

OF SLIDING PILLARS AND AXLES:

A Short history of Sliding Pillar Front Suspension

By John Merton

A sliding pillar suspension system is one where the stub axle, on which the wheel rotates, is fixed to a vertical sprung pillar which moves up and down in relation to the chassis, through a fixed support or supports.

A sliding axle suspension system is where the axle assembly is sprung and slides up and down on a fixed pillar.

Antecedents

For want of earlier evidence, credit for the first independent front suspension on a motor vehicle probably goes to the visionary French builder of steam vehicles *Amédée Bollée* on his 1873 steam vehicle "*L'Obeissante*" ("The Obedient One"). This vehicle is preserved in the *Musée des Arts et Métiers*, in Paris.

Although I have seen claims that this is a sliding pillar design, the Museum's Collection Curator, who kindly examined the vehicle on my behalf, has advised that it isn't, but is a leaf spring system. The photographs and drawings of the system which I have seen show elliptical springing outside the wheels (as was common railway practice at the time), these apparently being steadied by rectangular uprights. The stub axles were affixed to the bottom of the spring. It appears the system may have had a separate vertical pillar or column to transmit steering movement to the wheels. This system in itself was quite groundbreaking. It operated by chains running around to eccentric cog-wheels to give an Ackermann steering effect, the inner wheel, on the tighter radius, turning more than the outside one.

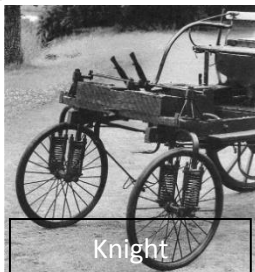
Bollée's later steam vehicle "*La Mancelle*" (the girl from Le Mans) also had independent front suspension, in this case by two fairly conventional stub axle assemblies, attached top and bottom to the ends of an upper and lower transverse leaf spring. This vehicle was also groundbreaking, setting a design standard for motor vehicles for years to come. It had a front-mounted three cylinder steam engine (albeit with the boiler at the rear), with drive to the rear wheels.



"*La Mancelle*" is also preserved in Paris, and the *Musée* has sent me some wonderful information on both, and other *Bollée* steam vehicles, which is currently being translated.

John Henry Knight.

Knight's 1895 car had a type of independent sliding pillar front suspension, but is probably more accurately described as a multiple sliding rod system.



There was a vertical fork to each front wheel, the shaft of which extended up as part of the steering apparatus. Two truncated prongs extended down over the rim of the wheel and had horizontal brackets on their lower ends. The wheel spindles had a bracket on either side, at each end of which a rod/ bolt extended upwards to go through holes in the bracket on the end of the fork prong. There appear to be locator tubes projecting downwards from the upper brackets to help hold the rods vertical. There was a coil spring between each of these rods. In other words there were two vertical locating rods and a spring on each side of both wheels.

This car has survived in the UK's National Motor Museum at Beaulieu.

Decauville and Eisenach.

The French *Decauville* of 1898 is arguably the first production petrol-engined motor car to have independent front suspension, this time by a more recognisable sliding pillar system.



The sliding pillar suspension is clearly evident in front-on photographs of this little car, examples of which still exist. In this example, the stub axle was attached to the bottom of the vertical pin, which slid up and down through a bush at the end of a transverse beam attached to the front of the chassis. The tops of the pins were attached to, and pivoted on, a transverse leaf spring.

Later the same year, the *Eisenach*, a forerunner of today's BMW, and sometimes called the Wartburg, emerged from Wartburg with an identical system.

Hardly surprising, as the *Eisenach* was simply the *Decauville* made under licence! An example of the *Eisenach* exists in the Henry Ford Museum in Dearborn. The *Decauville* was also made under licence in Italy as the *Marchand*.



Georgano intimates that another obscure French make, the *Ader*, may have used the same system for a time early in the first decade of the 20th century.

In 1905/6, the French *Sizaire Naudin* emerged with a fairly well-known example of sliding pillar suspension. It is a copy of the *Decauville*'s! However the *Sizaire Naudin* has be-

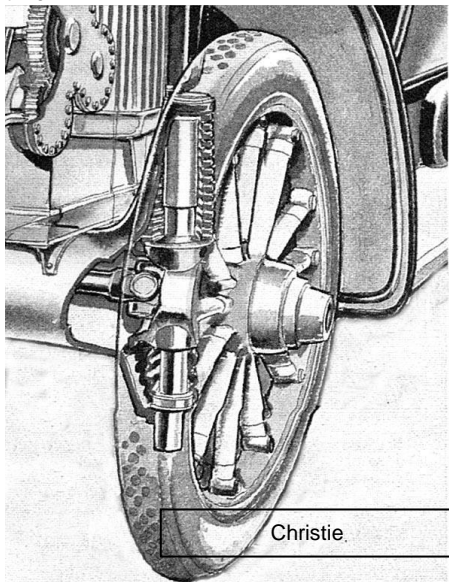
come better known probably because of its successes in *voiturette* racing before 1910.



If these early approaches can be summed up in a single word, it is "crude". They represent a virtual dead-end in suspension design.

Enter the USA – a Breakthrough

In around 1903/04, New Jersey inventor, J Walter Christie, introduced what we have come to regard as the classic sliding pillar front suspension system, remarkably unchanged in its various applications virtually to the current time.



Christie used a pillar sliding through upper and lower supports which were extensions fixed to each side of the front of the chassis. A helical coil spring surrounded the pillar and on some examples there seems to have been a smaller rebound/ snubber spring at the bottom.

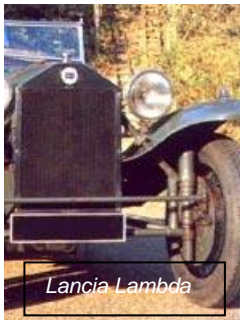
Christie, who is better known for his later work on military tank suspension systems, was a well-known, if largely unsuccessful participant

in racing on both sides of the Atlantic and his somewhat revolutionary designs, even for those times, would have been well-known among the then racing fraternity. They generally combined front wheel drive with his sliding pillar system and, variously, he produced an immense V4 engine driving the wheels direct through clutches at each end, and a series of transverse-in-line four cylinder New York Taxicabs also using his sliding pillar independent front suspension system.

In the 1905 Vanderbilt Cup race, *Vicenzo Lancia*, driving a FIAT, pulled out from the pits after a tyre change right in front of Christie. The resulting collision was perhaps prescient in view of what happened years later!

Lancia

Lancia's early cars had non-independent front suspension, with a beam axle suspended by semi-elliptical springing.



However, in 1922 the company introduced its famous "Lambda" which had a sliding pillar independent suspension system bearing a remarkable resemblance to Christie's design.

Lancia's innovation was to incorporate a hydraulic shock absorber into the sliding pillar. Lancia used this system, or variations thereof, for many years.

Morgan, and the Sliding Axle

In 1909, the first Morgan appeared. HFS Morgan's front suspension design likewise bore a remarkable superficial resemblance to Christie's system and this is undoubtedly where he drew his inspiration.

Operationally, however, the system was fundamentally different, and is not a sliding pillar system at all. It used a sliding axle on a pillar which was fixed, top and bottom, to supports extended out from the end of the chassis, with

coil springing surrounding the vertical pillar and bearing on the top of the sliding axle. Morgan patented his system in 1910.

With a few variations, this system is still being used on Morgans up to the current time.

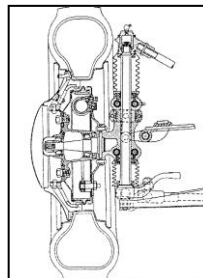
It is interesting that up until the mid 1950's the system always seems to have been described as a sliding axle system, with the axle sliding up and down on a fixed axle pin. The earliest, and quite incorrect, reference to it as a "sliding pillar" system appears to be in an "Autocar" test of the Series 11 4/4 dated 14 September 1956, and others, including, unfortunately, the Factory itself, subsequently copied this error. As the late Denis Jenkinson once said, repeat an error often enough and it takes on the semblance of fact, and this is certainly what has occurred here.

So, at the risk of putting a few noses out of joint, it is neither correct nor traditional to refer to the Morgan system as Sliding Pillar! The correct, and traditional, description is Sliding Axle.

Others

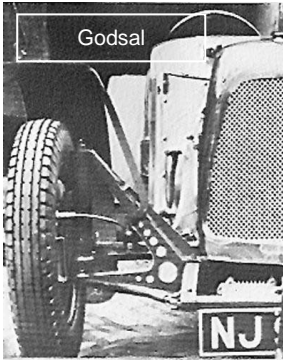
The above is but a potted history of the main developments.

Other cars have also used variations of either system, including the French make Tracta in the late 1920's, a few cyclecars in the 1910-20 period including various of the Carden/Tamplin models, and Alta (front and rear) in the late 1930's, along with various "specials" such as the famous Freikaiserwagen, which used a modified Morgan front suspension.



The American Tjaarda-Briggs prototype, which appeared at the Detroit Centenary of Progress Exhibition in 1933 followed the Morgan approach, but with a square pillar and both coil and transverse leaf springing.

More bizarre even was the system used on a one-off prototype British sportscar in the 1930's, the Godsai. I believe this car still survives in re-



stored form. The suspension, a sliding axle design, had a stub axle which slid on an inner vertical tube with a main spring above it and a smaller rebound spring below.

This was all enclosed in an outer tube with a vertical slot in it through which the stub axle shaft protruded. Damping was apparently provided by two plates faced with Ferodo material, which were pinned to the stub axle and which bore on the face of the outer tube, running up and down within two welded ribs. The tube assembly pivotted at its ends on ball thrust bearings, and a big bolt ran down the centre of the whole thing to hold it all together. A steering link was attached to the tubes. One can only imagine the effects of wear on the steering of such a system, and it seems that when the remains of the car were retrieved, wear in the slot made for a quite exciting ride!

