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RARE & UNIQUE VEHICLES

SPECIAL THEME: INNOVATION



Frank Costin's Sports Cars

Wooden Wonders

Centipede

Eight-wheelers Through the Ages

Rhombic Vehicles

May Not Be a Diamond...

Soden Transmission

You Don't Need to Change

Mathis VL 333

Marvelous, Mysterious & Unique



Wooden Wonders • Frank Costin's Cars



Air Route • Flying Cars

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SODEN TRANSMISSION

While everybody knows Walter Gordon Wilson and his Self Changing Gears, Graf von Soden's system which preceded it by almost a decade received less attention.

Werner Beisel has written a book about the Soden transmission.

YOU DON'T NEED TO GO AHEAD

PHOTOS: ZF ARCHIVE

(unless otherwise noted)



Alfred Graf von Soden-Fraunhofer, co-founder and first general manager of ZF.



SHW

The revolutionary SHW car featured self-supporting aluminum body, independent suspension, and a Soden preselector transmission in 1925.



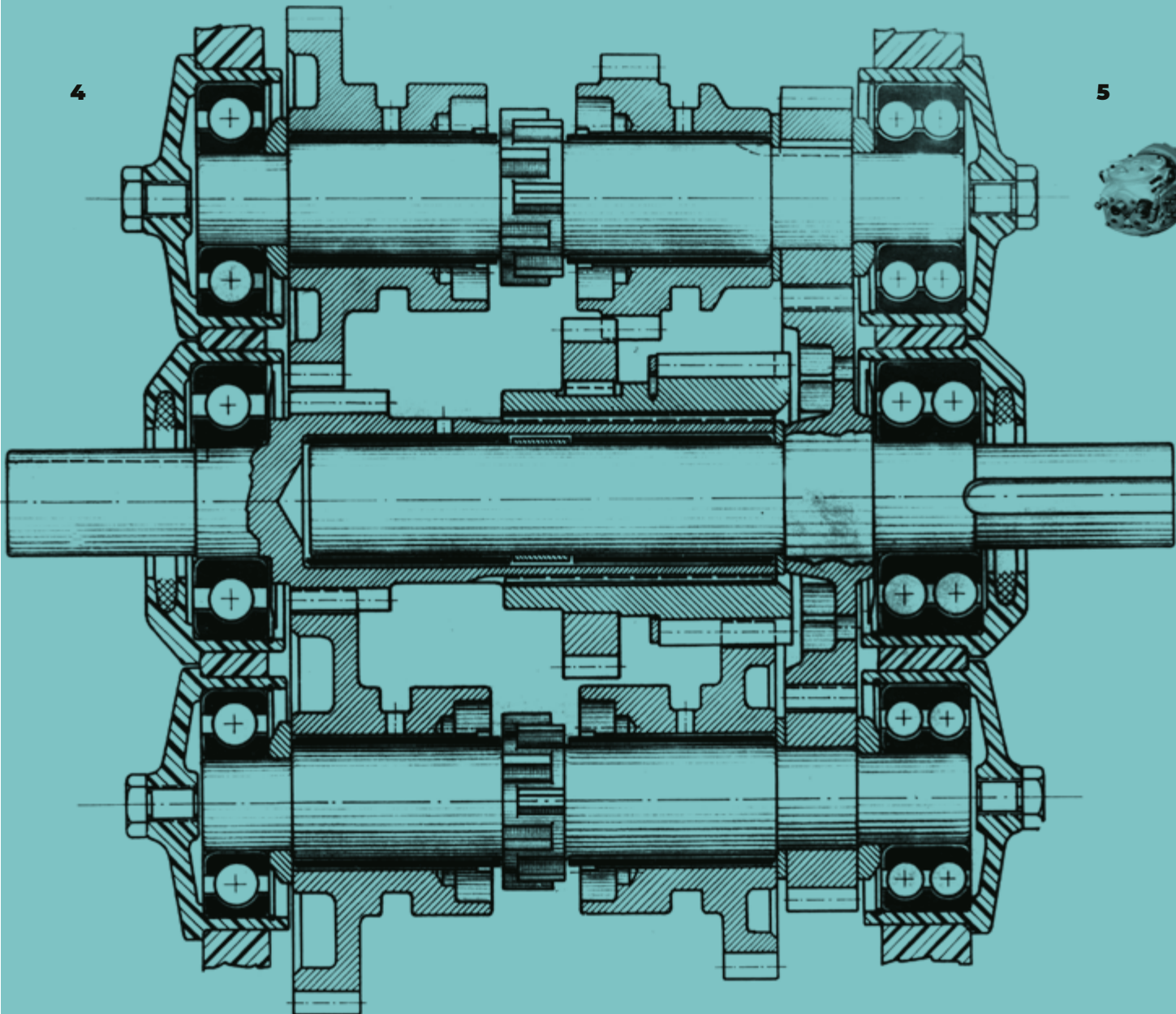
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1 In 1923 both German and English versions appeared showing the gear selector in the steering wheel hub.

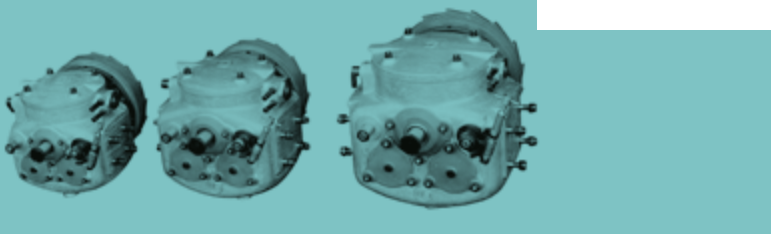
2 The 1923/1924 brochure has been translated to English.

3 Éts. Michel Potous announced the Soden transmission in La Vie Automobile in September 1924.

4 Claw couplings in 1921 with axially offset teeth.

LITERATURE

*Werner Beisel has written an extensive book about the Soden transmission. Simply titled **Das Sodengetriebe**, the 400-page softcover book offers an extremely detailed overview of Alfred Graf von Soden-Fraunhofen's innovation, listing every known application in passenger cars, trucks, rail cars, etc. The A4-format German language book is priced at EUR 39.90 and is available from www.sodengetriebe.de.*



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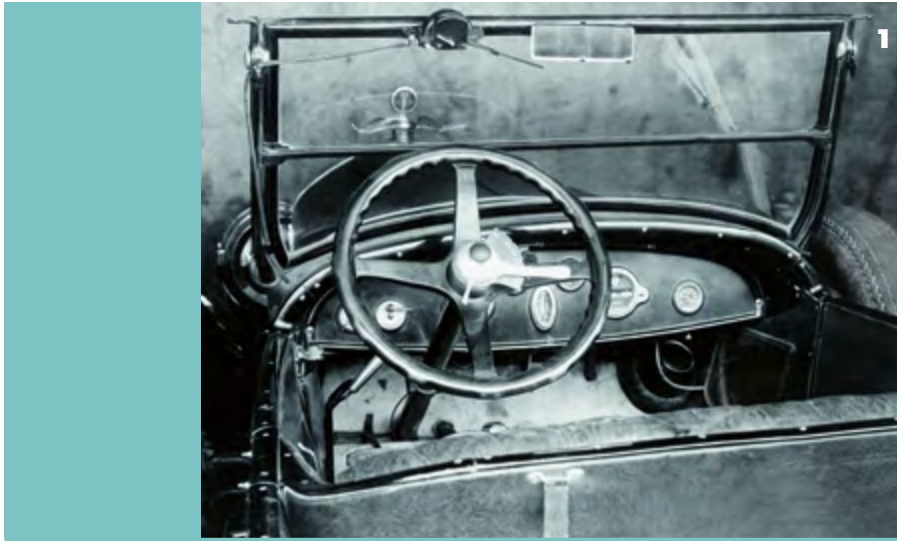
5 There were different sizes presented in 1921 for various passenger car models.

6 Max Maag's Pic-Pic was the second car equipped with a Soden transmission in 1920.

At the beginning of the 1920s, unsynchronized transmission was the norm, in which the running teeth of the gears were used to shift gears. In these systems, the gears were not constantly in mesh. Experience and practice were necessary in order to shift as smoothly and quietly as possible with matching engine rpm's and double-declutching. The shift lever, which was usually then installed outside the body, made shifting gears in bad weather a dubious pleasure. With the Soden transmission, a previously unknown shifting comfort was achieved. A gear selector with an easy-to-use small lever replaced the shifter. It was installed either on the dashboard or in the steering wheel hub. The gear changes took place independently of time, just by pressing and releasing the clutch. Double-declutching was no longer necessary.

ALFRED GRAF VON SODEN-FRAUNHOFEN

Alfred Graf von Soden-Fraunhofen (1875-1944) was the co-founder and first general manager of ZF. He studied mechanical engineering in Munich and became a graduate engineer upon completion of his academic studies in 1902. He first worked for Daimler-Motoren-Gesellschaft (DMG), where he worked together with Wilhelm Maybach (1846-1929). Later



1 In 1925 there was an attempt to equip an American Flint car with Soden transmission.

2 The ZF stand at the 1924 Berlin Show featured a Dixi and an assortment of Soden transmissions.

3 A gear selector for Szawe ...

4 ... and a set of transmissions for the company.





he developed a combustion engine with a friend from the university, and then worked for MAN for two years. In October 1906, Soden traveled to Lake Constance and saw an airship for the first time. In 1910 Count Zeppelin invited him to join Luftschiffbau Zeppelin GmbH as head of the testing department, which was to be newly created. Soden accepted the position and relocated to Friedrichshafen. During World War I, Soden introduced the idea of using bevel gears, manufactured according to the system invented by Swiss engineer Max Maag (1883-1960), for the airships. This idea culminated in the founding of the Zahnradfabrik (ZF) by Zeppelin Group and Maag. Soden became the company's first general manager. He remained a member of the board at ZF until his death in 1944.

SODEN TRANSMISSION DEVELOPMENT

As early as autumn 1915, immediately after ZF was founded, Graf von Soden had registered his first patents for a preselector gearbox, which were followed by many more. A year before the big reveal, a smaller presentation took place on October 29, 1920, in Vienna. Graf von Soden traveled from Friedrichshafen with the first ZF prototype vehicle. High-ranking representatives of the Viennese automotive industry and important specialist organizations took part in the demonstration, who were also able to test drive the vehicle. The event was reported by "Allgemeine Automobil Zeitung" in its November 28, 1920, issue under the title "Das Sodensche Schnelligkeitsgetriebe" (Soden Speed Gearbox). A Soden prototype was also prepared for Spyker in Amsterdam, The Netherlands, which used a Maybach W2 engine.

Between the first presentation in 1920 and the official launch at the 1921 Berlin Automobile Show, the transmission underwent further optimization, both functionally and to reduce costs. The transversely arranged controlling drum, which ensures that only one gear is engaged and locked, moved from the output side to the center of the transmission. The claw couplings were heavily modified, which significantly improved the locking safety even at different speeds. The design, size, gearing, and ratios of the symmetrically constructed three-shaft gearbox followed technical and scientific principles. The grinding process developed by Max Maag in 1913 was used for the gears. Compared to the previously common gears, which were only milled and hardened, the gears were significantly quieter.

GEARBOX VARIANTS

The Soden transmission was also available for other type of vehicles, including trucks and rail cars. Beginning in 1924 experiments were conducted with motorcycles, followed by special versions for military purposes.



2





1 Walter Schuricht produced a few touring cars in Pasing, which belongs to Munich today, between 1921 and 1923. One miraculously survived.

2 The gear selector was on the instrument panel.

3 A Soden gearbox, which forms a unit with the engine, steering gear, and front axle drive, was used in the SHW car.

4 The Soden transmission was made in 1922, which helps to date the car.



Passenger car variants in different sizes were called S2.5, S3, S3.5, and S4. Additionally there was a truck version, called S5L. These had four forward gears and one reverse gear. The basic transmission could be installed in the chassis at any suitable point between the engine and the rear axle. Special variants had also been developed for a number of customers, which were suited to be mounted directly on the engine. In the rail-car transmission, called TS18.5 the reverse gear was replaced by a fifth forward gear. The motorcycle transmission was limited to three forward gears, which were preselected by a twist grip on the handlebars. In 1965 ZF celebrated its 50th anniversary. The celebratory publication mentioned that around 75 companies used the Soden transmission. There are only a few which are known today and only a few surviving examples still exist.

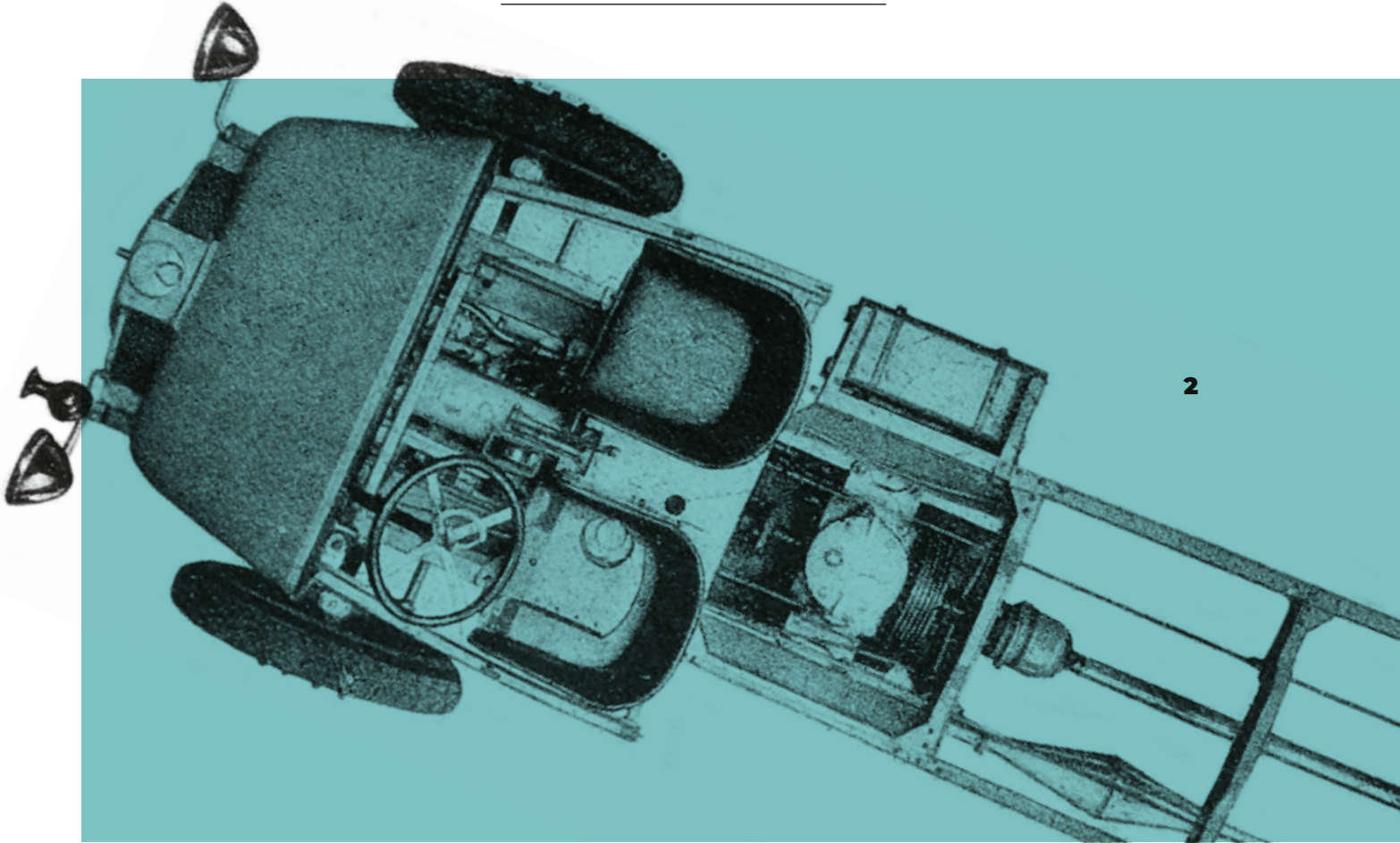
CUSTOMERS AND VEHICLES

German companies which offered the Soden transmission included such automobile producers as Bob, Dixi, Fadag, Hildebrand, Joswin, Lindcar, Nafa, Omikron, Gustav Otto, Schuricht/BAW, Steiger, Szawe, Turbomotoren AG, and others. Szawe in Berlin (see Rare & Unique Vehicles No. 3) was one of the early adapters. Szawe equipped its 10/50-hp six-cylinder variants with the Sb3.5 Soden transmission. In the 1920s, Luftschiffbau Zeppelin (LZ) supplied aluminum bodies to both car companies and their customers. For example, bodies were built on Hildebrand, Magirus, Maybach, Mercedes, Selve, and Tatra – and some of these vehicles had Soden transmission.

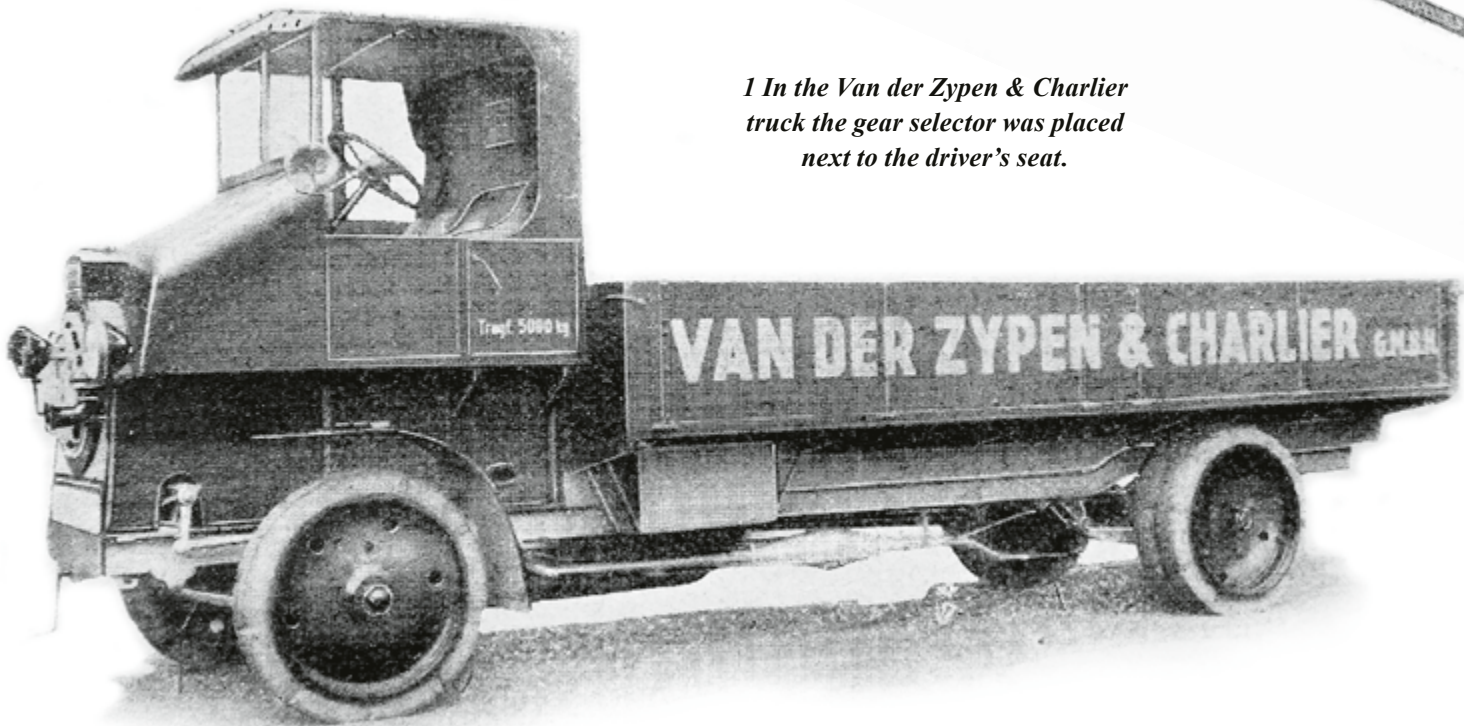
LZ also participated in the highly advanced project initiated by Wunibald Kamm (1893-1966) and realized with assistance from SHW (Schwäbische Hüttenwerke) in 1925. The SHW car already had properties that were still considered progressive decades later. In addition to the LZ's self-supporting aluminum body, the vehicle featured independent suspension, coil springs, four-wheel brakes, and front-wheel-drive. The flat engine formed a compact unit with the Soden transmission, drivetrain, and steering gear. The gear selector was integrated into the steering wheel hub. Three prototypes were built and were successfully tested for up to 100,000 km but due to the difficult economic conditions in Weimar Germany SHW decided to abandon the project. Today Deutsches Museum in Munich owns a prototype.

ACTIVITIES OUTSIDE OF GERMANY

Car manufacturers outside of Germany also had shown interest in the Soden, but the information is scarce. According to surviving documents, such as list of drawings, there were contacts made in Belgium, France, Great Britain, Italy, Netherlands, Austria, Switzerland, and the USA. Unfortunately, more detailed information about projects or prototypes evolving from these contacts is lacking.



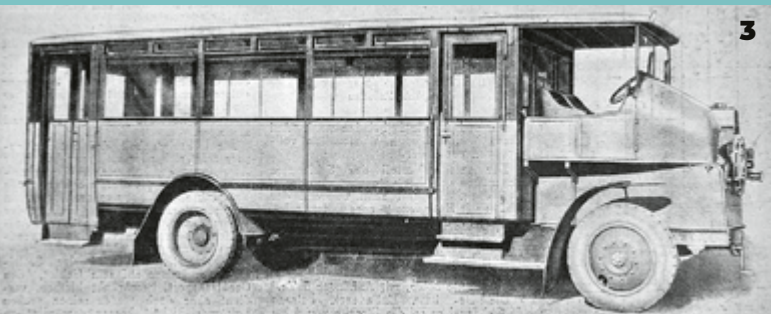
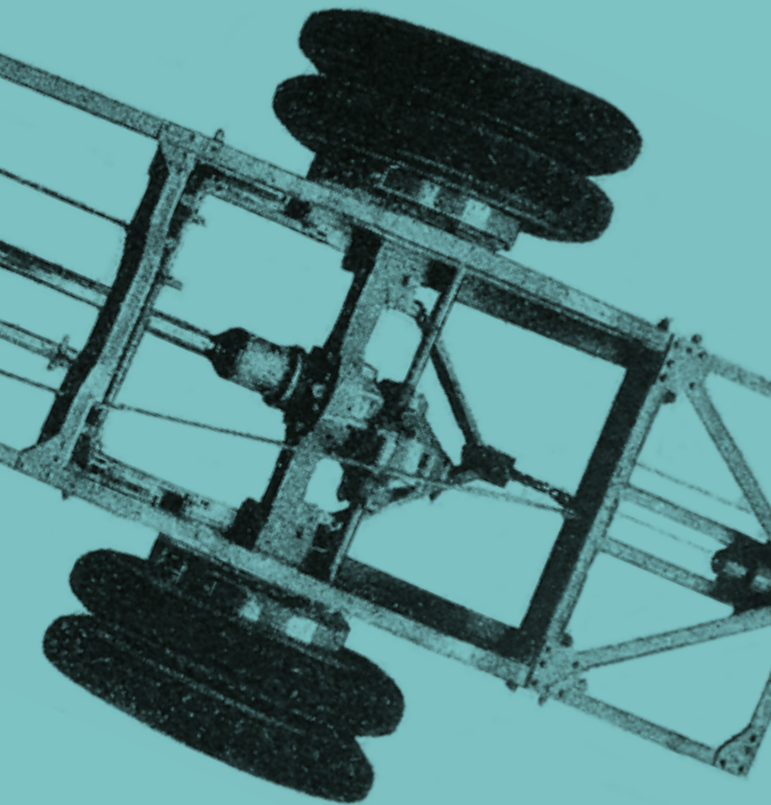
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1 In the Van der Zypen & Charlier truck the gear selector was placed next to the driver's seat.

2 Van der Zypen & Charlier mainly produced 4-ton trucks.

3 There was also an "Omnibus" body available.



3

In France there were several contacts set up regarding preselector transmissions leading to the founding of a local agency in around 1924 together with Établissements Michel Potous. There were contacts with companies such as Brasier, Buchet, Delage, Delahaye, Donnet-Zedel, Michel Un, Peugeot, Renault, and others. Drawings were created for all these companies. Information on the activities of these companies with the Soden transmission is still being sought. A prototype built by ZF for Renault was probably presented at the Paris Salon in 1924. In the January 1925 issue of "La Science et la Vie" magazine, the gearbox was described with pictures of a Renault prototype. A total of 40 drawings for the S3 and Sb3 versions were made for Renault.

Michel-Un, a manufacturer of luxury vehicles in Neuilly-sur-Seine, was only around in 1925/1926 with engines and chassis sourced from Donnet-Zedel. In the November 1925 issue of "Omnia" magazine a chassis was presented with a gear selector in the steering wheel hub and a Soden transmission flanged to the engine.

A total of 62 drawings were made for Brasier in the period 1925/1926. This indicates that production in France was considered. It was a variant bolted directly to the engine. The gear selector was installed on the steering wheel. The size Sb2.5 indicates a vehicle in the lower middle class. "Chaigneau-Brasier" superseded Brasier in 1926. It is not known whether the project continued.

However, "Europa Motor" in Austria wrote about Brasier in their May 1929 issue: "The Soden transmission is also an old and familiar acquaintance, which caused a stir at the Paris Salon in 1926 as a standard version in the Brasier, despite it being of German origin. This type of transmission, in which gear selection and gear shifting are separated from each other, which makes shifting extremely easy, has proven itself extremely well in truck construction and especially in rail cars."

Drawings for variants Sb3 and Sb3.5 for vehicles HP10 and HP12 were created for Peugeot. Of particular interest, however, are notes on drawings made in 1925 for an SP2 gearbox intended for the Peugeot 5HP small car. This size would have been below the smallest series variant S2.5. Unfortunately, there is no further information on this.

A development in the USA, possibly more closely related to the construction of a US airship, labelled LZ126 / Z.R.3 by the Zeppelin Group, was started in 1924 with Flint, one of the marques manufactured by Durant Motors. William C. Durant (1861-1947) had founded General Motors in 1908. He had been forced out of GM in a battle with other shareholders in 1920 and started Durant Motors in 1921. In 1925, ZF acquired a Flint vehicle for testing in Friedrichshafen. The Flint gearbox variant had some special features. The fourth gear was probably used as an overdrive, which was indicated on the gear selector by an increased distance between third and fourth gear. In addition, the transmission was apparently

OTHER PRESELECTOR SYSTEMS

There are other early preselector gearbox systems. The best known is probably the Wilson preselector gearbox, which was developed by a British engineer, Walter Gordon Wilson (1874–1957). In 1897 he set up Wilson & Pilcher, an early manufacturer of automobiles and supplier of engines for flying machines. After that company folded, he tinkered with the idea of a wheeled artillery tractor where the driver was to be protected by armor. This led to the development of the first tanks during World War I.

This new type of vehicle also featured his epicyclic gearbox. In 1928 he patented his preselector gearbox, where the driver preselected the next gear using a lever mounted near the steering wheel, then pressed the “gear change pedal” to activate the gear change at the desired time.

The Wilson system was used by Daimler, Talbot, and Armstrong-Siddeley, and it inspired others like Georges Roesch to design similar gearbox systems.

The Cotal gearbox is also often characterized as a preselector gearbox, but in reality it is a direct-selector gearbox, similar to the DSG systems used today.

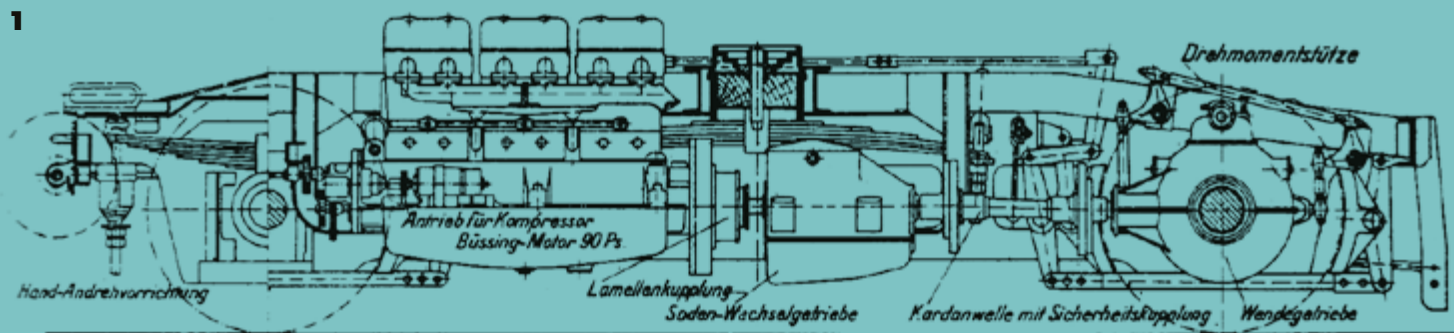
Maybach also worked on different solutions in the 1930s, such as the Doppelschnellgang-Getriebe (DSG), which was first available in the Maybach W6 in 1934. Here the correct gear was preselected via two control levers in the steering-wheel hub and then triggered by briefly releasing the accelerator. Later came the Schaltregler-Getriebe (SRG), where downshifts were made easier and more comfortable by a brief increase in engine speed, triggered by the gearbox. The desired gear was preselected with a gear selector lever on the steering column.

3 A rail car Soden transmission with electro-pneumatic control from 1926.

4 A few photos offer proof that Renault also experimented with the Soden transmission in 1924.

5 This electric tug did not use Soden transmission, but was used by ZF for internal transport.

SOURCE: VORWAHLGETRIEBE.DE

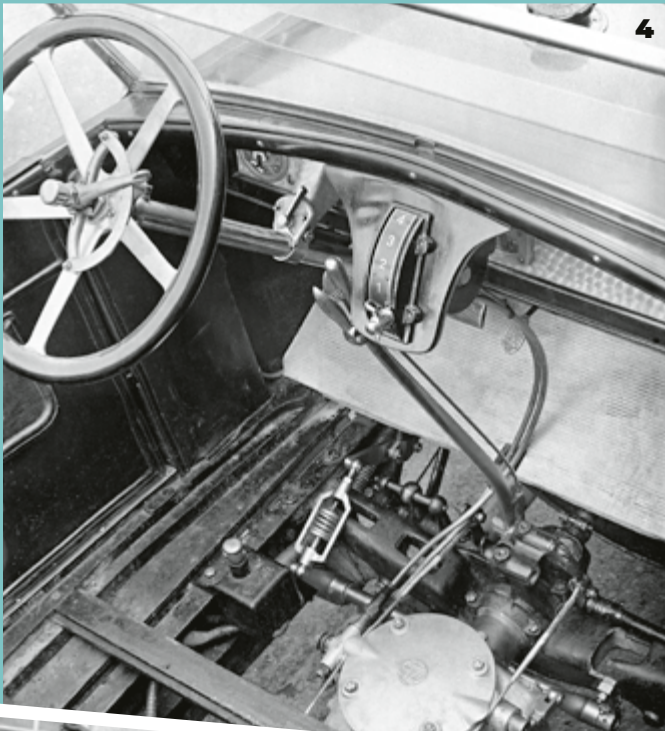
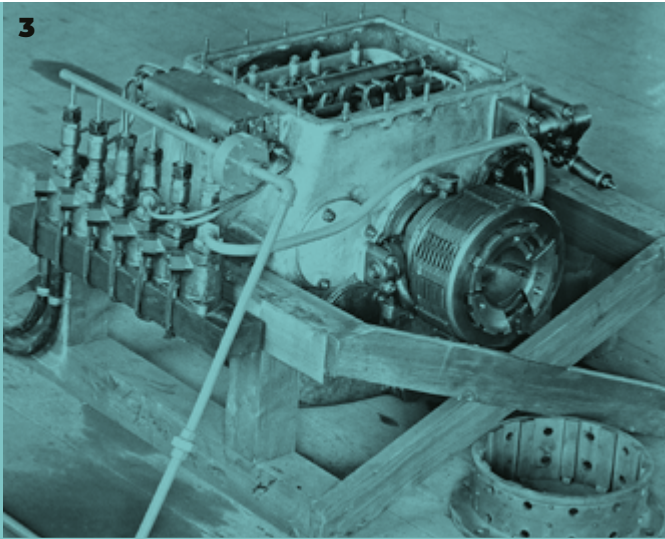


1 The Soden transmission was placed in the middle of the axle bogies.

2 Wumag in Görlitz was the first company to use the Soden transmission on railcars.

PHOTO: DR. WERNER BEISEL





already equipped with a “transmission theft lock” anti-theft device. In 1927, Durant Motors got into economic difficulties and production of Flint cars was halted. The Soden variant never went into series production. The Flint car was used at ZF for further testing until it was sold in 1932.

COMMERCIAL VEHICLES

In the truck sector, several traditional railway carriage manufacturers expanded their product range to include trucks. Technical components such as engines and transmissions were purchased from outside suppliers. For example, ZF was able to supply the S5L truck transmission Goossens in Aachen, Van der Zypen & Charlier in Cologne, and Wumag (Oekonom) in Görlitz. There were other companies mentioned, but often unclear how far the collaboration went.

RAILWAY RAIL CAR

In 1924, ZF started a Soden transmission project for rail cars with the WUMAG company in Goerlitz. Wegmann in Kassel and Dessauer Waggonfabrik AG followed and manufactured further rail cars with a total weight of up to 53 tons for the Deutsche Reichsbahn until 1931. The rail car transmission had five forward gears; the direction of rotation was reversed in the axle drive, which was equipped with two ring gears. In 1927, the Hungarian State Railways had a rail car prototype (MÁV BCmot 380) with MAN diesel engine and Soden transmission built by Schlick-Nicholson in Budapest. After the connection of Schlick-Nicholson to Ganz, the project was no longer brought to the series.

WHAT HAS BEEN PRESERVED?

ZF preserved the Soden transmission for several passenger car sizes. There are other exhibits in external collections. Three automobiles equipped with Soden transmissions in the 1920s have been preserved. An SHW car with front-wheel drive is in the Deutsches Museum in Munich and a road-worthy Schuricht from Pasing/Munich is privately owned. A Joswin with a six-cylinder Mercedes aircraft engine type D1 with 7.3 liters' displacement and 28/95 hp is impressively presented in the Louwman Museum in The Netherlands (see Rare & Unique Vehicles No. 1). Several rail cars formerly equipped with Soden transmission still exist in different states of preservation. Among these a WUMAG VT761 rail car from 1926 is the best preserved. ♦

The author would like to ask readers of the magazine if they have any photos or information on vehicles outside Germany with Soden transmission; please contact him at Beisel.Werner@sodenge triebe.de.