PATENT SPECIFICATION

Application Date: April 8, 1925. No. 9346/25. **254,414**

Complete Left: Dec. 31, 1925.

Complete Accepted: July 8, 1926.

PROVISIONAL SPECIFICATION.

Improvements in Axle Suspension for Motor Vehicles.

We, ALVIS CAR & ENGINEERING COMPANY LIMITED, a British company, and GEORGE THOMAS SMITH-CLARKE, a British subject, both of Holyhead Road, Coventry, Warwickshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to the suspension and mounting of the front axles of motor vehicles in which the drive is transmitted through the front wheels, and it has for its object to provide a suspension and mounting which will afford better steering than, under certain circumstances, can be obtained with conventional mountings and suspensions.

It is the custom in a motor vehicle driven through the rear wheels to provide a small amount of "caster effect" for the front steering wheels, that is to say, the point of contact of the tyres with the ground lies slightly behind the point of contact with the ground of an extension downwards of the swivel axis, the angle between the radius of the wheel passing through the point of contact with the ground, and the extension of the swivel axis being generally about four degrees. This provides for good steering when running forwards and in most cases is the best all round compromise.

When the front wheels are used for driving, the inclination of the downward extension of the swivel axis must be reverse to the foregoing.

Generally front driving wheels are used also for braking, and the steering is apt to be erratic, and "tricky" during deceleration or braking. By the present invention this defect is overcome.

Accordingly, the axle is arranged to rock so that, whilst the wheels are driving forwards, the extension line of the swivel axis lies behind the point of contact of the tyre with the ground (providing the normal, or slightly increased, reversed caster action), whilst during decelerating or braking this line is brought in front of the point of contact (providing what is known as "forward caster" effect). This "forward caster" effect removes the trickiness in the steering during deceleration.

The rocking action is preferably derived from the horizontal thrust which is transferred from the wheels to the frame.

For example, the axle may be connected with the frame at each side by a leaf spring arranged low down, and higher up there may be a radius rod connecting the axle with the frame, this rod being telescopic or free to slide at one end a predetermined amount, controlled by buffer springs or the like. During driving, this radius rod is extended and the axle thereby rocked in the manner required, due to the forward pull of the axle. During braking, the backward thrust of the axle causes the latter to rock about its spring attachments, shortening the radius rods and tilting the swivel pin in the required manner.

As an alternative to this arrangement, the radius rod may be a pressing, for example, of channel section parallel for a certain portion of its length and thereafter diminishing in width to the front axle. The web of the parallel sided portion is clamped between friction members attached to the vehicle frame, and a bolt extends through the friction members and through an elongated hole in the radius rod. Compression springs located under the head and under the nut of the bolt bear upon the friction members so that they exert a resilient friction pressure upon the radius rod. The latter, by reason of the elongated hole for the bolt, can rock about the latter's axis, and also has the necessary longitudinal movement to provide the required caster effect. This

[*Price* 1/-]

arrangement avoids the necessity for the telescopic connection, and moreover it provides a damping action which can be adjusted as required by increasing the loads upon the compression springs.

It will be understood that, in each case, the suspension spring and the radius rod are respectively attached to the front axle at appropriate distances below and above it.

Dated this 7th day of April, 1925.

ERIC W. WALFORD,
Fellow of the Chartered Institute of Patent Agents,
19, Hertford Street, Coventry,
Agent for the Applicants.

COMPLETE SPECIFICATION.

Improvements in Axle Suspension for Motor Vehicles.

We, ALVIS CAR & ENGINEERING COMPANY LIMITED, a British company, and GEORGE THOMAS SMITH-CLARKE, a British subject, both of Holyhead Road, Coventry, Warwickshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the suspension and mounting of the front axles of motor vehicles in which the drive is transmitted through the front wheels, and it has for its object to provide a suspension and mounting which will afford better steering than, under certain circumstances, can be obtained with conventional mountings and suspensions.

It is the custom in a motor vehicle driven through the rear wheels to provide a small amount of "caster effect" for the front steering wheels, that is to say, the point of contact of the tyres with the ground lies slightly behind the point of contact with the ground of an extension downwards of the swivel axis, the angle between the radius of the wheel passing through the point of contact with the ground, and the extension of the swivel axis being generally about four degrees. This provides for good steering when running forwards and in most cases is the best all round compromise.

When the front wheels are used for driving, the inclination of the downward extension of the swivel axis must be reverse to the foregoing.

Generally front driving wheels are used also for braking, and the steering is apt to be erratic, and "tricky" during deceleration or braking. By the present invention this defect is overcome.

Accordingly, the front driving axle is arranged to rock automatically so that reversed caster effect is provided whilst the wheels are driving forwards, and forward caster effect whilst decelerating or braking. This "forward caster" effect removes the trickiness in the steering during deceleration.

The rocking action is preferably derived from the horizontal thrust which is transferred from the wheels to the frame.

In the accompanying drawings,

Figure 1 is a side elevation partly in section showing the preferred construction with the parts shown in mid position, whilst

Figures 2 and 3 illustrate modifications, and

Figure 4 is a section on the line IV—IV of Figure 3.

Like numerals indicate like parts throughout the drawings.

In the constructions illustrated, the axle 2 is connected with the chassis frame 3 at each side by a leaf spring 4 arranged low down, and above this is a radius rod 5 also connecting the axle with the frame. This rod is in two parts and is telescopic, as shown, or is free to slide at one end a predetermined amount. The amount of movement is preferably controlled by buffer springs, as is shown at 6 and 7.

During driving, this radius rod 5 is extended and the axle thereby rocked in the manner required, due to the forward pull of the axle. During braking, the backward thrust of the axle causes the latter to rock about its spring attachments, shortening the radius rods and tilting the swivel pin in the required manner. To make the action clear, the line representing the axis of the steering swivel pin (not shown) is indicated at Z Z. When forward driving this line meets the ground at Y and during braking at X.

As a slight modification, hydraulic damping of the extension and shortening of the radius rod may be used, as is shown in Figure 2. Here the one part 8 of the telescopic radius rod enters a cylinder 9 on the other rod part 10 and this cylinder contains oil or the like

which can but slowly pass from one side to the other of the piston 10 on the rod.

As an alternative as shown in Figures 3 and 4, the radius rod 5 may be a pressing parallel for a certain portion of its length and thereafter diminishing in width to the front axle. The parallel sided portion is clamped between friction members 11 and 12 attached to the chassis frame 3, and a bolt 14 extends through the friction members and through an elongated hole 15 in the radius rod. Compression springs 13 located under the head of the bolt bear upon the friction members so that they exert a resilient friction pressure upon the radius rod. The latter, by reason of the elongated hole 15 for the bolt 14, can rock about the latter's axis, and also has the necessary longitudinal movement to provide the required caster effect. This arrangement avoids the necessity for the telescopic connection, and moreover it provides a damping action which can be adjusted as required by increasing the load upon the compression springs 13.

In the past it has been suggested to tilt the steering front axle of a motor vehicle, whereby the caster effect could be varied. In this case, however, the axle was not a driving one, nor was it fitted with brakes, and the tilting was employed in order to vary the inclination of the wheels when cornering.

In another case of an axle fitted with steering wheels, the caster effect was automatically adjusted according to whether the vehicle was moving forwards or backwards, but, here again, the effect was quite different from that obtained with the present invention, as the axle was not a driving one.

In prior Patent Specification No. 18,975 of 1906 there is described and illustrated an electrically-driven motor truck having an electric motor driving each steering wheel, and, in order to guard the motors against shock, the axle was connected to the frame at each side by a pair of parallel and telescopic radius rods, the telescopic action being controlled by springs. Thus the axle could move so that the steering pivots were correspondingly tilted, but, owing to the torque reaction transmitted through the motor casing to the axle, the caster effect, during driving and braking, was in each case opposite to that obtained under like conditions by the present invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. On a motor vehicle which is driven through the front wheels, the employment of a front axle which is arranged to rock automatically so that reversed caster effect is provided whilst the wheels are driving forwards, and forward caster effect whilst decelerating or braking, substantially as and for the purpose described.

2. An axle as claimed in Claim 1 in which the rocking is effected automatically from the horizontal thrust transferred from the wheels to the chassis frame, substantially as described.

3. A front steering and driving axle as claimed in either of the preceding claims which is pivoted underneath to a spring and connected above with the frame by means of a telescopic or sliding radius rod, substantially as described.

4. The complete suspension for a front steering and driving axle for a motor vehicle, substantially as described and illustrated in Figure 1, or in Figure 2, or in Figures 3 and 4 of the accompanying drawings.

Dated this 30th day of December, 1925.

ERIC W. WALFORD,
Fellow of the Chartered Institute of Patent Agents,
19, Hertford Street, Coventry,
Agent for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1926.

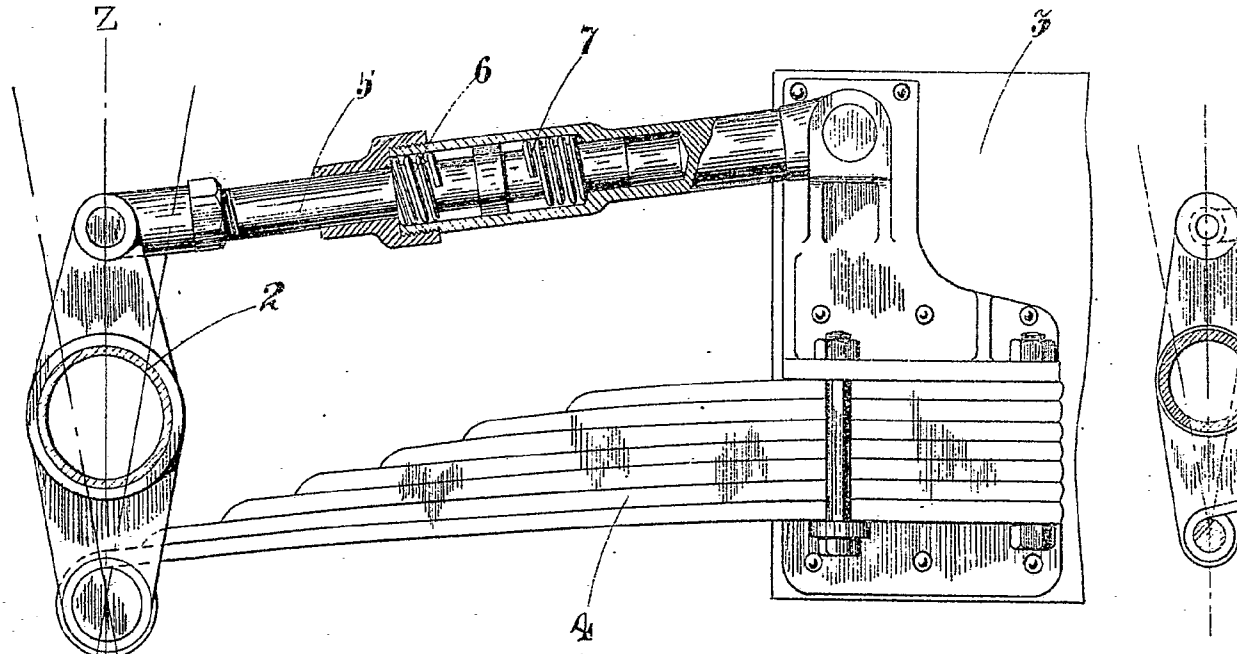


Fig. 1.

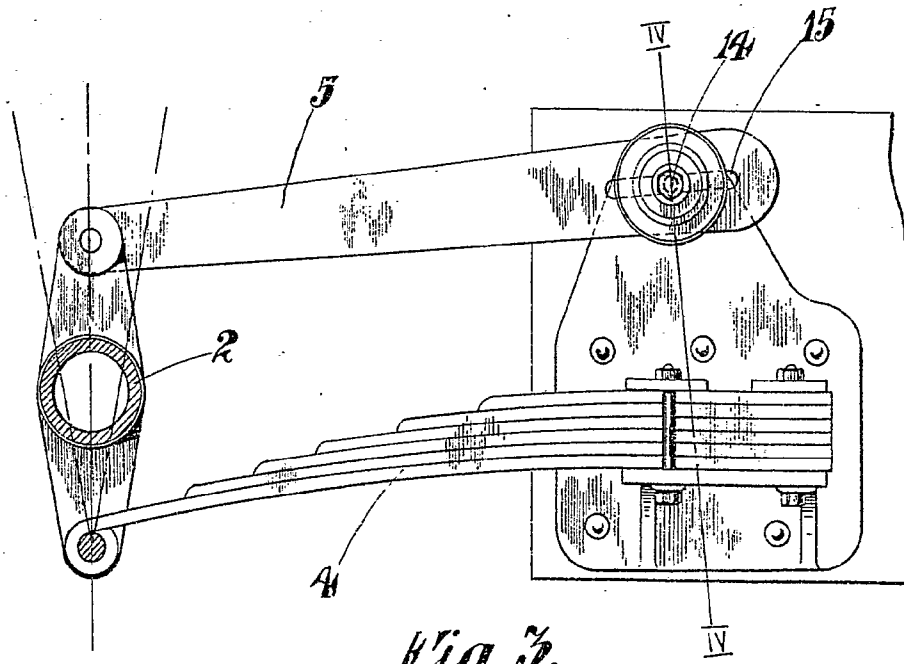


Fig. 3.

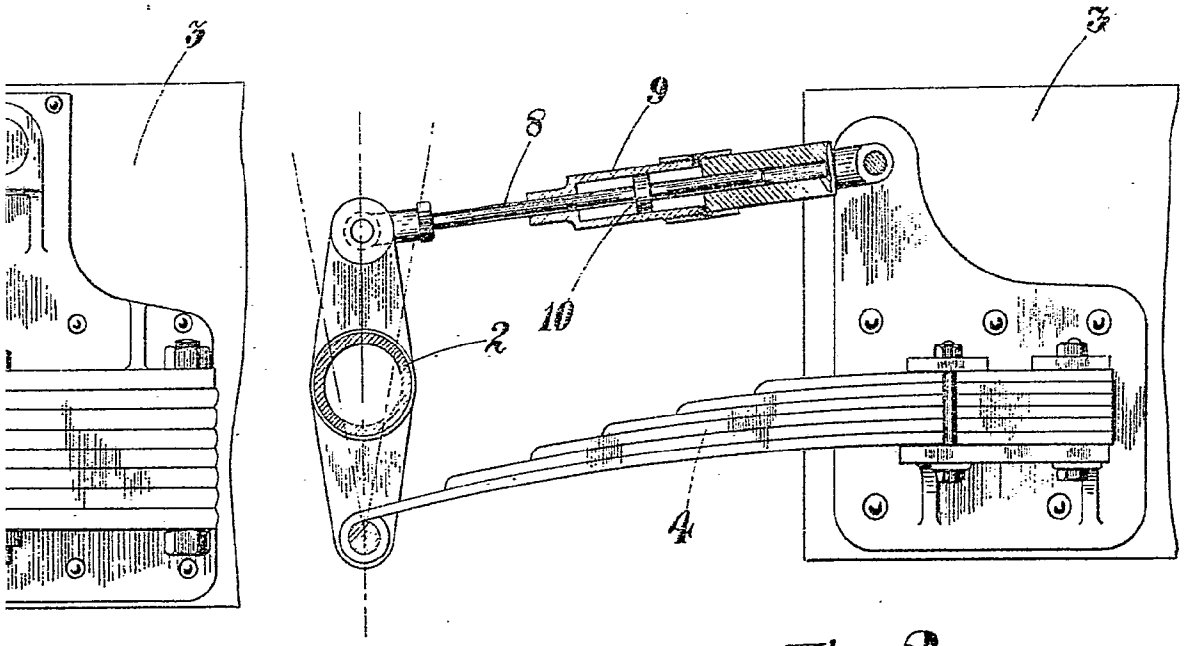
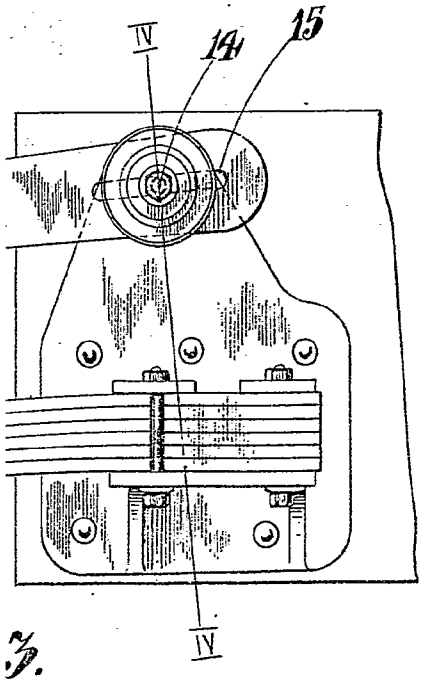


Fig. 2.



3.

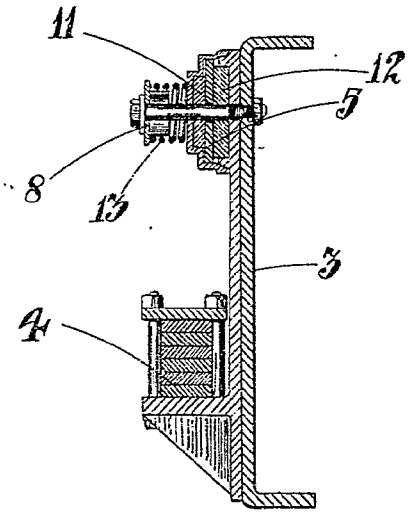


Fig. 4.

Charles & Read Ltd Photo Litho

254,414 COMPLETE SPECIFICATION

1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale]

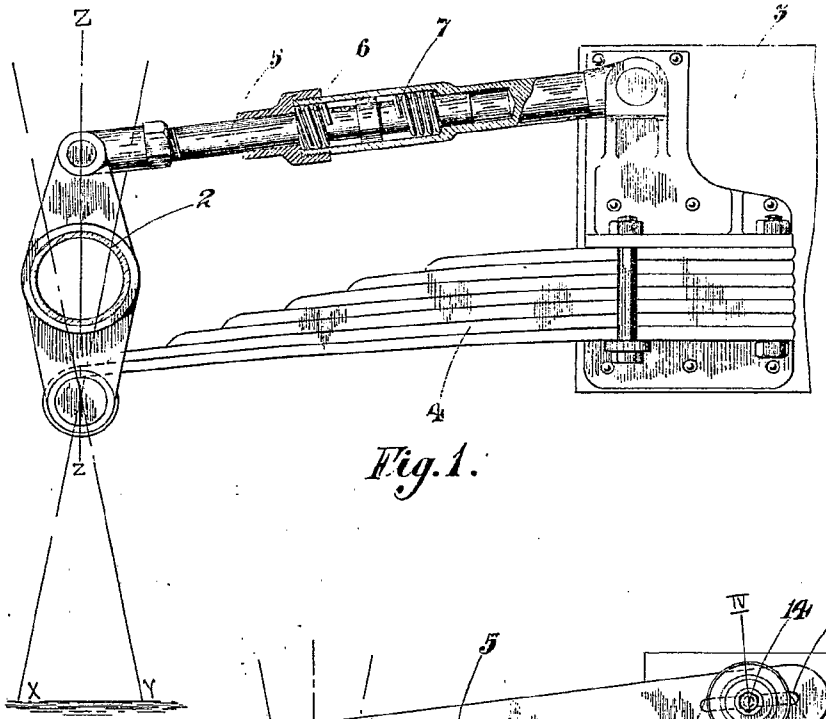


Fig. 1.

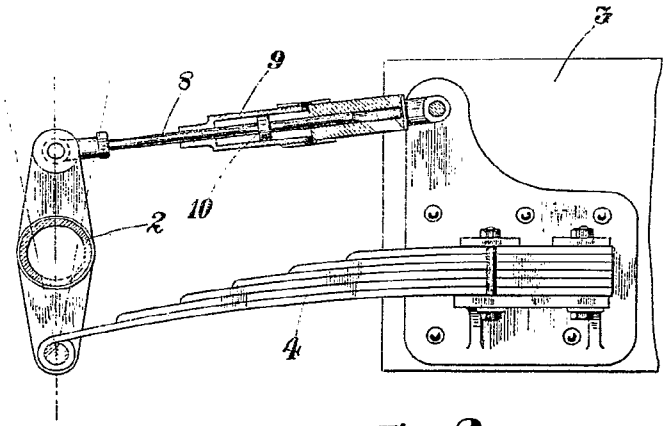


Fig. 2.

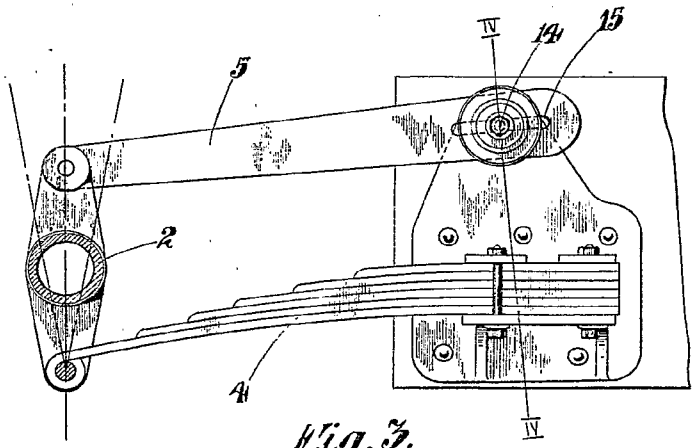


Fig. 3.

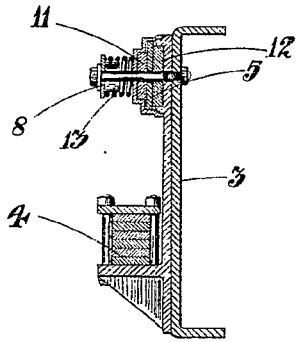


Fig. 4.

Charles & Read Ltd Photo Litho