

Tilling-Stevens

1906 - 1953



Roger Cox — Richard Rosa

Dr. Albert Gonzàlez

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Cover Illustration: Found languishing in a scrapyard in 1970 was XL1204 a Tilling-Stevens TS3A first delivered to Tilling's Catford depot in June 1922. The body was totally re-constructed to the original 026/22R0 design by Michael Banfield. (LTHL collection).

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Introduction

The Tilling-Stevens was an idiosyncratic but highly successful marque of road going commercial vehicles that emerged in the early years of the twentieth century. It maintained a prominent market position until business realignments outside its control led to its decline from the later 1930s and its ultimate sale and closure as an independent vehicle manufacturer after 1950. Sadly, errors abound in print and on the internet about the Tilling-Stevens company and its vehicles.

Very many pictures on the web randomly describe the TTA1 and TTA2 incorrectly, and the TS3 is often confused with the TTA2. The TS3 of 1913 was the first bus from the Maidstone factory to allow transverse seating in the lower saloon, but the preserved example at the Amberley Museum has a narrow Short Bros body of 1908, and very many early TS3 chassis were fitted from new with much older secondhand bodies with perimeter lower saloon seating. Elsewhere confusion frequently arises between the TS3 together with the improved TS3A, and the heavier, more powerful TS4 which had a bigger engine and higher bonnet level.

From the B10 onwards, the suffix letter 'A' after the model number stood for forward control in Tilling-Stevens classifications. This was not the case with earlier types such as the TS3A, a normal control model, where the suffix 'A' indicated a design development. The sometimes quoted model

number TS7A results from a similar misapprehension. The TS7 was a forward control machine initially designed to meet the specifications of the Public Carriage Office in London, and the occasional application of the 'A' suffix is a retrospective addition. The examples exported to Barcelona are sometimes shown as TS7B. Other sites confuse the normal control TS4 (though some forward control examples were built) with the forward control TS6, though the latter has escaped the addition of the superfluous 'A' suffix letter. The LTHL fleet list for Leicester Corporation correctly shows the first buses in the fleet to have been of the TS6 type; the Commercial Motor article of 12 June 1928 gives these as being TS4s, but this is an error. Again, the North Western batch DB 5065-88 of TS6s are sometimes mis-identified as TS4s, yet the preserved example, DB 5070, is unquestionably a standard forward control TS6.

The engine capacities of many of the Tilling-Stevens models have been obtained from the bore and stroke figures given in the archived copies of the Commercial Motor magazine, though some inconsistencies and some errors on the subject may be found therein. The engine specifications for the TTA1, TTA2 and TS3/A are reasonably assured, but the versatile TS4 was offered with optional engine sizes - 6.4 litres/40hp, 6.97 litres/45 to 50hp, and 7.72 litres/55 plus hp. The TS4 chassis became quite popular for fire appliances until the mid 1920s, the electrical generator being eminently suitable for powering pumps and rescue equipment. The chassis so employed were fundamentally modified bus models, but the larger 55 hp

7.72 litre engine derived from the Tylor JB4 was frequently specified for the purpose.

According to the Commercial Motor dated 13 November 1923, the forward control TS6 employed the same 5.7 litre engine as the TS3A, though improvements to all Tilling-Stevens engines were progressively made under the eye of Harry Ricardo, who, before he turned his attention towards compression ignition, specialised in improving the gas flow characteristics of side valve engines. When the TS6 was modified to meet the Public Carriage Office specifications for use in London it became the TS7, but this model appears to have had modest sales success elsewhere.

The Shire publications booklet, "Old Buses", has a picture of a Douglas Corporation double decker purporting to be a TTA1 which it is not. Douglas operated no examples of the TTA1, and the vehicle shown is a TS3A, almost certainly No. 8 of 1922.

Several internet fleet lists for Douglas Corporation show Nos. 13 to 16, the four Tilling-Stevens single deck deliveries of 1925, as TS17A models. This is patently incorrect; the TS17A did not appear until 1929, and was a forward control design of 16 ft wheelbase intended for double deck bodywork. The 26 seat capacity of the 1925 buses indicates normal control, and they were very probably TS3A machines. Subsequently, in 1930, Douglas Corporation did take seven examples of the TS17A with 34 seat single deck

bodies.

Certain published fleet lists name the manufacturer of some pre 1930 Tilling-Stevens deliveries as T.S.M. The Maidstone firm did not adopt the abbreviated form until August 1930, and all vehicles made prior to that date should be shown as Tilling-Stevens.

The Pamlin Print postcard firm of Croydon issued a number of pictures of Tilling-Stevens buses, and the wild inaccuracy of the captions is astonishing. Many machines are mis-identified, and one supposed Tilling-Stevens vehicle on a Pamlin postcard is actually a Thornycroft BC Forward.

One website states that the Maidstone company was taken over by Vulcan of Southport. In fact the opposite is effectively true. Tilling-Stevens purchased the rights to Vulcan designs in 1937, and produced them at Maidstone.

It is notable that, apart from a few individual applications, the standard production Tilling-Stevens petrol electric chassis variants, right up to the TS17A, plus the TS19 and TS20 military types, were powered by a four cylinder side valve petrol engine. No doubt such a motor met the premier requirement for torque delivery at lower rpm to drive the dynamo, but it is little wonder that the Tilling group felt that Maidstone's final throw of the petrol electric dice for passenger applications in the TS17A

measured up poorly against the modern, refined, six cylinder AEC Regent. Although Tilling-Stevens/T.S.M. offered more advanced ranges of mechanically driven passenger chassis throughout the 1930s and 1940s, it was the acquired Vulcan haulage designs that really kept Tilling-Stevens going from 1937 through to the sale of the firm to the Rootes group at the end of 1950.

The quoted power outputs of early commercial vehicle petrol engines were generally delivered at very low revolutions per minute by modern standards. Initially, this was around 1,000 rpm, but engine and oil development gradually raised this to 1,300rpm and later to 1,600 rpm. A governor was sometimes fitted to protect the machinery from overspeed damage. We may think that some of these early engines were unrefined in design, but this is not entirely true. Features such as ball and roller bearings, and pressure lubrication were often incorporated, but oil technology was in its infancy. The fast revving, highly turbocharged power plants of the modern age employ engineering design principles that have been known and adopted for over a century. It is the advances in metallurgy, oils and fuels that make today's engines possible. The design knowledge existed generations ago.

Contemporary accounts state that the performance of the petrol electric was less than scintillating on hills, where progress was said to be slow, though the summit was generally achieved. As the engineering of

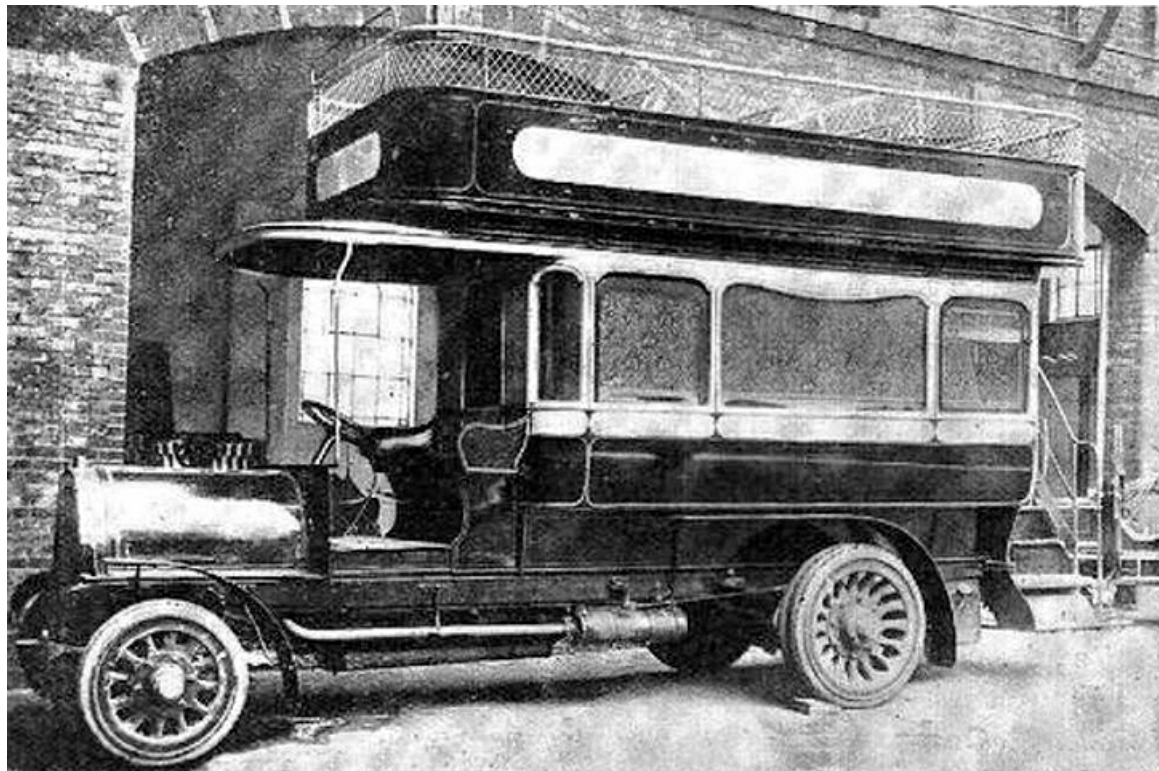
conventional transmission competitors, notably the Regent/Regal and Titan/Tiger models, became increasingly sophisticated, the petrol electric system simply failed to compete. Diesel engines were offered in a few Tilling-Stevens electrically propelled chassis, and were a feature of the Chiver's six wheel lorry rebuilds from TS6 buses, but by 1931, when development of the automotive diesel was just beginning to become significant, the petrol electric system was no longer regarded as a viable transmission option for commercial vehicles. The greater low speed torque of the diesel would certainly have given better performance and greater economy than a petrol engine, and the subsequent adoption of the principle for railway motive power proved to be outstandingly successful. The Southern Region diesel electric multiple units with huge four cylinder 61.8 litre English Electric engines proved to be the most reliable of all the British Rail diesel multiple units of their day. Now, of course, the petrol electric principle has become the basis of hybrid propulsion technology. *Plus ça change.*

1: The Formative Years

The principle of driving a dynamo by coupling it to a petrol engine had been tried in a number of applications by the year 1900. Several inventors conceived differing methods of harnessing and controlling the power so generated for motorised transport purposes, initially in railway applications. The Patton system appeared in the USA from 1890, but was not notably efficient. One markedly successful early design was the Hungarian Weizer petrol electric railmotor of 1903 onwards, which employed Siemens Schuckert electrical equipment and De Dion engines. A total of 65 railcars was produced, some of which survived until 1960. However, the adoption of petrol electric transmission for road vehicles, which had to meet more versatile performance requirements in respect of speed variation, braking, steering and gradient ability, was a rather more complex issue. In April 1903, the first motor bus operated briefly by the London General Omnibus Company was a petrol electric manufactured by the New Jersey, USA, firm of Fischer. In this the engine drove a dynamo to charge batteries which then drove two electric motors to power the vehicle, a principle now known as the hybrid system. At 7ft 5ins it exceeded the then prevailing maximum permitted width of 6ft 6ins, and was very heavy. Upon examination the Met Police refused to licence it, whereupon the LGOC shipped it back to the USA and sought a refund of the cost.

It was Henri Pieper (1867-1952), the son of the German born, Belgian based, engineer and gunsmith, Henri Pieper (1840-1898) who improved the Fischer transmission method employed in the 1903 pioneer vehicle of the LGOC, and registered the 1905 patent, the 'Mixed Drive For Autovehicles', employing the "Auto Mixte" petrol electric propulsion method. This drove the vehicle by means of the engine but through a magnetic clutch to a dynamo that acted primarily as a motor for propulsion. Under light load conditions, this dynamo was capable of supplying any surplus charge to a battery which, when occasions so demanded, could be drawn upon to supplement the electrical output generated directly by the engine in propelling the vehicle. A pioneer car employing this principle was shown in Paris in 1899. From 1906 'L'Auto Mixte' company began producing trucks, buses and fire fighting vehicles from its Belgian premises in Herstal near Liée. A demonstration of a single deck Auto Mixte bus, a Belgian built chassis but bodied in Britain, was given on Handcross Hill, Sussex, on 20 July 1906. Handcross Hill was sadly the location of the notorious Vanguard Milnes Daimler fatal omnibus accident just a few days earlier on 12 July, and the Auto Mixte demonstration was a publicity event in somewhat questionable taste.

Other manufacturers experimented with the petrol electric concept. The solitary Dodson bodied Hart-Durtnall petrol electric prototype ran in London from 1905. Greenwood and Batley and also Straker Squire brought out petrol electric vehicles in 1907. J.G. Parry Thomas, then of Leyland,



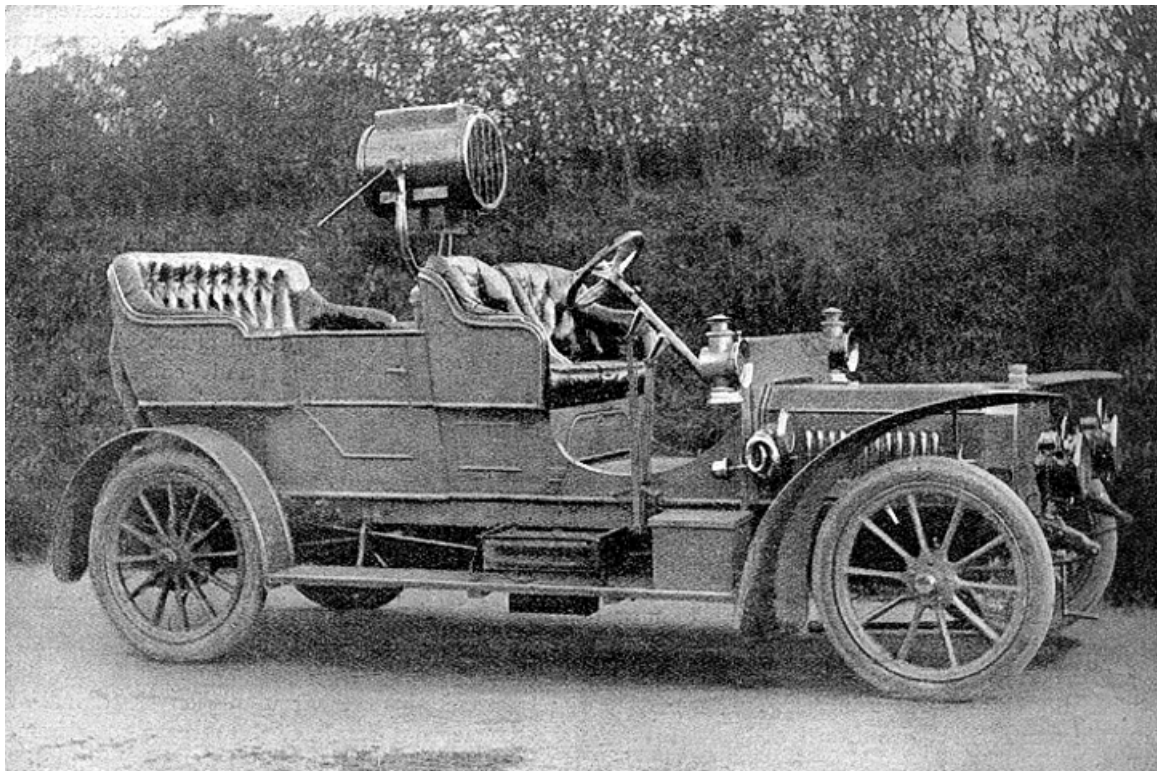
The solitary Dodson bodied Hart-Durtnall petrol electric prototype that ran in London from 1905. (LTHL collection).

patented a complex hybrid system in 1908. Also during 1908 the Parisian G.E.M. Company (Société Générale d'Automobiles Électro-Mécaniques) ran a petrol electric double deck bus employing the Pieper principles, which was supplied by the Belgian L'Auto Mixte company, between the Boulevard St. Germain and the Gare St. Lazare. Other pioneers with petrol electric transmissions were Dowsing, Jenatzy, Lohner - Porsche, Carolan, Astle - Wallace, Krieger, De Dion-Bouton, Milde, Germain and Farrow. Thus petrol electric transmission had attracted many early engineers, but the real genius behind the practical road going petrol electric vehicle was indisputably W. A. Stevens.

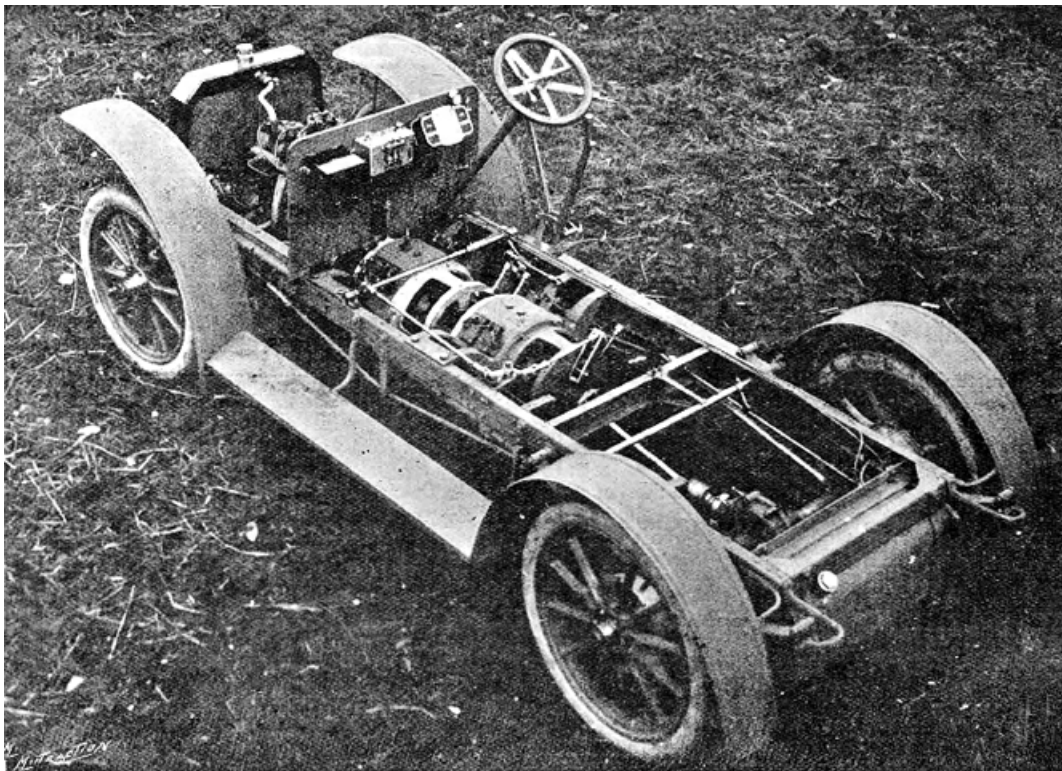
Following an early career as a physics teacher and consultant electrical engineer, William Arthur Stevens (1864-1935), inherited his father's timber business in Maidstone. In 1897 a private concern was formed with Mr Reginald Alfred Barker under the name of Messrs. Stevens and Barker, though it seems that their business association began some two years earlier, which then began the manufacture of electric motors, dynamos, generators and miscellaneous items of electrical plant. The partnership was dissolved when Mr. Barker retired through ill health on 19 September 1902 and died shortly afterwards in November. Mr Stevens continued the business until 12 May 1906, when it became a private limited liability company under the title of W. A. Stevens Limited. The manufacture of electrical and mechanical components continued, but Mr Stevens began experimenting with petrol electric transmission. The initial application

appeared in a petrol electric touring car chassis, believed to be a Clement Talbot, which, notwithstanding its purely experimental nature, gave such a satisfactory performance that it ran for five or six years before being restored to mechanical drive and sold. The company was thus encouraged to develop further the petrol electric system of transmission. The attention was attracted of Mr Percy Frost Smith, the Chief Engineer of Thomas Tilling Ltd., who, at a time when mechanical transmissions were rather fragile and somewhat difficult to master, saw it as a simple way of converting horse bus drivers to the new fangled motor buses. It is recorded that Richard Tilling met W. A. Stevens for the first time at the November 1906 Motor Show where the two parties agreed in principle to develop the petrol electric transmission for a fleet of London omnibuses.

Development continued jointly with Messrs Frost Smith and Stevens, with the added involvement of Mr Francis Edward Brown of David Brown, Huddersfield. Patents were successfully secured by Smith, Brown and Stevens, the S.B.&S. syndicate, in March 1907 for the design of a final drive transmission. This embodied a dynamo powering two electric motors, one on each side of the vehicle, separately propelling a special drive on each rear wheel which was carried on a dead axle. This concept eliminated the requirement of a differential. However, at a meeting held in January 1907 to discuss a paper by Messrs Hart and Durtnall on the subject of petrol electric propulsion, the prescient general view of those taking part came down strongly in favour of a live axle and a



How it all began - the 'Old Grey Car' of 1906, which ran with an experimental petrol-electric transmission for 5-6 years. (Richard Rosa collection).



The modified chassis of the 1906 Clement-Talbot showing the petrol-electric transmission. (Richard Rosa collection).

differential as the proven method of final drive.

In 1903 the Cerol Syndicate was registered possessing the rights to apply the Pieper system to motor vehicle manufacture in Britain. These rights were purchased from the Cerol Syndicate by The Gearless Motor Omnibus Company, registered on 23 May 1906 (which had some directors from the Daimler Motor Company of Coventry) to apply the Pieper Auto Mixte system to bus design projects, with the objective of embarking upon competitive bus operation in London. The original intent was that of importing vehicles from the the Belgian L'Auto Mixte company, but it was then resolved that the Daimler Motor Company would manufacture them. The prototype 'Gearless' vehicle, which appeared at the Commercial Motor Vehicle and Motor Boats Exhibition at Olympia in March 1908, used the Pieper principle in which the engine output drove a dynamo which acted as a motor for propulsion, but, which, under light loads, could provide charge to installed batteries capable of assisting progress with electrical power. However, the chassis design exhibited a number of shortcomings in that the final drive and rear axle were completely unsprung, and the rearmost part of the bodywork required a separate frame for support and springing, proving the need for further development.

In London and its surrounding areas the sudden and marked proliferation of motor buses from 1905 led the Metropolitan Police to view the early examples of mechanical propulsion with a deep suspicion bordering on

outright hostility. Early in 1906 the Commissioner of the Metropolitan Police issued a set of regulations governing the design and construction of buses operating in the area under his jurisdiction. From this date the Met Police Public Carriage Office possessed absolute authority over vehicle design, having the power to stipulate the maximum dimensions of 23 feet in overall length, 7ft 2ins in width and a maximum unladen weight of 3 tons 10 cwts, with axle loading limits of 2 tons at the front and 4tons at the rear. Minimum turning circles were specified, and severe constraints were placed upon mechanical and bodywork engineering features right down to the smallest details. These conditions were upgraded and revised over subsequent years, and had been relaxed by the year 1908 when electrically propelled omnibus experiments began to appear, but, even by 1924, manufacturers had to comply with no less than 65 regulations.

A petrol electric London omnibus that met the stringent criteria dictated by the Public Carriage Office was jointly designed by Messrs Frost Smith, Brown and Stevens employing the patents already secured in 1907 by the SB & S syndicate. The engine drove a dynamo which powered two electric motors, one on either side, each driving a separate cardan shaft to each rear wheel carried on a dead rear axle. These pioneer developments and first commercial applications were in Hallford chassis made by J. & E. Hall in Dartford, a mere 20 miles or so up the road from the Stevens factory in Maidstone, and the petrol engine used was the Hallford four cylinder unit of 4.4 litres, rated under the RAC formula at 24.85 hp.



The pioneer Hallford-Stevens that utilised an electric motor at each rear wheel, a transmission system that was subsequently employed by some USA manufacturers of petrol electric chassis. (LTHL collection).

Initially the pioneer bus was called the 'SB & S' for "Smith, Brown and Stevens", but the the name "Hallford-Stevens" was then adopted in acknowledgement of the developer of the practical electrical traction system. The prototype Hallford-Stevens double decker had an unladen weight of 4 tons, 15 cwt and 3 qtr, and was operated by Thomas Tilling between Peckham and Oxford Street from January 1908, remaining in service until early in 1912. The bus revealed characteristics of being slow both in starting and in gaining the then legal maximum speed of 12 mph.

In June 1910, having advanced its original "Auto Mixte" petrol electric designs, and being still intent upon motorbus operation in London, Daimler revealed the KPL double decker - the letters stood for Knight, who invented the sleeve valve engine, Pieper, and Lanchester who designed the vehicle. This was very advanced for its time, featuring forward control, integral construction in steel with aluminium panels and braking on all four wheels. Large Rudge Whitworth wire wheels contributed to the saving of weight. The bus was powered by two 12 hp engines, each coupled to a separate dynamo driving a worm gear powering each each rear wheel individually on a dead axle, a traction concept for which the SB & S consortium had already secured the patents in 1907. All the units were attached externally on each side of the vehicle. Although contemporary accounts suggest that twelve vehicles were placed under construction, it is certain only that two examples were completed, the first being operated experimentally for some four weeks in Birmingham.



The Daimler KPL double-decker of 1910 featured integral construction in steel with aluminium panels. It was of forward control layout, was fitted with four wheel brakes, and had all the units attached externally along the outside of the vehicle. Each rear wheel was driven by a separate electric motor. (LTHL collection).

In October 1911, the Coventry Daimler business was purchased by the Birmingham Small Arms Company. BSA revived the plans for the establishment of a competitive bus operation in London, now to be called the Premier Motorbus Company Ltd. For this project the chosen vehicle was to be the KPL double decker. Mr. Percy Frost Smith declared that the KPL electric propulsion system, which employed a separate electric power train on each side to drive each rear wheel individually, infringed the SB & S patents, and threatened to sue in the courts. The Daimler company, being reluctant to challenge Frost Smith, approached the SB & S consortium with an offer of £5000 to secure the patents. However, as part of a deal permitting the expansion of the London Tilling fleet to 150 buses, the LGOC had already secured the option to purchase the SB & S 'back axle' patents for the sum of £3000. This transaction was completed in May 1911, the sum of £975 being transferred to each member of the S.B. & S. syndicate. Faced with this insuperable problem, Daimler abandoned the KPL petrol electric design. Had this eventuality not occurred and the KPL been put into production, it is probable that the futures of both W. A. Stevens Limited and the Tilling-Stevens marque might have been seriously jeopardised. Indeed, the subsequent emergence of AEC as the dominant supplier of London buses might not have occurred. Another factor in that KPL abandonment decision was the enticement by Daimler in 1911, initially for the role of General Manager for the proposed competitive Premier Motorbus Co. in London, of the gifted engineer and LGOC B type bus designer, Frank Searle. With the end of the KPL programme, the Premier

project was not pursued, and Daimler turned instead to the production of Searle's conventional CC type, which proved to be a more sound commercial proposition. Ironically, Daimler then secured a substantial order for CC double deckers from the British Electric Traction Company for its London MET operations, the beginning of a complex relationship between Daimler, the LGOC and AEC that is beyond the scope of this article.

Pressured by its local authorities on what would now be termed environmental grounds, the Brighton, Hove & Preston United Omnibus Company had, from April 1908, taken the first of four battery powered Electrobuses. The Brighton undertaking was not then a Tilling company. Tilling did not acquire control until November 1916, when the BH&P firm found itself seriously short of vehicles after 13 of its nearly new Daimler buses were impressed by the armed forces. The London Electrobus Company, which had premises at Victoria, pursued a chequered existence following its formation in April 1906, when it allegedly invited investment on the false claim of possessing a patent giving it a monopoly in road electric bus design and manufacture. Following several court actions, the company had to refund more than 1,000 investors. The installed batteries were imported from the USA, and the 40 miles range in London service was extended by a three minute battery replacement procedure at the Victoria terminus. By 1909, however, the Electrobus business, which had two fraudulent lawyers as directors, was in decline and entered administration in 1910, whereupon Brighton, Hove & Preston

bought eight second hand Electrobuses from London, plus a further four for spares, to add to its existing fleet. Though the hills around Brighton posed something of a challenge to these electric buses they were deemed to be successful and remained in service until November 1916 when Thomas Tilling assumed control of the company.

Whilst gaining experience in electric bus operation, the Brighton, Hove & Preston company took a Hallford-Stevens petrol electric bus (this then being only the second such vehicle built) on trial in 1908 shortly after the arrival of the first Electrobus. BH&P ran it until August 1911, when the body was removed and the chassis returned to J. & E. Hall. In November 1908 three battery electric Hallford-Stevens buses were delivered to BH&P, and these, the only ones constructed under the agreement with Hall, remained in service, despite serious initial vicissitudes, from January/February 1909 until December 1915. Also in 1909, a Milnes-Daimler in the Brighton fleet was converted very successfully to battery propulsion driving through a conventional live axle. This confirmed that a single electric motor driving through a conventional differential to the rear wheels was a more dependable transmission method than the complex S.B.&S. system, though it did present the problem of accommodating the bulky dynamo beneath the saloon floor of a bus.

In 1904 Thomas Tilling Limited had began running its first motor omnibuses, these being of Milnes-Daimler manufacture which became the

preferred supplier up to 1911. From 1905 Tilling turned to motorised transport for its mail and bullion contracts using modified Milnes-Daimler chassis in which the manufacturer's idiosyncratic internally toothed pinion rear wheel propulsion mechanism, a system also employed by the Burton-on-Trent based manufacturer, Rykniel, was replaced by chain drive. Towards the end of 1910 Tilling similarly adapted the transmissions of three 3 ton Milnes-Daimler bus chassis to take new bodywork for the carriage of parcels between London and Birmingham. These initiatives heralded the start of Thomas Tilling's mechanical enterprises at Bull Yard, Peckham, that would lead to the emergence of the first Tilling-Stevens petrol electric omnibus.

In May 1910 W. A. Stevens Limited supplied two 2 ton petrol electric taxicab chassis to The Hague, Netherlands. The Stevens company records reveal that J. & E. Hall were not in a position to supply a 2 ton chassis, but for practical reasons in order to fulfil the contract, the Hallford 3-4 ton chassis was employed in the conversion of two examples to petrol electric transmission. Contemporary accounts continued to refer to these two chassis as 2 tonners, which, upon delivery, were subsequently bodied by the customer in The Netherlands. Photographs show that the shape of the bonnet and radiator of these two taxicabs was unlike that of the standard Hallford, though the chassis electrical equipment was marked 'Hallford-Stevens'. The relationship between Stevens and J. & E. Hall was ever somewhat strained, a situation compounded by the differences that

emerged over The Hague taxicab contract, and these became the last vehicles produced under the Hallford-Stevens name.

The Hallford-Stevens story is very complicated, and the liaison between the Hall and Stevens companies lasted for a mere two years during which design principles continued to evolve for both petrol electric and battery electric transmissions. During that period a number of trials and demonstrations were made to potential customers. From September 1910 a double deck demonstrator dating from October 1909, that had been earlier equipped for trials with a searchlight, was fitted with a single deck body and ran for 13 weeks with the Loughborough Road Car Company Limited. However, by the end of 1910, the ingenuity, effort and expense of four years work on petrol electric development since 1906, latterly in concert with J. & E. Hall, had yielded minimal financial benefit to W. A. Stevens Limited, and only a handful of vehicles had been produced. The collaboration between J. & E. Hall and W. A. Stevens was terminated by mutual consent around October 1910 to allow Hallford to concentrate on its own model ranges.

In September 1910, Stevens developed a new model for export to India. Three examples were ordered but it seems that only two were supplied. This design` abandoned the SB & S concept of a separate drive at each rear wheel, and reverted to trusted transmission principles by coupling a single electric motor to a Dennis live worm driven rear axle and

differential. Dennis influence was further represented by the adoption of the tried and trusted White and Poppe engine in place of the Hall unit. Contemporary accounts suggest that the Stevens company built the chassis at Maidstone, but this surely merely indicates that J. & E. Hall of Dartford had ceased to have any involvement, as Stevens had no chassis design and manufacturing capabilities at that time. It would have seemed logical for Dennis to have supplied the complete chassis for the incorporation of the electrical traction equipment by Stevens, but the radiator and the bonnet structure were not of standard Dennis design. The definitive identity of the chassis supplier thus remains unresolved.

In a January 1911 edition of 'Commercial Motor' Mr Frost Smith of Thomas Tilling, clearly not a man inhibited by modesty, declared that he was taking delivery of six new petrol electric buses of "his own design and construction". These, it was stated, were emphatically not Stevens models. By this he meant that they did not employ the Hallford-Stevens SB & S type of final drive, though Stevens electrical equipment would be fitted. This somewhat dismissive reference to the Stevens involvement provoked the displeasure of W. A. Stevens who sought the publication of clarification - at this time it would seem that relations between the Thomas Tilling and W. A. Stevens concerns were formal at best. In his statement Frost Smith was giving a hint of the new TTA which employed a single electric motor in conjunction with a conventional differential and final drive, a principle that had been adopted at the outset by Stevens

in his experimental car of 1906, and subsequently employed in the 1910 export models. In practice, the SB & S concept had already been overtaken by traditional transmission principles, and the purchase of the SB & S patent by the LGOC simply eliminated the opportunity of it being used by a competitor, notably Daimler in the KPL. In the normal control TTA, the very first production Tilling-Stevens model (it seems that the designation TTA1 was applied retrospectively when the more powerful TTA2 emerged later) the radiator was positioned behind the engine in a manner often described as Renault style, though it was equally a feature of some early Milnes Daimler buses. From as early as 1910, Mr Frost Smith had stated his preference for pressurised engine cooling by pump rather than the thermo-syphon method adopted by many other early motor manufacturers, and this feature was incorporated in the new design.

In the year 1911 the Maidstone works of W. A. Stevens was simply an electrical component supplier, and all the TTA1 assembly was undertaken at the Tilling base in Bull Yard, Peckham. The Tilling built double deck 34 seat (O18/16R) body of the 'New Light Type Omnibus' TTA1 had the same capacity as the contemporary LGOC 'B' type. The revolutionary petrol electric bus weighed 2 tons 8 cwt, was designed to carry 2 ton loads and employed a 4.3 litre 4 cylinder engine of 30 hp. The wheelbase was 13ft 6ins, the wheel track 5ft 6½ins, the overall length 19ft 4ins and the overall width 6ft 10ins. The type letters stood for Thomas Tilling, then presumably Auto (-matic?, -mobile?, -car?) to emphasise the gearless

transmission. At this moment of history 'Tilling-Stevens' was simply an appellation for the new vehicle, for no company of that name then existed. The TTA1 model was introduced into Tilling's London services from Sunday 11 June 1911 under an agreement finalised in May 1911 with the London General Omnibus Company approving the significant expansion of Tilling motor bus operations in the capital from 35 buses to 150. All those earlier geared buses had been replaced by TTA1 vehicles by May 1912, and by November 1913 the expanded Tilling fleet in London consisted entirely of the TTA1 type.

At the outset, the TTA1 appears to have been no more than a collaborative venture between Thomas Tilling Limited and W. A. Stevens Limited with the set objective of constructing 150 petrol electric buses to meet Tilling's bespoke requirements in London. It is doubtful that, within six months of Frost Smith's announcement of the TTA1, Tilling had the design expertise and engineering capacity at Peckham to construct a completely new chassis and engine to its own specifications. Given the limited initial objectives of the project, the chassis and the engine must surely have been obtained elsewhere for modification to petrol electric transmission using Stevens components. Some features suggest that Milnes Daimler may have been the source of the chassis, Tilling having been a satisfied and hence familiar user of that make up to 1911. The worm driven rear axle must also have been obtained elsewhere, possibly from Dennis, who been pioneers in this field since 1903, though Leyland and Halley had



The Tilling-Stevens TTA1 model was introduced into Tillings' London services from 11th June 1911. The new petrol electric bus weighed 2 tons 8 cwt. was designed to carry 2 ton loads and employed a 4.3 litre 4 cylinder engine of 30 hp. (LTHL collection).

adopted the principle also. Confirmation of the actual chassis and components origins remains elusive, but the answers may lie in the Tilling-Stevens files residing in the Rootes Archives.

At a substantial promotion luncheon at the Stevens factory in Maidstone on 20 November 1911, Mr Frost Smith conceded that the fuel consumption of the TTA1 was higher than that of its mechanical transmission competitors, but the petrol electric system showed clear advantages in terms of maintenance costs and reliability. However, rather confusingly, he also stated that the pioneer design had been operating satisfactorily for "three years and nine months", which must have been an allusion to the 1908 Hallford-Stevens machine.

An item in the 14 September 1911 edition of 'Commercial Motor' states that Tilling had earlier obtained the marketing rights for the Stevens electrical system. This agreement was restricted to its use in omnibuses and mail vans within the Metropolitan Police Area. W. A. Stevens retained the sole rights to manufacture and sell complete chassis outside the Metropolitan Police Area and also for vehicles other than omnibuses and mail vans within the Area. Later, the 21 December 1911 copy of that magazine records that, following the difficulties of the proposed Hadley Engineering Company to proceed with investment, the Tilling group was contemplating taking a financial interest in W. A. Stevens Limited.

The 'might have been' story of the Hadley Engineering Company began in 1910, when the Bilston, Staffordshire based engineering firm Joseph Sankey and Sons (a forerunner of GKN) purchased the former factory of the Castle Car Company at Hadley Castle near Wellington, Shropshire. Previously a subsidiary of George F. Milnes and Co. of Birkenhead, Castle Cars had been a tramcar constructor, and the factory machinery was capable of manufacturing body panels. In 1911, the Sankey body shop was transferred from the Bankfield Works, and the wheel shop similarly moved from the Albert Street Works, in both cases to the Hadley Castle Works, which then became the centre of the Sankey firm's automotive manufacturing. The Castle Works became extremely successful in the production of pressed sheet steel car and charabanc bodies and in the extensive supply of the Sankey wheel to British car makers. Sankey then sought an agreement with Thomas Tilling of Peckham and W. A. Stevens of Maidstone. This envisaged the manufacture of omnibuses and lorries through the sale of the Hadley works to a new merged business, to be called the Hadley Engineering Company Limited. A prospectus was prepared, and shares offered to the public, but difficulties emerged over an agreement made with the former owner of the Castle Works, G. F. Milnes, concerning the construction of passenger carrying road vehicles at the site. As early as 1902 Milnes had began offering commercial vehicles imported from Germany consisting of Daimler chassis and engines before forming a new company named Milnes-Daimler in that same year to expand sales. By 1907, with over 600 in service, Milnes-Daimler had become the largest motor

omnibus supplier in Britain, and sought to protect its position. Sankey then withdrew, and the Hadley project came to nothing. Despite this setback, by the end of the year 1911 Thomas Tilling had yet to take any financial interest in W. A. Stevens Limited.

The Birmingham & Midland Motor Omnibus Company had viewed the Daimler KPL project with some favour, taking a similar view to Thomas Tilling that a petrol electric vehicle would simplify the retraining of horse bus drivers to handle motorised vehicles. Though the relatively light TTA1 had been specifically designed to conform with the very constricting Metropolitan Police specifications, the abandonment of the KPL led to the arising of interest in the TTA1 in provincial fleets also. Thirteen TTA1 double-deck buses with O18/16R Tilling bodywork went to the Birmingham District Power and Traction Company Limited in 1912, and these passed almost immediately to the Birmingham and Midland Motor Omnibus Company Limited of Smethwick in a deal involving a transfer of shares. This Birmingham order was undoubtedly instrumental in raising the stature of Tilling-Stevens from being merely the assembler of a limited number of a unique type of London omnibus into a supplier for the wider market. On 3 October 1914, this complete batch passed to Birmingham Corporation, together with the depot at Tennant Street together with all the BMMO services running wholly within the city of Birmingham. Had the Birmingham order not been placed, the name Tilling-Stevens may well not have survived beyond the completion of the initial 150 London TTA1 buses, though the operational service figure of 150 would have been augmented possibly to

174 to cover maintenance and overhauls. Some of these saw later operation in the Brighton area following the acquisition of the BH&P company by Thomas Tilling in November 1916. The early years of automobile operation in the UK witnessed the practice of registrations often being swapped between vehicles, which has made the establishment of accurate production figures for all makes extremely difficult. It is thought that ultimately about 200 TTA1 chassis were manufactured in total, including those for other customers, Greenock & Port Glasgow and Newcastle. BMMO followed up its initial interest in petrol electric traction with orders for the later TTA2 model.

During 1912 Thomas Tilling Limited began injecting capital into W. A. Stevens Limited, and by July of that year had obtained a controlling interest. From the end of 1912 and through 1913, a new, fully equipped expanded workshop for vehicle construction was progressively erected at Maidstone, to which Percy Frost Smith, in addition to his role as Chief Engineer of Thomas Tilling, was appointed Works Superintendent. To meet the more taxing requirements of provincial operation, the TTA1 was complemented by the more powerful normal control TTA2 for 4 ton loads. TTA2 chassis assembly was initially undertaken at Peckham and the first example appeared in July 1913 - Maidstone did not enter into the construction of complete chassis until the very end of 1913. This heavier model did not meet the stringent design parameters dictated by the Metropolitan Police, and Thomas Tilling did not operate the type in

London, but provincial interest became modestly significant.

Apart from the more powerful engine and electrical equipment, uprated tyres and springs, the chassis design of the TTA2 was almost certainly identical with that of the TTA1. The TTA2 vehicle weight was 2 tons 15 cwt. and the design featured a large radiator with a rectangular bottom edge located in the conventional position at the front of the chassis. The four-cylinder engine, which surely must also have been a bought in proprietary unit, had a capacity of 6.4 litres and developed 40 hp. Again evidence of the source might lie in the Rootes Archives. Among the customers for the TTA2 were Birmingham, BMMO, Leeds, Liverpool, Loughborough, Oldham, Warrington, and Johannesburg.

In 1913, three experimental tramcars of the London County Council were fitted with the TTA2 engine and electrical system for use in the East End of London where local objections had prevented the installation of overhead or conduit electrical power supplies. These tramcars were still capable of using the main power supply where this was available. Several years later, in 1920, six tramcars of the Hastings system were similarly equipped with petrol electric propulsion for a two mile seafront service where the overhead power supply was deemed to be inappropriate. Unfortunately the narrow gauge of the Hastings fleet constrained the efficacy of the expensive installation. The trial was abandoned by the end of that year, to be replaced by conventional overhead power lines.

Beyond the Hastings application, this experiment does not seem to have been developed further.

From 1913 onwards Tilling began the manufacture of mechanically geared lorries using the type code letter 'B' in succession to the 'A' of the early petrol electric models. Construction took place initially at Bull Yard, but this was transferred to the Maidstone works from the 1 January 1914. These were one and two ton models, coded TTB1 and TTB2. Logically, the number should have indicated the payload in tonnage for each model, but the 1916 prices (sans tyres) - £600 for a TTB1 and £520 for a TTB2 - shows that the reverse was the case. The 15 hp 2.4 litre engine of the one ton model had a bore of 80 mm, whereas that of the 20 hp 3.1 litre two tonner was 90 mm, both having a stroke of 125 mm. Apart from the mechanical transmission, the chassis of Tilling-Stevens haulage types were fundamentally the same as those of the passenger models. (Indeed, not until 1931 did the Maidstone Company offer a specific goods chassis.) These geared lorries were supplied to the British and the French forces for front line use in wartime France and Flanders. They had a rectangular radiator with a slightly curved upper top tank initially bearing the legend TILLING, as no element of electrical transmission was incorporated, but this was soon supplanted by the TILLING-STEVENS name.

Neither the TTA1 nor the TTA2 was offered after 1913. The next Tilling-Stevens model was the TS3 for 4 ton loads or up to 50 passengers.

The TS chassis nomenclature reflected the transfer of production from Thomas Tilling at Peckham to the Stevens works at Maidstone in which Tilling now had a significant financial interest. The TS3 carried a new radiator design showing TILLING-STEVENS at the top but with a radiused edge at the base bearing the words PETROL-ELECTRIC. This followed a period during which a number of experimental radiator designs had been tried. At first, the contemporary mechanical gearbox lorries lacked the curved lower edge to the radiator that otherwise carried the words 'PETROL ELECTRIC'. Later on, certainly by 1922, geared lorries had that curved lower edge restored to display the word MAIDSTONE.

The earliest TS3 examples seemingly appeared from August 1913, but the picture is clouded by the probability that later TTA2 deliveries may have been equipped with the TS3 type radiator. The TS3 seems to have evolved closely from the TTA2, the significant difference of the new model being its capability of carrying wider bus bodywork embracing the rear wheel arches within the lower saloon allowing the fitment of transverse seating. No doubt refinements to the mechanical and electrical systems were incorporated after extensive experience service with the earlier types. Nevertheless, some of the buses delivered with the new radiator shape were equipped with bodywork that retained perimeter seating, which raises the question whether all were truly TS3 machines or just TTA2 types with a cosmetically altered frontal appearance. To confuse the issue further, some TTA2 deliveries had wider bodies over the wheel arches which



From 1914, Tilling-Stevens introduced the TS3 for 4 ton loads or up to 50 passengers. With the TS3 came the change in chassis designation from TTA to TS to reflect the name of the manufacturer rather than the major operator. (LTHL collection).

indicates that the TTA2 was certainly used to test features in the evolution of the TS3. The Graces Guide page of Petrol Engine Manufacturers for the year 1917 lists just three Tilling-Stevens entries, the two small engines for the B1 and B2 geared lorries, and the 6.4 litre 40hp engine that first appeared in the TTA2. (Curiously, the 4.3 litre engine of the TTA1, which was fitted to the later TS5, is not shown.) This indicates that the TS3 was powered by the same 40 hp engine that was installed in the TTA2, as Maidstone could not yet have been in a position to manufacture vehicle engines in quantity in 1913.

One of the original TS3 demonstrators, registered KT 610, with a wide body encasing the rear wheel arches, found its way into the Birmingham fleet via Midland Red in 1914, by which time it had received the new registration OA 5711. This bus received a succession of second hand bodies until its withdrawal in 1926, most with saloon perimeter seating for 18 passengers. Several early TS3 deliveries were similarly fitted with older second hand bodies by their operators. The potential for transverse seating in the design is shown in that a newly bodied production TS3 saloon could accommodate up to 29 passengers rather than the 22 or less of a narrow body. No TS3 vehicles entered the Thomas Tilling fleet in London, but several provincial companies took this model which met the less restrictive design specifications applying outside the Met Police area.

Tilling succeeded in obtaining twelve licences for omnibuses from Hove Council early in 1915, and initially transferred a number of TTA1 buses from the London fleet for the operations. These were progressively replaced by new TS3 machines up to and beyond the acquisition by Thomas Tilling of the Brighton Hove & Preston United Omnibus Co. Ltd in November 1916, when further TTA1 vehicles were temporarily despatched to Brighton to allow the withdrawal of the former BH&P fleet. Though the Brighton TTA1 vehicles were ultimately supplanted by new TS3 buses, one TTA1 remarkably survived in Brighton service until January 1925.

2: Tilling-Stevens Ltd.

At a Board meeting on 9 February 1915, Mr W. A. Stevens tendered his resignation as Managing Director of W. A. Stevens Limited. Doubtlessly the assumption by Tilling of financial and directional control of the company that bore his name must have deprived Stevens of much executive authority in the business, and an undercurrent of differences with the other directors must have been simmering for some time. Following his departure, the company was renamed Tilling-Stevens Limited on 7 May 1915. Despite misgivings by Tilling-Stevens Ltd. and the consideration of counter legal action, W.A. Stevens clearly retained his intellectual rights to manufacture his designs elsewhere. He formed Stevens Petrol-Electric Vehicles Limited in June 1916 and entered into an agreement with Dennis Bros. Ltd. of Guildford, whose petrol electric vehicles based upon the 'subvention' or 'subsidy' chassis had rectangular radiators derived from the wartime Dennis A type and were sometimes simply badged "Stevens". The initial examples were constructed as searchlight lorries or mobile workshops for military applications. The first buses put into service by Cardiff Corporation, then only a tram operator, were six single deck Dennis-Stevens machines of 1920, followed by six double deck examples in 1922. They remained in the bus fleet until 1931, but two, rebuilt as tower wagons, soldiered on until 1951. Cardiff subsequently opted for Dennis buses with mechanical transmissions. In 1919 Walsall Corporation took four Dennis-Stevens single deck buses with Dodson B28R bodies followed

by a further ten in 1920. All were withdrawn in 1928. The postwar lacklustre sales led to the joint venture between Dennis and Stevens being abandoned by 1922, and Stevens Petrol-Electric Vehicles Limited was wound up in 1926.

Throughout the war years, in common with many manufacturers, Tilling-Stevens turned increasingly to military contract work, and struggled to retain the staff and obtain the necessary materials to meet the orders for both military and commercial production. From 18 August 1915 the Ministry of Munitions of War took direct control which further constrained the ability of Tilling-Stevens to meet commercial demand. In July 1916 the Ministry advanced money to Tilling-Stevens for the extension of plant and buildings to facilitate further the company's contribution to war production. From this arose the beginnings in 1917 of the construction of a completely new factory building encompassing five floors that was finally completed in 1920, though a planned significant extension thereto was not pursued in the post war depressed economic climate and ultimately was never built.

From September 1916 a contract was awarded for the manufacture of the Tylor JB4 7.72 litre engine that was produced in quantity by several firms for a number of applications, including that of powering the AEC 'Y Type' lorry and the Whippet medium tank. This engine then became an option for some years in Tilling-Stevens chassis, notably for fire appliances.

The Armistice brought the war to an end on 11 November 1918, but political uncertainty remained, and the company was not released from Government control until 5 November 1919.

In 1919 the government set up a new department, the Ministry of Transport, to oversee the burgeoning mechanised transport scene. No doubt influenced by some lobbying from the LGOC, the new ministry accepted the need for a larger capacity omnibus to meet the pressures of public demand in London. The Metropolitan Police already had the discretion to permit the operation of vehicles that exceeded the updated 1906 regulations, and the introduction of the forward control AEC 'K' type from 1919 was covered by an increase in the laden axle weight limits from 2 tons to 2 tons 15 cwts at the front and from 4 tons to 4 tons 5 cwts at the rear. The maximum laden weight became 7 tons. In recognition of the view that even this was unduly restrictive, the rear axle weight was increased further in 1920 to 5 tons, the vehicle laden weight to 8½ tons and the maximum overall length to 25 ft. These relaxed criteria led to the subsequent introduction in 1921 of the heavier AEC 'S' type seating 54 passengers.

3: Into Public Ownership

At an Extraordinary General Meeting on 19 November 1919, it was confirmed that the Maidstone company would be reconstructed as Tilling-Stevens Motors Limited in anticipation of brisk business following the end of the war. The new company then ceased to be a directly owned subsidiary of Tilling when it was floated on the Stock Exchange on 27 November 1919. The share capital was £650,000, with Richard Tilling and Percy Frost Smith being among the directors, the latter being, in the words of a contemporary employee 'at all times unpredictable'.

Contrary to anticipated post war business expansion, the middle of 1920 saw the beginnings of a national and international economic slump that persisted for several succeeding years. Materials and equipment bought at premium wartime prices suffered severe falls in value and had to be written down. This affected all the firms in the motor manufacturing industry particularly badly, but the difficulties were compounded by the availability of cheap, war surplus vehicles now flooding the market which resulted in orders for new production being seriously curtailed. Tilling-Stevens, like other manufacturers, managed to recoup some costs by emergency price increases in its products, but the prevailing national economic situation did not offer an auspicious start to the upgraded vehicle ranges of the new company.

The TS4 model introduced at the October 1920 Olympia Show and offered from 1921 onwards for haulage and provincial bus operation was a heavier duty, normal control design for 4/5 ton loads or up to 50 passengers. Visually the more powerful TS4 usually had a higher bonnet level than the TS3. The TTA2 6.4 litre engine was initially the power unit for this chassis, but the stroke of this engine design was later lengthened to 6 ins increasing the capacity to 6.97 litres, still rated under the inaccurate RAC system at 40/50 hp. This new engine was fitted with Ricardo designed cylinder heads, cylinders and alloy pistons. The Tylor JB4 engine, which Tilling-Stevens had produced under military contracts during the war and continued to make for a few years after 1922 was optional in the TS4, particularly for fire appliances. This engine had a bore and stroke of 5ins and 6ins respectively, giving a capacity of 7.72 litres. The TS4 was a versatile model, with the option of petrol electric or, as the TSB4, with geared transmission. A forward control variant was produced in small numbers until superseded by the TS6, though the new, more economical TS3A became the popular contemporary choice for UK provincial and overseas bus operators.

To minimise maintenance and spares complications, the British armed forces had not favoured the petrol electric system in the front line. Many mechanically geared buses in Britain were appropriated by the military for troop transport, sometimes being replaced in the home market by Tilling-Stevens petrol electrics. Between 1914 and 1918, in addition

to the geared machines, the Maidstone firm produced around 300 petrol electric TS3 lorries for the War Office, which were used in support roles and as searchlight generators on the home front. In 1920, thirty one of these petrol electric lorries went on to contribute another facet to the early bus scene. They were bought by the Birmingham and Midland Omnibus Company, already operators of Tilling-Stevens petrol electric buses, whose Chief Engineer, Mr L.G. Wyndham Shire used the chassis as the basis for development. Experiments with conventional clutches and gearboxes ultimately metamorphosed into the earliest examples of the BMMO SOS breed. Initially, there was some suspicion at Tilling-Stevens concerning BMMO's manufacturing objectives, but ultimately there was an exchange of information between Birmingham and Maidstone to the benefit of both parties. For a while thereafter, new SOS buses were built on Tilling-Stevens chassis frames. In a letter to Commercial Motor dated 19 November 1948, Mr F. J. Hughes of Tilling-Stevens acknowledged that the experience gained in these early SOS projects greatly influenced the design of the highly successful B9/B10 series of 1926 onwards. (Incidentally, that same letters page includes sundry offerings from correspondents of the meaning of the initials "SOS" - Shire's Own Specification, Science Over Strength, Shire's Own Special, Shire's Orthodox System. Another theory suggested that it arose from the invasion of "pirate" operators in the territory of Midland Red - an "SOS" went out to Tilling-Stevens for a suitable mechanically driven machine. The debate remains unresolved to this day.)

1921 was a very bad year economically, and manufacturers in all industries suffered severely. During the 1919-1921 period Britain's GDP fell by over 20%, and by 8.1% in 1921 alone, figures that were not approached again until the financial crisis of the year 2008. To preserve its existence in such a hostile economic climate, Tilling-Stevens secured a bank loan of £115,000 that was not finally repaid until 1929.

To complement the company's fire engine activities, the turntable ladder and fire escape business of the Weybridge Engineering Company was purchased in January 1921, but the situation at Tilling-Stevens continued to deteriorate. In the summer of 1920 the workforce had numbered around 2000 but in March 1921 the entire works was closed temporarily and the then much diminished workforce of 150 laid off. The staff were invited to return under reduced pay conditions and work resumed, but trading continued to be difficult. By May of the year the national economic situation had begun to stabilise enabling Tilling-Stevens to offer its vehicles at consolidated prices. The company reported a loss of £148,212 for the year 1921, equivalent to £9.3 million today. Matters recovered somewhat by the following year, when a trading profit of £34,779 (roughly £2.5 million today) was posted. When set against accrued losses and liabilities, the final figure was a loss of £143,522.

The TS3 type chassis did not comply with the Metropolitan Police Public Carriage Office criteria and the improved Tilling-Stevens TS3A of reduced

weight acceptable for London operations appeared around June 1921. The TS3A had a new engine with Ricardo designed cylinder heads, cylinders and alloy pistons with the same bore but a shorter stroke than that of the 6.4 litre TTA2 and TS3, but was still rated at 40 hp from a lesser capacity of 5.7 litres. For London operations it took advantage of the relaxed Met Police regulations then prevailing, enabling 48 passengers to be accommodated within its normal control layout. The contemporary forward control AEC K type carried only 46 passengers, though its successor, the new S type, could accommodate 54 . From 1921 Thomas Tilling entirely replaced the TTA1 with the TS3A in its London and Brighton fleets, and the model became popular with other operators, notably companies in the Tilling/BAT group. The TTA1 buses released from London by the new TS3A fleet were dispersed to other operators with Tilling connections throughout the country, and some lasted until 1925, surely a remarkable achievement for a pioneer 1911 omnibus design.

A contemporary design from mid 1921 was the normal control straight frame TS5 which used an updated version of the TTA1 4.3 litre engine and was rated for 2 ton loads or 20/25 seat bus bodies. It had a low bonnet, and the small radiator lacked the 'Petrol Electric' wording cast at the base.

Despite the post recession handicaps of adverse rates of exchange together with the imposition of import tariffs by a number of overseas countries, matters improved gradually as the year 1922 progressed, and

Tilling-Stevens began to achieve success in export markets, notably in Spain where Barcelona and Madrid took significant orders.

Percy Frost Smith, whose health had been suspect between 1915 and 1918, parted company with the Tilling Group and with Tilling-Stevens Motors Limited on 7 September 1921. Perhaps health issues influenced his move, but he then embarked on a career as a transport consultant, and, jointly with Mr Philip Victor Powell, formerly the Tilling group Chief Electrical Engineer, as a vehicle designer. The fruits of these endeavours ultimately emerged as the straight frame F.S. Petrol Electric double deck omnibus offered for the burgeoning independent or "pirate" market in London. Frost Smith, became only the third independent, or 'pirate', to begin operations in the capital. He ran his PETROL F.S. ELECTRIC fleet from Railway Arch No 192 in Hercules Road, Lambeth from 12 November 1922, emulating the "pirate" practice of switching his routes frequently to maximise fares income. Unfortunately fellow "pirates" proved to be unconvinced by his design. Despite employing well proven components such as four cylinder 6.23 litres White & Poppe engines developing 40hp at 1,000 rpm, and Kirkstall/David Brown transmission units, the mere six examples constructed proved woefully unreliable. Furthermore, the heyday of unregulated independent bus operation in London was drawing to a close, soon to be transformed by much greater control.

Frustrated by the anarchic situation prevailing on the roads of the



Percy Frost-Smith's fleet of F-S buses, despite employing well proven components such as four cylinder 6.23 litres White & Poppe engines developing 40hp at 1,000 rpm, the six examples constructed proved woefully unreliable. (LTHL collection).

capital, the Metropolitan Police pressed for legislation, and the London Traffic Act, administered by Chief Constable A. E. Bassom, came into force on 1 October 1924. Amongst its provisions it enabled any thoroughfare within the City of London and the Metropolitan Police District to be declared a 'restricted street' upon which no additional omnibuses other than those operating on the 1 January 1925 could be introduced. This gave established operators, notably the LGOC, effective monopoly over much of London, and most of the pirates sold out or collapsed within a short time. With future revenue seeking opportunities now severely constrained, and with no further production in sight, the F.S. Petrol Electric Omnibus Company was declared bankrupt on 1 December 1924. The health of Percy Frost Smith declined rapidly under the strain, and he was diagnosed with cancer. On the 24 December 1924 he passed away at the early age of 48. It is recorded that the wife and children of this once influential man were left destitute and had to be rescued by means of a public appeal set up by Wilfred James Sharp of the Maidstone confectionary manufacturer, Edward Sharp and Sons Ltd.

The straight frame TS6, which, being intended for provincial use, was not subject to the very restrictive Met Police specifications for service in London, appeared in the early summer of 1923. This was a forward control machine for 5 ton loads/up to 64 passengers, and was powered by the 5.7 litre engine of the TS3A, though the 6.97 litre 50 hp engine was listed as an option. One version of the TS6 was constructed with a dropped frame,



A Southdown Motor Services Tilling-Stevens TS6. The TS6 was a forward control machine of 1921 for 5 ton loads/up to 64 passengers, and was usually powered by the 5.7 litre engine of the TS3A. (LTHL collection).

but the front part of the saloon floor of the Beadle 30 or 31 seat (trade reports vary) centre entrance body was raised to permit the necessary ground clearance for the bulky electric dynamo transmission units. Three such buses, variously termed the TS6A or semi low loading LL type, were supplied to Maidstone Corporation in 1926, and were withdrawn between 1934 and 1936.

The forward control, straight frame TS7 of 1923 was essentially the TS6 adapted to meet the conditions specified by the Met Police Public Carriage Office to permit its operation in London. It retained the 5.7 litre 4 cylinder engine of the TS3A and TS6 models and was designed for 4 ton loads or up to 64 passengers, though the lower capacity figure of 48 was adopted for London. A provincial version was also available, ten being exported in 1923 to Barcelona, and, in 1924, fifty examples of this type went to the General Bus Company in Shanghai, but both domestic and overseas sales otherwise were minimal.

The TS7 became the next standard bus in the London Tilling fleet which amassed a total of 166 double deckers and 12 single deckers in 1923/4 to complement the existing TS3A London fleet. These TS7s were purchased by the LGOC but operated by Tilling. The 026/22R open top double deck bodies were built by Tilling at Lewisham and Lee. The 12 single deckers had B30R bodies also constructed by Tilling, and were used on the Penge - Chislehurst route 109 (later the 227) which went under a low bridge at

Shortlands. These single deckers were erroneously described as TS6 types in Commercial Motor dated 3 November 1925. The Tilling London TS7 fleet was progressively displaced by ST type AEC Regents from 1930, and when the London Passenger Transport Board was formed on 1 July 1933 it subsumed the Tilling operations from October of that year. By that time just forty five TS7s remained. The single deckers were replaced earlier by AEC Regents in the autumn of 1932 and all the remaining TS7s were gone from London passenger service by the end of January 1934.

In Argentina, the provision of bus services in Buenos Aires was initially in the hands of 'Colectivos' running small buses based on private car chassis, but a fleet of forty Tilling-Stevens petrol electrics was also introduced into the city around 1925.

By 1924 Tilling-Stevens was offering five petrol electric models - TS3A, TS4, TS5, TS6 and TS7, and mechanically driven variants also, though there was a high degree of commonality of components.

Between 1922 and 1924, Midland Red converted 56 TS3 chassis to forward control layout and equipped them with front entrance open top 022/29F double deck bodies for busy town routes. The class was called the FS for 'forward steering', and the engines were fitted with Ricardo's latest type of side valve cylinder heads, cylinders and alloy pistons. The Tilling-Stevens factory certainly had a hand in this redesign (known as

'forward dash' rather than 'forward control' at that time) as it classified such vehicles as TS3Z/Birmingham type. Proving to be less than successful in service, these double deckers were all withdrawn in 1928 and 1929. Midland Red did not return to the double decker until the advent of the DDRE (often wrongly called the REDD) in 1931.

The cranked chassis frame AEC NS type, with a floor level some 11½ inches lower than that achievable with earlier UK bus designs, appeared from 1922. On solid tyres, the rear loading platform was just 14½ inches above the roadway, and access to the lower saloon was achieved by a further step of 11 inches. This floor height of 2ft 1½ ins could not be matched by contemporary Tilling-Stevens petrol electric buses which employed a higher, straight frame to accommodate the bulky dynamo and motor beneath the saloon floor. The laden floor height of the TS7 on solid tyres was 2ft 8ins. The subsequent conversion of twenty five examples to pneumatic tyres raised the height further. Consequently the Maidstone company's petrol electric products of the time always looked rather antiquated against their market competitors.

In the early 1920s the fire appliance range was given the classification TSF, with a suffix number indicating the maximum load.

The Maidstone company dabbled in the single deck trolleybus market during the 1920s. Tilling-Stevens trolleybuses were given the classification RC

for "Railless Car", but this was not always applied. The best trolleybus customer was Wolverhampton Corporation which took thirty two between 1923 and 1926, all with centre entrance Christopher Dodson bodywork for the first stage of a tramway replacement scheme. These were based upon the TS6 chassis in which the engine and dynamo were replaced by BTH electrical equipment. All were withdrawn in 1934. Beyond these, trolleybus sales were poor. Halifax bought an RC2 and fitted its own 26 seat front entrance body in 1924. It is recorded to have performed very successfully in service, and was certainly superior to its Halifax trolleybus stablemates, two ex Dundee Railless machines. Sadly, the atrocious state of the roadway led to the early abandonment of the solitary trolleybus route between Pellon and Wainstalls in 1926.

In 1924, Tilling-Stevens came up with a petrol electric trolleybus, the PERC1, said to be designed by Mr J. B. Parker of the Teesside Railless Traction Board. Based on the TS3A, it was offered as a solution to the problem of feeder services to a trolleybus network. Once the vehicle had linked up with the main system, it would connect to the overhead supply and operate as a normal trolleybus. When it reached the outer terminus the engine could be started from the overhead electricity supply and the bus would then run onward independently as a petrol electric. Originally of normal control layout with a Roe B26F body, it was later rebuilt to forward control and B32F configuration. This unique vehicle remained in the Teesside Railless Traction Board fleet until 1936. A later



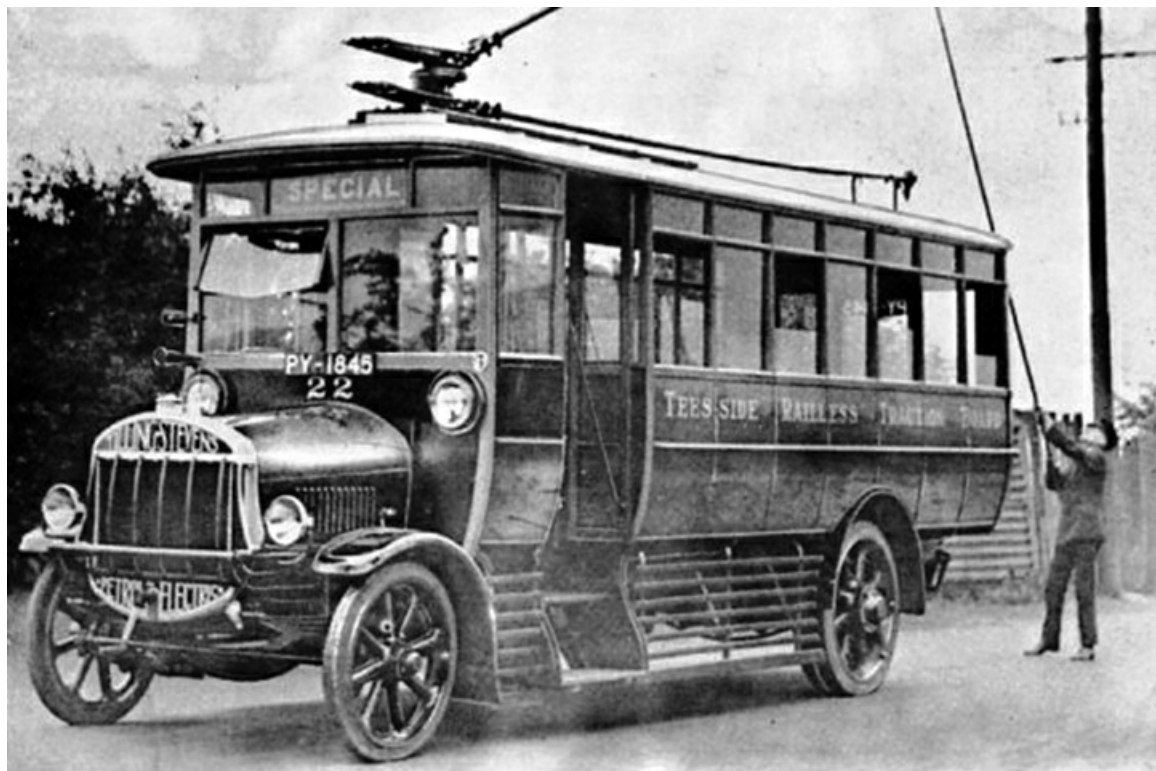
Tilling-Stevens' best trolleybus customer was Wolverhampton Corporation which took thirty two between 1923 and 1926, all with Dodson bodywork based upon the TS6 chassis in which the engine and dynamo were replaced by BTH electrical equipment. (LTHL collection).

development embodying the principles of the 1924 PERC1 emerged as a normal control petrol electric trolleybus based on the TS17A chassis, which was supplied to Turin, Italy, in 1931.

The only other trolleybus sold by Tilling-Stevens to a UK operator went to Ipswich Corporation in 1925. This had a 30 seat front entrance body by the local firm of Ransomes, Sims & Jeffries, which then became the preferred supplier of trolleybus chassis to Ipswich for several years afterwards. Surprisingly, Maidstone Corporation, which was replacing its tram network with trolleybuses from the early 1930s, did not take any Tilling-Stevens trolleybuses, though it did buy petrol electric and geared buses from the Maidstone based manufacturer.

In 1924 the Tilling-Stevens company concluded arrangements with Skoda in Czechoslovakia whereby the vehicles were marketed throughout Eastern Europe under the name of Skoda Tilling-Stevens. A similar agreement was made the following year in America with the Gray Motor Corporation which enabled Gray to obtain exclusive manufacturing rights for the Stevens electrical equipment in the USA.

Towards the end of 1925, the Tilling Group board stated that, "It was undesirable for the Company to be financially interested in the motor manufacturing trade, and it had therefore taken the decision that Thomas Tilling would cease to hold shares or be financially interested in any



In 1924, Tilling-Stevens came up with a petrol electric trolleybus, the PERC1, said to be designed by Mr J. B. Parker of the Tees-side Railless Traction Board. (LTHL collection).

company engaged in that trade, or be represented on the boards of any such companies. Accordingly, Thomas Tilling company had disposed of all the shares held until recently in Tilling-Stevens Motors”.

This announcement, which was reported in the 17 November 1925 issue of Commercial Motor, is of interest in two respects. Firstly, it runs counter to the widely held belief that the Tilling Group disposed of its Tilling-Stevens holding in 1930. Secondly, this stated view of the Group policy was completely reversed when Tilling/British Automobile Traction, together with the LNER, took over United Automobile Services in 1929, This purchase brought with it “The Coach Factory” of Lowestoft (later Eastern Coach Works) into the Tilling/BAT fold. However, in 1925, Richard Tilling was still in charge, and remained as Chairman until his death in 1929 at the age of 78. The abrasive J.F. Heaton was then elected Chairman of the Tilling Group, and most of the remaining Tilling family members resigned from the board in protest. (Alan Townsin has described Heaton as “a control freak”.)

The previous management team of United had already taken a vehicle purchasing decision that was to prove of major significance to the future of Tilling-Stevens. By 1928 the sales of Bristol chassis had dropped to a very low level, a reflection upon the economic circumstances of the time rather than the quality of the product, and the future of the Bristol manufacturing arm was seriously in doubt. The appointment in 1928 of B.V.

Smith, who had been trained at Bristol Tramways, as United Automobile's Chief Engineer led to the placing of an order late in that year for 130 examples of the Bristol 'B' type. This was the biggest single order that Bristol had ever received, and it undoubtedly saved the struggling company. The subsequent 1929 Tilling/BAT and LNER acquisition of United Automobile was pushed through by Heaton. Indeed, the BET directors of TBAT were far from convinced, ultimately conceding rather than endorsing the takeover. The United acquisition brought with it the Lowestoft coachbuilding activity, but the purchase of the Bristol business came about in a rather more complex manner. The Great Western Railway had eyed the local bus transport scene in Bristol for some time and wished to take a financial stake, but lacked the statutory power to operate tramways or taxis. Instead, the takeover of the Bristol Tramways & Carriage Company, together with its vehicle manufacturing arm, was effected in 1931 through the Tilling/GWR jointly owned much smaller Western National business, a latter day instance of David subordinating Goliath. The progressive transfer of Tilling engineering allegiance from Tilling-Stevens to Bristol took several years to establish, but ultimately it dramatically affected the futures of both manufacturers, the first for ill, the other for good. For a few years Tilling-Stevens continued to fulfil outstanding orders with TBAT operators, but, by the later 1930s, in Tilling controlled companies and in those TBAT operations where J.F. Heaton could exert his influence, the Tilling group had switched its purchasing preferences to Bristol.

Petrol electric vehicles were more expensive to buy than the contemporary geared machines from competitors, and the type number B8 (retaining the earlier 'B' classification for geared chassis adopted for the one and two ton lorries) seems to have been allocated to a prototype 30 cwt passenger design around the year 1925. This employed a sleeve valve power unit driving through a Wilson epicyclic gearbox, which, rather ironically, given the earlier dispute in respect of the KPL double decker, indicates the employment of a Daimler engine.

This B8 project was not pursued, and to broaden the appeal of the Maidstone products, the next Tilling-Stevens passenger type to appear from 1926 was the mechanically geared B9 with conventional engine, clutch and gearbox, though a few early examples did have the preselective transmission with drive taken up by the gearbox brake bands. This new chassis, intended for single deck bodywork, had a straight frame, the forward and normal control versions being classified B9A or B9B respectively. Rather optimistically, this modestly powered 63 bhp chassis was given the name 'Express'.

In the year 1927 Tilling-Stevens suspended the production of fire fighting vehicles and associated equipment believing that the limited market opportunities did not justify the expenditure of labour and other resources. (Eighty years later, Dennis of Guildford, the esteemed manufacturer of advanced fire fighting vehicles, finally came to the same

decision, and the last Dennis Sabre came off the production line in 2007.)

By 1928 further development of the Express chassis led to the dropped frame B10A and B10B, and these became the most commercially successful Tilling Stevens types after the initial heyday of petrol electric operation. All variants of the B9 and B10 were powered by a 5.12 litre four cylinder petrol engine with a three bearing crankshaft designed by Harry Ricardo, who had researched methods of improving the gas flow characteristics of side valve engines. Ricardo (surely optimistically) claimed that his new engine delivered an efficiency of 97% yielding a nationwide average fuel consumption figure of 9 mpg. Power output was initially 63 bhp, but this was progressively uprated to around 75 bhp in later years. The engine drove via a single plate clutch into a four speed gearbox, and thence to an underslung worm rear axle. Initially the B10 had brakes on the rear wheels only. Subsequent chassis variations were designated B10A2, B10C2 (respectively 15ft 6ins and 17ft wheelbases) and B10D2, reflecting customer choices and the increases in permitted dimensions and weights from 1931. A 4 ton haulage version with a 12ft 8ins wheelbase was offered with an updated version of the 6.39 litre engine that had first appeared in the TTA2. Some 2000 B9/B10 machines had been sold at home and overseas by the mid 1930s. An East Surrey B10A2 chassis of 1928 was fitted with a Short Bros lightweight metal framed 024/22R double deck body, and operated successfully for some years, though no more were purchased; East Surrey's financial and operating ties

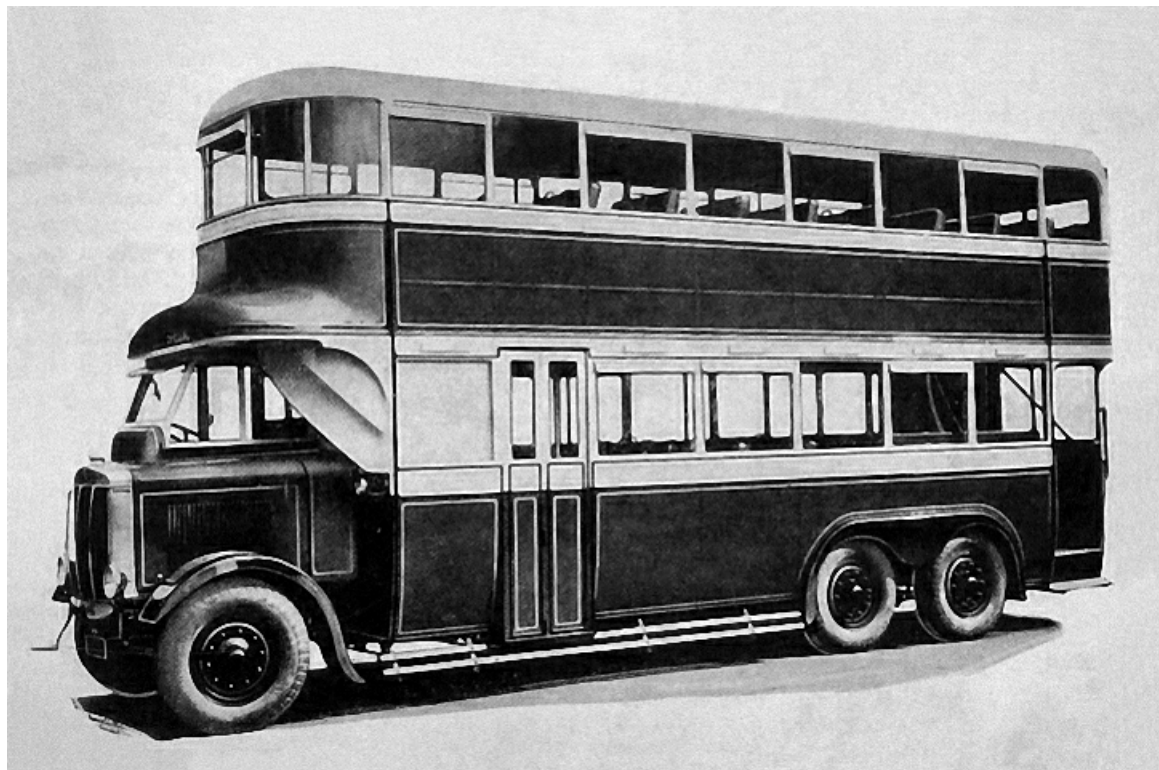


North Western B10A2, one of the lower framed B10A and B10B chassis that became the most commercially successful Tilling Stevens types. Some 2000 B9/B10 machines had been sold at home and overseas by the mid-1930's. (LTHL collection).

with the LGOC increasingly balanced engineering preferences in favour of AEC.

In the year 1928, the High Court ruled that the petrol electric vehicle was classified as an electric machine and thus taxable at half the rate of a vehicle with a conventional transmission. This should have proved a fillip to petrol electric sales, but the ruling was overturned in 1929 on the grounds that a petrol electric vehicle was just as heavy as a mechanically driven petrol vehicle and caused equal damage to the road surfaces.

For Tilling-Stevens the B10 was a major commercial success, but the Maidstone firm persevered with the petrol electric system. Though being doubtful of the continued market opportunities for the six wheeler, in 1927 Tilling-Stevens offered a new forward control three axle petrol electric double deck chassis, the TS15A. (What happened to the model numbers 11 to 14 inclusive, one wonders?) The Commercial Motor magazine of 27 October of that year declared that a conventional mechanical transmission variant was also contemplated, but this never emerged. Development had enabled the electrical components to be of reduced physical size and a dropped chassis frame was adopted. The Ricardo redesigned four cylinder engine of 6.97 litres was now rated at 95 bhp at 2000 rpm, and the drive line carefully positioned the electric motor and dynamo to allow the lowest possible floor level. To offset the weight



No more than two examples of the TS15A appear to have been constructed. This is the twin doorway and staircase Massey-bodied chassis operated by the Merseyside Touring Company, Liverpool in 1929. (LTHL collection).

penalty of the electrical components and keep the entire vehicle within the very constraining overall weight limitations of the time, elektron was employed for engine crankcase, cab floorboards and other non stressed parts. By that time, however, the days of the six wheeler outside London were effectively over and no more than two appear to have been constructed. The first one entered service in 1929 with Wolverhampton Corporation fitted with a Dodson H34/32R body. The other, carrying a curious twin doorway and staircase H35/29D body by Massey, was operated from September 1929 by the Merseyside Touring Company of Islington, Liverpool, which ran a service between Bootle and Liverpool.

The Chivers jam making company of Histon, Cambridge, used secondhand Tilling-Stevens buses for staff transport, and bought others that it converted into delivery vehicles, probably with the help of the Maidstone factory. One remarkable conversion was that of a TS3 delivery van, which, in 1926, became a six wheeled double deck bus, bodied by Chivers themselves, that had a capacity for 89 passengers. This bus fell foul of the Construction and Use Regulations of 1930, and it was subsequently rebuilt as a lorry. Chivers also bought a number of Tilling-Stevens double deckers from North Western in 1930, and converted them into six wheeled dropside lorries. The picture of DB 5078 on the internet has an erroneous caption that describes the vehicle as a conversion from a TS5, which was a 2 ton normal control model for 20/25 seat passenger bodywork. These forward control lorries were rebuilt from TS6 double deckers. However,



One of the Chivers conversions that could only have been undertaken in close co-operation with the Tilling-Stevens factory, and it is probable that the extensive reconstruction incorporated features adopted earlier in the six wheel TS15A design of 1928. (LTHL collection).

in addition to the third axle configuration, the front end structure of these machines indicates that substantial reconstruction of the original TS6 chassis took place. These lorries were pioneers also in being powered by Gardner 5L2 oil engines delivering 62 bhp at 1300 rpm - perhaps that is how the 'TS5' misapprehension arose - but the petrol electric transmissions must have been upgraded to cope with the heavier loadings. These remarkable Chivers engineering conversions could only have been undertaken in close co-operation with the Tilling-Stevens factory, and it is likely that the extensive reconstruction incorporated features from the six wheeled TS15A design of 1927.

The company's final passenger petrol electric offering emerged as the dropped frame TS17A, essentially a two axle version of the TS15A. Probably to mollify the Met Police, brakes were fitted initially to the rear wheels only. It was available in single or double deck form, and a 52 seat double deck example was displayed at the 1929 Olympia show. The new chassis retained the 6.97 litre engine used in the TS15A and inherited the same low drive line. A loaded frame height of 2ft was claimed, three inches higher than an AEC Regent. The Gardner 4L2 was listed as an engine option, but there is no record of such an installation, and the weight of the heavier diesel engine in conjunction with the dynamo might well have proved critical for London operation. A 16ft wheelbase 52 seat covered top double deck TS17A was operated experimentally by Thomas Tilling in London from 18 May 1929, a second example following shortly afterwards,



Tilling-Stevens' last passenger petrol electric offering emerged as the dropped frame TS17A, essentially a two axle version of the TS15A. Two 16 ft wheelbase double deck examples were operated experimentally in 1930 by Thomas Tilling in London. (LTHL collection).

whilst a third open top example was tried out simultaneously in Brighton. All three were withdrawn by December 1929, the bodies being removed and fitted to AEC Regents, the petrol electric chassis being returned to Tilling-Stevens at Maidstone. The archaic appearance of the TS17A when compared with its contemporaries from AEC and Leyland powered by modern, overhead valve six cylinder engines, is striking. By that time the London operations and commercial practices of Thomas Tilling were closely bound with those of the LGOC, and the subsequent rejection of the TS17A by the Tilling group in favour of the AEC Regent was surely unsurprising. Perhaps the resolute indifference of the Tilling group towards the TS17A provoked a deep disenchantment with the Tilling name that led to the renaming of the company in the following year. The ultimately futile development of the TS15A and TS17A in a vain hope of a resurgence in the petrol electric concept for passenger vehicles, had proved to be extremely costly and wasteful of time for the company, and meaningful sales failed to materialise. Douglas Corporation, a convinced operator of petrol electrics, took seven 16ft wheelbase TS17A single deckers with Northern Counties B34R bodies in 1930. These, however were the last Tilling-Stevens machines to arrive in that fleet, and, rather surprisingly, they were withdrawn by 1945, whereas most of the older TS6 buses lasted until 1949. Another customer was Widnes Corporation which took just one Massey bodied H52R double deck TS17A in July 1929, the last of a long line of Tilling-Stevens petrol electric buses in the fleet that began with its first TS3 in 1914. This was the first double decker in the Widnes fleet

since the initial Commer four double deck motor buses of 1909. The Widnes TS17A was withdrawn in 1937.

4: The T. S. Motors Era

From August 1930, the firm began calling itself T. S. Motors Limited, branded as T.S.M. on vehicle radiators, and gave the following reasons:-

(1) To remove the lingering impression that our products are confined to the manufacture of petrol electric vehicles.

(2) To emphasize that the operating company bearing an almost similar name has no financial or other interest in our company, and such support as we receive has depended and is dependent on the merits of the Express gear-driven chassis.

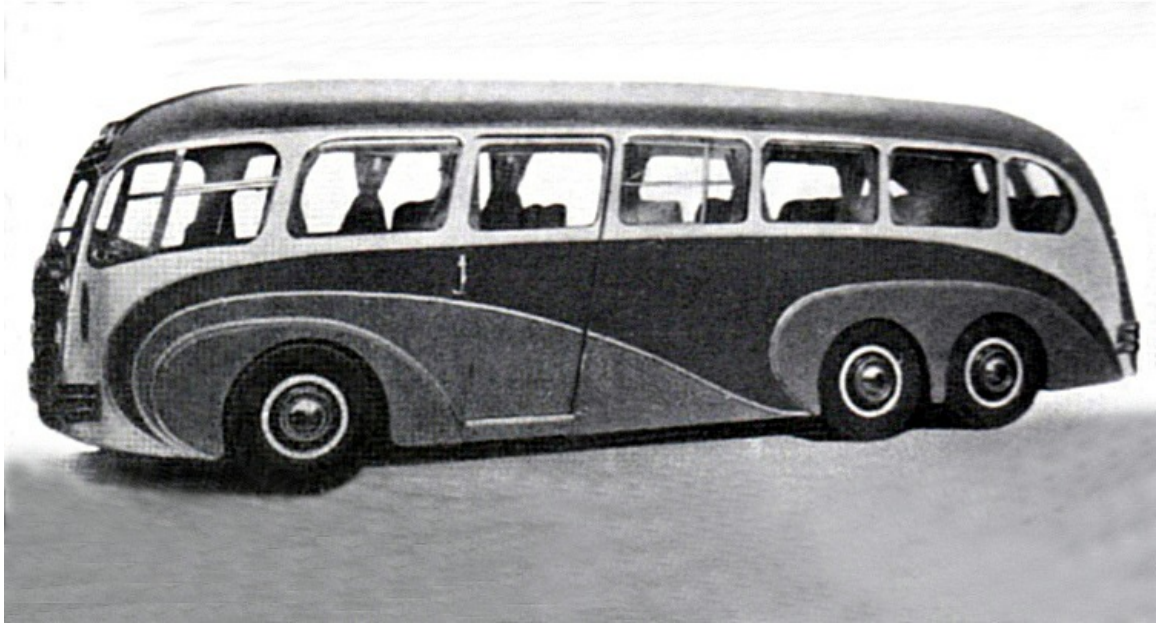
(3) To assure Government, railway and municipal authorities that when purchasing our passenger-carrying vehicles they do not support in any way their competitors, since we have no financial or other interest in any operating company or group of operating companies, nor are we ever likely to adopt such a policy.

(4) To enable the representatives of our manufacturing competitors to refrain from supporting tacitly or otherwise any contrary statement which may be made.

Right up to the commencement of the 1930s Tilling-Stevens/T.S.M. retained the decidedly dated radiator shape that gave the appearance of a much older design than those offered by its competitors. At last, well overdue, a much more modern front end was progressively adopted for most models

from about 1931.

With oil engines becoming of increasing interest to operators, Tilling-Stevens/TSM experimented with Gardner L2 engines in petrol electric chassis, and undoubtedly had much involvement in the 5L2 powered six wheel conversions into lorries of the ex TS6 North Western buses for the Chivers company. The 4L2 diesel option, along with the usual petrol alternatives, was offered in a four ton mechanically driven lorry, the first Maidstone built chassis specifically designed for haulage duties, though it was fundamentally derived from the flat framed chassis of the B9A and generally sold with the updated 6.39 litre engine. Previously all haulage models from the Maidstone factory had been adaptations of standard passenger carrying designs. The Gardner L2 engine was used by a number of contemporary chassis makers for pioneer diesel applications, though, being a maritime power plant, its relatively high weight and low governed speed - 1300 rpm for automotive applications - meant that it was not ideally suited to the task. A B10A was shown with a 4L2 engine at the 1930 Municipal Tramways and Transport Association Meeting in Manchester. The higher speed, lightweight development of the L2 range, the legendary LW series, emerged from Patricroft in 1931. In that year twenty five B10A2 chassis fitted with the 4LW engine were exported to the General Bus Company in Shanghai to be fitted with locally built single deck bodies. Remarkably, several of these were later converted into three axle double deckers. Other export orders were obtained from the Durban and



Tilling-Stevens astonished the market at the 1937 Commercial Motor Show by displaying this six wheel passenger chassis called the Successor. This had a 7.45 litre, 110 bhp, horizontally opposed, wet liner, direct injection, eight-cylinder oil engine with a five bearing crankshaft and integral balance weights. (LTHL collection).

Johannesburg municipalities in South Africa.

The Bill of 1931 creating the London Passenger Transport Board in 1933 saw the end of the Underground group ownership of AEC which then became a separate manufacturing concern in its own right. Within T.S.M there were hopes of a revival of petrol electric interest from the new London bus operator, to no avail. The LPTB was effectively a continuation of the LGOC in terms of management and commercial outlook.

In 1932 a B10 was exhibited at the Glasgow Motor Show with an early form of the Salerni fluid coupling between the engine and the gearbox. This did not attract a great deal of interest, though the Italian inventor, Piero M. Salerni, continued with designs for a fully automatic transmission right up to the start of WW2. A non Fascist with a British wife, Salerni spent much of his life in Britain, and worked for the Ministry of Aircraft Production during WW2 until intransigent officialdom ordered his arrest as an alien on 10 June 1940. Even Beaverbrook's Ministry could not effect his release. Together with other Italian and German internees and some German prisoners of war, Salerni was despatched from Liverpool destined for Canada on the liner Arandora Star. On 2 July 1940 the ship was torpedoed by U47, and sank with the loss of 805 lives, most of whom were the Italians and Germans being detained in the lower decks. Sadly, Piero Salerni was one of them. The Salerni transmission principles were adopted by Brockhouse Engineering of Southport who

marketed the device in the later 1940s as the Turbo Transmitter, notably in Crossley buses.

From 1931 the permissible maximum dimensions and laden weights for psvs were raised; double deckers were increased in length from 25ft to 26ft, and single deckers from 26ft to 27ft 6ins. The T.S.M. model numbering scheme became rather more complicated. Petrol electric designs retained the TS nomenclature, but mechanically geared machines adopted the following codes.

First letter = Model type. The letter 'B', being already in use, was incorporated into the new scheme. Subsequent letters from 'C' were used in alphabetical sequence.

Second group = Engine power (petrol) or manufacturer / no. of cylinders (diesel). The petrol engine codes were:

'60' for the new 95 bhp @ 2,000 rpm or 109 bhp @ 2,500 rpm 6.8 litre six cylinder unit. '49' for the 106 bhp 6.97 litre and '39' for the 63/75 bhp 5.12 litre four cylinder units.

These were all side valve engines embodying Ricardo principles. Ricardo seemingly had a belief in reducing the number of crankshaft bearings to a minimum. His very successful 5.12 litre engine design of the B9/B10 had just three crankshaft bearings instead of the conventional five in a four

cylinder unit, and he extended this precept to the new six cylinder design. This had just four crankshaft bearings whereas most manufacturers employed seven. The limited market reception towards the T.S.M. models powered by the B60 six cylinder engine suggested that operators remained unconvinced..

Diesel engines were given a figure for the number of cylinders followed by a code letter denoting the manufacturer - L for Gardner, M for Meadows, P for Perkins.

Third letter = Driving position. A was the letter for forward control. B denoted normal control. Later production forward control B10s had the suffix letter 'A' followed by the figure 2. Subsequent options incorporated the letters 'C' or 'D' in place of 'A' which meant a chassis specification variation, not the driving position.

Fourth number = Wheelbase. 3 meant a wheelbase of 12ft. 8ins, 4 around 13 to 14ft 6ins, 6 the double deck figure of around 15½ to 16ft, 7 for around 17 to 17½ft, and 8 for 18ft 7½ ins.

Accurate details of all the models produced in the 1930s are difficult to establish, but some examples are given below. In truth, sales were limited, and it is likely that several options did not exist outside the catalogue.

B39A7 and B49A7; updated versions of the B10 Express types offered from 1932. The figure '39' indicated the basic 5.12 litre Ricardo four cylinder engine which, by that time, gave 74 bhp. The '49' engine was the four cylinder 6.97 litre unit used in the TS17A petrol electric. As with the older B10 classification, some variants had 'C' or 'D' suffixes. Gardner diesel engines were offered as options. The B type was replaced by the modernised HA type in 1935 (see below).

C60A7; 1931-1935. This new 17ft wheelbase saloon type with the Ricardo designed B60 6.8 litre six cylinder side valve petrol engine was introduced to compete with the Regal and the Tiger. Set against such powerful market competition, sales were modest. A C6LA7 Gardner powered variant was offered. Maidstone Corporation took four examples of the C60 type in 1932/3, the last Tilling-Stevens machines to enter its fleet, but these were powered by Crossley VR6 47/99 oil engines. Six examples of the same type with Crossley engines were supplied to the General Omnibus Company in Hong Kong.

D60A6 and D60A7; 1931-1935. Double and single deck models for 52 and 36 seat bodies powered by the B60 petrol engine, with wheelbases of 16ft 1in and 17 ft respectively. D6LA6/D6LA7 and D5LA6/D5LA7 with the Gardner 6LW or 5LW engine were also listed.

E60A6; A variant of the D type double decker with the same engine and

transmission. E6LA6/E6LA7 and E5LA6/E5LA7 options were again listed. T.S.M. having by then lost its preferred position with the Tilling group, and facing powerful competition from the Regent and the Titan, the D/E type double deck models were not a commercial success, only 29 double deck examples being constructed in total.

F; The fire engine ranges were given the 'F' suffix from the 1920s.

GG; In 1931, in collaboration with Carter Paterson, the company designed a 2 ton delivery machine, wryly coded GG as an allusion to its suitability for horse drawn delivery van replacement. The 1.2 litre engine and four speed gearbox unit was mounted vertically amidships beneath the floor of the chassis behind a very low entry cab, wherein the driver controlled the vehicle from a standing position.

HA39A7; 1935-1939. Single deck 7 ton chassis with a 17ft wheelbase, a modernised development of the proven B type. This was promoted as the 'New Express' for 32-39 seat bodies with an updated version of the 5.12 litre four cylinder petrol engine, now rated at 74 bhp at 2,100 rpm. The less common HA49A7 was a more powerful model using a development of the 6.97 litre engine that had been fitted to the TS17A. HA5LA4 and HA4LA7 options with the Gardner 5LW and 4LW respectively were also listed. An 8 ton goods version with a 14ft 6ins wheelbase was classified HA39C4, with the 6.97 litre engine being an option in the HA49C4. By the mid 1930s,



A 1936 HA39A7 model, a single deck 7 ton chassis, that was an updated development of the proven B type. This was promoted as the 'New Express' for 32-39 seat bodies with the 5.12 litre four cylinder petrol engine, rated at 74 bhp at 2,100 rpm. (LTHL collection).

the significant competitors in the four cylinder passenger saloon market were the Dennis Lancet and the updated Leyland Lion.

J5LA7; 1935-1937. Single deck chassis for 36 seat bodies with the Gardner 5LW, the gearbox being in unit with the engine. Only two were constructed.

H5LA4; 1938-1942. Short wheelbase chassis developed from and essentially similar to the J type.

Another haulage model was offered from 1935, a light 3-4 ton goods model with the name 'Merlin'. With an unladen weight of 2½ tons, this was assembled almost entirely from existing and proprietary parts, and was powered by a Hercules engine sourced from the USA.

During the 1930s, the T.S.M. passenger carrying and haulage designs suffered severe competition from advanced models produced by other manufacturers, notably AEC, Daimler, Dennis and Leyland. In 1932 the company introduced the B4LC3 4 ton goods chassis powered by the then new Gardner 4LW, but, in the depressed times, it made a modest impact upon the market. In the same year T.S. Motors entered into discussions with Karrier Motors with a view to purchasing the struggling Huddersfield firm, whose product ranges were perceived to be complementary to those of T.S.M. All production was to have been transferred to the Maidstone works under the proposed new company name of T.S.-Karrier Motors Limited.

There was some dissent at this proposal from the then Managing Director of T.S.M. supported by a group of shareholders. This led to major differences among the directors which had a seriously deleterious effect upon the output of the company. During the latter part of 1932 some months saw the production of no vehicles at all. The Karrier proposals ultimately stalled on 6 February 1933 when a receiver was appointed to T.S.M. itself.

T.S.M was released from receivership on 22 March 1934. Karrier in turn went into receivership in June 1934 and was bought by the Rootes group, which closed the Huddersfield plant and moved production to Luton. Richard Clayton of the family who had founded the Karrier business had been a supporter of the earlier T.S.M. bid, and he then joined the Maidstone firm.

A trading loss of £7,974 was reported by T.S.M. for the year ended 31 December 1934, to which figure was added a further £2,000 to cover stock written off, mostly obsolete petrol electric componentry. This left the firm with an accrued debt of £156,231 (£14 million at today's prices).

Throughout the 1930s, the precarious financial position of T.S.M. was reported regularly in the trade press, and this may have deterred some prospective vehicle purchasers fearful of the demise of the company and the disappearance of mechanical support. Many manufacturers in all fields were failing during those depressed times and such apprehension was not

unfounded.

The death of Mr. W. A Stevens, the pioneer of successful petrol electric propulsion for road vehicles, was reported June 1935. His estate was valued at £9,769, about £891,000 today.

5: The Reversion to Tilling-Stevens

Curiously, references in the technical press to the products of T. S. Motors during 1935 began describing them once more as Tilling-Stevens, though this anticipated by some two years the reversion of company name to Tilling-Stevens Limited, the name adopted when the 1906 company Tilling-Stevens Motors Limited was renamed in 1915. The company name change from T. S. Motors to Tilling-Stevens Limited did not occur until 21 October 1937. The T.S.M. nomenclature had never been entirely accepted by its customers nor by the vehicle operating industry who felt more at home with the familiar Tilling-Stevens name.

The newly renamed firm astonished the market at the 1937 Commercial Motor Show by displaying a six wheel 17ft wheelbase passenger chassis called the Successor. This had a 7.45 litre, 110 bhp, horizontally opposed, wet liner, direct injection, eight-cylinder oil engine with a five bearing crankshaft and integral balance weights. The minimal number of crankshaft bearings suggests Ricardo involvement in the design. The engine was mounted behind the front axle to which was bolted a vacuum operated Maybach seven-speed preselective gearbox which utilised constant mesh gears and dog clutches rather than epicyclic gears. The propeller shaft ran to the underslung drive on the third axle, the four wheels of the rear bogie being independently sprung. Insofar as it embodied a host of new and, perhaps, untried ideas, it might be regarded as the Guy

Wulfrunian of 1937. A four wheeled 12ft 6ins wheelbase 8 ton goods version called the Yeoman was also displayed. In reality, it is almost certain that neither of these innovative machines ever ran under the power of the eight cylinder engine. Reputedly the crankshafts kept disintegrating under test, and, as with the 1931 Gilford low floor double decker, certain parts of the display engines were made of dummy materials. Nothing was subsequently heard of those ambitious and costly 1937 dead end ventures, but the futuristic C34C Duple body on the Successor show model was modified by April 1946, either by the dealer Mitchell of London SW12, or by Alf Susans t/a Fountain Coaches of Twickenham, to fit the front engined, AEC powered chassis of ex LGOC LT1000. In July 1949, this unique vehicle passed to White Heather Coaches of Southsea who ran it until 1957.

In November 1937, Tilling-Stevens acquired the model ranges and petrol engine designs of the Vulcan Motor and Engineering Co of Southport, Lancashire, hoping thereby to extend its influence more successfully into the haulage vehicle market. Formed in 1902 to build motor cars, the Vulcan company had suffered a chequered career after 1918, and, despite adding buses and lorries to its ranges in the 1920s, it went into receivership in 1931. The receiver managed to keep production going until 1937, when the entire share capital was acquired by J. Brockhouse and Company. The Vulcan works premises were retained for general engineering as Brockhouse Engineering (Southport), but the rights to the motor vehicle side of the business were sold to Tilling-Stevens, who set up Vulcan Motors Limited

to handle the sales. The Vulcan deal proved to be better for Tilling-Stevens than the ultimately aborted Karrier merger would ever have been. Production began again at Maidstone from 1 March 1938, and Vulcan goods models thereafter became a valuable contributor to the financial standing of the Tilling-Stevens company. Nonetheless, in November 1938 there was a capital reduction from £650,000 to £256,688 after heavy losses in previous years.

In August 1938 the death was reported of Mr Richard Clayton, formerly of the Karrier business, who had transferred to Tilling-Stevens when the proposed merger of the Maidstone and Huddersfield companies was abandoned.

Tilling-Stevens had maintained its long standing link with its origins in electric motor production for vehicle and for static applications. In the years leading up to World War II and throughout the hostilities, the company offered a range of battery electric haulage vehicles in normal or low chassis heights, models EV4 and EV1 respectively, and a three wheeled mechanical horse tractive unit, all offering payloads of 2 to 4 tons. A battery electric model offering a five ton payload, the EV5, was later added to the range.

The company specialised also in searchlight trucks in which the engine engaged the electric generator to power the light. The normal control 3 ton petrol electric TS19, of which 437 examples were made between 1935

and 1938, had the Ricardo side valve engine of 5.1 litres which drove the rear axle electrically through a two speed Cotal gearbox. The later 3 ton semi forward control TS20 from 1939 was equipped with a 4.6 litre side valve Vulcan engine developing 78 bhp at 2,800 rpm, which powered the rear axle conventionally through a four speed gearbox. Under the bonnet lay a 24kW generator that could be coupled to the engine for searchlight purposes, but this model also found application as a workshop in field hospitals and repair locations where the generator was used to power medical tools and other equipment. Over 850 examples of the TS20 were produced for the military.

From 1938 the General Omnibus Company in China had favoured the short wheelbase 30 seat H5LA4 for some steeply graded routes in Hong Kong. Twelve examples of this model were diverted to the home market in 1942, and these were the only Tilling-Stevens buses to be supplied during the conflict, during which no passenger vehicles, only the Vulcan haulage models, were permitted to be produced by the company.

The 1939 '3½ tonner', '5 tonner' and '6 tonner' Vulcan lorries had Vulcan petrol or Perkins diesel power, but the 4LK Gardner was fitted experimentally and very successfully by at least one operator. In about 1941 the Vulcan cab was redesigned in a more modern style, and, as the 6 ton 6PF and 6VF, with Perkins P6 diesel or Vulcan four cylinder 78 bhp petrol engines in conjunction with a four speed gearbox, these were

manufactured during the war in significant numbers, believed to be about 1,000 in total, to meet essential civilian needs.

6: Postwar Production

When hostilities ceased in 1945, the Maidstone works continued to supply Vulcan models 6PF and 6VF which were progressively updated over the ensuing five years. The articulated 8ft 6½ ins wheelbase 6PFA and 6VFA for 10 tons became available with Scammell coupling gear and an Eaton two speed axle, and 9ft. 9ins wheelbase tippers were added to the range. The passenger versions of the Vulcan 6PF and 6VF, sometimes referred to as the PPF/1, continued to be offered for full fronted 27 ft. long bodywork on 15ft. 3ins. wheelbase chassis. Towards the end of the company's separate existence the 7GF, a 7 ton goods model with the Gardner 4LW engine, was also offered. The Vulcan haulage ranges, which were also quite successful in the export markets, proved to be more valuable contributors to the financial position of Tilling-Stevens than the passenger models.

Postwar, the company widened its productive output by returning to the manufacture of electrical units and a small range of electrical vehicles.

The new Tilling-Stevens passenger vehicle ranges appeared from 1946. No further mention was made of the advanced concept Successor, though the company did persevere, albeit unsuccessfully, with the eight cylinder horizontally opposed engine until about 1946. The post war Tilling-Stevens machines were all of conventional design, and the radiator was a larger version of the pre war style, now with a slightly more curved

profile. The dropped frame K6LA7 had a Gardner 6LW driving into a David Brown direct top five-speed gearbox with sliding mesh engagement for first and second gears and constant mesh for third and fourth. The offset underslung worm driven rear axle had the optional high ratios of 4.2 to 1 for coaches and 4.8 to 1 for buses to suit the direct drive fifth gear, with lower alternatives being available. Dewandre triple-servo vacuum brakes were fitted, and the electrical system was rated at 12 volts. The K5LA7 version had the 5LW engine, and fifty two of this model, together with fifty six of the shorter K5LA4, were delivered to the Motor Bus company in Hong Kong from February 1948 until 1952. Kowloon Motor Bus, also in Hong Kong, took fifty of the K5LA7 type in 1947/48. At the time, these were the largest Tilling-Stevens fleets in the world, and the buses certainly proved their worth in highly taxing operating conditions, some lasting in service until 1967. Under the pressures of high demand for passenger bodywork in the expanding post war market, several of the established coachbuilders with full order books tended to avoid unfamiliar chassis. A number of new entrants sought custom in the psv coachbuilding arena, and Tilling-Stevens models were often bodied by a co-operative group that included Associated Deliveries, Dutfield, Hogger, Longford and Theale.

Perhaps recalling the TS17A fiasco and the poor market reception of the D and E double deckers of the early 1930s, no attempt seems to have been made by Tilling-Stevens to offer a 16 ft. wheelbase K6LA6 for the post



Dating from 1949 this is a post war Tilling-Stevens dropped frame K6LA7 with conventional design and pre-war style radiator with a slightly curved profile, seen here with Altonian Coaches it is now in preservation. (Roger Cox).

war double deck market, though the limited availability of Gardner engines might well have been a factor in this decision.

September 1948 brought two further models. The new, compact and powerful 135 bhp Meadows 6DC630 engine of 10.35 litres was fitted to the K6MA7, which also had a 24 volt electrical system. A full fronted lighter model with a straight chassis frame, the L6PA7, in essence just an extended version of the Vulcan 6PF passenger model, was powered by the Perkins P6 engine developing 70 b.h.p. at 2,200 r.p.m. This drove through a single-plate 12 ins clutch and a five speed direct top gearbox. Braking was provided by a continuous flow hydraulic servo-pump driven from the gearbox mainshaft by twin v-belts.

All these models were entirely competent performers, though the lively Meadows engine soon revealed rather high fuel consumption and dubious reliability characteristics, and bus operators using it (mostly in Guy Arabs) often replaced it with an alternative power unit by the first C of F inspection.

In the immediate post war period, facing pressures for repayments of the war debt, the economic emphasis of the Labour government was on earning income from export business, with materials being allocated to manufacturing companies accordingly. By that time, though Vulcan lorries were having modest export success, Tilling-Stevens had retained very few

overseas customers for its passenger ranges other than those in Hong Kong, and the company voiced its displeasure at the perceived unfairness of government policy towards suppliers to the home market. Furthermore, the nationalisation of road haulage threatened domestic sales of the Vulcan lorry range. The company even considered setting up some overseas assembly plants to obviate the difficulties of currency allocation and import licences, though this was not pursued.

Without significant export orders or a major presence in the home market when ranged against its bigger manufacturing competitors, the firm directed its passenger vehicle sales towards the independent sector. In 1950, having run up a loss of £31,027, £1.38million today, in the previous year, the company brought out a revised medium weight range of Vulcan haulage and Tilling-Stevens passenger models, together with some upgraded battery-electric vehicles. The new passenger model, designated L4MA8, was essentially an extended version of the L6PA7 chassis with a wheelbase of 18ft 7½ ins allowing the fitment of full fronted 30ft by 8ft bodywork. The electrical circuit was rated at 24 volts. A direct top five speed gearbox was fitted in unit with the engine in conjunction with a final drive ratio of 5.125 to 1, delivering a maximum speed of about 50 m.p.h. The continuous flow hydraulic braking system was carried over from the L6PA7. With a fond, backward glance at the outstandingly successful B10, the flat framed L4MA8 was optimistically branded the "Express Mark II". The power unit was the very new Meadows 4DC330 oil engine, a four-cylinder



In 1950 Tilling-Stevens introduced the L4MA8, that was essentially an extended version of the L6PA7 chassis with a wheelbase of 18 ft 7½ins allowing the fitment of full fronted 30ft by 8ft bodywork. (Barry Nunn).

5.43-litre direct-injection unit which had counter rotating weights coupled to the crankshaft to reduce vibration. However, this feature must have absorbed some of the power, for the output was a modest 80 b.h.p. at 2,200 r.p.m. As a measure of comparison, the contemporary Gardner 'K' type 4LW developed 75 bhp at 1700 rpm from 5.6 litres. At 1700 rpm, the Meadows engine would have been producing only around 60 to 65 bhp and delivering markedly inferior torque to the Gardner. No doubt the Meadows, which had the timing gears located at the rear of the crankcase, was selected for its smoother running and compact design. Tilling-Stevens claimed that the Express Mk II could deliver fuel consumption figures of 16 to 20 mpg and was two tons lighter than the contemporary Leyland Royal Tiger, which was hardly a meaningful comparison. Sadly, the real or imagined merits of the Express Mk II did not convince the operating industry, and sales were modest, despite the low chassis price of £1395, some £900 less than the earlier K6MA7.

In the difficult trading times then encircling the company, rumours persisted in the trade press throughout the early postwar years of a possible merger with another manufacturing undertaking. Then the 3 August 1950 edition of The Times reported that agreement had been reached in principle for the sale of Tilling-Stevens to the Rootes group. In September 1950 the Bedford SB appeared, and priced at £690 for a bare chassis, or about £2000 with a Duple Vega body, it immediately captured much of the passenger lightweight market that Tilling-Stevens had been

courting. At the same time, the modern Bedford 7 ton S type haulage range presented a severe challenge to the sales of Vulcan 6/7 ton lorries, by then of dated design.

On 5 September 1950, despite having introduced new and updated models earlier during that year, the Maidstone firm finalised its sale to the Rootes Group, which maintained production of the existing Tilling-Stevens and Vulcan ranges until they were withdrawn from the market in 1953. Stocks of the Vulcan haulage range and the Express Mk II passenger model were then being offered at prices well below the official listed figures. Realistically, by 1950, Tilling-Stevens/Vulcan was in terminal decline, and the Rootes deal must have been warmly welcomed by the directors and shareholders.

From 1954, now under Rootes control, the Maidstone company went on to earn justified acclaim as the manufacturer of the three cylinder TS3 opposed piston two stroke diesel. A variety of opposed piston engines had emerged from the turn of the 20th century, generally for heavy duty purposes. In the early 1930s the Swiss Sulzer company brought out its range of ZG9 opposed piston two stroke diesel engines for stationary applications, available in two, three or four cylinder versions, In 1934, Ransom Eli Olds (who set up the Reo company) secured a US patent for an opposed piston two stroke oil engine, thereby constraining other US manufacturers from pursuing competitive designs without a licence. No

example of the Olds engine, which bore a remarkably close resemblance to the Sulzer ZG9 range, was ever made, but a hint of collusion arose from 1937 when the ZG9 range began being manufactured by the Hill Diesel Engine Company of Lansing, Michigan, an R.E. Olds subsidiary. From the early 1930s the German Junkers company developed the opposed piston two stroke diesel Jumo aero engine which reached a production total of about 900 by the end of WW2. During the war and in the immediate postwar period the complex Napier Deltic three bank engine emerged, initially for Admiralty maritime purposes, but which was later adopted for rail traction also.

The eminently successful compact British TS3 horizontally opposed two stroke diesel engine for automotive applications was capable of being installed in the horizontal plane beneath the cab floor of a commercial vehicle. The pioneer development was undertaken in 1948 at the Rootes plant at Stoke, Coventry, and the engineers involved resolutely maintained that the 'TS' nomenclature stood for 'two stroke', not 'Tilling-Stevens', which, at that time, was still independent of the Rootes group. The transfer of production and future development to Maidstone did not occur until 1953, with full production getting under way in 1954. Notwithstanding its characteristic exhaust bark, the TS3 engine became the standard, economical and reliable power plant in Commer lorries and coaches, and in chassisless coaches produced by Beadle and Harrington. The later introduction of less raucous diesel alternatives in Bedford and Ford chassis led to the dwindling and ultimate demise of

demand for TS3 power in passenger vehicle applications. Chrysler progressively assumed full control of Rootes and, in 1968, cancelled the TS3 engine production, and its promising TS4 four cylinder development, in favour of Cummins power units - decidedly prematurely as it turned out. Chrysler Europe, by then facing serious decline (and ultimate bankruptcy in 1978) went on ruthlessly to rationalise its UK operations. The former Tilling-Stevens Maidstone plant, which by then was manufacturing air conditioning products, was closed in 1975.

It is noteworthy that Cummins has since developed a four cylinder horizontally opposed piston diesel engine for military uses, and one wonders what debt of design gratitude is owed to the TS3 and the projected TS4.

The 1917-1920 built Tilling-Stevens factory in Maidstone still stands, with Grade II listed status, an outstanding example of an industrial building in the Kahn Daylight System.

7: The Barcelona Tilling-Stevens

We are indebted to transport historian Dr. Albert Gonzàlez for the following authoritative information concerning the complicated history of the Tilling-Stevens Barcelona fleet. In 1922 four double deck TS3A were sold to the then CGA (Compañía General de Autobuses) company. The first three, diverted from a Thomas Tilling London batch in March 1922, were painted red. The last one came from a Southdown batch and arrived in green livery with white window surrounds. These buses received fleet numbers 1-4. The next deliveries arrived in August 1922, being 12 TS4X single deckers numbered 5-16, followed by TS3A buses 17-54 in several deliveries, bringing the total of the TS3A type to 42. According to drawings and invoice, the final 10 buses were of the TS7B semi forward control type and were fitted with bodywork seating 64 passengers. Thus, with the exception of the final TS7B deliveries, all Barcelona's new Tilling-Stevens double deck buses were TS3A type with 026/22R bodies. The TS4X machines were all saloons.

In September 1923 Madrid offered 50 TS3A buses, then merely one year old, to CGA, but the Barcelona operator had no interest in them at that time. Some years later, when the suburban services had grown and the Exposició Internacional de Barcelona 1929 approached, CGA was in need of more buses, and the offer of the 50 Madrid Tilling-Stevens TS3A machines was accepted. In addition, one of the Madrid TS4X buses offered at the same time was

found to be in a good condition on arrival in 1928, and entered service as number 151 early in 1929. The ex Madrid TS3A vehicles arrived in Barcelona around September 1928, and all but one were dismantled, the bodies being scrapped. Mechanical parts were kept and renewed and the company prepared a new body design. This was a double decker with an attractive body in a livery of red with a cream band contrasting with original Tilling-Stevens wheels. This body had an enclosed staircase and, like that in the TS4X buses, an inside cab for the driver. A new engine was made in the CGA workshops with a cylinder head for diesel fuel, but at the beginning buses were propelled with petrol. In 1926 some trials were made with a carburettor prepared for a mix of petrol and diesel, though, after some initial problems, the fleet was converted to diesel which proved to be much cheaper than petrol. These buses were built from March 1929 onwards (buses 201 - 244). Two ex Madrid frames were converted into a single deck version of the 200 class and were numbered 261/2 for use in suburban roads with trees. Another of the frames was used as a petrol tank lorry with crane. From 1930 until 1937 further TS3A based double deckers were built with the upper deck extending over the bonnet, giving four more seats. This was a more attractive design than that on the earlier 201 -244 batch, and these were numbered 275 - 310. The bus company also prepared two prototypes, the first being a lowbridge double decker on a Tilling-Stevens frame numbered 325 in 1933. In 1937 number 216 appeared, a special bus on an unknown frame fitted with tyres, preselective gearbox and a wider and longer body with a more aerodynamic

front. Barcelona was strongly Republican at the onset of the devastating Spanish Civil War between 1936 and 1939, during which both of these buses disappeared and much of the city fleet was rendered out of order.

The CGA company was collectivized during the Civil War and named Autobuses (G.). The last TS4X single deckers went back into service in 1939 after the war; these were numbers 11, 13, 14 and 16, being generally employed on suburban routes like AC, EC and MO. Two more remained, nos 6 and 8, but these were not used. All the TS4X buses were scrapped after 1941. In 1940 five more buses were updated (326 - 330) re-using bodies of the 275 batch, these being fitted with pneumatic tyres and a mechanical gearbox. At the same time a number of the 201 - 244 buses were fitted with pneumatics (as no solid tyres or semi-pneumatics were available) on Tilling-Stevens frames and equipment. As the nineteen forties progressed, some of these buses received petrol engines and mechanical gearboxes. All the 275-310 serviceable batch, except the five converted into 326 - 330, plus some lost during riots, were dismantled from 1941, their bodies being transferred to new frames and converted into trolleybuses 501 - 533. Later, numbers 326-330 were similarly converted into trolleybuses and numbered 534-538. The last services with former 200 class buses were held on route 'G' in 1952 after which the remaining buses were withdrawn until being scrapped in 1957. The last ex-200 class trolleybuses lasted in service until 1962 when they, too, were scrapped.

The arrival in Barcelona from 1948 of ACLO buses (the name used by AEC in some of its overseas markets) put the remaining petrol-electric buses out of service, by then mostly in a derelict state in a depot yard. The Tilling-Stevens buses history in Barcelona is a fascinating one and they proved to be very reliable and, driven carefully, lasted for a long time. Transports Metropolitans de Barcelona (TMB), Barcelona's public transit company, is about to start the rebuilding of an old 1922 Tilling-Stevens TS4 city bus. As a local transport historian, Dr. Gonzàlez has been charged with a historical survey concurrent with the rebuilding work, and LTHL wishes the project well. Dr. Gonzàlez has written a comprehensive history of the Barcelona bus companies from 1905 to 1951 and this has been published in two volumes: 1996 (2007 2nd ed.) and 2013, and he has also now published a history on the CGA bus company.



Barcelona operated a substantial number of TS3A double-deckers from 1922. (LTHL collection).



The Bus Archive is a registered charity dedicated to the collection and preservation of records, photographs, publications and publicity for the road passenger transport industries - bus, coach, trolleybus and tram - and make these freely available to the public for research and education.

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Additional information, corrections and photographs are always welcome.
Our general email address is: lth.library@gmail.com

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Series Editor: Peter Gould (secretary@lthlibrary.org.uk).