unrestricted with respect to the movement of its axis; the said invention furthermore contemplating the provision of means which will cause the trailer to follow the course of travel of the vehicle to which it is coupled.

The invention consists essentially in combining with the pivotal axis of gear of the class in question a brake arrangement of such a nature that the said axle, in place of being entirely free, as has usually been the case, can only move in an angular or rotary direction about its axis by overcoming a resistance which is sufficiently strong to prevent displacement through inertia or through accidental causes when the rolling element proper ceases to be in contact with the surface upon which it is intended to run, and yet sufficiently weak as not to prevent the reaction arising from the said surface modifying the angular position of the gear.

This construction enables running gear of the class in question to be of great utility

when fitted to the landing chassis of aerial machines and also applicable with advantage to trailers for land vehicles intended to travel at a high speed.

The invention also includes other features or arrangements which are preferably used at the same time, and which will be more particularly described hereafter.

Among these arrangements is one more exclusively applicable to trailers for land vehicles and practically requiring that the running gear of the trailer shall be of the kind already mentioned. This arrangement consists in forming the means or device for attaching the trailer to the vehicle pulling it, in such a way that the said device only allows the trailer and the vehicle to which it is attached to be displaced in such a manner that their planes of symmetry coincide.

Another arrangement to which the invention refers, and applicable to brake mechanism for axles adapted to turn in the required direction, is one comprising a device moving with the said axle, the said device being hinged upon a pivot pin, which pin is perpendicular to the axle, and at one end of a beam, the opposite end of such beam being hinged by means of a pivot pin parallel to the first mentioned pin to a fixed piece, the whole mechanism being so arranged that the beam can oscillate around the pivot pin connected to the fixed element, without bringing the pivot pins nearer together.

The invention includes more particularly certain constructional embodiments of its principles, and comprises, as new industrial products rolling gear of the class in question comprising the said principles, special parts suitable for their construction and apparatus comprising the application of running gear embodying the principles especially gear for the landing chassis of aerial vessels, and above all, for trailers for road vehicles intended to be drawn along rapidly.

In order that the invention may be clearly understood it will now be described with reference to the accompanying drawings

but it is to be understood that the drawings and description are merely given by way of example.

Figures 1 and 2 of the said drawing show respectively in side elevation and in diagrammatic plan, upon a very small scale, a trailer for an automobile, connected to the said automobile in one method of carrying out that portion of the invention relating to the means of attachment, the running gear comprising a single wheel mounted according to one of the methods described in that portion of the invention relating to such mounting.

Figs. 3 and 4 show in transverse section on the line 3—3, Fig. 2 and in corresponding plan, on a larger scale, the connecting elements for attaching the trailer to the automobile.

Fig. 5 shows in section on the line 5—5, Fig. 2, and on the same scale as Figs. 3 and 4 certain of the parts for mounting the running gear.

Figs. 6 and 7 show in a similar manner to Figs. 3 and 4 parts having the same functions as those shown in the latter figures, but constructed and arranged according to a second method of carrying out that portion of the invention relating to the means of attachment.

Figs. 8 and 9 show respectively in longitudinal section and in plan, with parts removed, and to a small scale, a trailer having a single running wheel mounted according to a second method of carrying out that portion of the invention relating to the mounting.

Figs. 10 and 11 illustrate respectively in side elevation and plan on an enlarged scale, the braking mechanism and its association with the chassis frame.

Figs. 12 and 13 show respectively in diagrammatic back view, with portions in section, and in part diagrammatic plan to the same scale as Figs. 8 and 9, the back of a trailer provided with two running wheels mounted according to a modified method of carrying out the second form of that portion of the invention relating to such mounting.

Fig. 14 shows in a similar manner to Fig. 12 the same parts illustrated in the latter figure, but with the parts shown in the position they would take up when one of the running wheels passes over an obstacle.

As will be seen the invention is shown in the drawings as applied to the attachment and running gear of a trailer for an automobile vehicle, as this is one of the most useful applications of the invention.

In the first place, as regards the trailer.

This trailer *a* apart from the means of attachment to the automobile and its running gear, is constructed in any appropriate manner.

As regards the means of attachment,

This is so constructed and arranged that it only allows the trailer to so move as regards the vehicle to which it is attached, that the planes of symmetry of the two vehicles always coincide.

With this object in view the means of attachment is preferably constructed from parts which, on the one hand enable the trailer to oscillate, relatively to the vehicle to which it is attached, around an axis perpendicular to the plane of symmetry of the latter, and so that, on the other hand, it is prevented moving in any other manner with respect to the vehicle by which it is drawn.

The means of attachment may with advantage be constructed in the manner shown at Figs. 1 to 4.

In this construction *b* are two shafts fixed to the front of the trailer, each of which has at its forward extremity a connecting eye with a horizontal and transverse opening *c*. *d* are corresponding forked connections attached to the back of the automobile, and so constructed that the said eyes can be connected to the said forks by means of horizontal hinge pins *e*.

As an alternative and as shown at Figs. 6 and 7, the two shafts *b* which are similar to those already described in other respects may have connecting eyes *c'* with vertical openings. *d'* are two hooks adapted to engage the said eyes *c'*. Connected to each of these hooks is preferably a clamping bolt *d''* which as will be clearly seen from the drawing can be brought into or out of action when it is desired to attach or detach the trailer.

As regards the running gear.

This gear comprises, in the preferred construction, either a single wheel *f* or a pair of such wheels.

The single wheel, as illustrated at Figs. 1 to 5, or each of the wheels as illustrated at Figs. 8 to 14 is rotatably mounted in a suitable fork or support *g*. This fork is extended into an axle *h*, pivotally mounted in a housing *i*, integral with the trailer.

It is to be observed that the arrangement is such that the point of contact of the wheel, or the point of contact of each of the wheels with the ground, is not in the prolongation of the axis of the shaft *h* corresponding to the wheel; the running gear being self steering or self turning as to direction.

When the invention is carried into practical effect in the manner just described, a trailer is obtained which possesses advantages over those in ordinary use.

In ordinary cases the trailer is connected to the leading vehicle by means of a hinged or like draw bar and is provided with running gear which is not self steering or self setting as to direction, which is the cause of drawbacks.

The improved trailer constructed according to the invention allows the vehicles to be backed and also allows the trailer even when curves are being negotiated in the backward or forward direction, to move within the limits of the wheel base of the vehicle to which the trailer is attached, provided of course that the distance between the point of contact of the running gear on the ground and the rear axle of the automobile is not greater than the distance between the front and rear axles of the said automobile.

Although the practical results from the arrangements already described are extremely satisfactory, it is however desirable although not indispensable, in order that the movements of the vehicle should be correct, to embody, in the running gear, the principle about to be described.

The gear itself is mounted in a resilient manner, and, most important of all, a braking system is added, of such a nature that when the gear for some reason or other is not resting on the ground it retains the direction in which it is set or only deviates to an insignificant extent from the direction into which it has been set through the movements of the vehicle and the force of reaction exerted from the ground.

The supplementary arrangements just mentioned are supposed to be embodied in the remainder of the cases now to be considered.

As to the resilient mounting, j is a helical spring, of suitable size and strength, mounted in any desired manner between a bearing for the axle h and a suitable projection. It may be located with advantage between the housing i and a projection on the axle. The arrangement is in any case such that the spring tends to push the axle downward or to push the housing upward.

As regards the braking device, this may with advantage be constructed as shown at Fig. 5, but the arrangement illustrated in Figs. 8 to 14 is to be preferred.

In the arrangement shown at Fig. 5 the braking device is of the so called disk type, comprising preferably a plurality of superposed disks or their equivalents k and l , only one of each being shown in the drawings.

One of the disks k is rigidly connected to the casing and the other disk l is rigidly connected to the axle h .

The disks are brought into frictional resilient contact by the compression spring m , the pressure of which may be regulated by screwing a cap fitted at the top of the housing up or down as may be required.

In the method of carrying out the invention illustrated at Figs. 8 to 14 the brake mechanism is of the so called gripping or clamping type. It comprises two semicircular grips n and o , adapted to embrace the

axle h and to clamp the latter in a way which is at once resilient and capable of adjustment. For this purpose a hinge may be provided at p , by means of which the two jaws are connected together at one extremity. q is a screw threaded bolt pivoted at one end to a pin parallel to that of the hinge p and to the fixed jaw. The bolt q passes through an eye in the lug at the free end of the jaw o and s is a helical compression spring resting between the said lug and a nut r by means of which the pressure between the jaws can be regulated and the grip on the axle h as will be readily understood.

In place of the methods for exerting a braking action upon the axle of the running gear just described, other types of braking mechanism may be adopted for instance one of the band brake type.

It is to be observed that where the running gear is mounted so that it is resilient, the braking mechanism should be so constructed and arranged that it allows for the free longitudinal sliding movement of the axle or of each of the axles h of the running gear.

For this purpose various arrangements may be adopted. For instance in the case of the method of carrying out the invention shown at Figs. 1 to 5, where the resilient means are connected to the trailer, in order that the axle h can move longitudinally, longitudinal featherways or their equivalents may be provided in one of the parts engaging corresponding feathers in the other part, or some other analogous device allowing for the longitudinal sliding motion may be adopted.

Where the first braking method is employed, it is desirable to make the disks l and k through the friction between which the axle h is controlled of considerable thickness so that the wear shall be slow and consequently any play which might tend to cause a sliding movement of the axle h shall be inconsiderable.

According to another method of carrying out the invention and as shown at Figs. 8 to 14, the axle h is so mounted that it can only move in a rotary or angular direction about its axis.

In this case the means of connection can be such that as the trailer follows the vehicle the parts can accommodate themselves to the direction of the running gear.

As a consequence, where the second method of constructing the braking mechanism is adopted, it is desirable, in order to connect the jaws n and o to the trailer to provide a kind of beam at t . This is so mounted that it can turn about a horizontal axis at one of its extremities, where it is connected to the jaw n , for instance by means of screw bolts u . The beam t is also connected by a horizontal pivot at the other ex-

tremity t^o to a fixed part of the trailer, for instance by means of a bolt v passing through an elongated eye provided in a piece w fixed to the trailer, the joint thus formed being so proportioned and arranged that it does not interfere with the movements either of the beams or of the parts connected thereto.

The said beam t is preferably made and arranged in all cases so that it is as long as possible, and in order that it should be less bulky, it is desirable to place it transversely with respect to the trailer, as shown at Figs. 8 and 9, so that if any play is produced where the second extremity t^o is connected, the resulting play at the other extremity is reduced to a minimum.

The arrangement just described may be adopted both where there is a single running wheel and where there are two independent wheels.

In the latter case, as two beams t are required they may be to a certain extent combined together. This may be effected by forming the outer ends not as has just been described, but in the manner shown at Figs. 12 and 14, so that a telescoping system is provided, which enables one of the two wheels to be displaced independently of the other, each of the two braking devices acting as a fixed point with respect to the other.

With this arrangement, each time the running gear is forced to leave the ground, either it does not deviate from the direction in which it is set, or else it only deviates therefrom to an insignificant extent, and as a result it remains in the direction or substantially in the direction required, when it again comes into contact with the ground. This causes the tendency to skid to be reduced or eliminated, and avoids the risk of the running gear being wrenched away or partly or wholly broken.

Each time the vehicle has to round a curve, the running gear is compelled by the reaction exercised thereon by the ground to take up automatically the required direction and to remain in that direction as long as the radius of the curve does not change.

The correct operation of the whole mechanism only depends upon the proper regulation of the braking means.

As has already been stated, the invention is not limited in any way to the methods of carrying the same into effect which have already been described and illustrated on the accompanying drawings, but includes all modifications coming within a fair interpretation of my claims.

Among these modification may be mentioned the following:—

A construction in which the wheel or each of the wheels of the running gear is replaced by twin wheels. In this case the support g is preferably not formed as a fork, as shown,

but by a member attached between the said pair of wheels.

What I claim as my invention and desire to secure by Letters Patent of the United States of America is:—

1. In a running gear for trailers, a frame, a substantially vertically disposed shaft, means mounted for vertical oscillation for holding the shaft in operative relation to the frame, means for retarding rotary movement of the shaft, and a traction wheel connected to the shaft, the bearing of which is offset with relation to the axis of the shaft.

2. In a trailer, a frame, a shaft, means for holding the shaft approximately vertically in operative relation to the frame to permit rotary motion of the shaft and movement axially, a traction wheel having a bearing connected to the shaft, the said bearing being offset with relation to the axis of the shaft, and means for retarding the free rotary motion of the shaft.

3. In a trailer, a frame adapted to be connected to a vehicle, a support for the frame comprising a shaft, a bearing connected to the frame in which the shaft is rotatable, means associated with the bearing whereby the said shaft is movable axially, a traction wheel, a bearing therefor, means for connecting the bearing to the axle whereby the said bearing is offset with relation to the axis of the axle, and means for frictionally retarding the rotation of the shaft.

4. In a trailer, a frame, a bearing, means pivotally connected to the chassis and to the bearing for vertical oscillatory motion, a shaft rotatably mounted in the bearing, means for exerting friction on the said shaft, a traction wheel, and means whereby the traction wheel is connected to the axle offset with relation to the axis of said axle.

5. In a trailer having a running gear comprising an axle, means for rotatably mounting the axle, vertically pivotal means connected to a frame of the trailer and to the last mentioned means, means for exerting friction on the shaft, and a traction wheel connected to said shaft and offset with relation to its axis.

6. In a trailer, a frame, means for connecting the frame to a vehicle, a shaft, a bearing in which the shaft is rotatable, means for rotatably holding the shaft whereby the said shaft may move vertically with relation to the frame, means for exerting friction on the said shaft, and a traction wheel having a mounting connected to the said shaft.

7. In a trailer, a frame, wheels for supporting the frame, mountings for the wheels with relation to which said wheels have angular and vertical movement, means for exerting a braking action to retard angular movement of said wheels, oscillatable means for connecting the mountings to the frame,

oscillatable means for connecting the mountings to each other, the said means for connecting the mountings to each other having a telescopic joint.

- 5 8. In a trailer, a frame having means of connection to a vehicle, wheels for supporting the frame, vertically extending shafts supported by the wheels, bearings for the wheels being offset with relation to the axes
10 of the shafts, bearings for the said shafts,

means having telescopic joints for connecting the bearings together, and braking means associated with each of the shafts.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HENRY KAPFERER.

Witnesses:

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HENRY T. WILCOX.