VOL. 2 | NO: 7 | SUMMER 2022

€12.90

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

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TRADE IN OFFER BY AVC

AVC

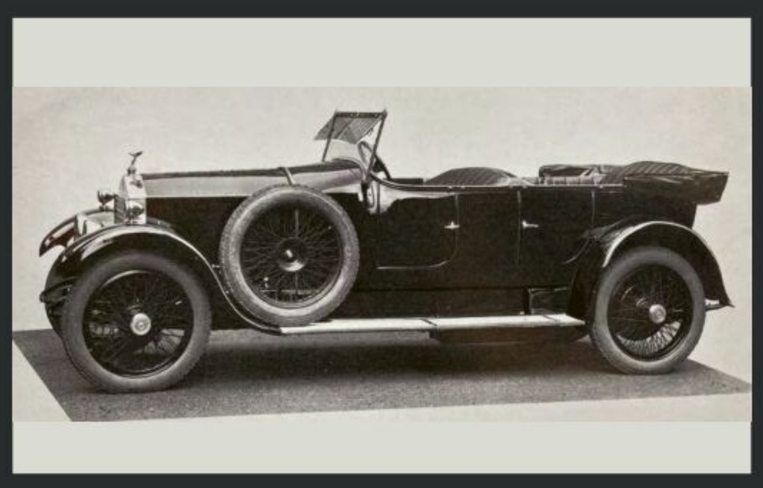
AUTO VETERAN COMPANY

1950 Delahaye 175S by Carrozzeria Motto Torino

- Overal winner at 1951 Rallye Monte Carlo
- ex-Jean Trévou
- ex-Louis Chiron
- 1951 Carrera Panamericana participant
- Valid FIA Passport
- Lightweight aluminium body by Carroserria Motto Torino

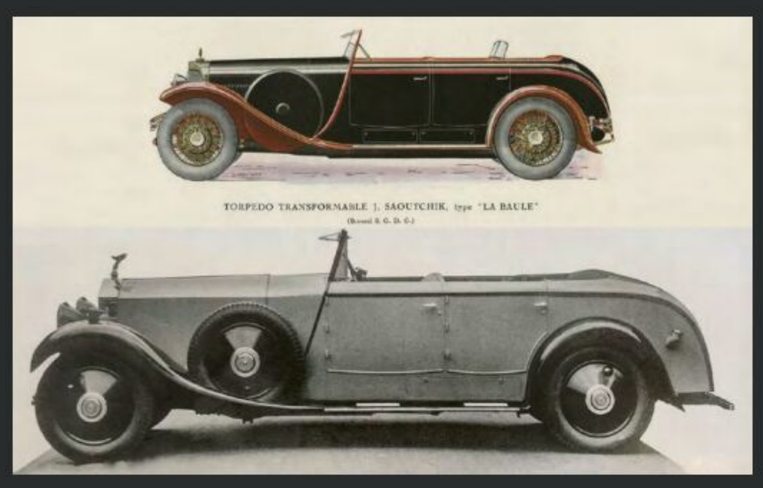
1952 Delahaye 235 Coupé by Antem (ex Rally Monte Carlo)

- Ex-Dunlop team car driven by Roger Crovetto and Julio Quinlin
- Only 3 owners since new, with 60 years of single ownership
- Original, unrestored and good running condition
- Comes with comprehensive dossier and period pictures



1923 Rolls-Royce 20HP **'Barrel Sided' Tourer** by Barker

- The most sought after Twenty coachwork with nice color combination
- Older restoration (including new cylinder head) with beautiful patina (dark green over black)
- Long therm ownership for almost 40 years
- Running sweetly, driving nicely and ready to use



1929 Rolls-Royce Phantom I **All-weather Tourer** by Park Ward

- Built according to the patent „La Baule" of Jaques Saoutchik of Paris
- Only 3 owners since new
- Well-documented history and large "dossier"
- Desirable KR series "The biggest Rolls-Royce ever built"

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WELCOME

Editor's Letter

Dear Readers,

WITH THE EASING OF COVID-19-RELATED RESTRICTIONS, classic-car meetings are returning. In the last three months we met with our readers in Essen, Stuttgart, and Beaulieu. Thanks for the nice words and the support we received. It was nice to see you all!

There are two recurring themes that came up in discussions, which I just would like to reiterate here:

- *Readers are worried that we will run out of material. Please rest assured, we have plenty of ideas going forward. There are some great themes coming up in the future.*
- *We would like to encourage our readers to set aside time for reading the magazine. Our intention is to offer you substantial content with every issue, which you can use for future reference. Take your time and enjoy!*

The current theme is "Innovation." Our plan was to offer some of the articles as part of the "Alternative" theme, but eventually we had so many article ideas that it was decided to split the "Alternative" theme into two sub-themes. Innovation was fun to play with. I wrote a feature on the four-wheel-drive artillery tractors of the Austro-Hungarian Monarchy, as I have done some research at the Kriegsarchiv in Vienna, which contains documents relating to the Austrian military. Also, our frequent contributor Thomas Ulrich was keen to honor the memory of his late friend Hans Peter Bröhl and compile an overview of cars with rhombic wheel arrangements. From these two article ideas blossomed a whole issue very quickly. Flying cars was an obvious choice, and our good friend and partner Alexander W. Trimmel dug into his archive to offer you an overview of the most interesting attempts. We also welcomed the return of J. Michael Hemsley, who provided lots of assistance when the magazine was conceived. Now we are happy to feature his drive story of the Mathis VL 333, though we are mostly content-driven and we always try to supplement the stories with many historical images. In some of the technical themes, like Eric Eckermann's historical account of Ackermann steering and Dr. Beisel Werner's meticulous overview of the Soden transmission, we also include drawings and diagrams.

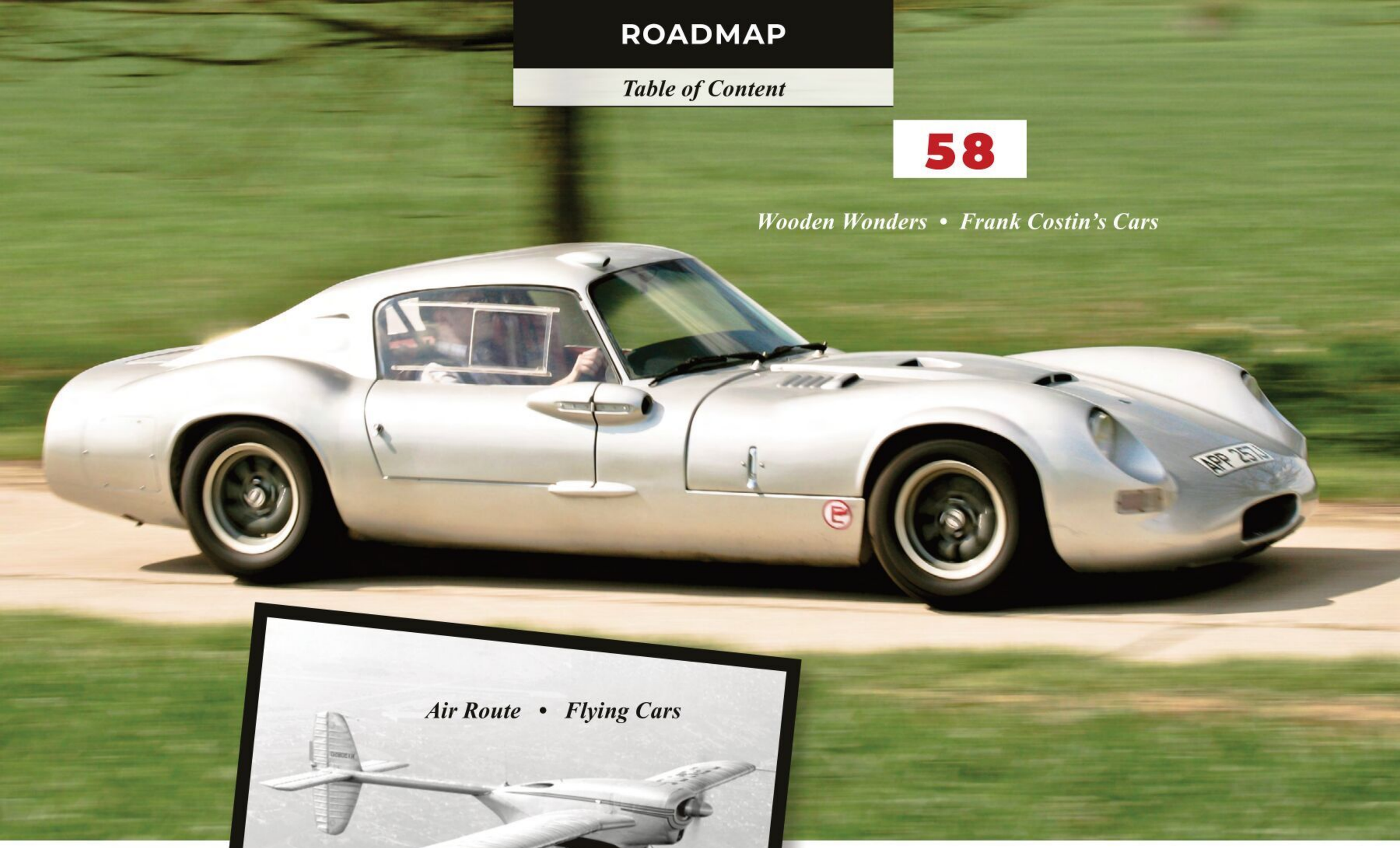
We would like to express our gratitude to our partners who support Rare & Unique Vehicles. Great cars from the collection of Auto Veteran, Sammlung K, Central Garage, and Thiesen round out our current issue.

Dr. Pál Négyesi

EDITOR AND PUBLISHER

ROADMAP

Table of Content



58

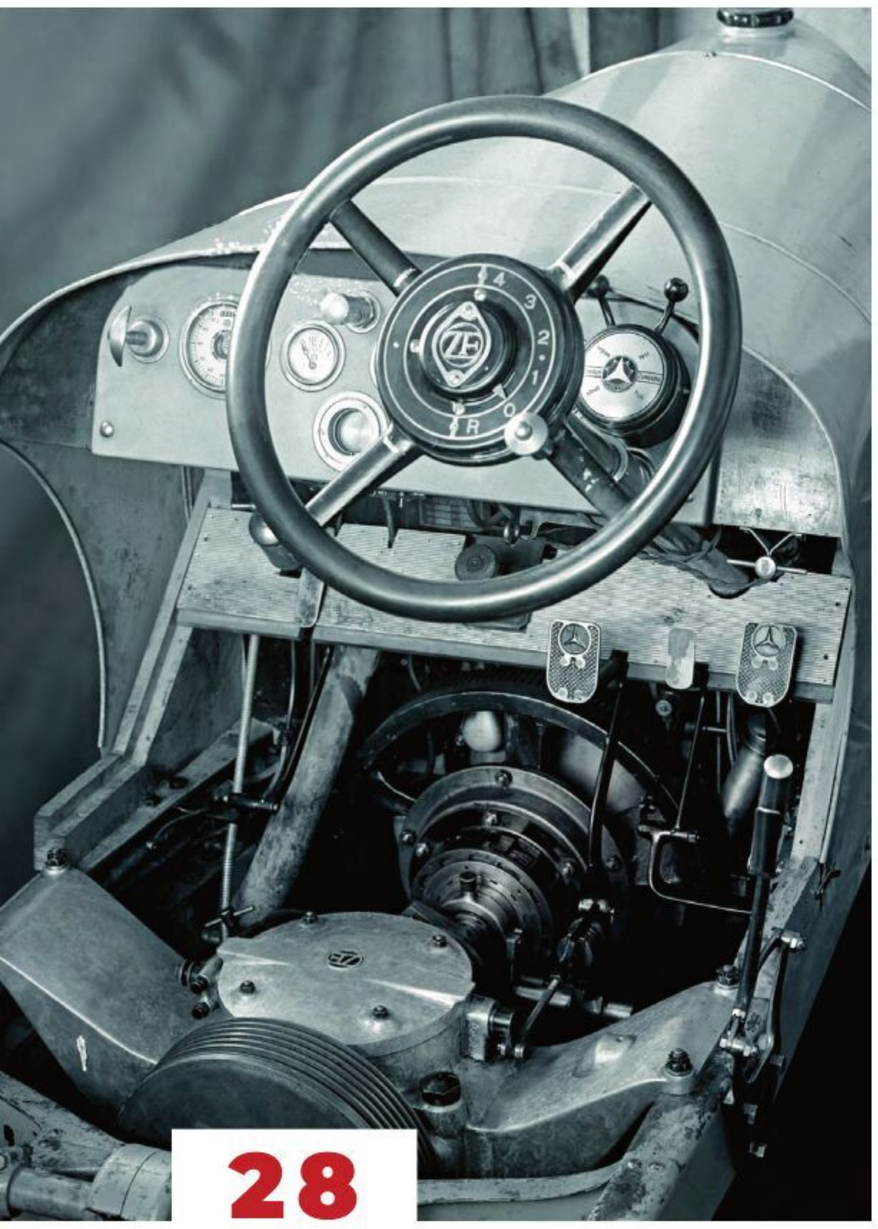
Wooden Wonders • Frank Costin's Cars

70

Air Route • Flying Cars

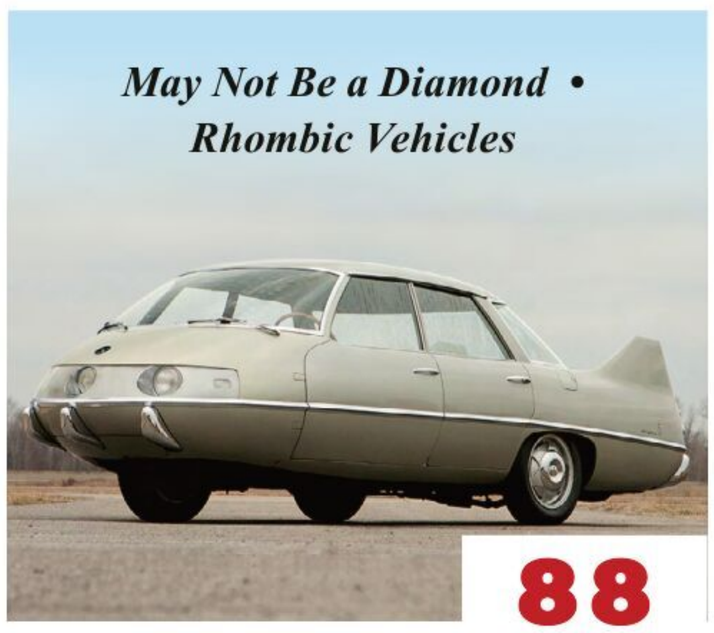
SPECIAL THEME:

INNOVATION



28

You don't need to change • Soden transmission



88

50

Marvelous, Mysterious and Unique • Mathis VL 333

COLLECTORS CORNER

SPIN THE GLOBE

IMPRINT

Vol. 2. No. 7 (Summer, 2022)

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MOTION. AUTOS, ART, ARCHITECTURE EXHIBITION OPENS AT GUGGENHEIM BILBAO

Norman Foster, a renowned British architect and designer, curated a new exhibition celebrating the artistic dimension of the automobile. It is on display at the Guggenheim Bilbao museum until September. CarDesignNews called the exhibition "a visually stunning tribute to the golden age of the automobile," which highlights the fact that industrial art is art! There are dozens of extraordinary cars shown, including the Bertone BAT7, a Bugatti 57 Atlantique, a Pegaso Z-102, and many more.

MERCEDES-BENZ 300 SLR SOLD

On behalf of Mercedes-Benz, RM Sotheby's held an invitation-only auction on May 5 at the Mercedes Museum for just one car. However, this was no ordinary Mercedes: it is a 1955 Mercedes-Benz 300 SLR, a hardtop version of the roofless racing car Sir Stirling Moss drove to victory at the Mille Miglia race that year. The winning bid was €135 million, making it the most expensive car ever sold at an auction.

PHOTO: BURKHARD BROSER

RARE & UNIQUE VEHICLES UPDATES

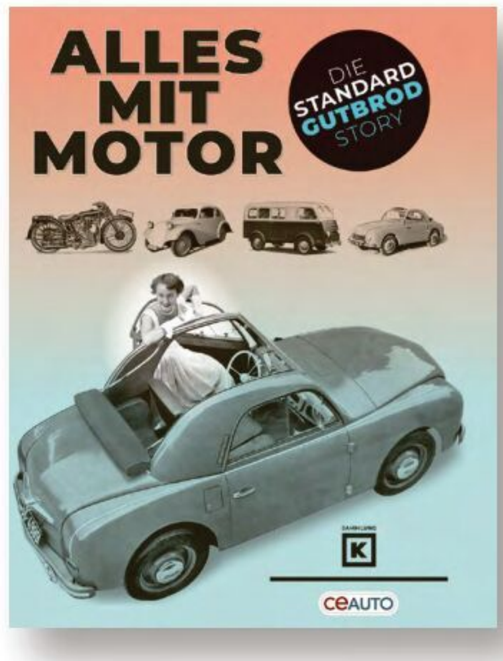
Over the past three months we were finally able to meet readers, contributors, and acquaintances in person! First we appeared at Techno Classica Essen, as part of Classic Motorcars Holland's display. This was followed by a book debut in April at the RetroClassics Stuttgart show (see opposite page), and finished with a fun weekend at the Beaulieu Autojumble. The magazine was also displayed by our trusted partner and local correspondent, Alexander W. Trimmel, at the Tulln Classic Car Fair on the weekend, 21-22 May! It was great to see the reaction and hopefully we can be on the road again soon!

THORNEY KELHAM UNVEILS JAGUAR XK RESTOMOD

Thorney Kelham, a British restoration workshop, is offering an upgrade to the classic Jaguar XK family, which was built by Jaguar between 1948 and 1961 in XK120, XK140, and XK150 forms. The basic chassis and powertrain will remain, though the engine will undergo a thorough overhaul, with a swap over to fuel injection. The body is all-new, taking inspiration from the E-Type Lightweight and period '50s racing cars.

CANADA'S FIRST SUCCESSFUL INTERNAL-COMBUSTION CAR RE-CREATED

In 1897 George Foote Foss, a machinist, blacksmith, bicycle repairman, and inventor from Sherbrooke, Quebec, Canada, built a car for himself, which was powered by an internal-combustion engine. This is considered to be Canada's first successful automobile. After years of hard work, Ron Foss, his grandson, revealed the Fossmobile in early May, a tribute to this pioneer car, which will be shown around the country before eventually being donated to the Canadian Automotive Museum.



GUTBROD BOOK REVEALED

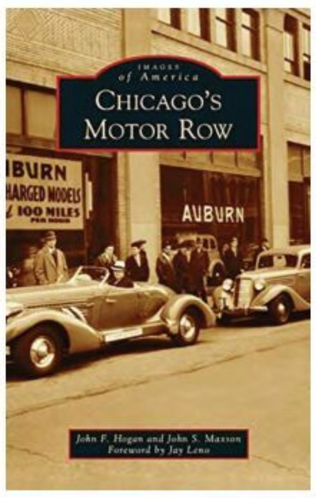
At the RetroClassics show in Stuttgart (April 21–24), ceauto GmbH, the publisher of Rare & Unique Vehicles magazine, together with Sammlung K, presented our new book, Alles Mit Motor – Die Standard/Gutbrod Story. This 272-page book charts the story of the Gutbrod family and their vehicle-building enterprises from 1926 to 1954. It was written by Otfried Jaus, who has been researching the brand for 30 years; Andy Schweitzer, a respected motoring writer, historian, and book publisher; and Paul Schilperoord, who delved into the life and works of Josef Ganz. To celebrate the book, we put together a special exhibition of Standard and Gutbrod cars and trucks, which included several vehicles from the Sammlung K collection, a Gutbrod Superior with fuel injection from Bosch Classic, Paul Schilperoord's Standard Superior reproduction, and several vehicles from private collectors. Our stand received a special prize from the organizers!

REVIEWS

Books

A selection of the latest book offerings from around the world.

Our panel of experts includes Frederik E. Scherer, David Cooper, Wolfgang Buchta and Dr. Pál Négyesi.



Streets of Dreams
WHEELING AND DEALING IN CHICAGO

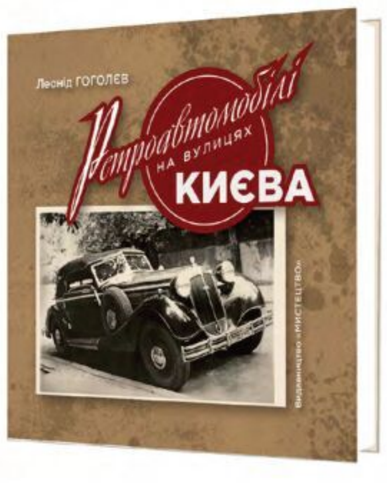
Automobile histories tend to focus on the building of cars, not the selling. Authors John Hogan and John Maxson do an excellent job telling the story of Chicago's Motor Row, largely through historical photos contrasted with current photos of the same views. This long street in Chicago in its 1905-1936 heyday was the premier sales venue in America, featuring more than 65 automobile dealerships, repair shops, parts suppliers, etc. It is now listed in the National Register of Historic Places. In the 1980s, the third floor of the former Centaur Motors building on Motor Row was this reviewer's office and workshop, complete with a working car elevator. Today, little of the once bustling historic section remains along South Michigan Avenue and many of the remaining buildings are derelict. In Jay Leno's introduction, he evokes the era and points out the changes taking place as America converted from horse to horseless. Arcadia Publishing provides a lot of information at minimal cost in more than 12,000 titles in their Images of America series. These books are filled with historical photographs on various aspects of American history, all with characteristic sepia soft covers. **DC**

John F. Hogan & John S. Maxson: Chicago's Motor Row (Images of America)
Arcadia Publishing, 128 pages, 147 images, in English, $14.39 USD, ISBN 978-1467107624

Ukrainian
STREETLIFE FROM DAYS GONE BY

The art of photographing interesting cars on the street and then compiling books on the subject is nothing new. Paul Simsa famously did this in Germany, but there are other similar books in Japan, France, America and elsewhere too. Still, the latest iteration of the genre by Leonid Gogolev, a well-known motoring journalist in Ukraine, is something unique. As its title suggests, it looks at cars photographed on the streets of Kyiv in the 1950s and 1960s. And the first chapter, Trophies On the Streets of Kyiv, will be of particular interest to many collectors as it shows Horch and other German cars which were brought to Ukraine (then part of the Soviet Union) by the Red Army during World War II. Another chapter deals with American cars and trucks which remained in Europe after the War. Language barriers aside, this is very entertaining reading. **PN**

Leonid Gogolev: Ретроавтомобілі на вулицях Києва
(Retro Cars on the Streets of Kyiv)
Books on Demand, 176 pages, 150 photos in Ukrainian, 390 UAH.
Available from
https://www.book-on-demand.com.ua



DKW SKTB10
A TALE OF BUILDING AND REBUILDING

While simplicity is purportedly the biggest advantage of the two-stroke engine, the DKW SKTB10 engine is the exception that proves the rule: It's a supercharged two-cylinder opposed piston two-stroke, built during the immediate post-war years in the Soviet occupation zone. Sounds crazy? It surely was. The Soviets had ordered the former DKW competitions department and its chief engineer August Prüßing to build it, mandating explicitly the elaborate (but efficient) technology. The necessary material wasn't always available, but regardless of the circumstances, those working on the project ran the risk of being accused of sabotage in case of material failures...
In the end, the machines were sent to the USSR where they competed successfully. And then there was Kurt Kuhnke, a privateer from Braunschweig in Western Germany, who took up Prüßing's ideas and built his own opposed-piston engine motorbike KS 1. It had survived in authentic condition until collector Hermann Herz "rebuilt" it, creating a DKW that never existed. The bike was lost forever... Even though this paperback counts only 112 pages, it contains a multifaceted story, combining technology, biographies and many historical documents. **FES**

Frieder Bach, Heiner Jakob: Der letzte Kompressor-Zweitakter mit DKW-Genen, Mironde, 112 pages, 125 images, in German, 14,50 Euros, ISBN 978-3-96063-035-7

Royal
WHEN STYLE RULED IRAN

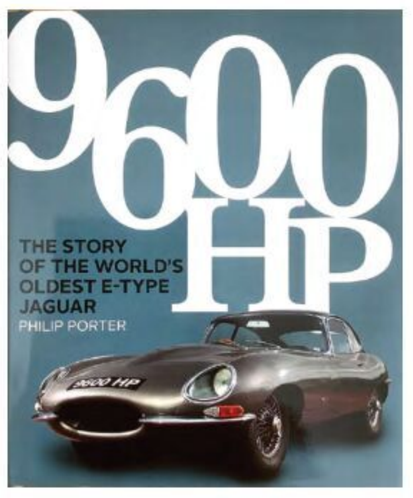
The Persian monarchy lasted around 2,500 years and in the 20th century these kings had a great affinity to the automobile. This heavy tome is dedicated to these vehicles – both cars and aircraft. The book is not a monotonous catalogue, but rather the history of the royal automobiles is embedded into the history of the country and into the history of the ruling family(ies). The fascinating story starts with the steam powered Gardner-Serpollet 10 HP bought in 1900 by Shah Mozaffar al-Din which was the first automobile in Persia, and ends with the last Shah of Iran, Mohammad Reza Pahlavi, sent into exile in January 1979. The last Shah contributed the largest part to the royal garage and he is featured in this book. His appearances in the Lamborghini Miura, Mercedes 300 SL, or Maserati 5000 GT are world famous (and illustrated in great period pictures). The children's cars of the Princes and Princesses have been included as well. The author tries to describe the fates and to document the whereabouts of the vehicles, many of which have found their way to the "National Automobile Museum of Iran." **WB**

Borzou Sepasi: Fit for a King. The Royal Garage of the Shahs of Iran
Dalton Watson, 564 pages,
1046 photos, $150 USD
ISBN 978-1-85443-292-6

Pourtout
FINE FRENCH COACHBUILDING

Marcel Pourtout was one of the greatest French coachbuilders in the late 1930s. His enduring masterpieces include the Peugeot Darl'mat roadster, the Embiricos Bentley, and the Delage D8-120S Aero Coupe, all designed by his brilliant collaborator Georges Paulin. A full appreciation of Pourtout's achievements has not been possible until the recent publication of this comprehensive new book by Jon Pressnell. Publisher Dalton Watson has produced another superb monograph on a great coachbuilder. With 754 photographs, extensive references, and access to the Pourtout family's unpublished archives, Pressnell tells the story chronologically, setting it in the historical context of the company's start in the aftermath of WWI, continuing through the Great Depression years and the occupation of France during WWII, and concluding with the business adaptations Pourtout made after the war. He explains in detail the Tour de France and other specialty commercial vehicles Pourtout made after the traditional coachbuilding business ended. Pressnell, a long-time contributor to Classic & Sports Car magazine, is a compelling writer. This should be considered one of the definitive books in a coachbuilding library. **DC**

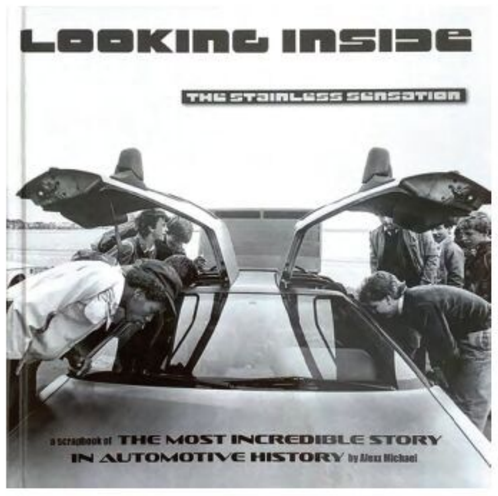
Jon Pressnell: Marcel Pourtout – Carrossier, Dalton Watson,
488 pages, 754 images, $150 USD
ISBN 978-1-85443-286-5



Jaguar E-Type
THE MANY ASPECTS OF AN AUTO-BIOGRAPHY

Philip Porter is a Jaguar connoisseur. And it is fair to say that he is a lucky man. First of all, he has become the publisher of high-quality automotive books. And then there's this car in his garage: a Jaguar E-Type with the registration "9600 HP." It's none other than the car that arrived at the 1961 Geneva motor show just 20 minutes before the scheduled presentation and after a legendary non-stop full-throttle drive. But looking at Porter's book about the car, its history and restoration, this is just a detail: Starting out from the question as to why the E-Type Jaguar became such a success at all, he unfolds a varied story with many aspects to discover. It is a welcome addition to general monographs on Jaguar and the E-Type alike. "Hopefully, this book is no dry technical paper but rather a romance, a celebration and a detective story," the author writes in the introduction. Yes, it is! Compared to the first edition of the book entitled "The Most Famous Car in the World," Porter has added more information and archives on designer Malcolm Sayer that would have made a book of its own, though. Apart from the small type size interfering with the readability, the book is well designed and a compelling read. Highly recommended. **FES**

Philip Porter: 9600 HP. The Story of the World's Oldest E-Type Jaguar
Porter Press, 320 pages, ca. 430 images,
in English, approx. 60 Euros
ISBN 978-1-913089-27-6



DeLorean
RIGHT FROM JOHN Z'S DESK

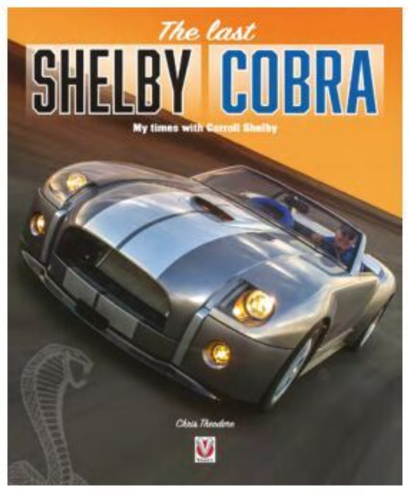
Apart from being the world's most famous time machine, the DeLorean DMC-12 is also the symbol of a downfall – the downfall of its creator, John Z. DeLorean. Did he really think he could save his company with a shady drug deal? No, of course not. DeLorean was a skilled businessman, not a dreamer. Alexx Michael is a rock musician, but he is also a true DeLorean enthusiast. As such, he has become an expert on the DMC story. Drawing on extensive archives from the company, he has chosen the form of a "scrapbook" to unfold it – from the first calculations to DeLorean's court trials. Barrie Wills, the final chief executive of DeLorean Motor Cars Ltd. in Northern Ireland, is quoted many times, setting the record straight and pointing at all the backbiting that is still involved up to this day. Unfortunately, in many other cases the author leaves it up to the reader to draw conclusions from all the abounding correspondence, stunning photographs, spidery notes etc. Novices will struggle a bit, but those already familiar with the subject will enjoy delving deep into it. There is a bookmark and a collector's coin included in the price, but one would have wished that the author had invested more in the book design and the typography. **FES**

Alexx Michael: Looking Inside. The Stainless Sensation
RSR Music & Publishing, 500 pages, ca. 750 images, in English, 79 Euros, available on www.deloreanbook.org

VW Kübelwagen
WHEN THE UNIFORM WAS LEFT BEHIND

When the Second World War was over, the German military had spread their machinery all across Europe. Until then, the KdF factory in Wolfsburg had produced 50.788 Kübelwagen "Typ 82" and the car's role during the war is well documented. In the postwar years though, many Kübelwagen ended up in the hands of civilian owners. Some appreciated its off-road qualities (e.g. on farms or in the forestry), others commissioned extensive conversions right up to new bodywork, transforming their Kübel completely. In his new book, VW collector Alexander Fritz tells the stories of different Typ 82's in the post-war years of his native Austria, which is a good idea as the subject has been neglected until today. Unfortunately, the publisher seems to have neglected the need of coediting and guidance to this project. More than once, Fritz' text raises questions, not to mention that it lacks referencing and suffers from the absence of sufficient proofreading. On top of that, the various restorations portrayed in the book seem idiosyncratic, to say the least – but that's a VW phenomenon which needs to be discussed elsewhere. After all, taking up a good subject is just not enough. **FES**

Alexander Diego Fritz: Vom Krieg in den Frieden
Hollinek, 188 pages, 428 images, in German, 49 Euros,
ISBN 978-3-85119-387-9



Prototype
CHRIS, CARROLL, PETUNIA AND DAISY

Chris Theodore was Vice President of Engineering at Chrysler and Ford in the 1990s and early 2000s. When work started on the Dodge Viper, he met Carroll Shelby who acted as a consultant. They would eventually become (and remain) friends until Carroll's death in 2012. When Theodore went to Ford, he helped reuniting Shelby with the blue oval. Both men would work in the team that created the modern Ford GT (Codename: Petunia) presented in 2002, and the next project was a new Cobra, codenamed "Daisy". Luckily enough, Theodore was able to buy the prototype at an auction in 2017; nevertheless, his book is not just about Daisy, nor is it solely about the author's relationship with Shelby. It's a personal memoir, giving insight to the executive levels – but from a totally subjective point of view, and focusing only on the prestige projects. The appendix contains lists of the different development teams and their members. The images, often snapshots of poor quality, match the personal side of things, while the standardized layout wouldn't knock Shelby's cowboy hat off. But at the end of the day, this book is an interesting read, never mind the somewhat misleading title. **FES**

Chris Theodore: The Last Shelby Cobra. My Times with Carroll Shelby
Veloce, 160 pages, 180 images,
in English, ca. 30 Euros
ISBN 979-1-787114-50-0

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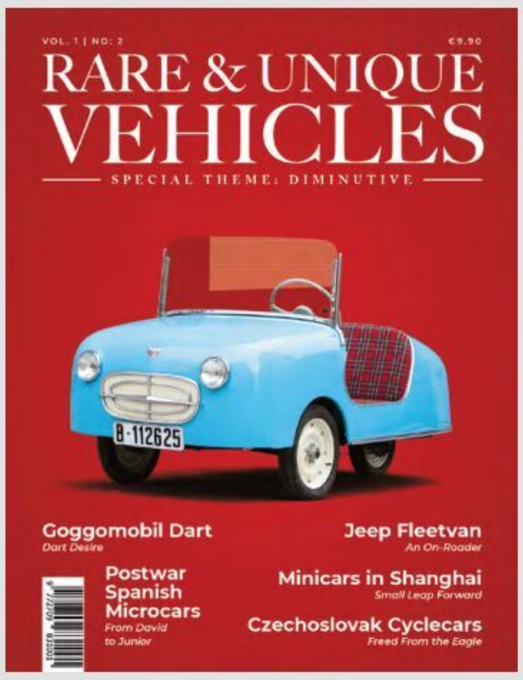

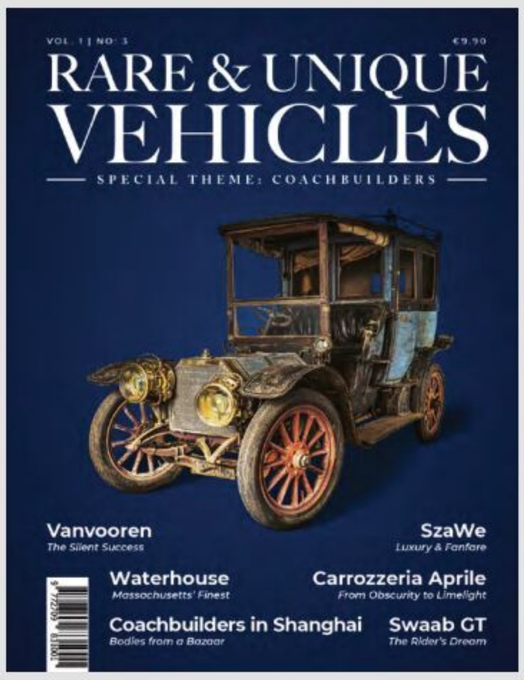

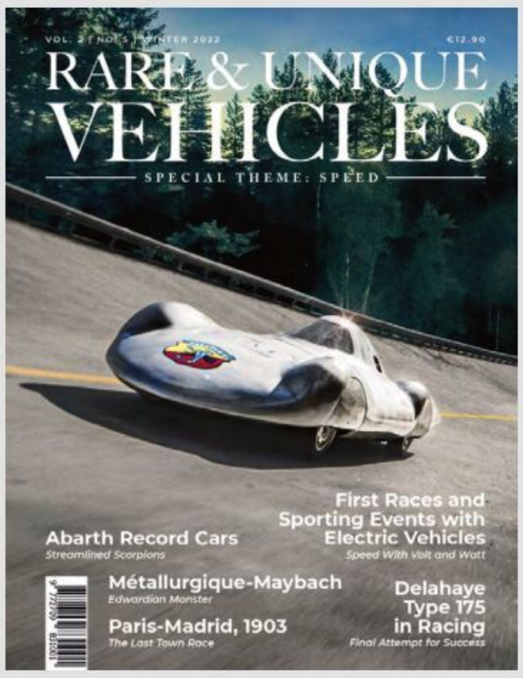

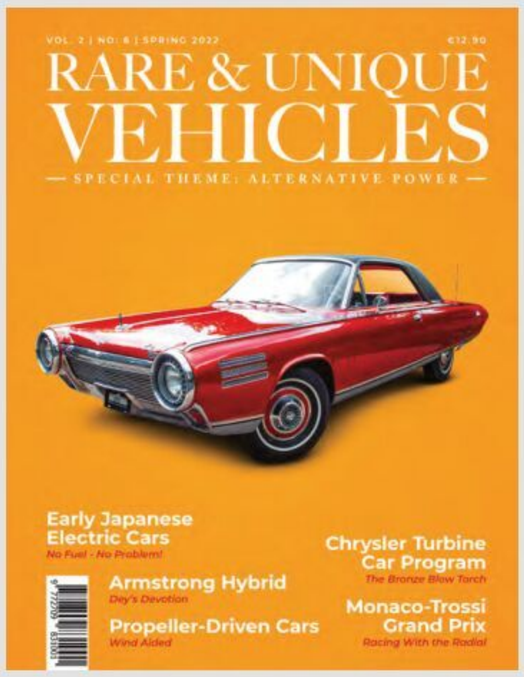

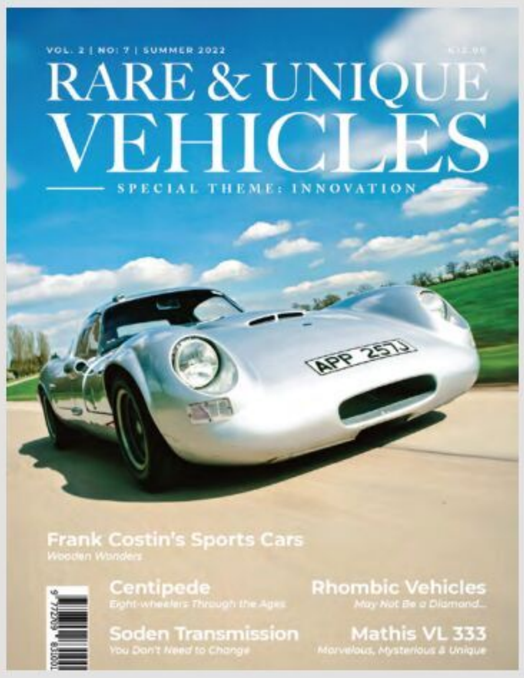

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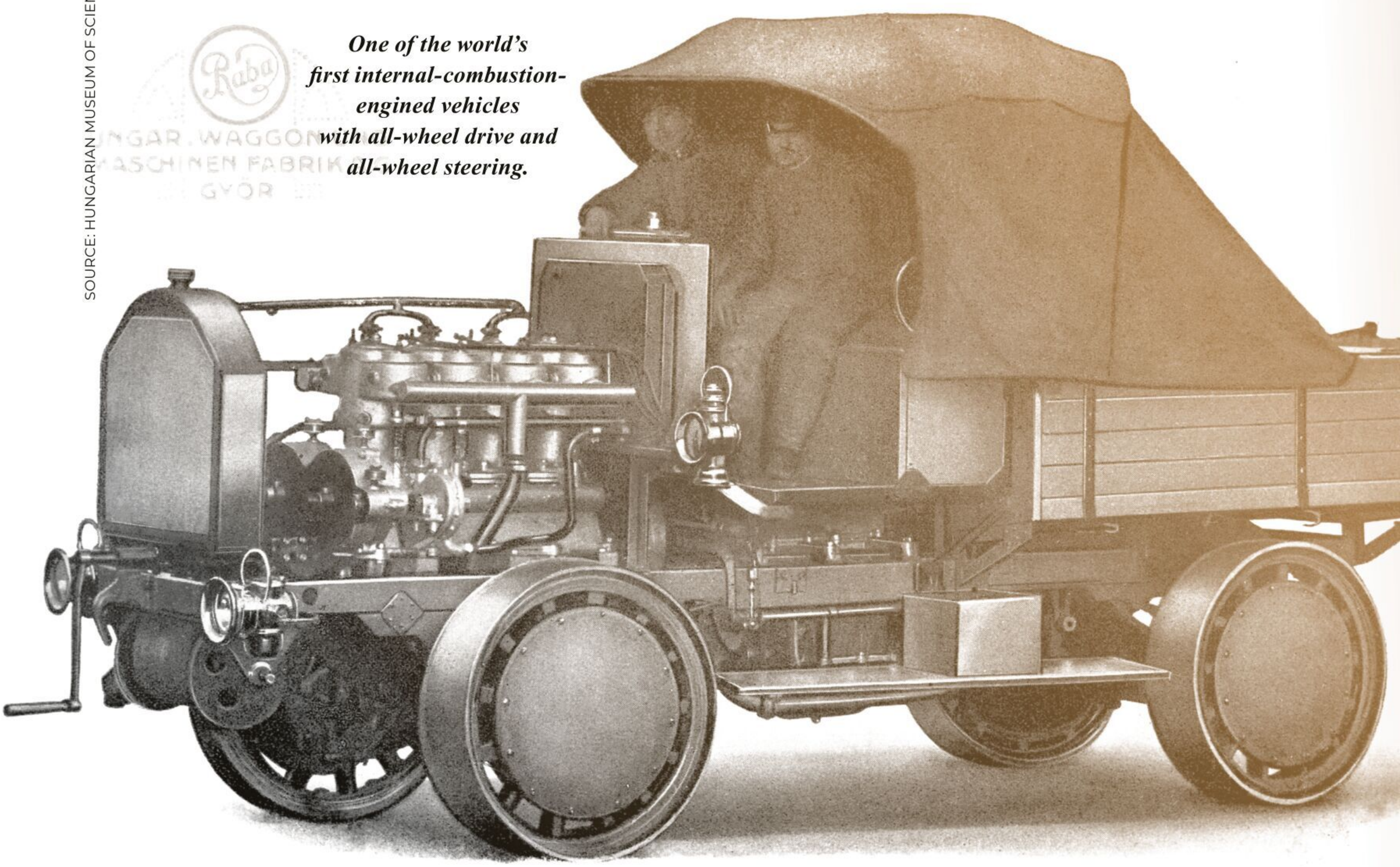
SOURCE: HUNGARIAN MUSEUM OF SCIENCE, TRANSPORT AND TECHNOLOGY (2)

Benzinmotor-Zugwagen

Bauart 1904, mit Vierräder-Antrieb

THE TLASKAL TRAIN

One of the world's first internal-combustion-engined vehicles with all-wheel drive and all-wheel steering.



Motorleistung...	40 PS	Radstand	3200 mm	Tragfähigkeit...	2000
Hub	150 mm	Spurweite	1460 mm	Geschwindigkeit	24
Bohrung	120 mm	Radabmessungen...	1000/250 mm	Eigengewicht...	4300

CARRYING WEIGHT

MILITARY TRACTORS

OF THE AUSTRO-HUNGARIAN MONARCHY

Over 110 years ago, the Austro-Hungarian Monarchy developed all-wheel-drive, hybrid, and all-wheel-steering military tractors. **Dr. Pál Négyesi** looks at the early experiments and the later production variants of these remarkable vehicles.

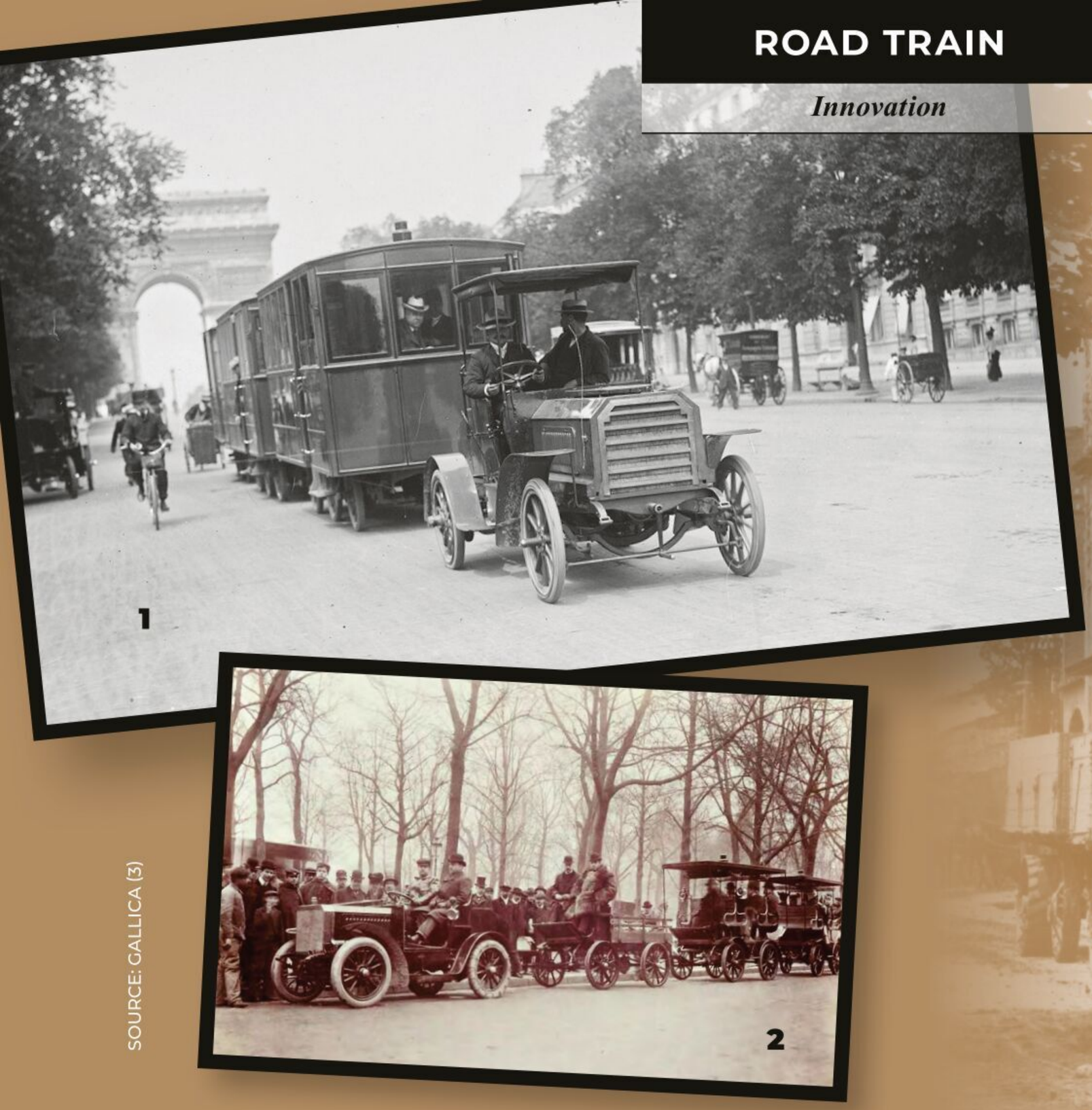
SOURCE: KRIEGSARCHIV

The Tlaskal train was tested at the 1905 military exercise.

The Tlaskal train was able to pull up to five trailers.

ROAD TRAIN

Innovation



SOURCE: GALLICA (3)

THE RENARD TRAIN

1 A Renard train was used in Paris as an alternative to trams.

2 The first public outing of the Renard train was at the 1903 Paris Salon.

3 The first version was based on a Darracq passenger car.

The 1904 Vienna Auto Show was a watershed moment in the history of the motorization of the Austro-Hungarian Army. In 1896, a German Daimler truck was tested, followed by steam locomotives, steam trucks, and a few experimental trucks built by the newly formed Österreichische Daimler Motoren GmbH. Beginning in 1903, military leaders of the Monarchy started planning a war against Italy, which required heavy artillery such as siege mortars. Transportation of these devices was extremely difficult due to their weight.

However, the military was inspired by the French Renard Road Train at the 1904 Vienna Auto Show to urge local companies to develop similar vehicles to aid with the transportation of artillery equipment. Until the First World War, a plethora of vehicles were built, culminating in Ferdinand Porsche's Landwehr Train series.

THE RENARD TRAIN

Charles Renard was born on November 25, 1847, in Damblain, France. A clever child, he won a scholarship that eventually led him to graduate with honors from one of the leading universities. With the advent of the 1870 Franco-Prussian War, he left school early and took up a military career. For his bravery he was awarded the Cross of the Légion d'Honneur.

Extraordinarily, he developed a now widely used system

After Renard's death the British Daimler company acquired the British rights. This Renard-Daimler was used at the Talarn hydroelectric power station in Spain.

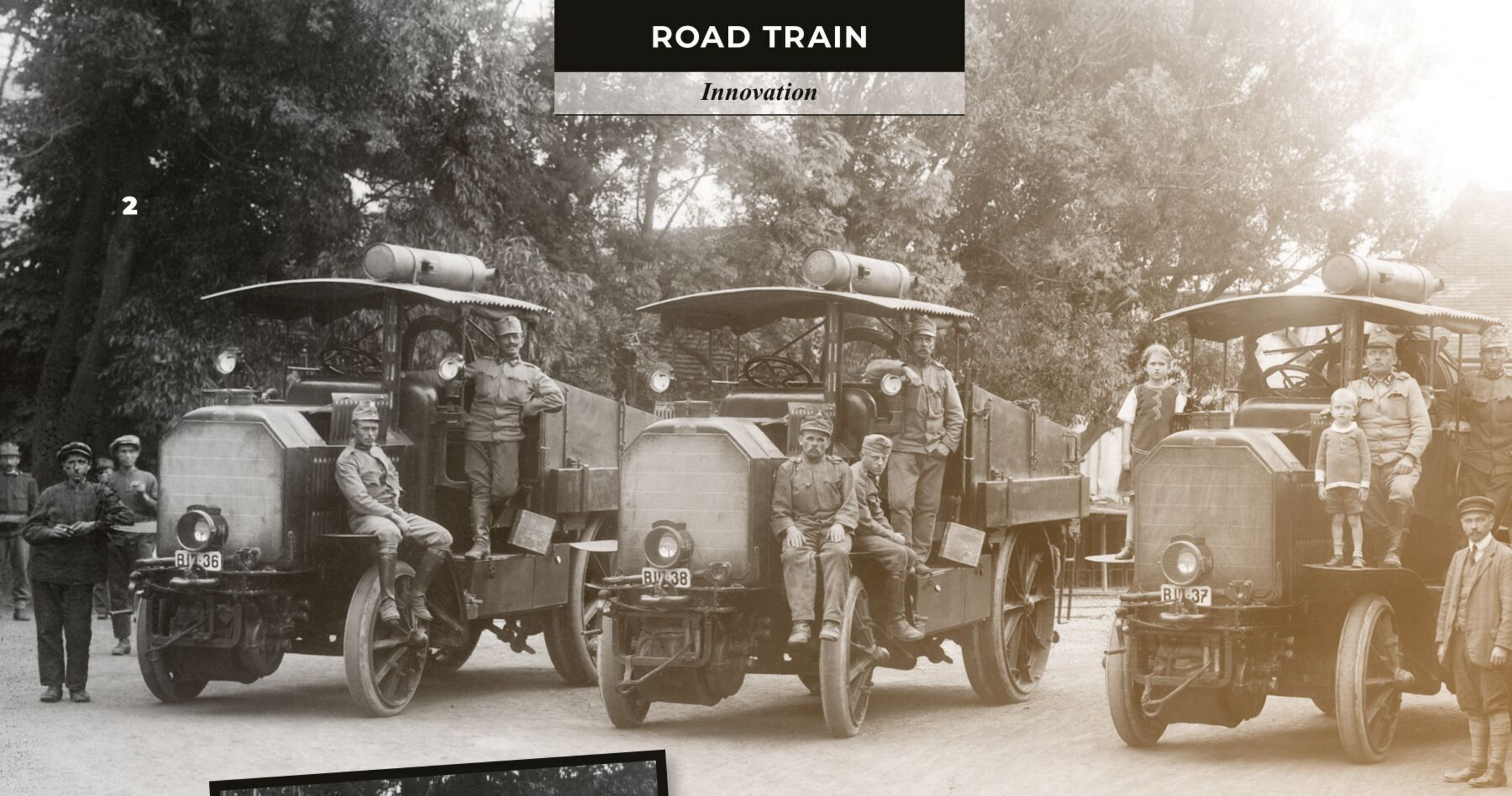
SOURCE: NATIONAL LIBRARY OF NORWAY

known today as Renard numbers (ISO 3) to organize and standardize mechanical construction. His system helped the French Army reduce the number of different balloon ropes kept in its inventory from 425 to 17!

After the war, Renard studied aerial navigation and worked for the army's aeronautical department. He, along with his brother Paul and Arthur C. Krebs, built the La France dirigible in 1884, which was the first fully controllable flying machine able to return to its starting point.

Once Renard retired from the military he spent the rest of his life working on commercial patents. In 1903 he came up with the idea of the Road Train, which was developed together with Darracq. It was first shown at the company's stand at the 1903 Paris Salon. The Road Train consisted of a tractor hauling six-wheel steerable trailers. The center axle of each trailer was powered through a series of cardan shafts driven from a power takeoff from behind the rear axle of the trailer. It was a revolutionary vehicle that could carry 20 tons of weight. This was the predecessor of today's hauling trucks. Naturally it was not without faults: when crossing uneven ground, the central driving wheels could lift up and lose traction. The transmission joints were deafeningly noisy, and the path the rear truck took cut corners – to the detriment of anything that happened to be in the way.

Unfortunately, Charles Renard did not live to see the success of his Road Train. He became depressed at the French government's lack of interest in his innovations and its subsequent refusal to fund their development. The last straw came when the French government rejected his candidacy for membership to the Académie des Sciences. In April 1905 he committed suicide. Like many of the innovations we discuss in Rare & Unique Vehicles, Renard's Road Train was



SOURCE: PORSCHE (4); AUSTRO-CLASSIC (2)

DAIMLER ARTILLERY TRACTORS

1 The first Daimler all-wheel-drive armored car from 1905.

2 Forty M 12 tractors were supplied before WW 1 to pull mortars. Each tractor was capable of towing between 30-36 tons.

ahead of its time. After Renard's death it was marketed by a newly formed syndicate and found buyers all over the world, including Australia.

THE TLASKAL TRAIN

Ludwig Tlaskal Edler von Hochwall, a captain in the Monarchy's army, saw the Renard Road Train and sprang into action. Von Hochwall had already patented a four-wheel-drive vehicle in 1902 and believed he could upgrade Renard's design. His tractor had a payload of 10 tons, but it featured both all-wheel drive and all-wheel steering. As the Austrian Daimler company was busy with their own experiments, he turned to the Hungarian Railway Carriage and Machine Factory (later known as Rába) in Győr to build the prototype for him. The experimental vehicle with five trailers was barely finished in time for the 1905 military exercise. Everything was fine until the contraption had to brake on a four percent gradient. It took 200 meters to stop the vehicle – and, not surprisingly, the Tlaskal train was quickly rejected. However, Renard's idea would be resurrected, after a round-about history.

ÖSTERREICHISCHE DAIMLER AND ŠKODA

Over in Wiener Neustadt Paul Daimler, Gottlieb Daimler's eldest child, became chief engineer of Daimler's local subsidiary in 1902.
His first all-wheel-drive vehicle was the Panzerautomobil in 1905, one of the first armored vehicles with an internal-combustion engine. Daimler designed an all-indirect four-speed gearbox that took the drive downward through two selectable pinion pairs of gears that gave a choice of ratios

4

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3

3 For the Austrian Daimler subsidiary the first large military contract came in 1908 with the M 08.

4 Ferdinand Porsche updated Paul Daimler's all-wheel-drive system for the M 08.

5 The M 09 was a development of the M 08, which was produced between 1909-1912. It had more equipment.

for eight forward speeds in total. Drive to the front and rear wheels was through a differential that could be locked for difficult terrain.

This vehicle was shown at the 1906 Vienna Auto Show, where it was inspected by Emperor Franz Joseph I of Austria. Later it was modified, but ultimately the army rejected the idea.

In the meantime Paul Daimler and his team continued their experiments with four-wheel drive and completed their own road tractor in the spring of 1906. It was powered by a 60-hp, four-cylinder petrol engine, and its power was distributed to all four wheels via a four-speed gearbox. The front wheels had bevel gears and the rear wheels had pinion drives. It lacked a conventional differential. The vehicle had a dry weight of 3.5 tons with a payload of two tons. The military provided three trailers for the tests, which had two handlebars for the two axles. This solution eliminated the problem of cornering on narrow streets. In 1905, Paul Daimler had to return to Stuttgart, and Ferdinand Porsche replaced him as technical director.

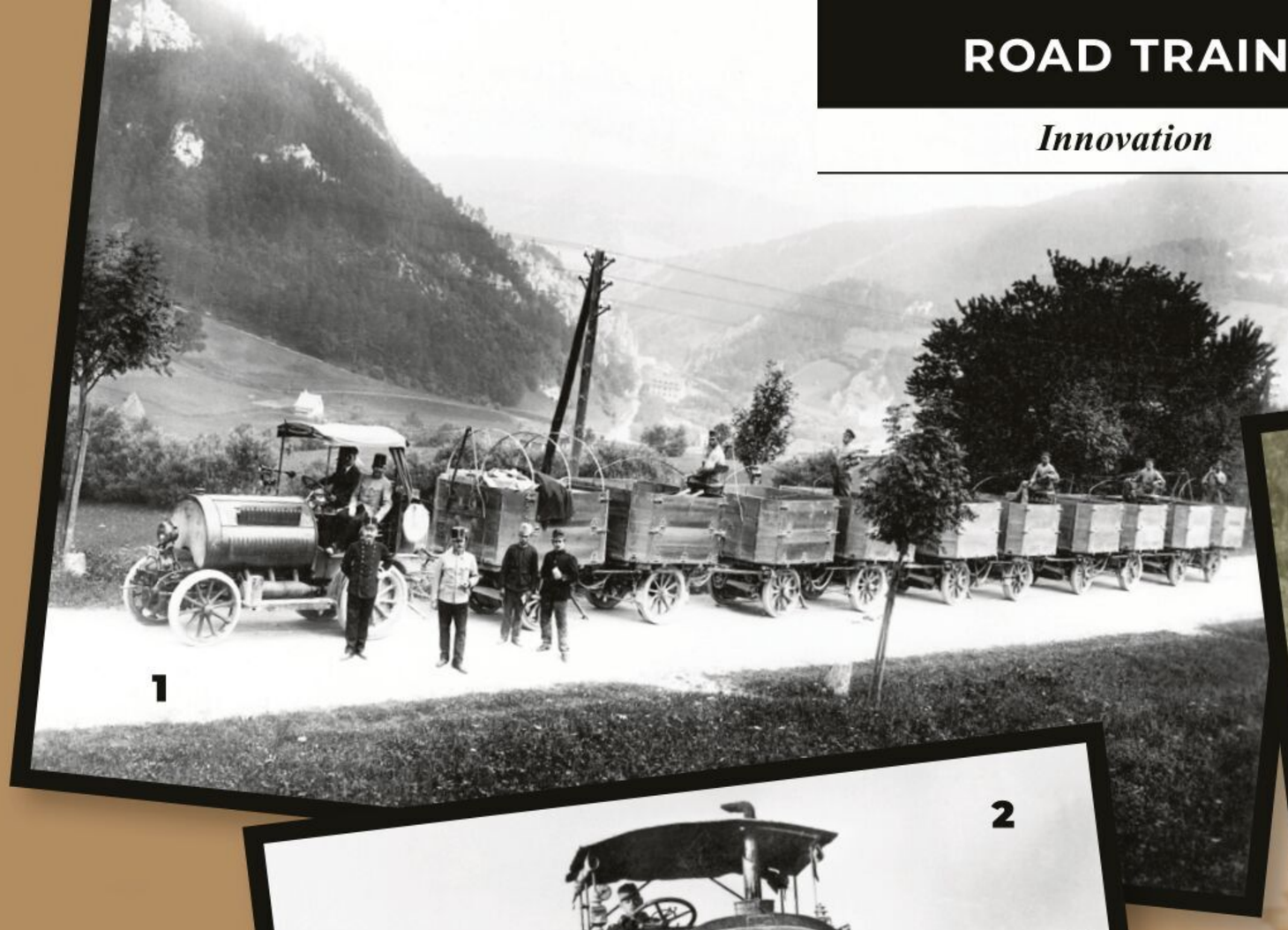
Porsche's first work on this field was the M 06 artillery tractor in 1906, which used Paul Daimler's all-wheel-drive system in a longer chassis. It also carried a drum winch.

At the same time a new company entered the scene: Škodawerke from Pilsen. They utilized a patent from Archduke Leopold Salvator. His patented all-wheel-drive powertrain was developed further by Škoda to include all-wheel steering as well. The Škoda tractor prototype was able to pull 17 tons of materials, but its steering was so heavy that reportedly two men needed to operate it!

In 1908 the Army ordered a dozen all-wheel-drive tractors from Daimler. Called the M 08, Porsche developed a new, 80-hp six-cylinder engine for the vehicle and further updated

ROAD TRAIN

Innovation



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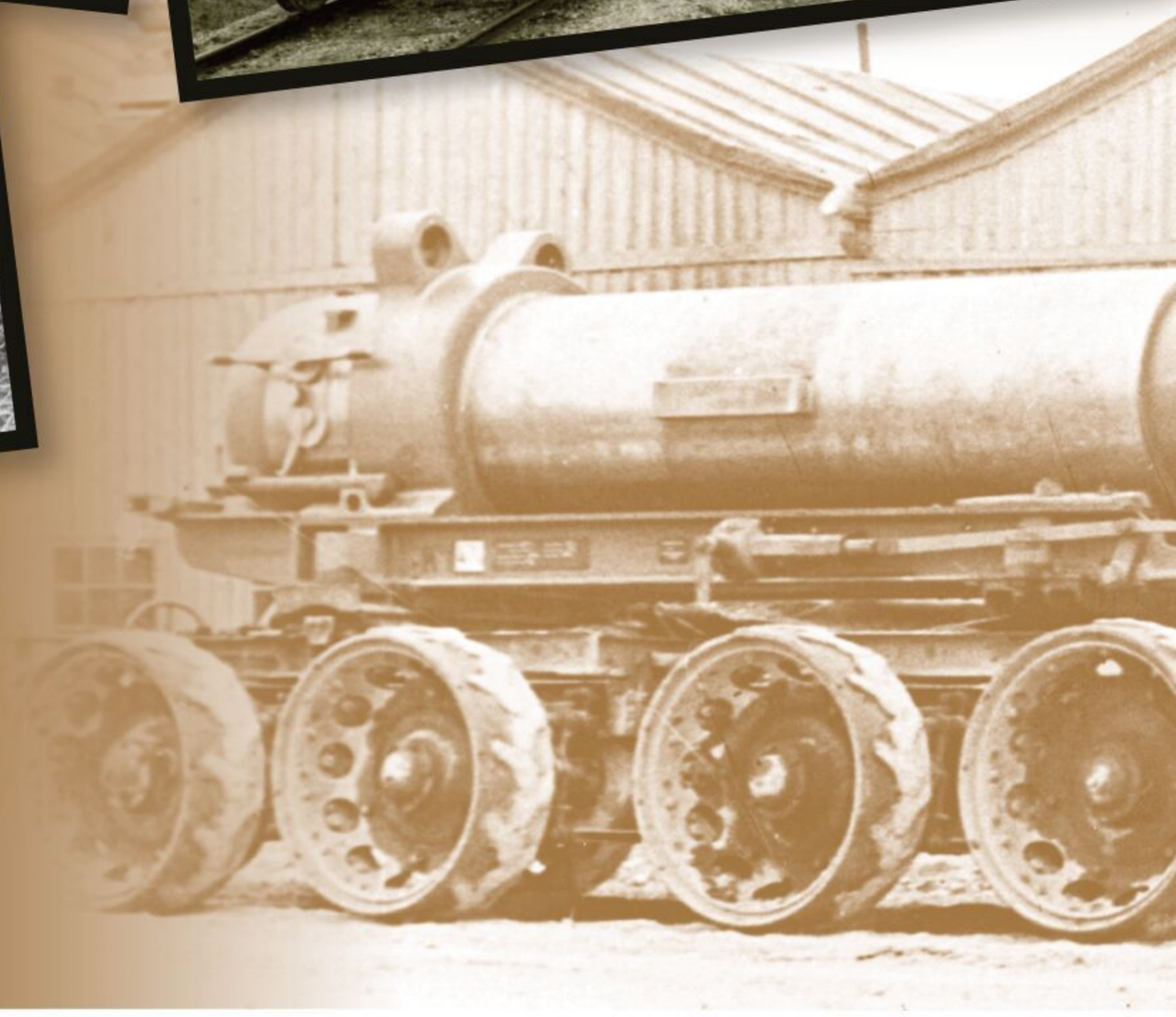
SOURCE: PORSCHE (2), AUSTRO CLASSIC (2)

LANDWEHR TRAIN

1 In 1912 the Road Train idea was revived with the Landwehr Train.

2 The first Landwehr Train was able to pull five trailers on the road.

3 The Landwehr Train was also able to use rails.

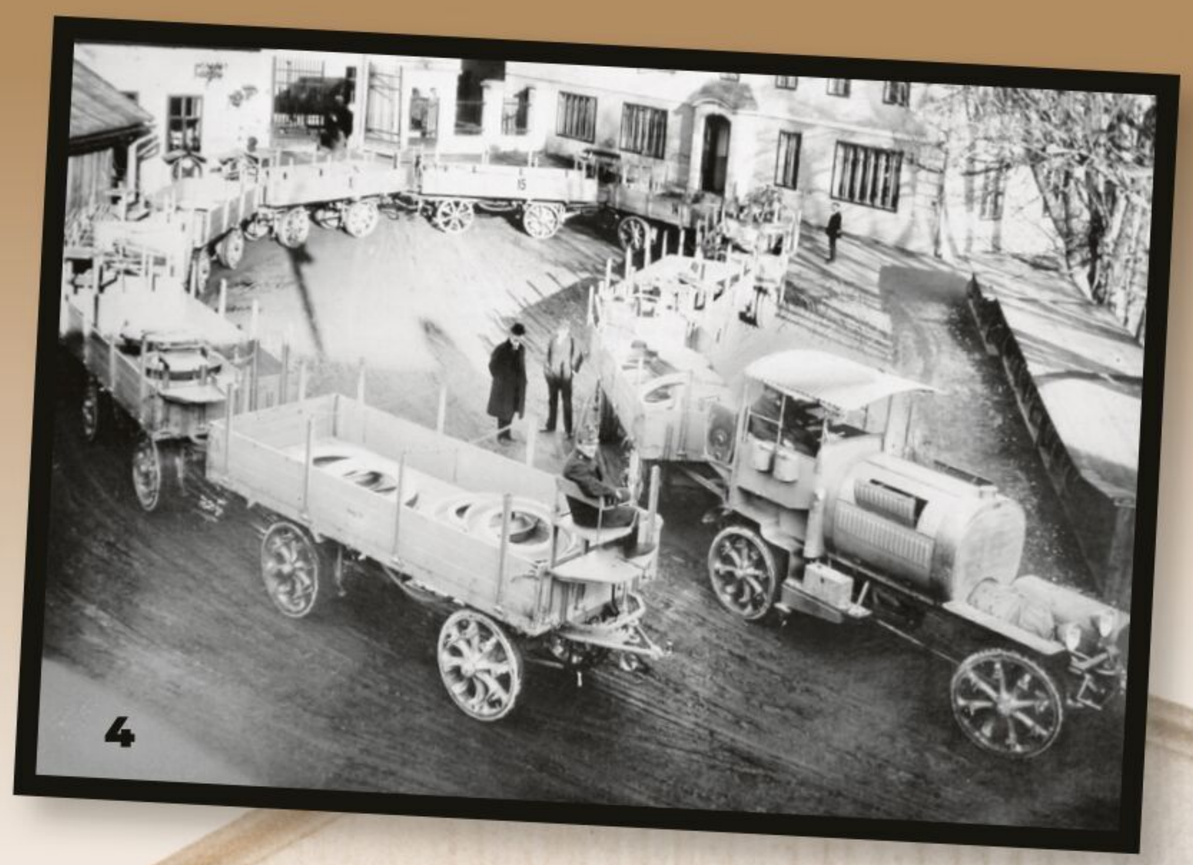


Paul Daimler's four-wheel-drive system. Though built for trailer towing, each M 08 had a rear platform for additional gear. In the following years both Škoda and Austro-Daimler built other four-wheel-drive tractors for the Military. Ferdinand Porsche slowly increased his influence and eventually pushed the German Daimler company out from its Austrian subsidiary. In its place came Škoda. The consolidated companies were able to supply both mortars and transportation vehicles to the army.

The last of the line was the M.17 in 1917 which weighed 10.6 tons and had a wheelbase of 3 meters. Power came from a giant 13.5-litre four-cylinder engine using technology being developed in parallel for aero engines in the form of vee-inclined overhead valves. Appropriately nicknamed 'Goliath,' it had a top speed of 15 km/h and was capable of towing a Škoda M 11 mortar, which weighed 20.8 tons!

LANDWEHR TRAIN

In addition to the artillery tractors, the road train idea was revived in 1912. The next generation was initiated by General Landwehr von Pragenau and was called the Landwehr Train. It was built by Daimler and featured Porsche's innovative petrol-electric hybrid drive. These trains consisted of a generator car and a variable number of trailers, up to five on the road and up to 10 on rail, each carrying a five-ton payload. For the rail journeys, flanged steel disks were screwed onto the solid-rubber-tired road wheels. A 100-hp petrol engine in the generator car was coupled directly to a 70-kilowatt dynamo. This supplied electrical energy via cables from the first to the last car to electric motors mounted in the hub that drove every second axle of the train. So the trailers were self-propelled and not towed. As in the case of the Renard Road Train, the vehicle was able to traverse



4 A publicity shot of the B-Zug was taken in the yard of the Wiener Neustadt factory, featuring 10 trailers!

5 The Skoda howitzer weighed 81 tons and was disassembled into four parts so it could be transported.

The updated version of the Landwehr Train featured hybrid driveline and was able to pull 38 tons with a maximum speed of 15 km/h.

the harshest of road conditions with relative ease. Tangled mountain side roads were no issue either as the individually powered carts could handle the tightest serpentines.
The Landwehr Train used another railway practice for safer stopping: the vacuum brake, which was perfected by John Hardy, a French-born engineer of British origins. The System Hardy brake saw brake lines on both the generator car and the trailers, with the pump being driven by the engine. Subsequent versions of the Landwehr Train were used to haul light cannons and mortars as well. The last version, called C-Zug, pulled a single eight-wheeler trailer and was used until the Second World War. ♦

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HALF-TRACK WONDER

Innovation

An early test of the Kégresse half-track. The driver is Prince Orloff, patron and mentor of Kégresse.

FROM EXCESS TO PROG

Adolphe Kégresse is considered the most outstanding inventor of half-track vehicles. He shot to fame in the 1920s in his work with Automobiles Citroën. **Stanislav Kiriletz** looks at the beginning of Kégresse's developments in imperial Russia.

ADOLPHE KÉGRESSE

Another system was developed by René Le Grain in France. By installing skids the snowmobile did not get stuck in snow, but the wheels slipped.

L'arrière du système Le Grain.– Une fois que les patins portent, les roues „grattent" la neige et la machine n'avance plus.

Adolphe Kégresse and Prince V.N. Orloff with the Tsar's Delaunay-Belleville 70/80 HP in 1908.

Kégresse's first attempt to convert a Mercedes Simplex to be used in snow during the winter of 1909-1910 ended in failure: the front wheels were supported by skids, but the rear wheels stuck in the snow despite snow chains.

HALF-TRACK WONDER

Innovation

Système Le Grain -- Les patins arrière enlevés la machine repart si la hauteur de la neige ne dépasse pas 30-35 centimètres - Janvier 1911

Kégresse was prepared for the next winter. He removed the heavy body of the car and installed additional skids. Deep snow still proved to be a challenge.

Adolphe Kégresse was born on June 20, 1879, in the French city of Héricourt. His work with Citroën is now in history books, but he developed such cars much earlier. The first chapter of his life has been poorly and chaotically represented in historical literature, so it is worth examining this history in chronological order.

The inventor began his career in Russia, and it was there that his talent was clearly manifest. In 1904, after graduating from the École Technique in Montbéliard, he arrived in St. Petersburg, where he got a job as a mechanic in the Motor Division of the G.A. Lessner Machine-Building Works, a local automobile manufacturer. Soon, he was respected enough that he was nicknamed Adolphe Adolphovich – his father's name had been added in typical Russian fashion.

As Kégresse struggled with the Russian language, he put a small ad in a local newspaper, looking for a teacher. A young woman responded. Soon their relationship went beyond teacher and pupil and they married. According to contemporary witnesses this did not increase his Russian language skills. However, the need for a thorough study of the Russian language soon disappeared. Kégresse changed his place of work and ended up in a place where his interlocutors spoke fluently in French, the fashionable language of the upper classes in Russia at that time.

COURT CHAUFFEUR

The Lessner plant cooperated with Daimler-Motoren-Gesellschaft in Germany: it built engines and cars under license in small numbers and also sold, serviced, and repaired German cars. One of their clients was the head of His Imperial Majesty's military-field chancellery, Prince Vladimir Nikolaevich Orloff. Orloff was a passionate motorist who owned two luxury cars, a Mercedes and a Delaunay-Belleville. He soon noticed the energetic Frenchman and befriended him.

Orloff sometimes gave a ride to the Tsar in his Mercedes. In 1905, Nicholas II decided to acquire several cars and set up his own garage at his residence in Tsarskoye Selo. The work was entrusted to Prince Orloff. The following year, the Imperial Garage received its first cars, one Delaunay-Belleville and five Mercedes Simplex, all with 45-hp engines. At first, Prince Orloff was the personal chauffeur of the Tsar, but soon he found the right person. Under his patronage, Adolphe Kégresse was invited to serve in the garage.

Starting his court career as a trainee, Kégresse became an excellent driver and was elevated to the position of Head of the Technical Section and Chauffeurs of the Imperial Garage. This meant that the Tsar was driven by a Frenchman, first under the supervision of Orloff, and then by Kégresse alone.

The Tsarskoye Selo complex featured the latest technology, including a "White Garage" with an assortment of spare parts, tires, petrol, and oil, but also featuring well-equipped workshops and a two-story mansion. The mansion housed

SOURCE: FABIEN SABATÈS (3)

HALF-TRACK WONDER

Innovation

SOURCE: THE SWISS FEDERAL ARCHIVES VIA HARVEIGS

SOURCE: FABIEN SABATÈS

First tests were conducted with Mercedes-Kégresse prototype No. 2 during January, 1911.

The Austin-Kégresse half-track armoured car during testing in 1916.

Kégresse's office and apartment. As the imperial automobile fleet grew, the construction of new garages began in St. Petersburg and the surrounding area, as well as in the Crimea at a summer residence in the village of Livadia. Personnel were replenished, and things were in full swing, but only in the summer season.

During the season the court chauffeur had a lot of work, but from November to April he was sitting idle. Constant snowfall did not leave any opportunity for the operation of cars; horse-drawn sleighs had to be used. During the quiet first winter, Adolphe Kégresse decided to adapt one of the cars for driving in deep snow and off-road. The cars from the initial purchase only served as the personal transport of Nicholas II and the Romanoff family for a short time. From 1908, they were replaced with new cars of various brands. The old ones were released from duty. One Mercedes 45 HP was given to Kégresse for his personal use. He decided to use this car to implement his idea. The process of implementation can be seen in the photographs signed by the inventor personally.

FIGHTING SNOW AND MUD

The first attempt to adapt the car for driving on snow and off-road took place in different countries of Europe and North America at the very beginning of the 20th century. However, almost all of them were unsuccessful. The inventors struggled with designs from the simplest to incredibly complex. But they all faced the same problem – the impossibility of creating a vehicle that can move equally well on- and off-road. By and large, this problem is still relevant today. Adolphe Kégresse was well aware of the work of his predecessors, as well as their successes and failures. However, rather than follow previous approaches, he decided to go his own way from the very beginning. It took him more than three years of continuous work, testing different systems in practice. In 1913, the perseverance of the designer finally brought excellent results. The protégé

HALF-TRACK WONDER

Innovation

In February 1915, a Russo-Baltique C 24/40 HP equipped with the Kégresse half-track was tested in Tsarskoye Selo with a sledge attached, where 10 employees of the Imperial Garage were riding.

Adolphe Kégresse in 1917.

In March 1913 Adolphe Kégresse personally tested his system on rough terrain near Tsarskoye Selo.

Nicholas II himself was given a tour in a Russo-Baltique-Kégresse in 1915.

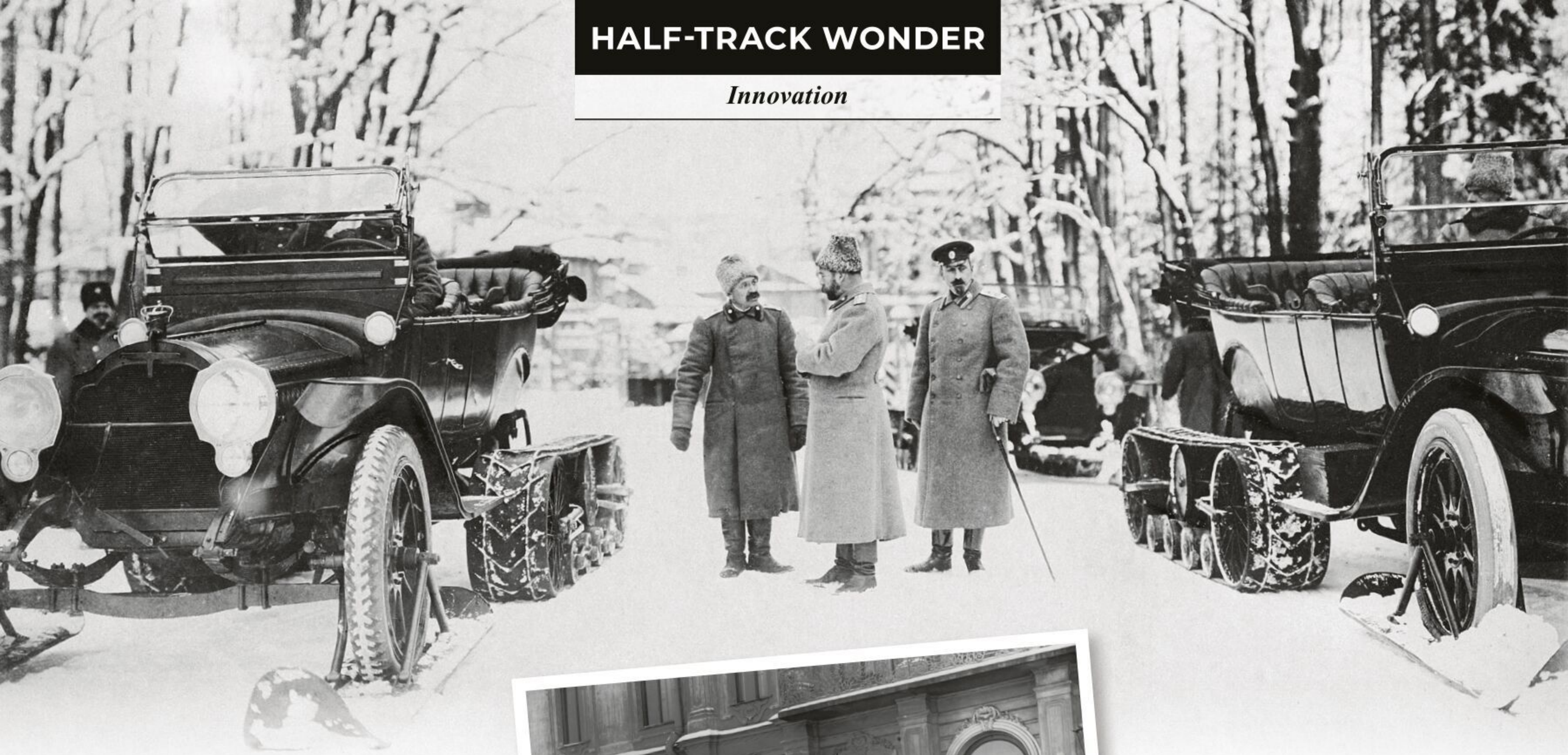
SOURCE: FABIEN SABATÈS

of Prince Orloff settled on driving a car by means of an "endless tape" or "endless belt" – as he called the caterpillar mover of his design. In Russia, the drive unit was given the name "Accessories of Kégresse," despite the fact that he did not invent it. But it was Adolphe Kégresse who first brought it to perfection and enabled its widespread use to increase a vehicle's cross-country ability. He managed to create a universal fixture suitable for any car.

"The proposed device is subject to a set of devices that, being assembled on an ordinary automobile chassis, allow the car to move over any terrain, for example, a plowed field, sand, mud, clay, the like, and mainly on snow, and move from soft road or soft snow several meters deep on a hard road, regardless of its condition, moreover, automatically, without stopping the machine," described Kégresse in a patent application for the innovative invention, dated February 5, 1912. The royal garage's equipment was suitable for the construction of the first prototypes of all-terrain snowmobiles, though they were not yet perfected. Kégresse obtained a number of patents in Russia, France, the United States, and many other countries for "a sled car moving by means of endless belts with pressure rollers and equipped with swivel skids on the front axle" of an improved design.

For the construction of fully serviceable machines, it was necessary to seek help from industrial enterprises. In 1913, at the 4th International Automobile Exhibition in St. Petersburg, Adolphe Kégresse presented two half-track vehicles that were based on a Mercedes and a Russo-Baltique. The engineer had been assisted in his work by the Russian-Baltic Waggon Works in Riga and the Partnership of the Russian-American Rubber Manufactory "Treugolnik" in St. Petersburg.

In February 1913, the Imperial Russian Automobile Club organized a "sledge test" on the ice of Malaya Nevka in St. Petersburg. Three cars participated in high-speed races: a propeller-driven motor sleigh made by Count Jacques de



This photo is dated from 1917. Adolphe Kégresse demonstrated a converted Packard to Emperor Nicholas II. Major General V.N. Voyekoff, commander of the palace, stands at the right.

The Austin truck which was equipped with Kégresse half-track and used by the Sanitary Column during World War I.

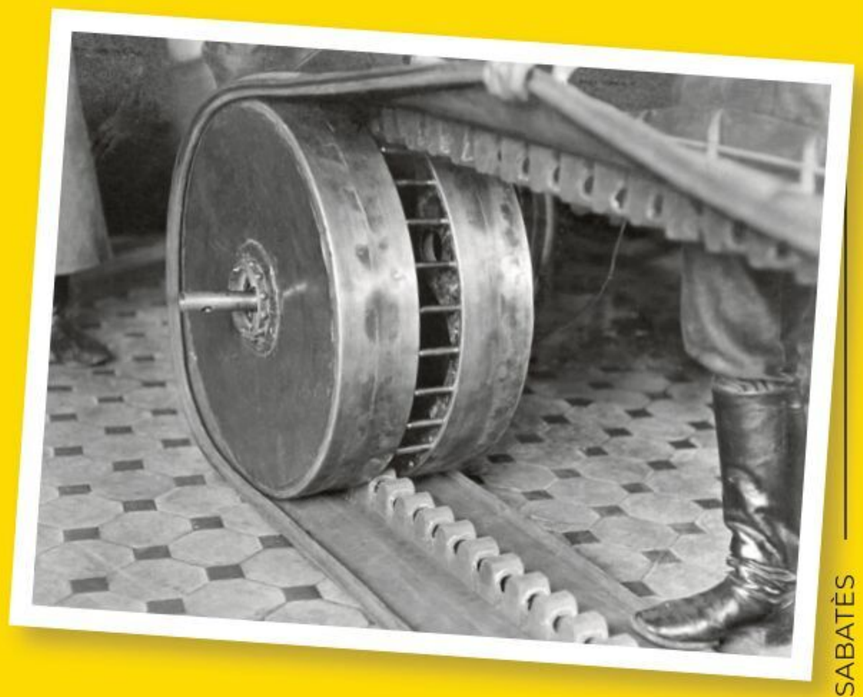
Lesseps in France, another one by Russian inventor Igor Ivanowitch Sikorsky, which was manufactured by the Russian-Baltic Wagon Works, as well as a Mercedes-Kégresse snow-mobile driven by its builder. The best result at a distance of 1 km and the second result at a distance of 3 km were shown by Adolphe Kégresse. Then he took part in the winter races organized by the St. Petersburg Automobile Club on the frozen Baltic Sea along the route St. Petersburg-Kronstadt-St. Petersburg and on the ice of Neva near the Winter Palace.

"KÉGRESSES" IN THE SERVICE

Perhaps the first Kégresse snowmobiles would have remained experimental machines, suitable only for fun and winter racing, had the First World War not begun in 1914. The army needed all-terrain vehicles. In the fall of 1915, Kégresse, by that time already an officer of the Russian army, submitted a detailed description of his design to the Technical Commission of the Main Military-Technical Directorate. A resolution followed immediately: "It is highly desirable to test the Kégresse device on vehicles of different systems, and especially the possibility of using them for armored vehicles, which can be of great importance." Immediately, two new Russo-Baltique C 24/40 HP vehicles were equipped with caterpillars and skids. In March 1915, the autosleigh was successfully tested in snowdrifts in Tsarskoye Selo, on the streets of Petrograd and on the ice of the Neva. The conclusion was: "In its present form, Monsieur Kégresse's snow car is completely finished, developed, and is a highly useful invention, the whole wide future of which is now even difficult to foresee."

In the summer of 1916, one British Austin armored car was experimentally put on tracks. The first cross-country trip near Petrograd went brilliantly. For two months, the armored car was tested near Mogilev, where the Headquarters of the Emperor was located, in motion on soft and wet ground, ditches, hillsides, and even on swampy terrain. On the impassable Mogilev province, 286 verst (305 km) were covered, after which the car was tested for a longer run. The distance from Mogilev to Tsarskoye Selo in 725 verst (773.5 km) was successfully covered by a half-track armored car without significant damage in 34 hours and 15 minutes. Based on the results of these tests, the War Department approved a plan to install the system on 145 cars and trucks and 39 armored cars. The production of Kégresse Devices ("Accessories of Kégresse") was entrusted to the Poutiloff Works, and multilayer tracks were ordered from the Treugolnik factory.

For the first time in the world, mass production of half-track vehicles began in the then capital of Russia – the city



The endless belt from 1914 which was ready for production.

SOURCE: FABIEN SABATÈS

A MODEL

In 2012-2013 Stanislav Kiriletz together with a partner built a scale model of the Russo-Baltique C 24/30 HP which was equipped with a Kégresse half-track. 60 such models were put together using Soviet models as a basis.

of Petrograd. By the end of 1916, five sanitary sleighs were made on the reinforced chassis of Austin and Renault cars. All of them joined the Automobile and Sanitary Column of the Imperial Russian Automobile Club named in honor of the heir to the Tsar, Tsesarevich Alexei. The sledges were intended "to work on virgin snow" on the Northern Front in the Baltic Provinces, where they proved to be the best. At the same time, the workshops of the Imperial Garage began refitting Packard cars with half-tracks. By the end of January 1917, "Accessories of Kégresse" had been installed on nine Packards.

Production was halted by the February Revolution of 1917. After the abdication of Nicholas II from the throne, his cars were placed at the disposal of the Provisional Government. Adolphe Kégresse, aligned with the former Tsar, resigned and left with his family for Finland. At the end of World War I, he returned to France. The manufacture of his "devices" continued slowly in Petrograd. Various estimates put the number of conversions from 15 to 34, most of them remaining in warehouses.

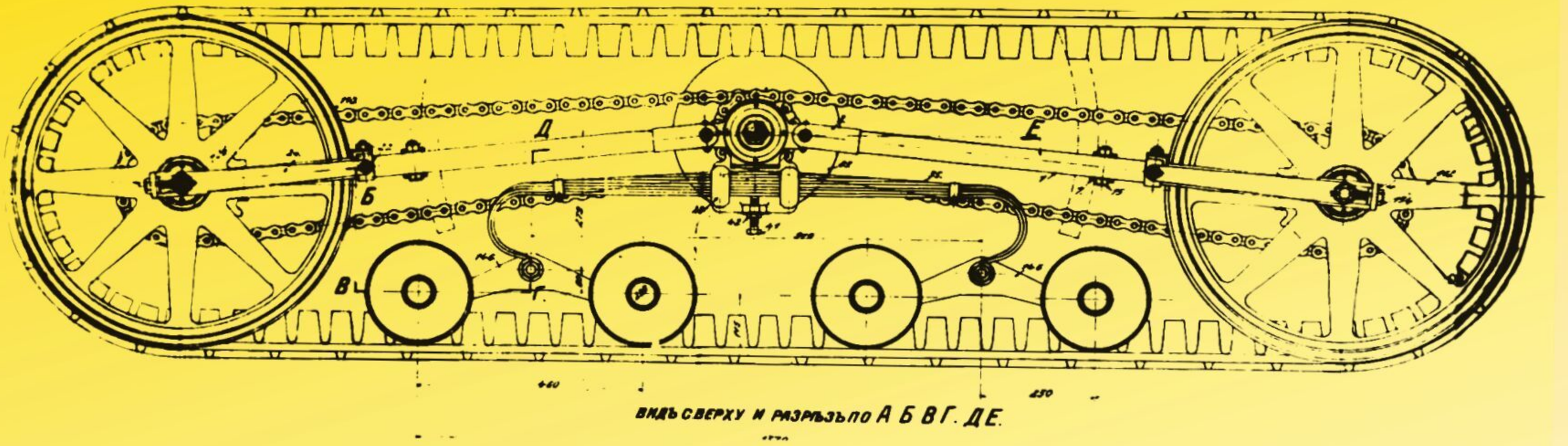
The Bolsheviks, who took power in Russia in the fall of 1917, also remembered the autosleighs created by Kégresse. At the height of the Civil War in 1919, the Poutiloff Works built a dozen half-track armored vehicles on Austin chassis and probably converted two more Packard cars that were used by the leaders of the proletarian revolution, Lenin and Trotsky. After that, the autosleigh was forgotten for a long time. At the end of the 1920s, some of the Kégresse kits that remained in the warehouses were installed on cars of different brands. Among them were two Rolls-Royce cars, one of which is still mistakenly considered Lenin's snowmobile.

LATER LIFE

In 1920 André Citroën acquired the rights for Kegrésses invention and created a separate company to allow him to further develop and market his ideas for the Autochenille, or caterpillar car. Publicity was generated using Citroën Kégresse vehicles on a series of well-reported ambitious overland expeditions across Africa and Asia. Production vehicles proved popular with the military and, in particular, found use throughout Europe in farming and forestry roles.

After leaving the Citroën company, Kégresse continued to innovate. In 1935, he developed the AutoServe gearbox-transmission system. In 1939, he pioneered the development of modern small guided tracked bombs. Kégresse died in 1943 at Croissy-sur-Seine. ♦

A drawing of the Kégresse system in 1916.



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 CHANGE

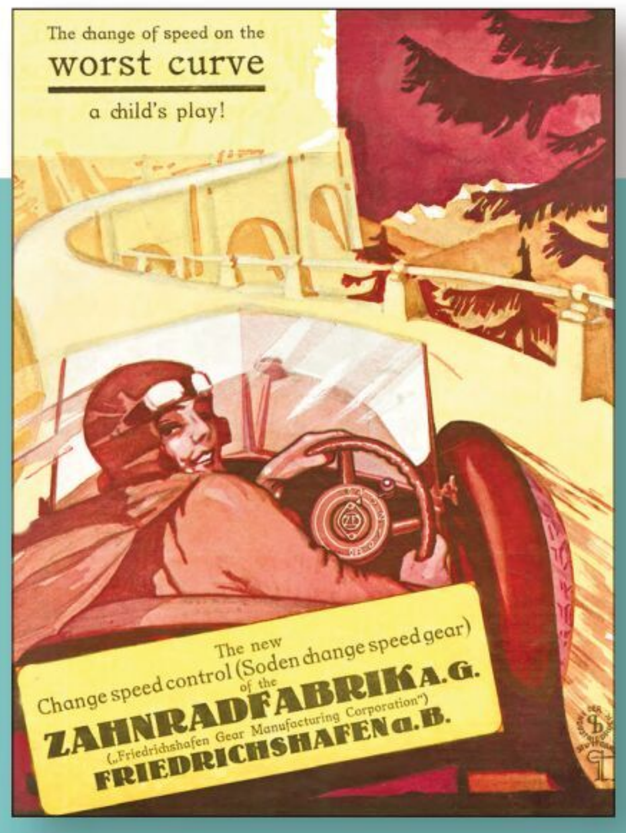
PHOTOS: ZF ARCHIVE

(unless otherwise noted)

SOURCE: WIRTSCHAFTSARCHIV BADEN-WÜRTTEMBERG, B 1009 BÜ 179

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

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


The change of speed on the
worst curve
a child's play!
The new
Change speed control (Soden change speed gear)
of the
ZAHNRADFABRIK A.G.
(„Friedrichshafen Gear Manufacturing Corporation")
FRIEDRICHSHAFEN a. B.

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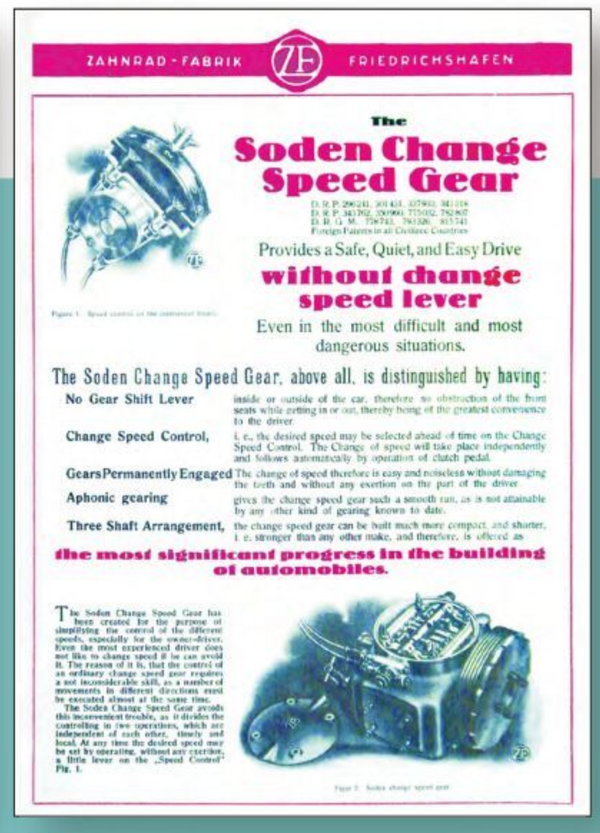
ZAHNRAD - FABRIK
ZF
FRIEDRICHSHAFEN
The
Soden Change Speed Gear
Provides a Safe, Quiet, and Easy Drive
without change speed lever
Even in the most difficult and most dangerous situations.
The Soden Change Speed Gear, above all, is distinguished by having:
No Gear Shift Lever
Change Speed Control,
Gears Permanently Engaged
Aphonic gearing
Three Shaft Arrangement,
the most significant progress in the building of automobiles.

2


Le Nouveau changement de vitesse!
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Supprime totalement le levier
garantit une conduite sûre, tranquille, commode, tant dans les circonstances les plus périlleuses qu'au milieu du trafic intense des grandes villes.
CARACTÉRISTIQUES ESSENTIELLES :
Aucune espèce de levier de changement de vitesse
Sélection des vitesses par Combinateur
Pignons toujours en prise
Dentures silencieuses
Disposition à 3 arbres
Le Changement de Vitesse Z. F. représente le progrès capital de la construction automobile
de ces dernières années
ÉTABLISSEMENTS MICHEL POTOUS
SALON DE L'AUTOMOBILE 1924 (1re Série). — STAND 201, SALLE Z

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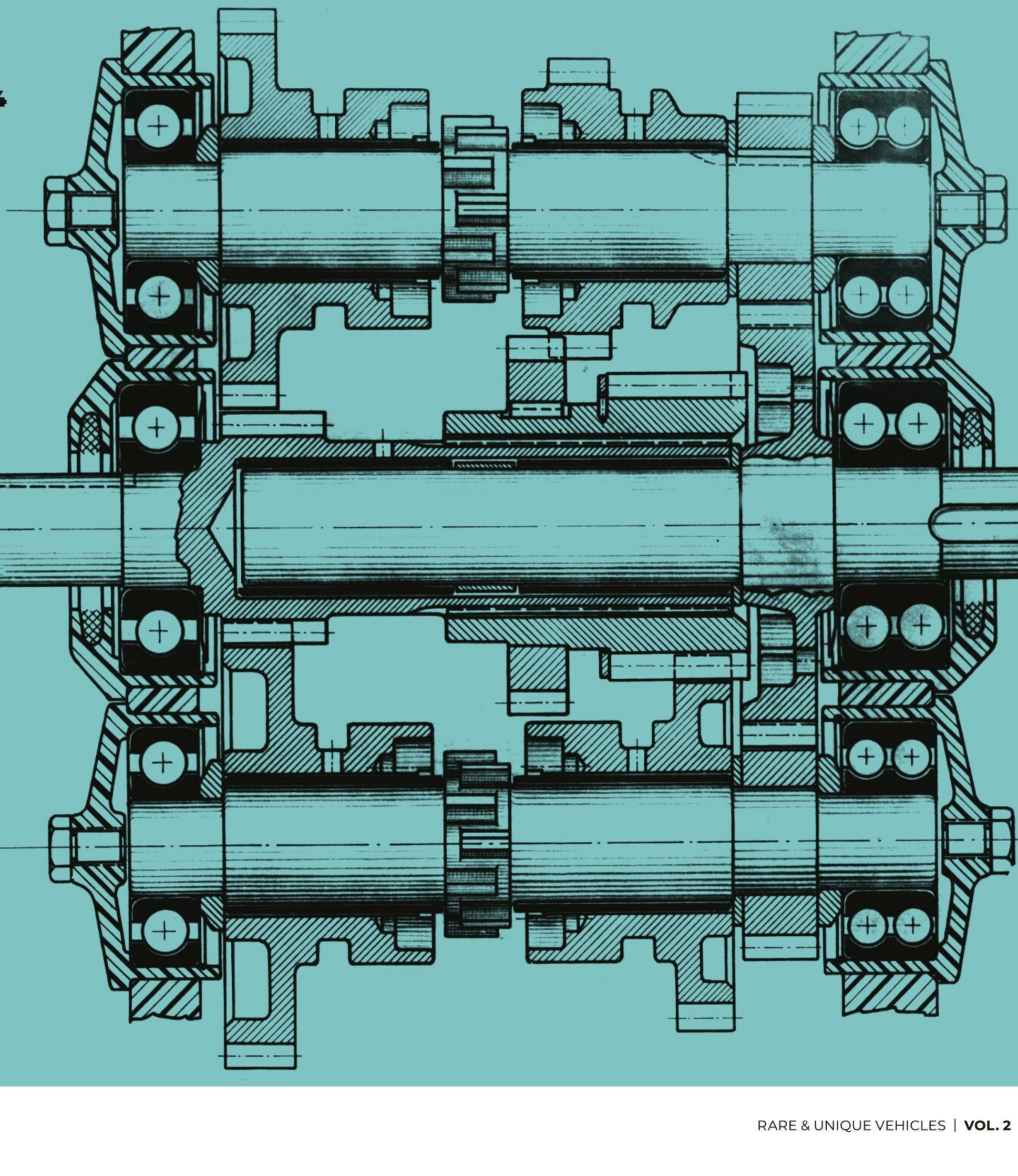

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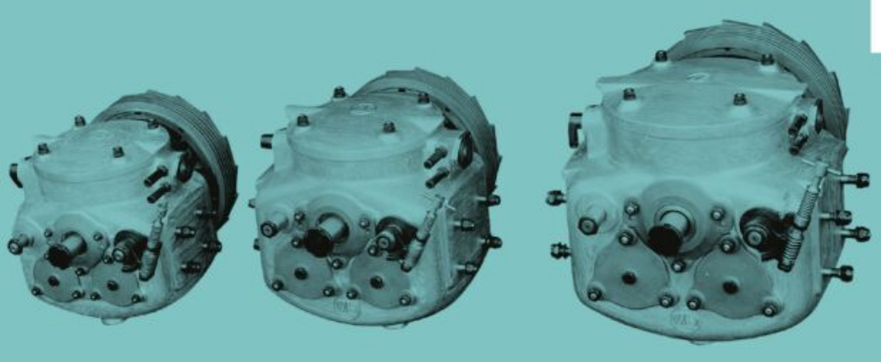
1 In 1923 both German and English versions appeared showing the gear selector in the steering wheel hub.

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.

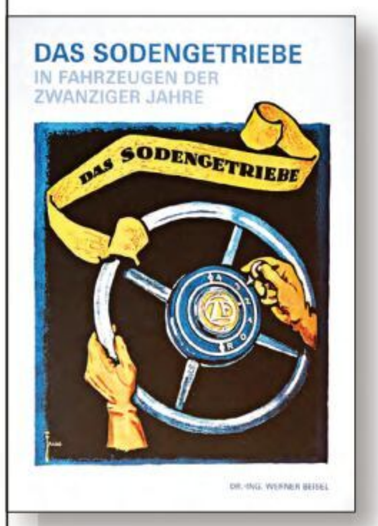


5 There were different sizes presented in 1921 for various passenger car models.

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

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****.*



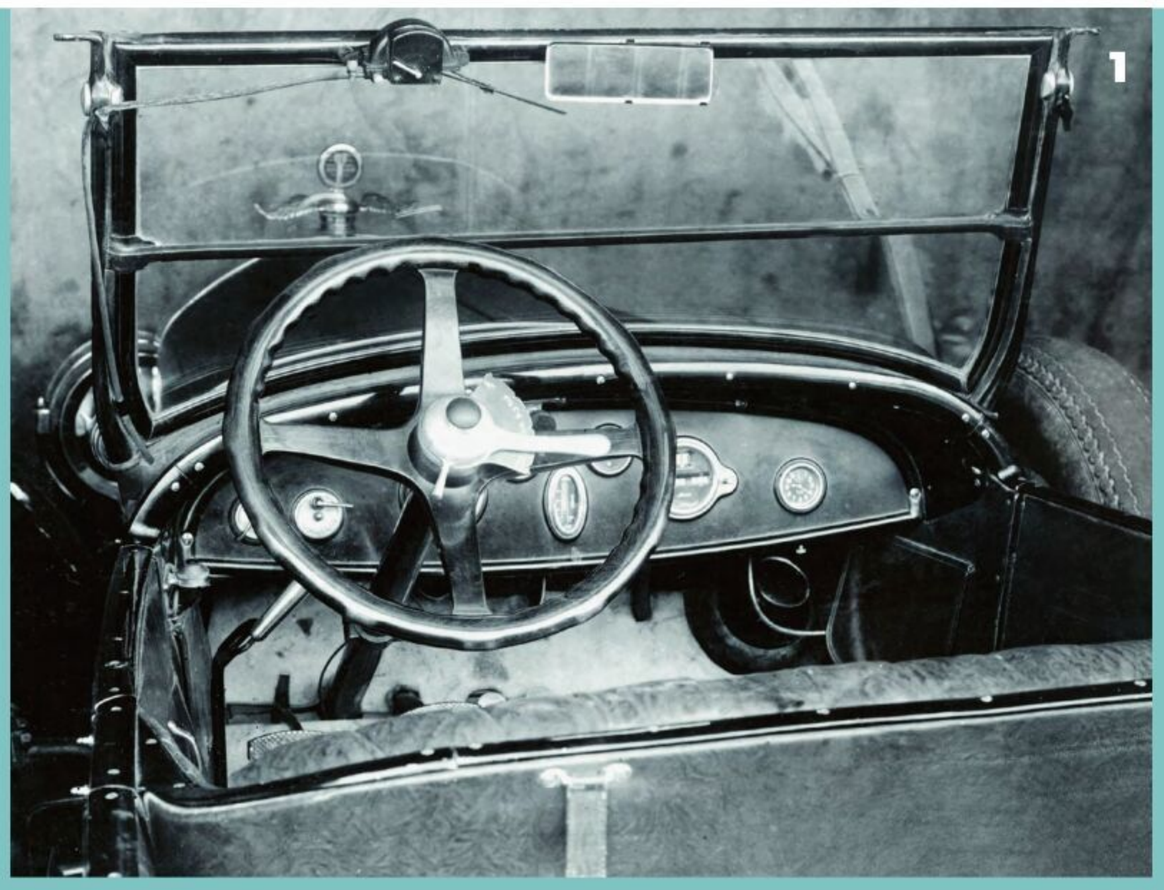
At the beginning of the 1920s, unsynchronized transmission was the norm, in which the running teeth of the gears were used to shift gears. In these systems, the gears were not constantly in mesh. Experience and practice were necessary in order to shift as smoothly and quietly as possible with matching 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

GEARS GRINDING

Innovation



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.

GEARS GRINDING

Innovation

PHOTOS: DR WERNER BEISEL (4)

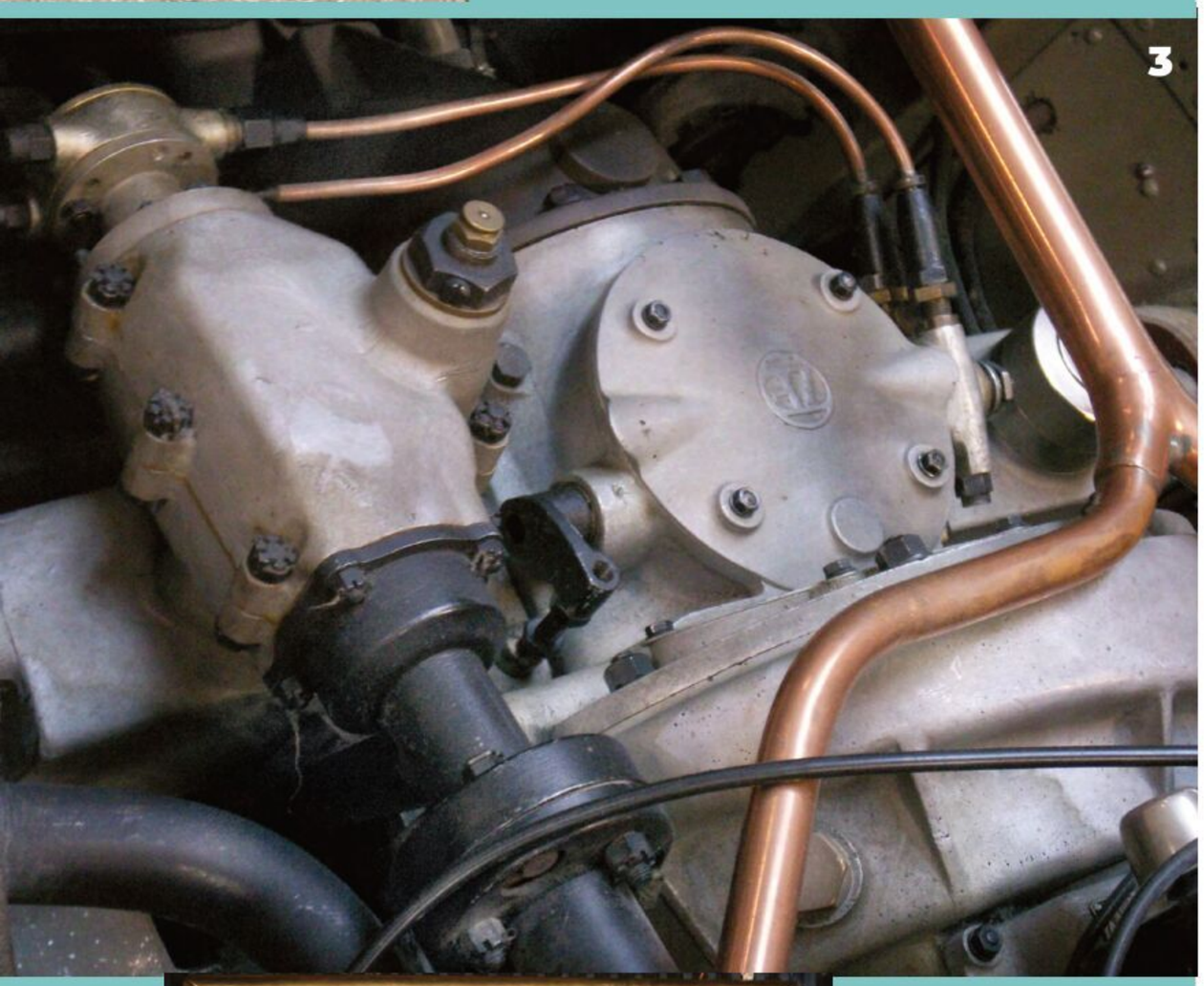
1

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.



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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

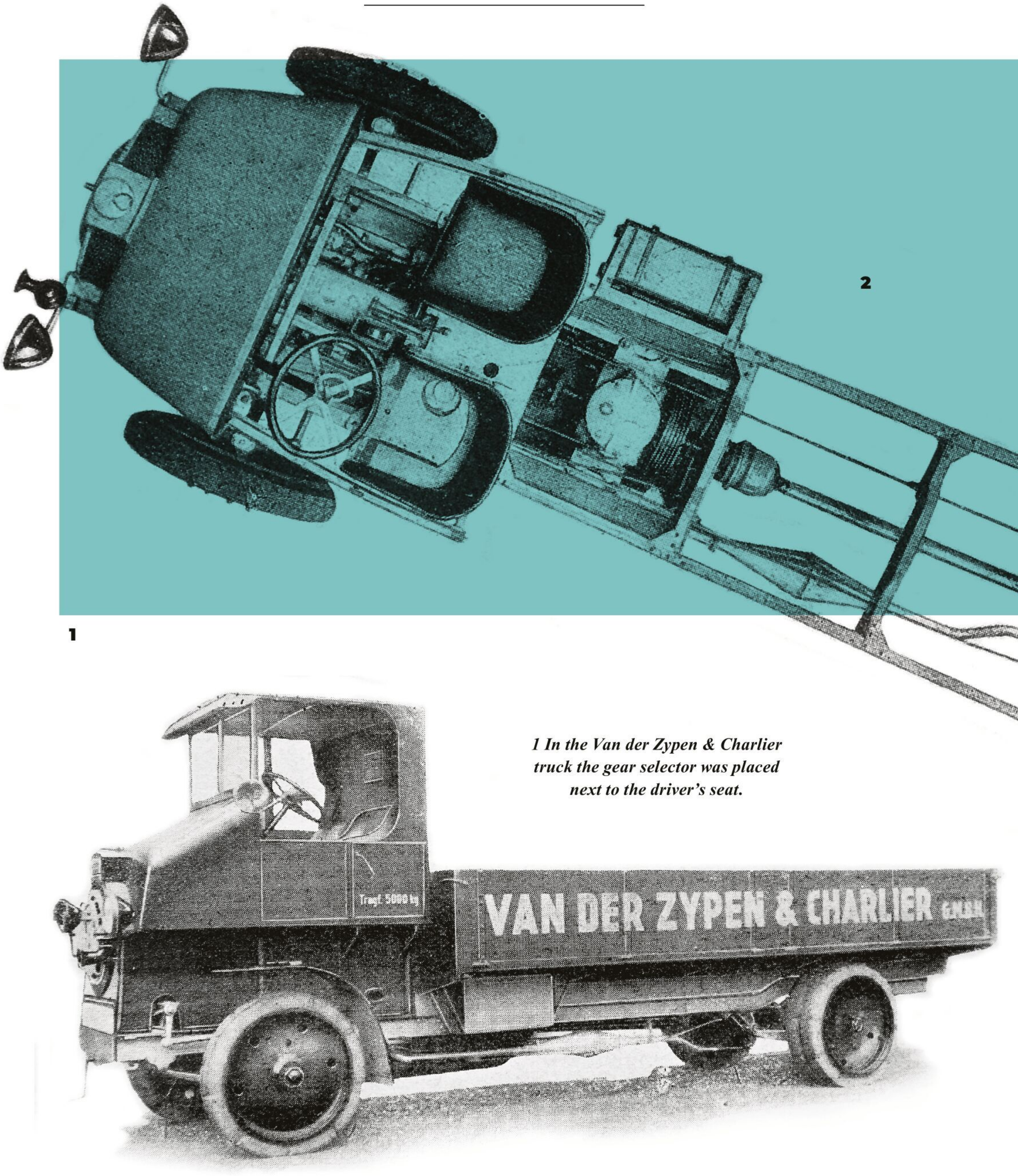
German companies which offered the Soden transmission included such automobile producers as Bob, Dixi, Fadag, Hildebrand, Joswin, Lindcar, Nafa, Omikron, Gustav Otto, Schuricht/BAW, Steiger, Szawe, Turbomotoren AG, and others. Szawe in Berlin (see Rare & Unique Vehicles No. 3) was one of the early adapters. 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

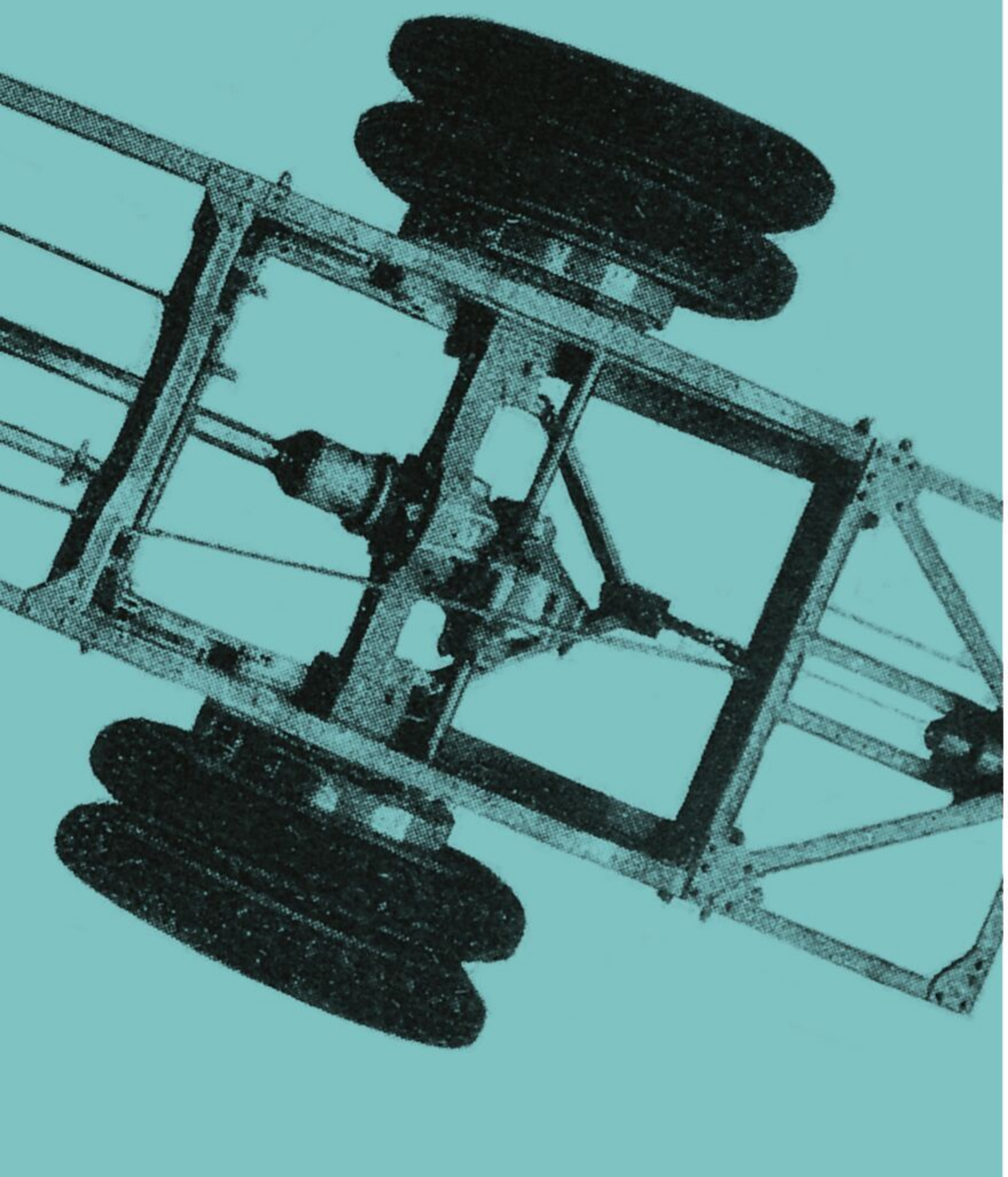
Car manufacturers outside of Germany also had shown interest in the Soden, but the information is scarce. According to surviving documents, such as list of drawings, there were contacts made in Belgium, France, Great Britain, Italy, Netherlands, Austria, Switzerland, and the USA. Unfortunately, more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

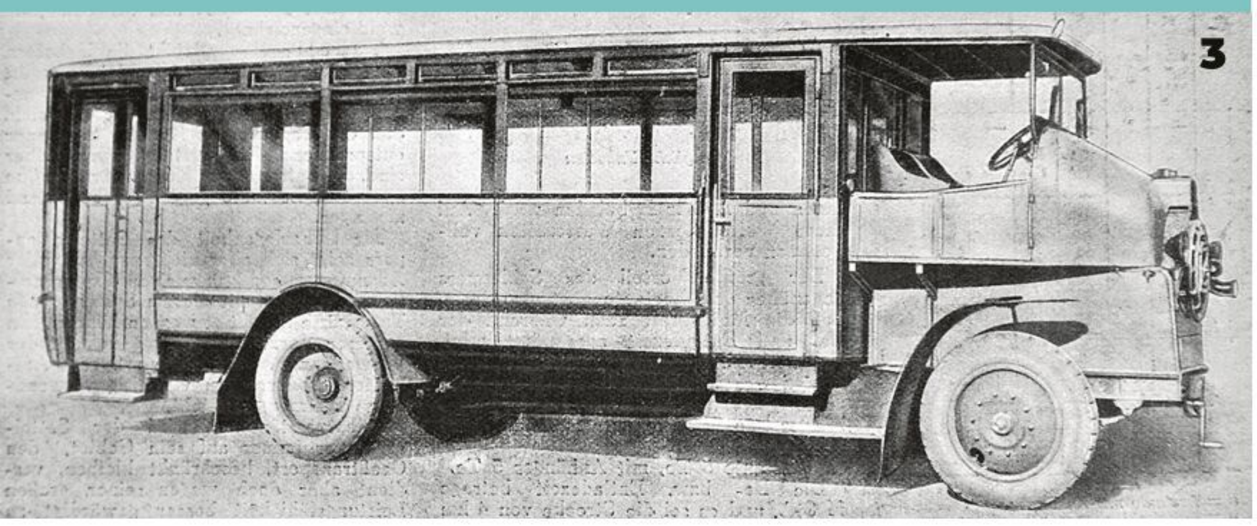


1 In the Van der Zypen & Charlier truck the gear selector was placed next to the driver's seat.

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

3 There was also an "Omnibus" body available.





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.

SOURCE: VORWAHLGETRIEBE.DE

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.

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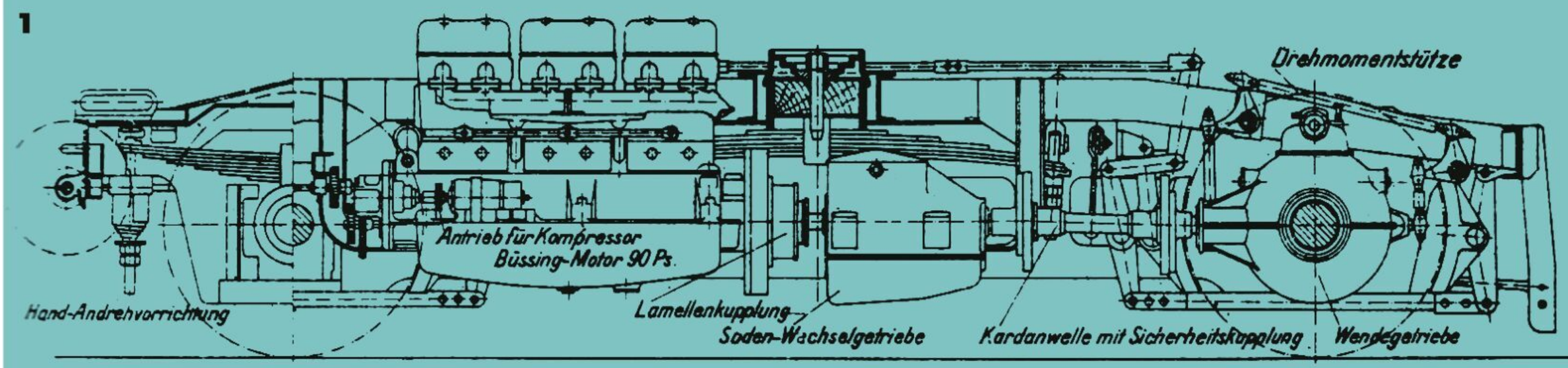
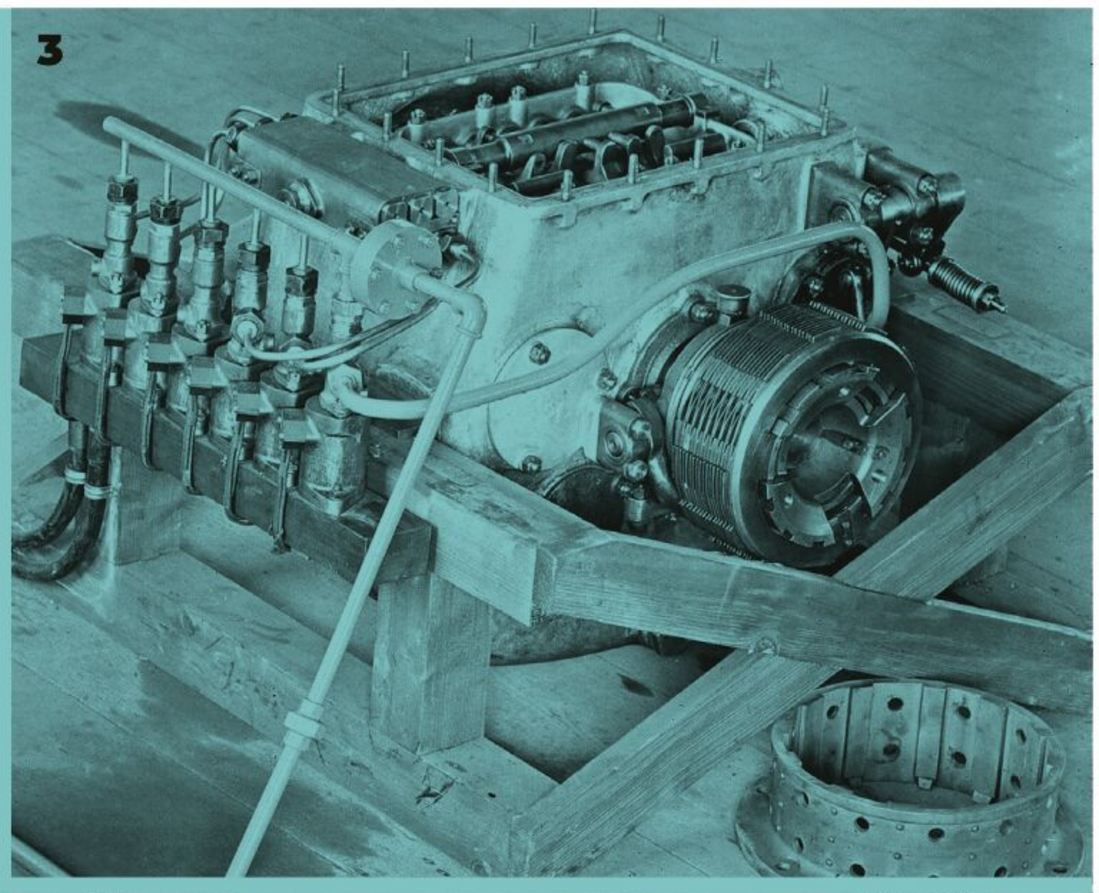


1 The Soden transmission was placed in the middle of the axle bogies.

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

PHOTO: DR WERNER BEISEL

2



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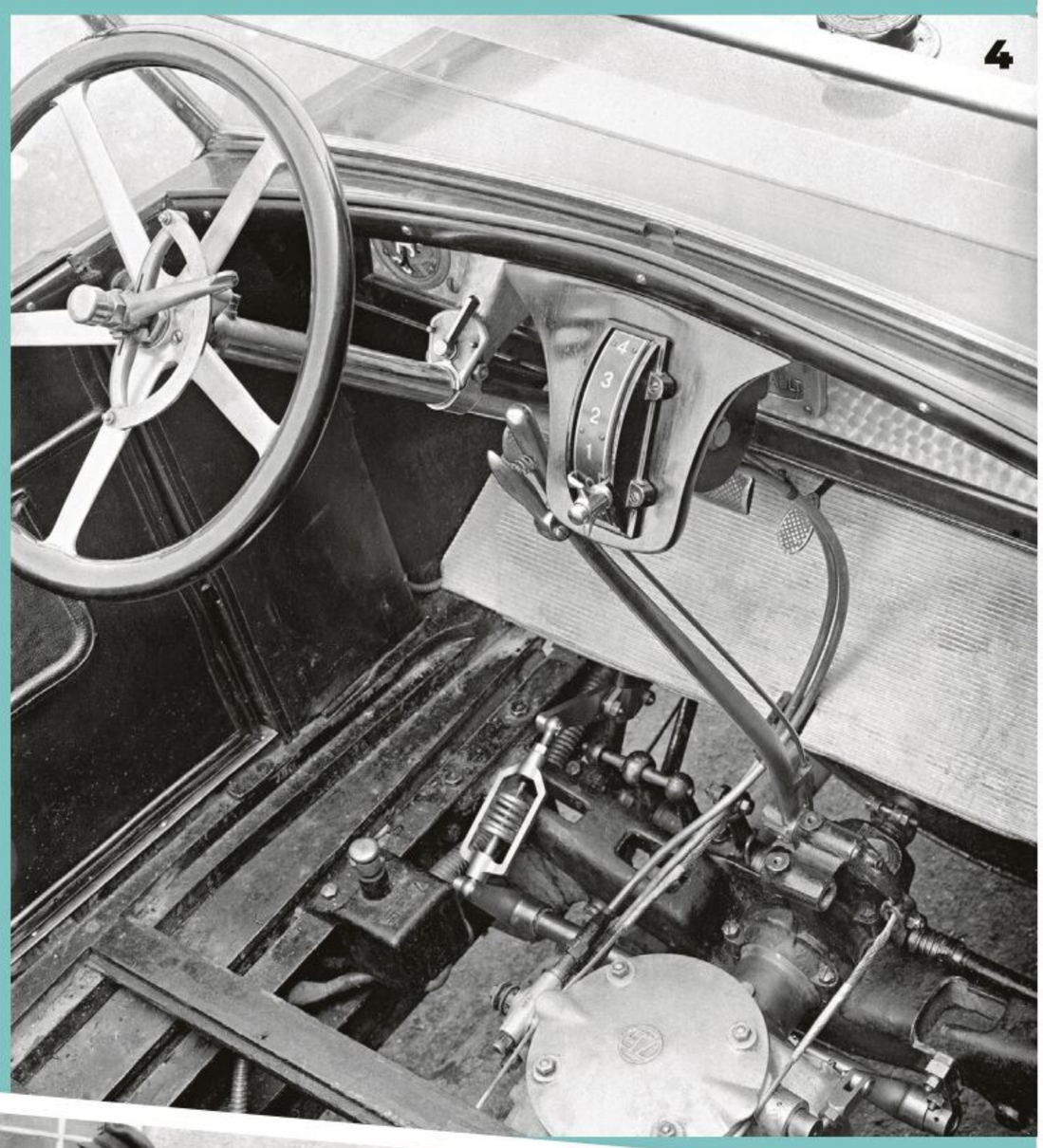

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already equipped with a "transmission theft lock" anti-theft device. In 1927, Durant Motors got into economic difficulties and production of Flint cars was halted. The Soden variant never went into series production. The Flint car was used at ZF for 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

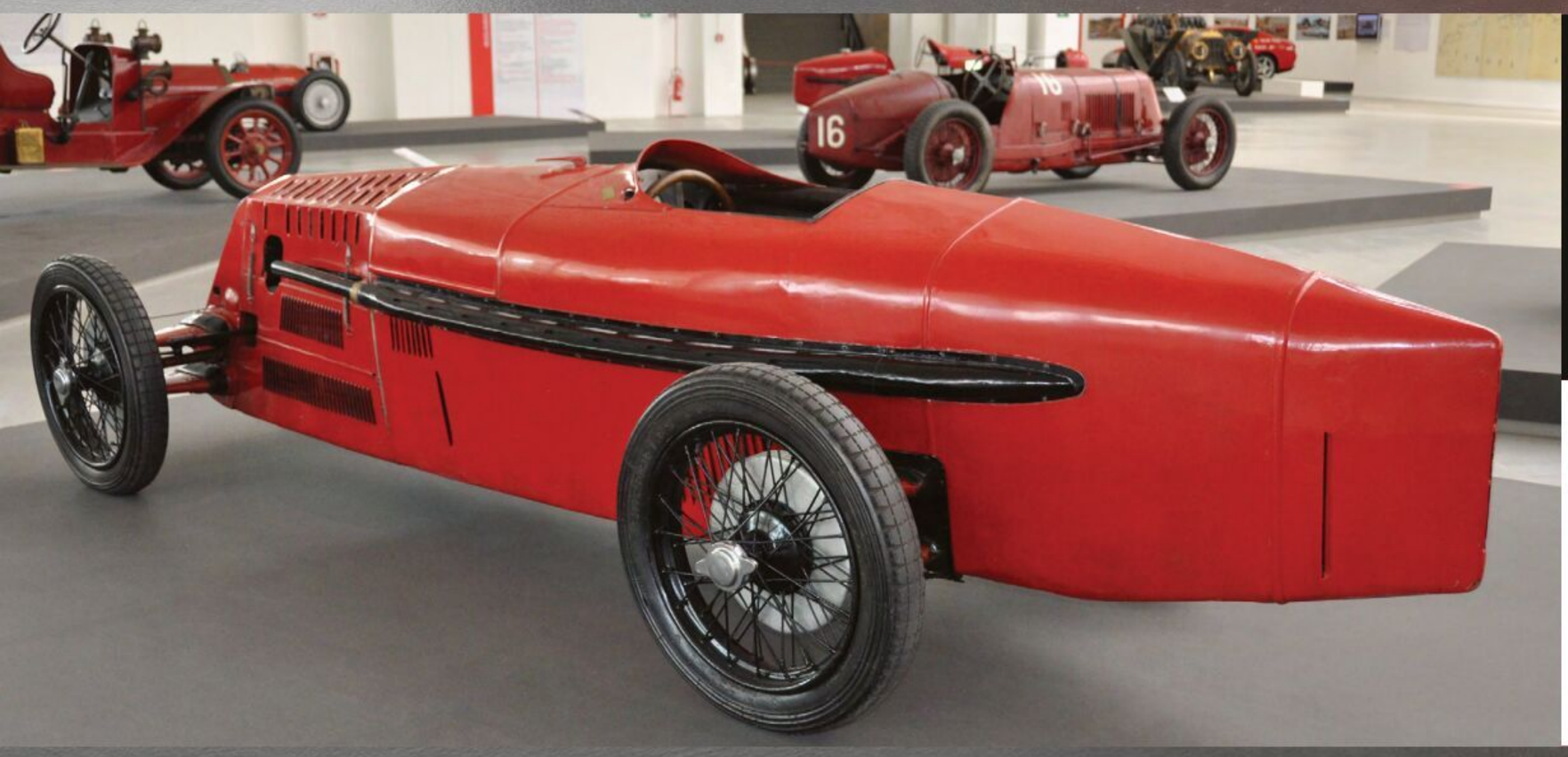
In 1924, ZF started a Soden transmission project for rail cars with the WUMAG company in Goerlitz. Wegmann in Kassel and Dessauer Waggonfabrik AG followed and manufactured further rail cars with a total weight of up to 53 tons for the Deutsche Reichsbahn until 1931. The rail car transmission had five 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@sodengetriebe.de.

Giulio Cesare Cappa was one of the unsung heroes of early Italian motoring: he was the head of Fiat's technical department before joining Itala, where he also became chief engineer. One of his masterpieces, the Itala 11 Grand Prix racing car, deserves more attention, argues **Frederico Signorelli**.



The end of the exhaust pipes are enclosed in the tapered tail.

Cappa's front-wheel-drive prototype racing car never fulfilled its potential.

ITALA 11

AVANT-GARDE RACING DREAM

FRONT WHEEL DIVE

Innovation

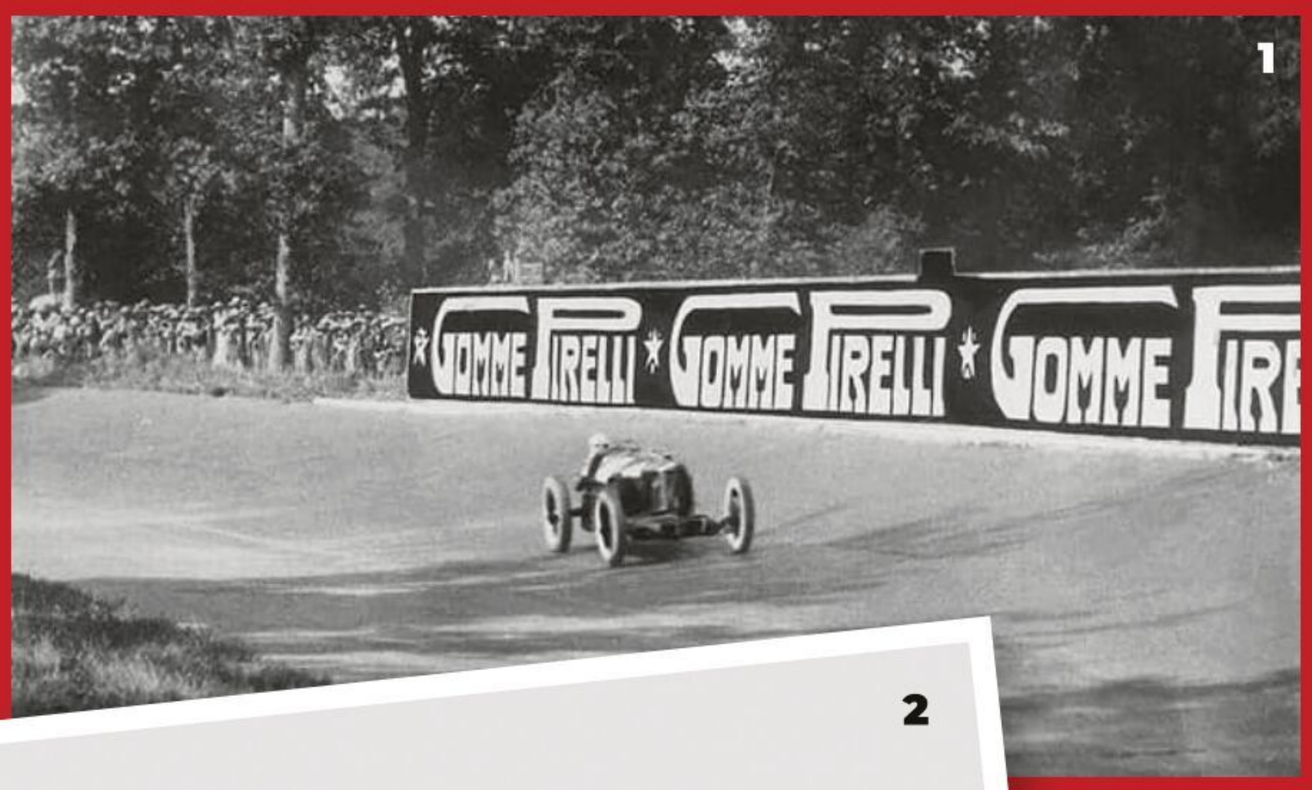
Itala, or, to be precise, "Ceirano Matteo & C. Vegni Marca Itala," was set up in 1903 in Turin at the behest of Matteo Ceirano, a member of the Ceirano family, which set up a number of Italian brands including Ceirano, Fratelli Ceirano, Rapid, Junior, SPA, SCAT, SCAT-Ceirano, and Aurea.

Within a year the brand had earned an excellent reputation as a manufacturer of high-quality cars, so much so that a few shareholders decided to invest in a new company, Itala Fabbrica di Automobili. This resulted in the abrupt exit of Matteo Ceirano, who found himself no longer in control. The company was now helmed by Giovanni Battista Figari and Luigi Parodi, the new majority shareholders. These changes did not affect Itala, which went from strength to strength and set up a new manufacturing plant. The old plant was sold to newcomer Lancia in 1907.

During these early years, Alberto Balloco was the technical director. He developed a string of successful racing cars such as the 24 HP of 1904. It was followed by the 100 HP in 1905, which won the Coppa Florio with an average speed of 104 km/h. Another great success belongs to Alessandro Cagno, who won the first edition of the very hard and prestigious Targa Florio in 1906 aboard a 35/40 HP. But certainly the most extraordinary result was the victory in the legendary Beijing-Paris Raid in 1907, won by Prince Scipione Borghese at the wheel of a sturdy 35/45 HP. These racing cars, which brought fame and lured customers to the company, were also joined by popular touring models. For example, in 1909 a sumptuous and elegant Landaulet was built by the Cesare Sala carrozzeria in Milan on a 35/45 HP chassis at the request of Queen Margherita of Savoy. The car was nicknamed "Palombella."

AN EXPENSIVE WAR

In 1915 Italy entered the First World War. Immediately, the focus of its industrial production changed to military vehicles, especially trucks and aircraft engines. This seemed to work well for Itala, which had launched production of these types of vehicles a few years earlier. However, the Royal Italian Army requested the delivery of 200-hp airplane engines, licensed from Hispano-Suiza. This large 3000-unit order essentially almost put the company out of business. Production of the 200-hp engines required new machinery,



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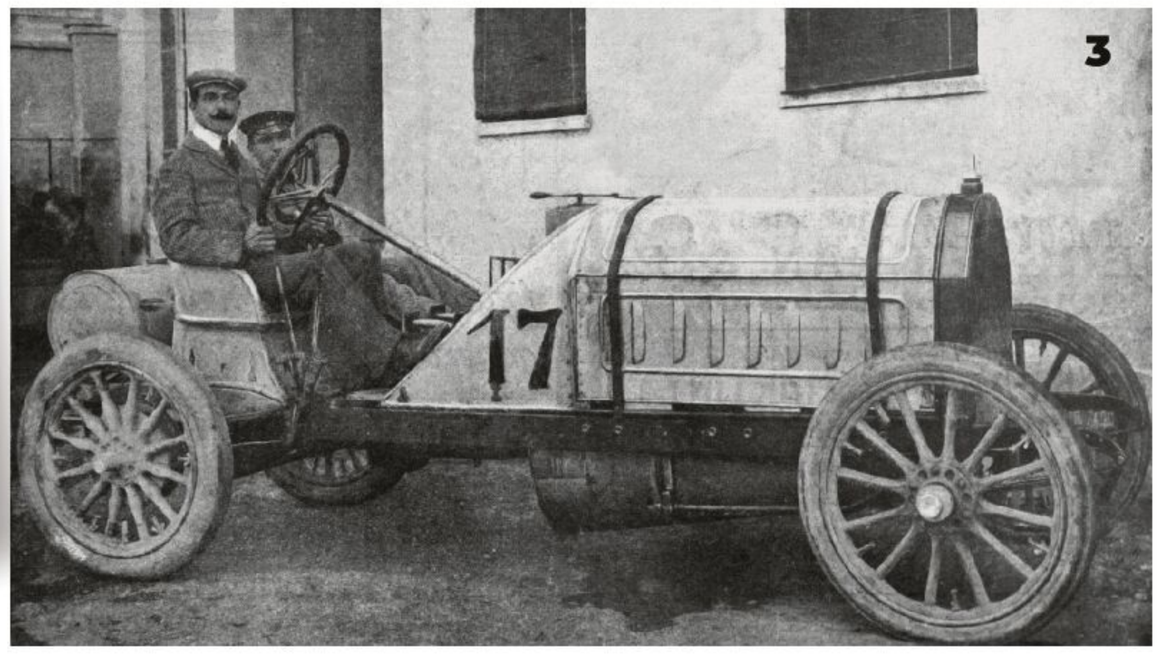
1
The Monza Circuit in the 1920s.

2
In 1907 an Itala 35/45 HP won the Paris-Beijing Rally resulting in enormous publicity.

3
The Itala 112 HP won the 1905 Coppa Florio race.

4
This Lavocat & Marsaud-bodied Itala 61 is also part of the Mauto's Collection.

2



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which took time to acquire and install. By the time the necessary equipment was functional and the army's requests for changes in the design were processed, the war ended and the army abruptly canceled the order. This left the company in shambles.

Embittered by the situation, Engineer Balloco left the debt-ridden company laden with stockpiles of unnecessary materials. In the early 1920s, the state intervened as the company was no longer competitive. In 1924 Itala was nationalized and reorganized. As part of the modernization plan, a new engineer was hired who was given almost managerial responsibilities. He was Giulio Cesare Cappa.

CHANGE THAT ADVANCES

Giulio Cesare Cappa was born in 1880 in Voghera. He graduated in Mechanical Engineering at the Polytechnic University of Turin in 1904 and soon became a well-known figure in the automotive scene. Cappa co-founded Aquila Italiana in 1905. In 1914, he became Technical Director at Fiat, where he contributed significantly to the development of Grand Prix cars and worked on everything from production cars to trucks and aircraft engines. Cappa was a visionary genius, but difficult. In 1924, after repeated disputes with general management, he resigned from Fiat and opened his own design studio.

One of Cappa's design clients was Itala. His first project was the 61, a car that was aimed at relaunching the Itala brand with its refined construction, competitive price, and lightweight design. Cappa used aluminum extensively. Even the cylinder block of its 1995-cc, 60-hp, in-line six-cylinder engine was made of alloy. In short-wheelbase configuration the alloy frame weighed only 800 kg, rising to 850 kg in the long-wheelbase version. This light weight made a maximum speed of 100 km/h possible. There were a lot of patented solutions in the 61. The most unusual was a height-adjustable steering column together with the instrument panel. Unfortunately, these innovations came at a cost. In 1926 when the 61 was finally launched, it was more expensive compared to its competitors from Alfa Romeo and Lancia and it was beset with reliability issues.

A DREAM IN THE DRAWER

A document entitled "preliminary estimate of the 1100-cc type car" dated May 20, 1924, shows that Cappa worked on

SOURCE: MAUTO

another project as well while developing the 61. This was even more innovative, a fast and light monoposto racing car with front-wheel drive and fully independent suspension! Franz and Carlo Alberto Conelli were two wealthy, enthusiastic racing brothers who won several times in Bugatti cars. Cappa had approached them with a proposal: to provide them with a versatile racing car to enhance their racing career. The Conellis were intrigued and placed an order.
At the same time, Arturo Mercanti, who set up the Monza racetrack in 1922, had heard about the project and invited Cappa to introduce the new car in the 3rd Vetturette Gran Prix, which was to be held on September 6, 1925. In May 1925, just over three months before the race, Cappa decided to introduce the project "for the supply of five racing cars" to the management of Itala.
The project totally consumed Cappa at a time when the company was struggling. To design and build these cars, Cappa proposed a new joint venture between Itala, Giuseppe Acutis, the CEO of Itala, and himself.
Cappa set out to rent new premises where he could develop and build the cars, with parts provided by Itala. He had to follow a very strict schedule: the engine had to be completed by July 1 with the complete car ready to be tested by August 15!

FROM "CORSA" BUT BUILT IN SERIES

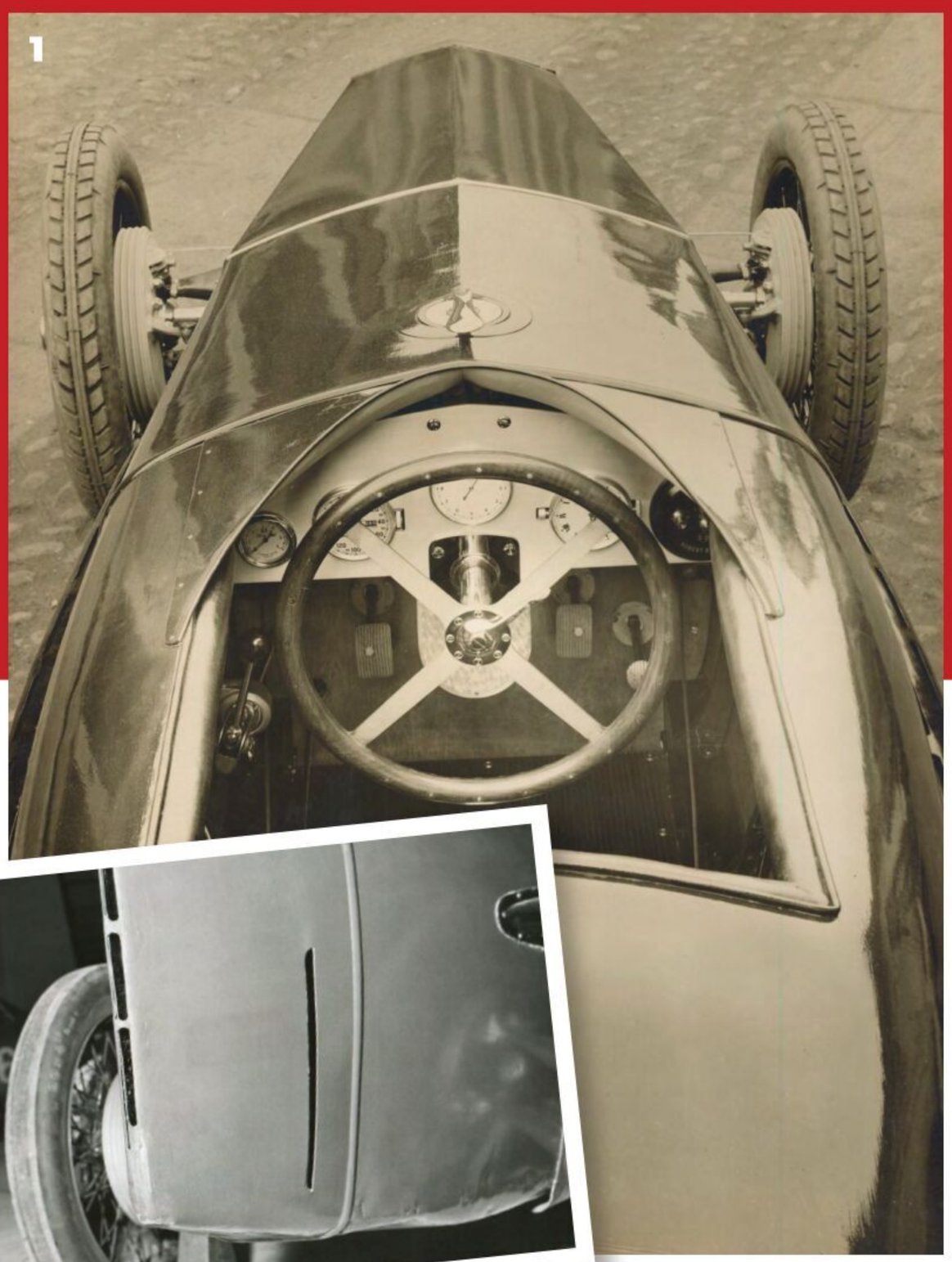
Cappa was planning for larger-scale production and designed a chassis that could have accommodated different engines and bodies. The frame was made of sheet steel with wooden reinforcements at the attachment points of the crossbars, the engine, and the bodywork.
The frame and engine were independent of each other, so that the latter could be mounted after the bodywork was completed and fixed to the frame itself. Cappa envisioned being able to install different types of engines ranging from 1100 to 1500 up to 2000 cc, without any modifications to the chassis. With Cappa's design, if an engine broke during the race, a swap could easily have been executed.
Cappa also designed an easy way to change the body. Once the assembly of an engine on a chassis was completed, the bodywork could be changed, e.g., from monoposto corsa to biposto corsa or two- or four-seater sport.
The engine was mounted in the front. The transmission, the

1
The compact interior ensconces the driver perfectly.

2
Cappa donated the prototype to Mauto in 1941.

3
The tapered tail enhanced aerodynamic efficiency.

4
Bodywork still carries the signs of WW2 bombings.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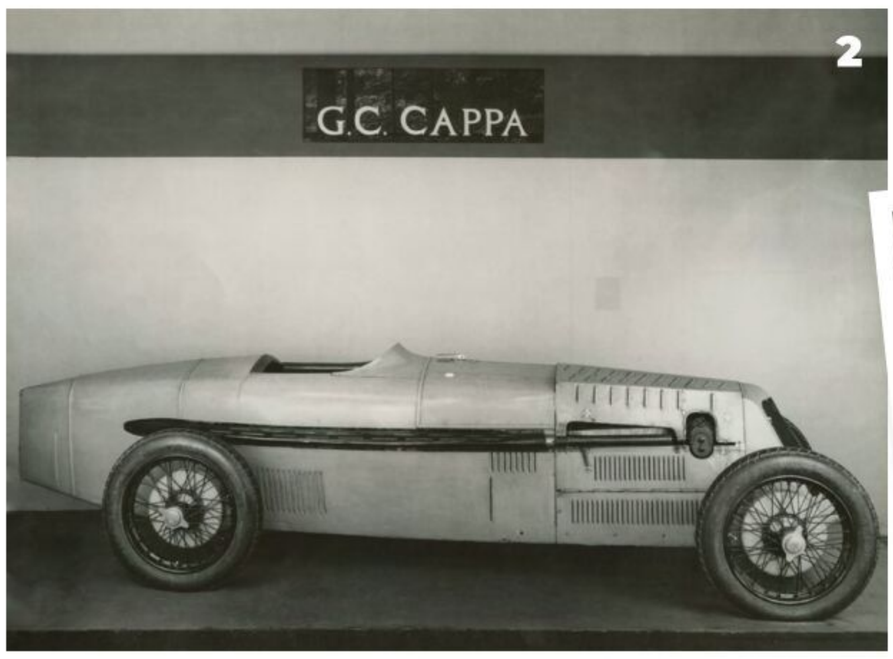

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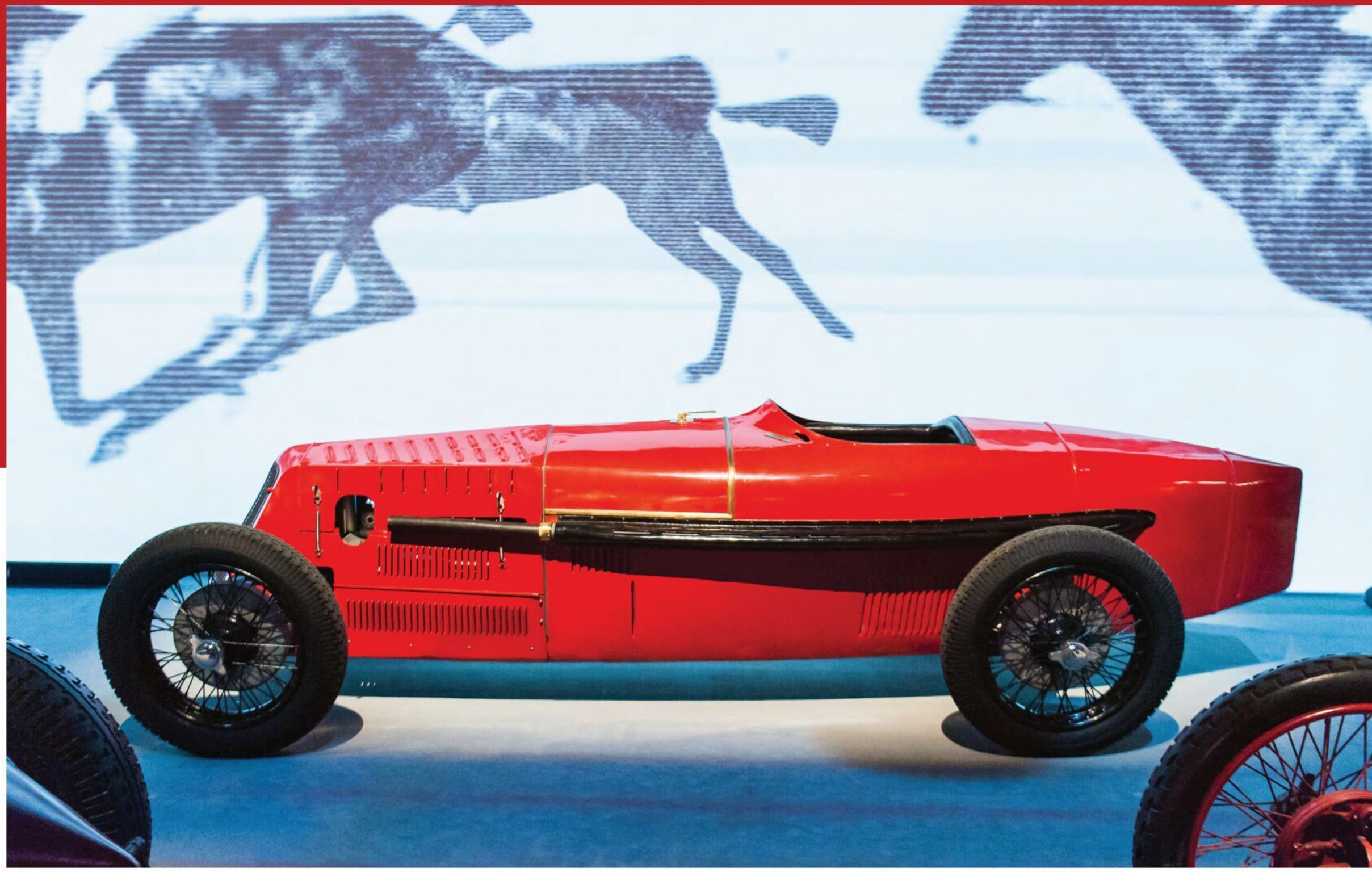
steering box, and the differential were combined into a single unit, which also supported the front suspension and radiator. The engine was a small masterpiece: a water-cooled, supercharged V-12 unit with the cylinder banks angled at 60 degrees. The camshaft was overhead, placed between the two rows of cylinders with two valves for each cylinder, a single carburetor placed above, and a Roots supercharger. Capacity was 1050 cc providing 60 hp with a maximum engine speed of 6500 to 7000 rpm. Top speed was claimed to be 150 km/h. The gearbox had four speeds plus reverse with a control lever next to the driver. One unique detail was both functional and aesthetic. The exhaust pipes, which exit from the front hood – one for each bank of cylinders – join together at the back of the body and are enclosed in the tapered tail. This ensured maximum compactness and aerodynamic efficiency. The car itself was also compact, featuring a length of 3900 mm, width of 1700 mm, maximum height from the ground of 1000 mm, wheelbase of 2500 mm, and a track of 1200 mm. Named the Itala 11 due to its 1100-cc engine, the car had a streamlined single-seat body built in aluminum and painted red. A second model was built, called 15, with an engine increased to 1456 cc.

THE CURTAIN FALLS

Only one of the Cappa-designed race cars was finished in 1925. It never raced on a circuit. This was probably due to bureaucratic difficulties linked to the establishment of the new company and the difficult situation of Itala, which finally closed in 1930.

Cappa wrote a report with undisguised bitterness: “Various events have prevented the planned program from having a follow-up as had been hoped. The establishment of a company of which the Itala company was a part did not come to fruition for reasons that are too complicated to explain here.” He also addressed Itala’s general manager: “You must deliver to me without any additional charges, the Itala 11, as well as the parts inherent to the car itself and the first five samples that had to be built. With this delivery, any reciprocal contractual obligation and any lot of Debit and Credit relating to the order of the car 11 are considered suppressed.”

In 1941, Cappa donated the car to MAUTO, Museo Nazionale dell’Automobile, in Turin, and it remains a suggestion of what Cappa could have developed under different circumstances. ♦



Later in life Creti became a cult leader.

SOURCE: LEGGENDE METROPOLITANE

The publicity photo showing the lightness of the small car went viral in the 1940s.

Automotive history is full of charismatic personalities, but few are as eccentric as the Italian Marcello Creti. Although his contribution to the motoring world was very small, it is still worth a closer look, says **Tobias Baldus**.

SOURCE: JAN DE LANGE

MARCELLO CRETI

AND THE PEDAL-AUTO

"THE NEW EDISON – BORN IN ITALY"

Marcello Creti was born on Easter Sunday, April 16, 1922, in Rome into a family with wealthy ancestors from Lecce. From his early childhood, his schoolmates, teachers, and even family members considered him to be a bit different, a distracted and listless student, who always seemed absorbed in his thoughts. But it didn't take long until people recognized that the kid was more than just a bit unusual. It became obvious when one of the many technical drawings by Marcello Creti (who was only 13 years old at the time) was submitted to an engineer. To his amazement, the engineer found that Creti had solved an electronic problem which perplexed scientists: the elimination of the Larsen effect. Two years later, Creti invented the Amplitele, regarded as one of the forerunners of the mobile phone, which also allowed simultaneous phone calls on the same line. Suddenly the whole world was reporting on the young inventor, describing him as a "little Marconi" or "the new Edison born in Italy." The British newspaper Argus wrote: "A is in London, B is in New York, and C is in Rome! The day will come when these three persons will be able to hold conversation together, across these vast distances, just as if they were sitting in the same room! And this, thanks to a new invention by a very young scientist, Marcello Creti." And the Indian newspaper The Tribune added: "It looks like stuff from the year 2000 and we are only in 1938."

The huge media coverage following its presentation attracted the attention of Benito Mussolini and the Fascist Party. Italy was just stepping up preparations for the looming war and had huge interest in Italian engineers and their developments for propaganda and military reasons. Marcello Creti was awarded the Gold Medal of the Fascist Syndicate of Investors by the Duce, who received him and even visited him on a number of occasions.

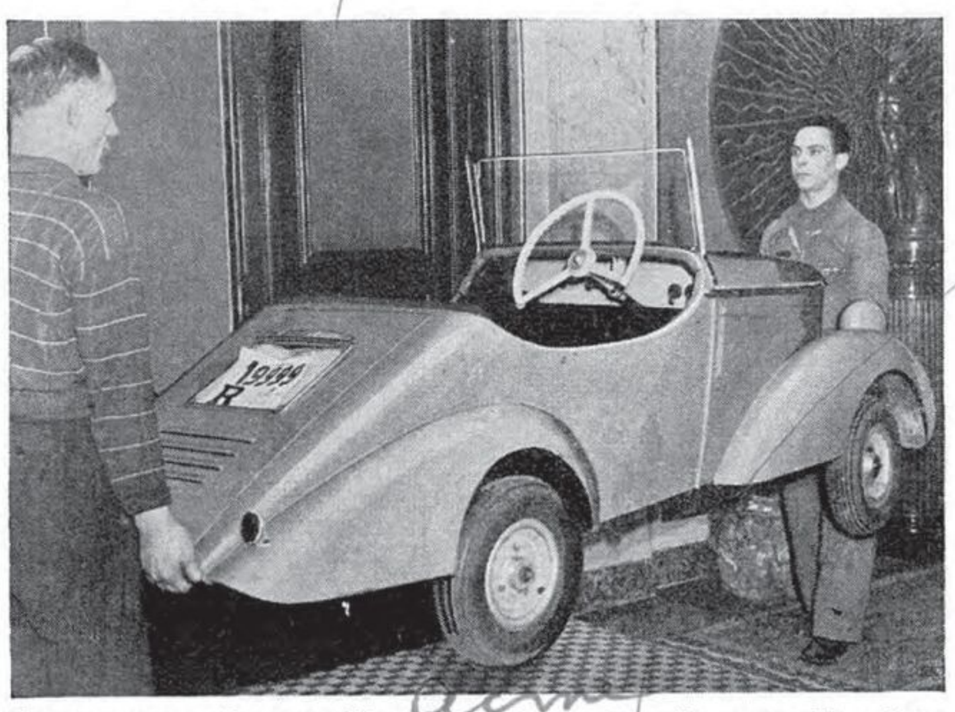
THE PEDALAUTO

Around 1939, in response to Italy's gasoline rationing, 17-year-old Marcello Creti constructed a car that would be as economical as possible. He built a little two-seater that weighed about 130 kilograms and was powered by a one-cylinder engine. This allegedly allowed a top speed of 40 mph (60 km/h), and in fact a number of newspapers stated the top speed to be 50 mph. The Pedalauto claimed to travel 160 km (100 miles) on a gallon of gasoline. (Other sources claimed even more outrageous figures of 137 mpg and 165 mpg.) Supposedly this efficiency was possible because of a special housing in the piston head so that the gases were given a movement to exert a more effective and balanced pressure on the piston, compared to the more random pressure generated in common combustion chambers. This design had the effect of reducing mechanical stress, which gave the engine lower fuel consumption without loss of power. Should one still run out of gas, the car carried an emergency battery that was claimed to provide energy for another seven hours.

"Inspired by Premier Benito Mussolini's self-sufficiency campaign, [Marcello Creti also] equipped his machine with bicycle pedals so that on level stretches the driver can cut off the motor and really learn what self-sufficiency means," wrote The Rapid City Reporter in 1940. The body was built

K 429

One-Cylinder Midget Auto Run by Gas, Battery or Foot



Two men can easily carry this car, which runs 165 miles on a gallon of gas

Running out of gas does not worry the owner of a miniature Italian car, since it has a storage battery capable of running it seven hours in an emergency. After that, it has pedals to drive it the rest of the way home or to a filling station. The tiny auto, which will sell for $250, is so light that two men can pick it up and carry it into the garage or house. Its one-cylinder engine drives it at top speed of fifty miles an hour and it runs 165 miles on a gallon of gasoline.

JULY, 1940

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Marcello Creti
Rome. Italy

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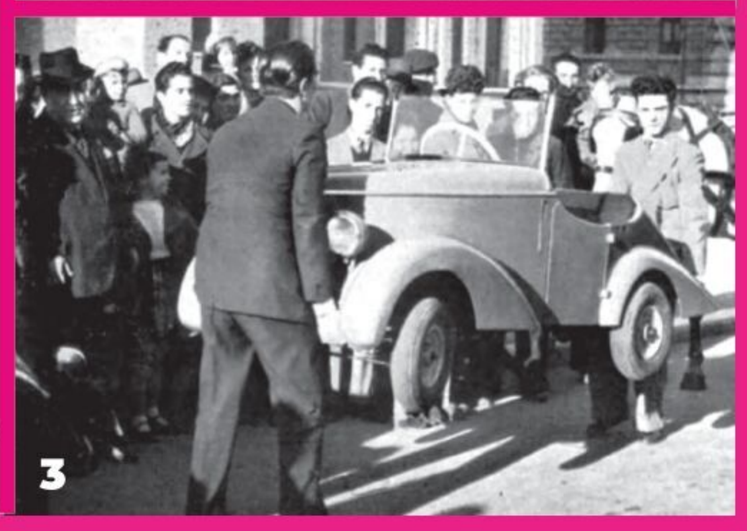

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SOURCE: JAN DE LANGE

entirely of the alloy Avional, an aluminum-magnesium alloy that was said to have the strength of steel with the lightness of aluminum. In February 1940 the Pedalauto was exhibited at the Palazzo Venezia and was first tested by Count S.E. Ciano, who became enthusiastic. Later Mussolini himself did a test drive. Afterward it was presented in different cities, including an exhibition at Circus Maximus in Rome.
Creti believed that on a reasonable scale of production the Pedalauto could be marketed for approximately $150. In articles from a later date, a possible price of $250 was mentioned. But it very much seems like those numbers were just plucked out of the air, as the only indication of interest in producing the car came from the commissioner of the 1942 World Exposition, Mr. Cini, who offered to construct a number of machines for use at the fairgrounds.
Because of World War II, the colossal World Exposition, which was supposed to celebrate twenty years of Fascism and the revival of the Roman Empire, never took place. On June 10, 1940, Mussolini had declared war on Great Britain and France. From then on, production of a little people's car was not on the agenda any longer, and the Pedalauto quickly faded into oblivion. However, Marcello Creti continued actively inventing during the war. One of his devices was an anti-aircraft beacon that avoided the necessity of direct-current generators by running on alternating current.

THE RATIONAL ANALYST BECOMES MESSIAH

At his later age, Marcello Creti's interests expanded far beyond technical inventions and so did his eccentric views. The inventor started to travel the world, and his field of actions moved toward natural research, biology, mineralogy, archaeology, and medicine. Once praised for his analytical and rational way of thinking, he now articulated his belief that a race of superior beings had ruled the earth in prehistoric times – beings he called the "Antalidei." Creti detected their spirits in the Ernici mountains. He took over the ruins of the ancient Benedictine Monastery of San Luca, which he rebuilt entirely. Soon the place looked like a cabinet of curiosities, as it was filled with technical drawings, all sorts of instruments and inventions, art, gemstones, fossils, shells, and so on.
He gathered a group of about 30 followers around him who lived with him in the monastery (now named Sapienta, or Wisdom), blindly believing in his extraordinary abilities and considering him a new messiah. The movement was called Ergos – Energia Radiante Governante Ogni Scienza, or "radiant energy governing all science." With special powers given to him by the spirits of the Antalidei and with the help of his fellow Ergonians, Marcello Creti continued to realize inventions. Among his later inspirations were an electroshock apparatus, a device to measure electromagnetic emissions deliberately given off by plants, and therapeutic technical systems to cure cancer using stimulating, immaterial energies from the cosmos.
In the end, neither his 130 inventions nor his spiritual thoughts had much of an impact. After having lived a life truly unfazed by convention, this extraordinary man died in Sutri, Italy, on an extraordinary date: January 1, 2000. ♦

1 Popular Mechanics in America also featured the car, which again was carried by two people.
2 Creti with his portable phone, which was the forerunner of today's mobile phones.
3 The two-man stunt was often repeated.
4 The two-seater Pedalauto quickly faded into oblivion.

SOURCE: JAN DE LANGE

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MARVELOUS MYSTERIOUS

AND

UNIQUE

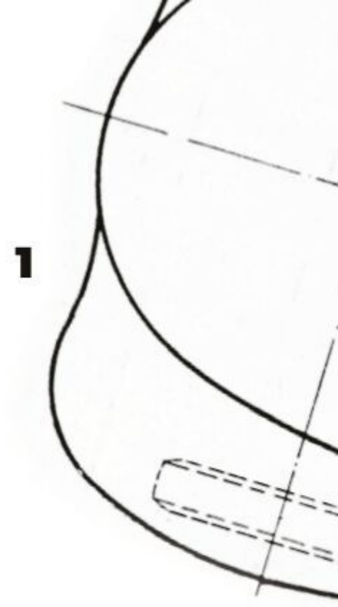
The VL 333 was very futuristic in appearance.

The Mathis prototype was shown at the Paris Auto Show in 1946.

MATHIS VL 333

The Mathis 333 was Émile Mathis's last attempt to return to the automobile industry. **J. Michael Hemsley** was lucky enough to drive the sole survivor.

ORIGINALLY PUBLISHED IN THE MARCH 2017 ISSUE OF VINTAGE ROADCAR MAGAZINE.



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Alain Cerf, whose collection makes up the Tampa Bay Automobile Museum, is an inquisitive man with an engineering background. His firm makes machines that will shrink-wrap pretty much anything you can think of that needs to be shrink-wrapped. Technology and innovation are a part of Cerf's business, and his interest in them extends to his automobile collection. The museum (www.tbauto.org) displays nearly 60 interesting and beautiful automobiles, many of them on the cutting edge of technology for their time: Ruxton, Cord, Citroën, Tatra, Panhard. When Cerf learned that the only remaining Mathis VL 333 might be available, he and his son, Olivier, worked hard to acquire it. Once it was theirs, though, they discovered that finding records and documents about the car and the man behind it were even rarer than the car. Still, there is enough information about Mathis the man and his businesses for us to start there.

ERNEST CHARLES "ÉMILE" MATHIS AND HIS COMPANIES

Émile Mathis was born in 1880 in Strasbourg, which is now in France but then in Germany. The Alsace-Lorraine region, where Strasbourg is located, was part of either France or Germany, depending on which had won the most recent war. He was the son of a successful hotelier in Strasbourg and probably should have thought of himself as German. But his name had a distinct French pronunciation – mat-EESE, sounding the same as the famous Impressionist painter Henri Matisse. So the Mathis family probably thought of themselves as French. That may have been what led to several emigrations by Émile, all the result of the major wars of the 20th century.

The hotel industry apparently didn't interest Mathis. By 1902, he was working for Lorraine-Dietrich, where he met Ettore Bugatti. Both left Lorraine-Dietrich, and, in 1904, Bugatti designed a car for Mathis, who was opening his own business. Mathis & Co. produced cars called Mathis, Hermès, and Hermès Simplex. All were four-cylinder cars with chain

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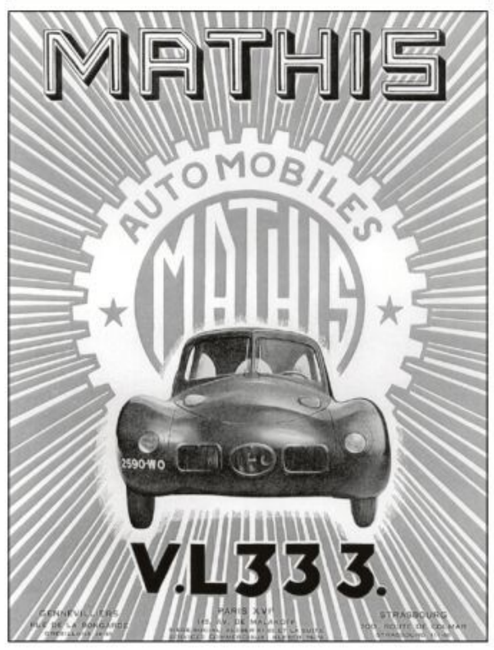
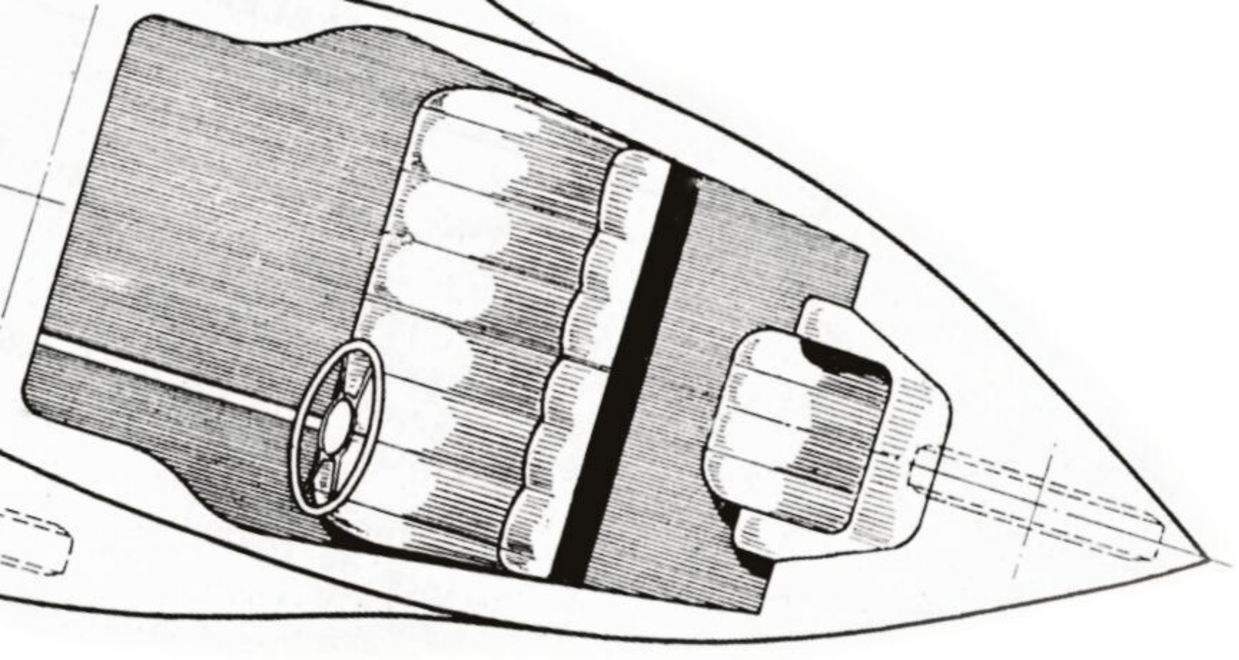


1 The VL 333 was based on a design by Jean Andreau.

2 Before the war Mathis was the fourth biggest automobile manufacturer in France.

3 Émile Mathis hoped for a glorious return with the VL 333.

4 Body was made from aluminum, resulting in a weight of 389 kg.



drive and a variety of engines with horsepower ranging from 28 to 98 horsepower. In 1905, Mathis created Auto-Mathis-Palace. It became the largest automobile sales agency in Germany and third-largest in the world. They were the exclusive agent for Germany, Switzerland, and Luxembourg for Lorraine-Dietrich, Panhard et Lavassor, and Florentia and had a sales monopoly for several other marques of cars and boats. It was also the world agent for Mathis & Co.

The main product of Mathis & Co became Hermès cars, built under license from Bugatti. Unfortunately, they apparently had serious reliability problems. In 1906, when production of Hermès cars ended after many complaints about the cars, Mathis tried to get Bugatti to buy back the remaining chassis and parts. With the failure of the Hermès, the relationship between Mathis and Bugatti soured. Bugatti tried to remove all mention of that relationship from his papers, although the list of Bugatti "types" still shows Type 6 (1904) and 7 (1904-05) as Mathis-Hermès.

Mathis built his first large factory in Strasbourg in 1907. It was in that factory in 1910 that he built the first "true" Mathis automobile. His first automotive successes were his Babylette with a 1.1-liter engine and the 1.3-liter engine Baby. The car used a small, multi-cylinder engine probably based on Bugatti's work.

He continued to be a successful "German" automobile manufacturer until the start of World War I, when in 1916 he was conscripted into the German army. It appears that the army sent him to Switzerland to buy equipment and supplies for the German government – tires and trucks are mentioned in different references. On what turned out to be the last of these trips, he deserted to France with the German money and joined the French army. He remained away from Strasbourg until the end of the war when he returned to his home and factory, now a part of France once again.

He was soon producing cars again, attracting the attention of other automakers and dabbling in a little racing. In 1921, Spyker, in Holland, imported Mathis voiturettes and called them Spyker-Mathis. It was an attempt by this upmarket firm to add an economical car to its lineup. This was a failure, apparently because the Dutch public refused to believe that any car by Spyker was economical. Racing was never a focus for Mathis, and there were few good results to show for the races in which they ran. But they were raced; René Dreyfus drove a 6-hp Mathis in his first amateur race. During the early 1920s, Mathis & Co. entered their cars in the French Grand Prix, but they were a serious underdog – they were 1.5-liter cars competing in a 3.0-liter formula. In the 1921 French race, the cars started in pairs at 30-second intervals. The first pair away was Mathis in one of his own cars against DePalma in a 3.0-liter Ballot. Mathis fell back quickly and retired after six of 30 laps. Jimmy Murphy won the race in a Duesenberg.

Despite the lack of racing results, the company grew. Mathis cars were popular. By 1927, Mathis had become the fourth-largest manufacturer in France, producing more than 20,000 cars that year. In an attempt to compete with Citroën, Mathis began producing six- and eight-cylinder cars. He was serious enough to engage Italian designer Giuseppe Merosi to consult for the company. Then the Depression intervened, and Mathis had to look for other markets for his cars. One failed attempt was a joint venture with William Crapo Durant in 1930. Durant felt he had missed an opportunity when he was unable to join with Austin for what became the American Bantam. His idea was to produce 100,000 Mathis cars in his Michigan factory. As with so many other plans during the Depression, Durant ran out of money, and the venture was scrapped. Mathis continued to struggle. He built a short-lived FOH with a three-liter straight-eight engine in 1931 to compete with the bigger French and German cars, and he introduced the Emyhuit with a synchromesh transmission and hydraulic brakes in 1933. All too late – the Mathis factories closed. Then a new opportunity arose in 1934; Ford was looking for a European partner. New tariffs had made it uneconomical for an American auto company to import

cars to France. Mathis and Ford joined to create Matford SA Française in Strasbourg. The cars copied the style of British Fords and became their major competitor. Eventually Ford found a way to operate in France without a partner, so Mathis was dropped and production ceased in 1939.

As the German war machine began its march through Europe, it was obvious to Mathis that Alsace would be in the German sights. He also knew he would be on the German "most wanted" list because of his desertion during the War to End All Wars. By the time France fell, Mathis was in the United States. U.S. machine tools he bought for his factory in France had not been delivered, so he kept them in the U.S., created Matam (Mathis-America), and began manufacturing munitions for the U.S. Navy. It is estimated that he built 260 million shells during the war. He received a navy commendation for his efforts.

At the end of the war, his company was bankrupt – puzzling, since knowing that the war was coming to a close and that munitions would no longer be needed, he could have made plans to begin manufacturing something different; he certainly had the capability. He had built prototypes of a small car for the U.S. market during the war, and Dutch Darrin may have even been involved in the design. Unfortunately, the U.S. was not ready for a small car, and either Mathis didn't recognize another opportunity or wasn't interested in continuing Matam.

When Mathis returned to France late in 1946, he found that the plant had been seriously damaged by Allied bombing during the war. He rebuilt the factory, intending to re-establish Mathis as a French automobile marque. The factory was rebuilt by 1948, but there was a new, more difficult challenge than a bombed factory. Mathis was not well connected with the politicians in France and was left out of the government plan to restructure the French auto industry. He was on the outside and could get neither the necessary permissions nor materials. He kept his factory going by building aero engines for light aircraft and making parts for Renault, but he really wanted to pursue his ideas for two new cars, the Mathis VL 333 and 666. For reasons that remain somewhat mysterious, neither car ever reached production. Aero engines and parts for others weren't enough to keep the business healthy, and Mathis was out of business in 1950.

MATHIS VL 333

Automobile designers and innovators have tried to find the best aerodynamic shape for their vehicles. Even in the early days of the 20th century, Castagna produced a special bodied Alfa for an Italian count that was rounded at the front with the body tapering to a point at the rear. Industrial designer Norman Bel Geddes wrote in the 1930s that the teardrop was the ultimate shape for an automobile. R. Buckminster Fuller built three teardrop-shaped Dymaxion cars that he intended to show at the World's Fair in Chicago in 1933-1934. Other designers had a variety of ideas about how to

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achieve better aerodynamics other than the teardrop. Some results of their work, like the Martin automobiles in the Lane Motor Museum, were seen as oddities and never put into production. Many other automobiles included aerodynamic elements in their design – the Chrysler Airflow is a good example – but it was rare for a truly aerodynamically designed car to reach mass production.

Production-car designers weren't the only ones seeking aerodynamic efficiencies. A slick skin and low coefficient of drag were especially important to designers of race cars. Land Speed Record cars are probably the best examples. From MG to Mercedes-Benz, many manufacturers were looking to use speed records and race wins to help market their cars. But these were cars that had limited application to the production cars of the time. Great for marketing, but they were a bit too far from the shapes that the public wanted on their cars.

When it came to designing the most aerodynamic automobile, some designers believed that the car should have only three wheels, so the bodywork could taper in a way that would smooth the flow of air over the car's body. Of those who developed three-wheel designs, most, like Fuller, put the single wheel in the rear. Gary Davis put it in the front, apparently to allow four-across seating in his car. His design was successful enough to sell 18 cars but not successful enough to keep the company in business.

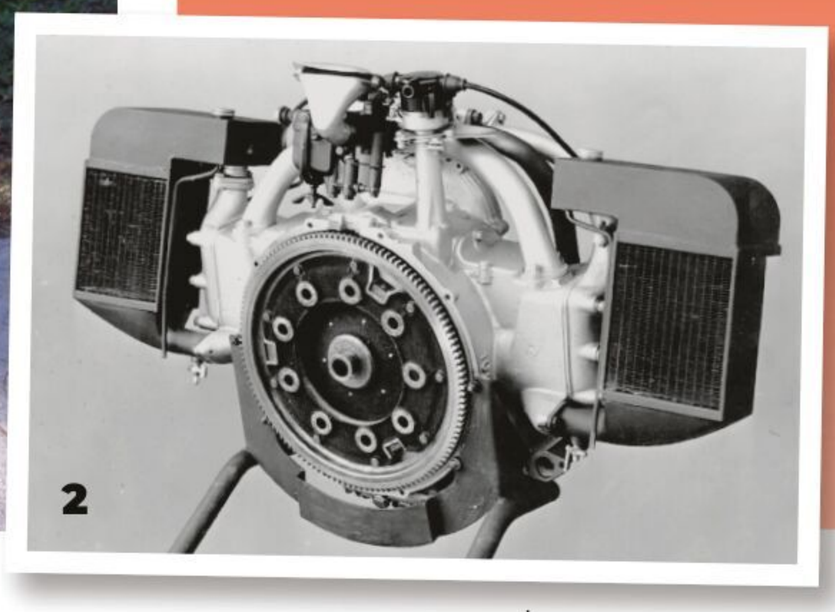
Émile Mathis believed in small, economical automobiles. He sometimes produced big, powerful cars, but he always had small cars in the company's lineup. Possibly his crowning achievement was his innovative VL 333 – three wheels, three

1 This car today resides in the Tampa Bay Automobile Museum.

2 700 cc flat-twin engine was capable of 15 hp.

3 Each cylinder had its own radiator.

4 Four-speed gearbox transferred power to the front wheels.



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passengers, and three liters of gasoline per 100 kilometers. Beginning in 1942, several prototypes were built, but only one, the last one, still exists. The VL 333 was a very innovative automobile in many ways – body shape and construction, suspension, and engine are the most obvious.

The shape of the body appears to have originated with Jean Andreau, director of the Aerodynamic Research Center in Chausson, France. He was looking for a shape that provided the most stability and least drag, and found that the best shape was extremely rounded in the front and had faired wheels and a rounded fin at the rear. He submitted the design in a French small-car competition in 1934, but it did not win. Undeterred, he continued to develop the design and, in 1937, did a full-scale test of the body on a Peugeot chassis. He found that the coefficient of drag for his body design was 0.28.* This was 58 percent less than for the standard Peugeot, and the body shape was very stable in side winds.

By 1940, Mathis was involved with Andreau and intended for Andreau's design to be used for a small Mathis car after the war – the VL 333. In a 1967 article for Automobile Quarterly, Karl Ludvigsen called the Mathis "a very sophisticated polliwog-shaped three-passenger car with probably the best aerodynamics that have ever been seriously proposed for a production car." He further said the car was "very practical and not unattractive." "Polliwog shaped" is possibly the best description of the car. It had the extreme roundness that Andreau wanted in the front with both the sides and roofline tapering to the point in the rear. The result was a coefficient of drag of only 0.22. Andreau actually thought it might have been even lower – 0.18 – if the car had a longer tail, although that would have been a less practical shape. The shape allowed for a comfortable two-part bench seat for the driver and one passenger and a folding seat in the rear for a second passenger.

Development of the car continued in France during the war despite the firm's owner being in the U.S. Between 1942 and 1945, nine prototypes were built and tested. This was done secretly since the Germans forbade work on automobiles for the civilian sector. Somehow, the prototypes secretly crossed the border into Switzerland where they were road-tested, then sneaked back into France.

The war over, the French government imposed draconian measures on the automobile industry. Politicians and bureaucrats believed they were better suited to reinvigorate the French auto industry than the automakers. Taxes on expensive cars eventually put many of the coachbuilders out of business, Renault was nationalized, and scarce materials were rationed. One of the scarce materials was aluminum. Both Grégoire and Mathis had cars they wanted to build that needed aluminum. For unknown reasons, Mathis was denied the aluminum, putting an end to VL 333.

The end of the VL 333 was a shame. It had been acclaimed at the Paris auto show in 1946 and widely advertised. It appeared to be a car desperately needed in postwar Europe – small, low cost, and very economical. It was tested by the French government and achieved 3.4 l/100 km (69 mpg). But

* THE COEFFICIENT OF DRAG IS A DIMENSIONLESS QUANTITY OF THE DRAG OF RESISTANCE OF AN OBJECT IN A FLUID ENVIRONMENT, SUCH AS AIR OR WATER.

REVIVAL

Innovation

1 Front seats are comfortable, although they don't provide much lateral support.

2 Between 1942 and 1945 nine prototypes were built and tested.

3 The prototype received a lot of attention by both the public and the media.

4 Rear seat is foldable.

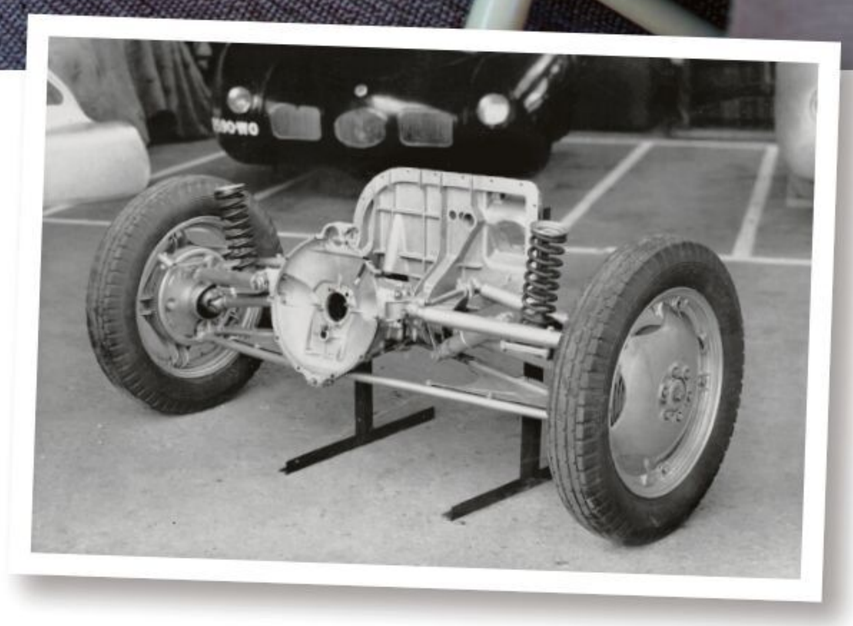
decisions were made that prevented the manufacture of the car. Mathis tried one other more conventional car, a four-wheeled, six-passenger, six-cylinder called the 666, but it was also never produced.

Alain Cerf knew the owner of the only remaining Mathis. When he heard that the owner had died, he let the family know he was interested in the car. The family intended to sell the car to a museum so it would remain in France, but the museum refused the car. After considerable negotiation, Cerf bought the car and brought it to Florida. Cerf works hard to learn as much about the cars in his collection as he can. The Mathis proved to be a challenge. All the records concerning the relationship between Mathis and Ford were missing – possibly sent to America after Matford was dissolved. Records concerning the decision to provide aluminum to Grégoire and not Mathis were also missing. Cerf had a unique and innovative automobile in his possession, but there were large gaps in the history of the companies Mathis created and the car that was possibly his greatest automotive creation.

The car has unibody construction using 20-gauge aluminum sheetmetal requiring 6000 spot welds. The engine is a 700-cc flat-twin producing about 15 horsepower and driving the front wheels through a four-speed transaxle. The engine is unusual in that the pistons and rods are designed so that both pistons' stroke is out from the crankshaft at the same time and in at the same time, rather than operating like conventional opposed pistons – one going out from the crankshaft while the other is coming back in. It has two separate cooling systems, one for each cylinder, but no water pump. Out of concern about driving the car in Florida, the car was tested in July, but it did not overheat. Still, to be safe, gauges were added to keep the driver informed of engine cylinder temperatures. The suspension is fully independent. The front suspension uses coil springs but with the shocks located on an angle below the springs and between two locations on the chassis. The adjustable rear suspension for the single wheel is unique. It uses a hydraulic cylinder with a spring inside. The wheel is attached to one side of the suspension to make it easier to remove when necessary. This is a very unusual and innovative automobile.

DRIVING IMPRESSIONS

The use of aluminum kept the weight of the car low – only 389 kg (858 pounds) – and fuel economy high – 3.4 l/100 km (69 mpg), as already noted. But with only 15 horsepower, it is not a fast car. Top speed was once tested to be 105 km/h (65 mph), but acceleration might be best measured in rotations of the Earth. It is a momentum car – a driver does everything possible to keep the speed up at all times. That is important to keep in mind when driving the Mathis, and I did my best to keep the revs up in each gear while negotiating the winding roads of the test drive. Entry and exit require some attention to your head, since the slope of the body is such that you can bang your head if you lean back when you enter the car. To start the car, simply turn the key and pull the starter knob. It starts immediately and runs with a bit of vibration caused by the way the pistons move in the engine. The car has an open gate for the shifter – "like a Ferrari," I say to Andy Kinworthy, the museum's mechanic. We both laugh at the analogy since there is an important difference: the gate is under the dashboard and out of sight. Kinworthy shows me where to aim the shifter to ensure it goes into first



The front suspension is fully independent and uses coil springs.

SPECIFICATIONS

Body:	*Aluminum unibody fixed head coupe*
Wheelbase:	*2300 mm/90.6 inches*
Track (front):	*1500 mm/59.1 inches*
Length:	*3400 mm/133.9 inches*
Width:	*1740 mm/68.5 inches*
Height:	*1425 mm/56.1 inches*
Weight:	*389 kg (858 pounds)*
Suspension:	*Independent. Coil springs with separate shocks in front; adjustable hydraulic cylinder with internal spring in rear*
Engine:	*Flat 2-cylinder*
Displacement:	*707 cc/43.144 cid*
Bore/stroke:	*75x80 mm/2.95x3.15 in*
Compression:	*6.25:1*
Power:	*14.85 bhp @ 3000 rpm*
Induction:	*Single downdraft Zenith carburetor*
Transaxle:	*Four-speed manual driving the front wheels*

gear – in the center of the right-side temperature gauge. In gear, clutch out, and we're off at a pace that would be politely described as steady. First gear proves to be the only gear difficult to find. Once underway, the shifter falls precisely into each of the remaining gates as long as you keep the revs up. Only when stopped did I have to look to make sure I was aiming the shifter at the center of the right-hand gauge. With a momentum car, negotiating turns, especially neighbourhood corners, requires keeping the speed up. The car has surprisingly little lean, thanks to its wide stance and independent suspension at the front. The seats are comfortable but offer little lateral support, so it's a good thing that the Mathis is not a fast car in the corners. The steering wheel is large, so steering effort is low. Gauges are positioned so that they're easily seen. There is a jump seat for the third passenger, who needs to be pretty flexible to access it. The space behind the front seats also provides the only storage – more than adequate, if there is no third occupant.

The brakes are small drums, but they are quite good for this light car. They slow the car smoothly without any grab. Kinworthy tells me that there are reports that if you go fast enough and brake hard enough, the rear wheel will lift off the ground as you stop. I didn't try it, and I don't think anyone at the museum has either. The story is believable, since it is very light in the rear – one person can lift it off the ground. I've heard it said by the Top Gear presenters that it is most fun to drive a slow car fast. I can't say that I drove the Mathis fast, but it was a fun car to drive – just getting the shifter gates right was satisfying – but it was the level of head turn that the car generates that makes you smile the most. Ludvigsen said the car is "not unattractive." I'd have to agree with that and add that it is unusual enough to be cool. I am privileged to have been able to drive it.

EPILOGUE

There are a number of mysteries associated with Émile Mathis and his cars. Why did he allow Matam to fail when he likely could have taken advantage of the demand for consumer goods after World War II? Was it always a ploy by Ford to use Mathis as a way into France with their own cars? Why did the French government refuse to allow Mathis access to the materials he needed for the VL 333? Was it because of the level of effort to manufacture the body, including 6000 spot welds? Was there a prejudice against three-wheeled or two-door cars? What happened to all the records Cerf found missing? And where did all the money come from after each failure or bankruptcy? The last and most mysterious of the questions surrounding Mathis was about the way he died. He was killed in a fall from a hotel window in Geneva in 1956. Was it an accident? Suicide? Murder? No one knows. Thankfully, one of his best accomplishments remains. The Mathis VL 333 is a window into his vision of the French automobile industry – a vision of innovation not shared by the French government at the time. ♦

LIGHTWEIGHT

Innovation

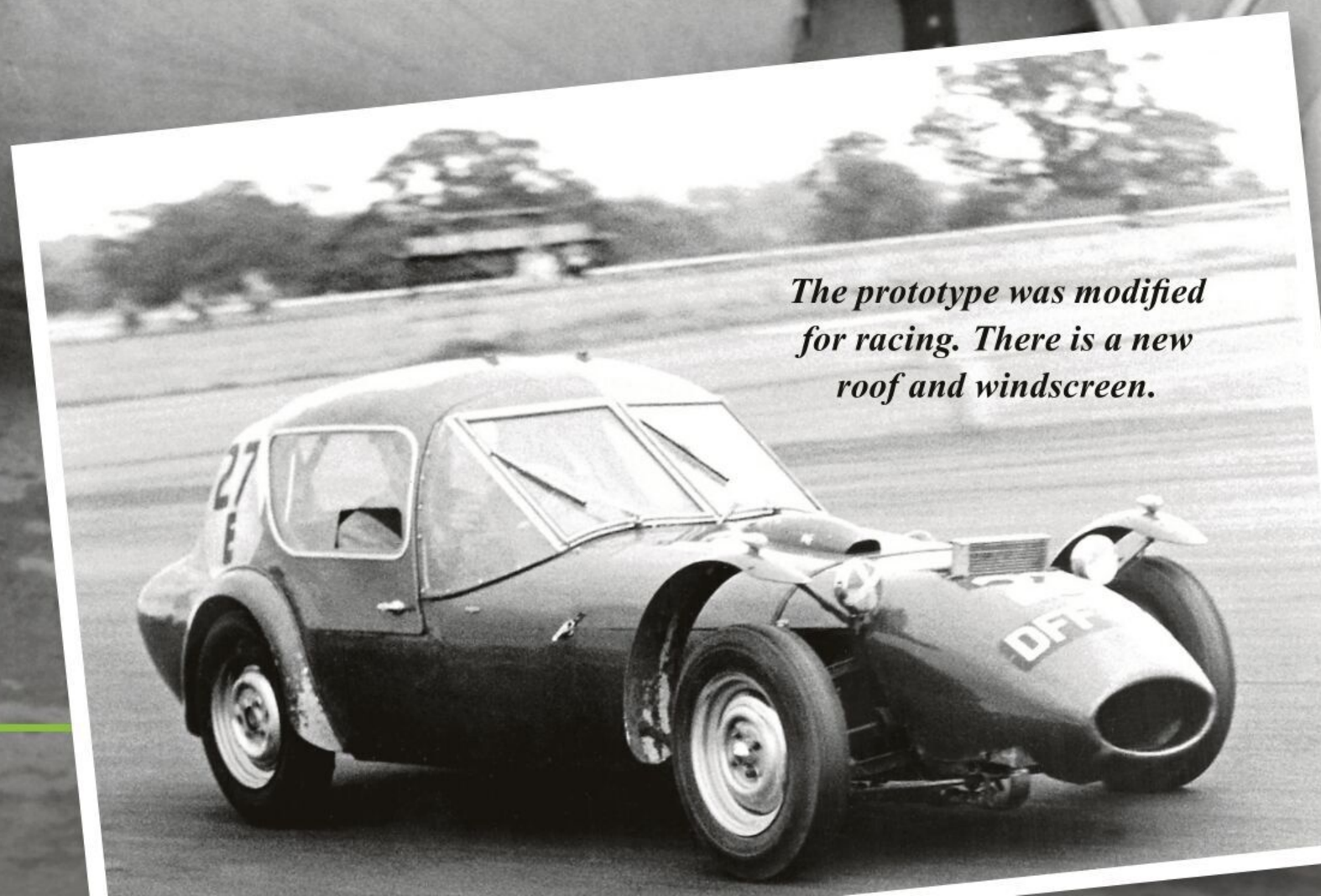
SOURCE: GEORGE PHILLIPS / THE REVS

LIFE AND WORKS OF FRANK COSTIN

WOODEN WONDERS

Frank Costin devoted his life to enhancing racing-car aerodynamics. He was also renowned for the use of wood in his cars. **Alexander W. Trimmel** has been a fan of Costin's for decades.

Frank Costin with the proto-type Marcos chassis.



The prototype was modified for racing. There is a new roof and windscreen.

SOURCE: HISTORIC MARCOS REGISTER

In a profile on Frank Costin, Mike Lawrence described him in MotorSport magazine as "an engineer, arguably of genius, who has designed dozens of cars, as well as boats, aircraft, and bobsleds… He completely lacks interest in production engineering and has precious little business acumen." Costin's original Marcos set the bar for racing cars in the late 1950s, and his subsequent works were just as accomplished.

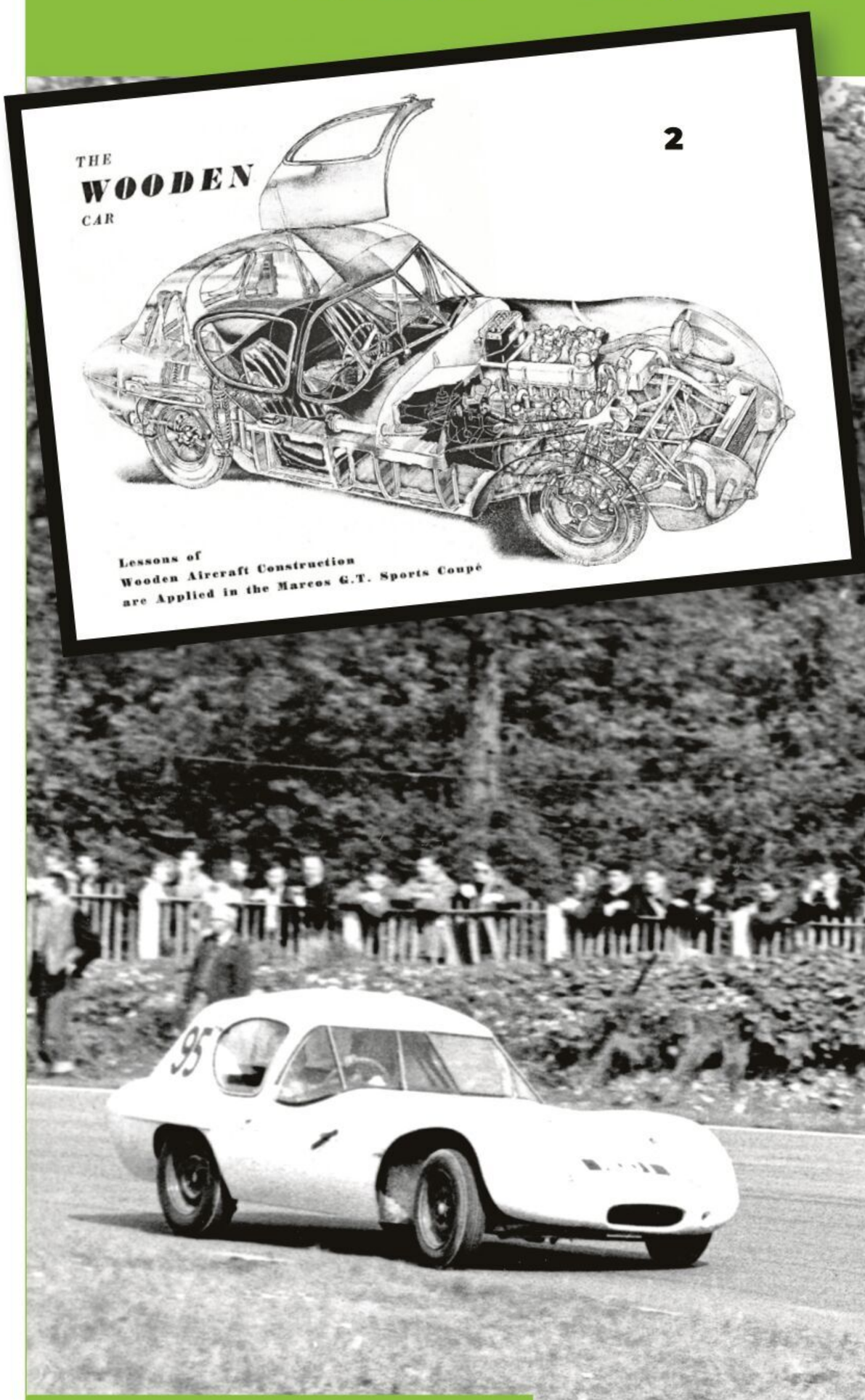
MARCOS XYLON, 1959

Costin was very impressed with the concept of the Lotus Seven: it was basically an inexpensive motorcycle on four wheels, which offered a lot of driving pleasure and could have been used successfully as a club racer at the same time. But there were areas where Costin saw problems, such as its suitability for bad weather, and he also criticized the tendency of the chassis to corrode due to the ingress of water. In 1959, Frank Costin and Jem Marsh met at a 750 Club meeting in a Hitchin pub. As well as racing his homebuilt Austin 7 Special, Jem ran Speedex, a company dealing with Austin and Ford tuning parts in Luton, near London. After a few pints and endless discussions late into the night, they both agreed to build their own car. It was decided that a coupé would be put together that conforms to the CSI regulations for the GT class up to 1000 cc, with sufficient luggage space and driving comfort for everyday road use. It was to be priced in comparison with the Lotus Seven. Frank was responsible for the general engineering plus fabrication of both the chassis and the bodywork. Jem's area of expertise was engineering, assembly, and marketing by Speedex. A tubular frame chassis made of aluminum or steel seemed far too expensive and complex to manufacture, and a fiberglass monocoque à la Lotus Elite was out of the question. Costin knew the advantages and disadvantages of plywood, as he worked with the material during his aircraft industry years. It was easy to work with, and it was also very cheap, so he bought some panels from hardware stores.

Due to the cross-gluing of the individual veneer layers, plywood is not only characterized by its extraordinary strength and lightness, but it is also insensitive to any temperature differences or fatigue, and it is corrosion-free and, with appropriate treatment, fire-resistant and waterproof as well. Furthermore, it can be easily processed with the simplest of equipment, even by inexperienced people. Costin's chassis construction consisted of a continuously smooth underbody on which he placed six torsion boxes. There were two high sill boxes and the center tunnel in the longitudinal direction, as well as a transverse box in the engine compartment, cockpit, and rear axle area. 1.5-mm and 3-mm pressed wood parts were supplemented with spruce strips at the connection points and glued together using

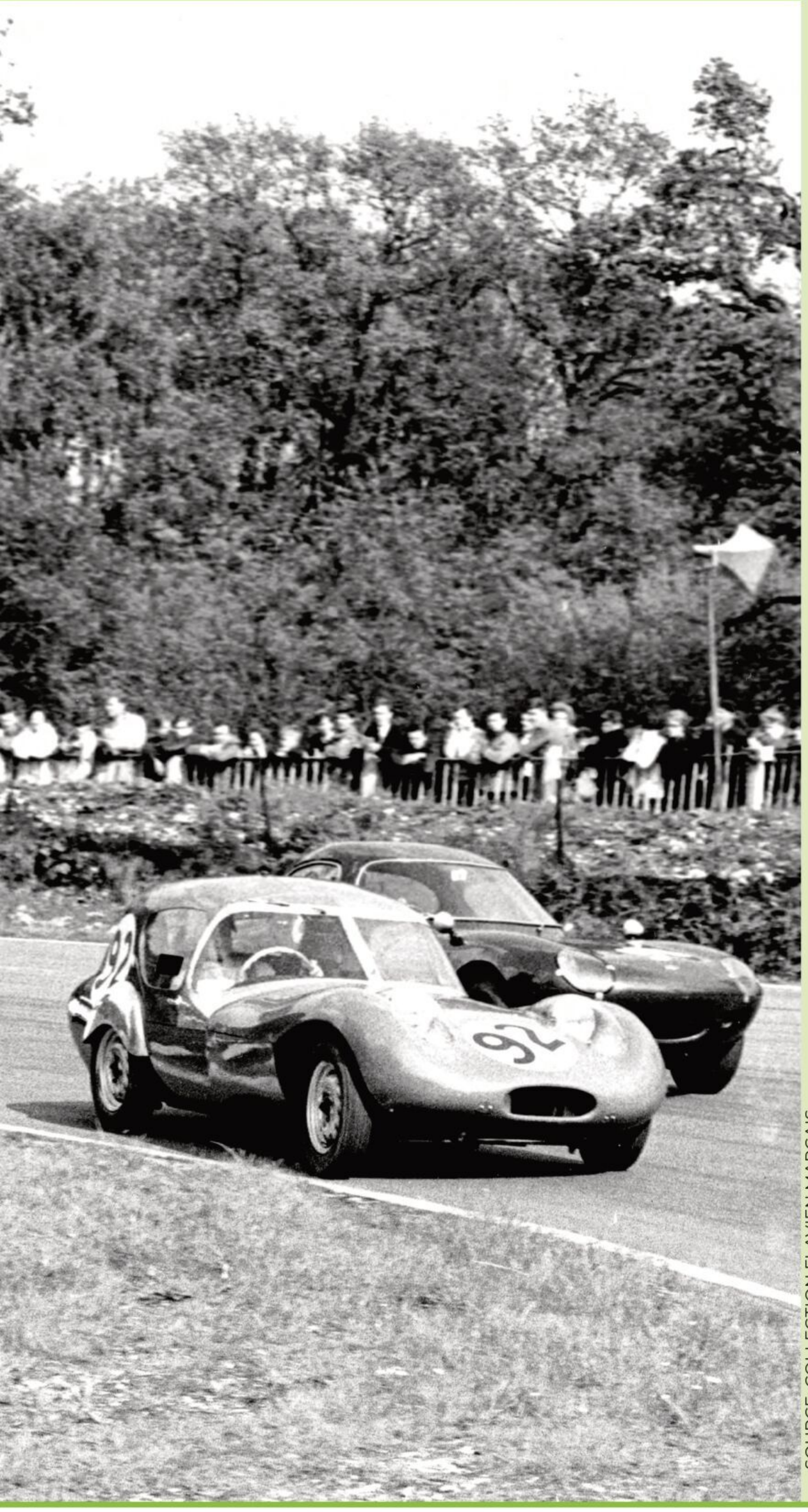
1 The Ultimate Low Drag Vehicle was commissioned by TVR with a view to production.

2 The complexities of the Marcos chassis are shown in this cutaway.



Three Marcos racing each other at Brands Hatch in 1962. At the front is Christopher McLaren (Marcos Xylon 1st series), followed by John Hine (Marcos Luton Gullwing) and Jackie Oliver (Marcos Xylon 2nd series).

SOURCE: FRANK COSTIN AUTOS



SOURCE: COLLECTION FLAVIEN MARÇAIS

BIOGRAPHY

Francis Albert Costin was born on June 8, 1920, the eldest of four siblings in the culturally influenced London district of Hammersmith. His mother taught him to play the piano, and his father reported on exciting research on the South American rainforest. Frank's grandfather made sure that Francis applied the topping to the breakfast bread exactly evenly and showed him how two mahogany boards could be seamlessly joined together with the smallest amount of glue. Mathematics was Frank's favorite school subject. Pictures of a Zeppelin with its aerodynamically shaped passenger cell determined his professional future at the age of eight. He wanted to be an aircraft designer and started at General Aircraft at the age of 17 as a fitter. After just one year he was already behind the drawing table, drawing wings. He then moved to Airspeed in Portsmouth in 1940, where he ended up in the Experimental Department. After the end of World War II, Airspeed was taken over by De Havilland Aircraft Ltd. Costin, however, had no love for the postwar aircraft industry.

At the behest of his brother Mike, who worked at Chapman's Lotus Engineering near London, Frank attended a car race for the first time in 1953, and he was amazed by the bravery of the drivers. But he found the cars, especially the Lotus Mark VIII body model which Mike later sent him, odd from an aerodynamic point of view: "[The cars] wound me up, I knew I could do better than that!" said Frank later. Eventually Chapman assigned Frank the task of making Lotus Mark VIII, IX, X, and XI aerodynamically sophisticated. According to Peter Kirwan-Taylor, who was responsible for the basic shape of the Lotus Elite, which was also enhanced by Frank: "Frank Costin has the same enthusiasm and logical approach to problems that Colin Chapman has, and their work on aerodynamics of automobiles was way ahead of anyone else at the time."

Chapman and Costin worked together in 1956, when David Yorke, team manager at Vanwall, commissioned them to make the racing car more competitive. Chapman designed a new, stiffer chassis with revised rear suspension, while veteran aerodynamicist Costin designed a distinctive new body with the lowest drag. The public praised the car as one of the most beautiful racing cars ever built. Costin's take on this? "That's not what people said when it first appeared, but in motor racing, if a car wins it becomes beautiful."

Did this philosophy continue after Costin built his first car, the Marcos Xylon?

Araldite, a phenol-based adhesive that could fill the gaps well – so there was no need for screws, nails, or any other metal fasteners. Only a few staples fixed the spruce strips in the right places. The very high sills required the installation of gullwing doors modeled after the Mercedes-Benz 300SL. For aerodynamic reasons, the roof was pulled far back, and the windscreen was designed in four parts. The plywood construction, which weighed only 65 kg, achieved a torsional stiffness of 4067 Nm per degree of chassis twist. This was directly comparable to the much more elaborate fiberglass monocoque of the Lotus Elite.

Costin completed the first chassis in just four months, working in a windowless, cold stable in the courtyard of the Lion Hotel in Dolgellau, North Wales. On January 24, 1960, Jem Marsh delivered the tuned Ford 100E engine, transmission, and suspension parts. Two days later, the idiosyncratic racer with a monoposto snout and free-standing fenders over the front wheels roared in the hotel courtyard. A member of the Dolgellau municipal council who was present named the car "Marcos," combining the first three letters of the builders' family names. For the following press presentation in London, the car was provided with painting and interior equipment at Speedex. In the first prototype, the suspension parts were still screwed directly into the wooden chassis. From the second car built, Costin used a very lightweight front subframe and full wraparound front hood with Healey Sprite–style headlights. This car, which was equipped with a 1000-cc Cosworth 105E engine, was delivered to Bill Moss. He achieved nine class wins in a row and set five lap records with the Marcos and was adored by the press. However, the same journalists nicknamed Costin's "Marcos" as "Ugly Duckling." Frank's design was functional, technically correct, and aerodynamically sophisticated. However, he did not adhere to commercial purposes. The car was not fashionably styled. Only nine Xylons were built before Jem Marsh called in Dennis and Peter Adams to upgrade its styling – much to Costin's displeasure, as it added significant weight to the car. He called it "heavyweight." Losing interest in the project, Costin dropped out and transferred sole rights to Marsh. The Adams brothers retained the excellent concept of the wooden chassis until the early 1970s.

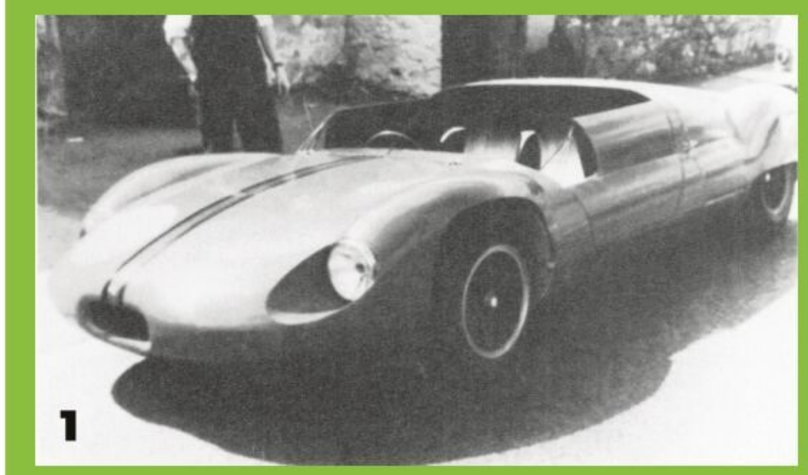
ULTIMATE LOW DRAG VEHICLE, 1962

In 1962, Costin was commissioned by Brian Hopton and Keith Aitchison, two directors at TVR, together with Arnold Burton, a financier, to build the ultimate drag-free grand touring car with an eye on serial production. The wooden chassis construction with the stiff torsion boxes, already known from the Marcos, was supplemented by a structural part similar to a roll bar behind the three seats, which represented part of the wooden construction. The steering wheel and pedals were adjustable, and instruments and switches had their fixed places. A DKW three-cylinder 1000-cc two-stroke engine and gearbox was installed behind the seats to build the front of the car as low as possible. The shift lever in the right sill box was connected to the gearbox by cables. The chassis offered independent wheel suspension all around with ultralight magnesium wheel carriers and wishbones; even the brake calipers of the all-wheel disc brakes were made of magnesium. The body was consistently modeled according to aerodynamic principles, including a flat underbody and economical use of air intakes. The tail and nose were made of fiberglass, and wooden body parts were covered with fiberglass. The large, curved roof structure contributed significantly to the rigidity of the car. The huge plexiglass panes provided the best all-around view but also merciless heating of the interior. Another weakness of the car proved to be the lack of engine cooling.

The prototype drove like a Formula 3 racing car. Its excellent handling and incredible agility enabled the streamlined lightweight to reach a top speed of 144 km/h (90 mph). Even if the interior ventilation and engine cooling still had to be improved, this extremely courageous and progressive concept was believed to have great market opportunities. With 450 drawings labeling each component engineered, the car was near production-ready, but TVR was sliding towards bankruptcy. While Aitchison and Burton tried to save TVR, Costin's brilliant work remained at the prototype stage due to financial constraints.

COSTIN SPORTS RACER, 1963

Jim Diggory, a Volkswagen and Volvo dealer from North Wales, who successfully raced a Marcos, wanted to have a



1 The first version of the Costin Sports Racer nearing completion.

2 As with so many of Costin's designs, the Shopping Car had a touch of aircraft in its styling.

Group 6 racing car built by Frank Costin to compete against the dominant Lotus 23. He was convinced that Costin could design a car that was more aerodynamic, lighter, and stiffer. For this purpose, Costin made a wooden chassis slightly modified from the Ultimate Low Drag Vehicle without a roll bar and with a flat seating position. Contrary to the original idea, only the middle part of the car was made of wood. The suspension, engine, and transmission were attached to tubular steel frames to allow easier maintenance and access to the powertrain via large hoods at the front and rear. The frames were made from delicate ½-inch round tubing, bolted to the chassis with ½-inch bolts, calculated to the exact minimum by Costin. The finished car weighed just 400 kg (900 pounds) without fluids. The aerodynamically optimized aluminum body was made by Williams & Pritchard. A Cosworth-tuned Lotus Twin Cam engine provided plenty of power. A typical Costin trademark is the small but very effective elliptical cooler air intake at the front. Costin designed the windscreen, cockpit side panels, and rear body panel as an aerodynamic unit to reduce turbulence to a minimum. But Diggory had overreached financially, and he could not afford to use the finished car. Eventually it was sold to a Dr. Norbert McNamara in California. McNamara was an enthusiastic racer, but during an event he collided with a Brabham BT8, and then rolled over four times. He walked away with broken ribs, but the Costin Sports Racer's body and subframe were totaled. The rigid wooden cell remained intact. McNamara was so excited about the car's potential that he ordered a second car from Frank Costin. Costin hadn't made any notes when the first example was built and had to reconstruct the new car from memory over the next two years. McNamara had a ridiculously expensive 2-liter Webster Coventry Climax engine primed for the car, which he over-revved on the first test. Due to lack of money, he had to abandon racing, which he regretted: "My only regret is letting Costin down by not achieving the car's full potential – it was one of the great things he designed."

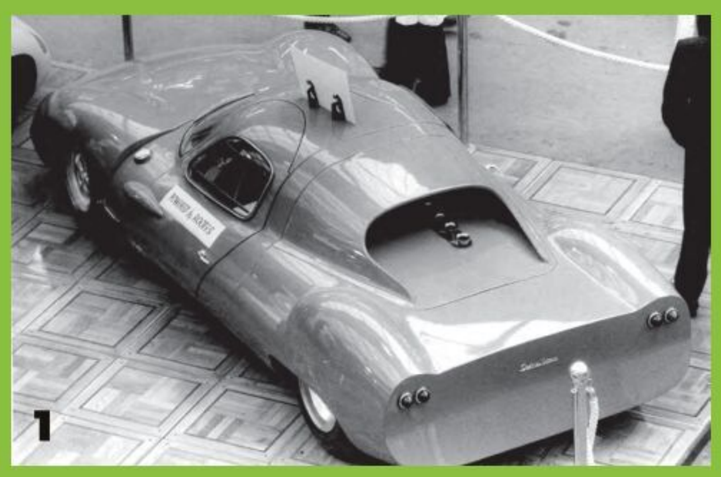
COSTIN SHOPPING CAR, 1964

In the mid-1960s, with advancing mass motorization, general interest in inexpensive city vehicles was great. Frank Costin dealt with it in his usual uncompromising way. His "shopping car" consisted of a simple wooden monocoque, which also incorporated the roof into the structure, and three unsprung wheels so that it could be classified as a motorcycle for tax reasons. A 50-cc Honda unit propelled the diminutive vehicle. Since the motorcycle transmission did not have a reverse gear, the city runabout, which weighed only 74 kg (164 pounds), had to be parked by lifting it using the carrying handle at the rear. Costin's wife, Nan, found this to be very easy to do. This vehicle, which looked more like an airplane than a car, was extremely fuel-efficient and could climb any incline. For the first time, Costin asked a local artist if he could design a more pleasing exterior for the shopping car. The results were frightening from Frank's point of view. The roof is too low and the footwell is too short, but the car is twice as big and twice as heavy. In the end, he stayed true to his "form follows function" design and painted the Costin Shopping Car in red.

COSTIN NATHAN, 1965

In 1965, Willie Griffiths, former Lotus chief mechanic and manager of Roger Nathan's racing activities, tried to convince Frank Costin of the capabilities of the featherweight Imp alloy engine. The motor gear unit weighed a mere 104 kg (230 pounds) in racing trim, with an astounding output of up to 100 hp per liter. When Roger Nathan agreed to be both the driver and the responsible person for the engineering of a proposed Group 6 car, Costin went to work enthusiastically. The Costin-Nathan was a modified little brother of the Costin Sports Racer. This time, however, in contrast to the Sports Racer, tools, molds and gauges were made from each part so that, if successful, the car could be mass-produced in the Lotus manner. The aerodynamically advanced body was now made of fiberglass, and the headlight covers adorned an intersection line between fender and hood curves. The car was presented at the Dorchester Hotel in London during the Christmas holidays, where Colin Chapman cheekily said to Frank: "You've done something wrong, you've designed a very pretty vehicle!" This statement actually made Costin think he had done something wrong. He hadn't, as the results proved emphatically with seven class wins and seven lap records in 10 races in the 1966 season.
As a logical progression, the Costin-Nathan was given a

SOURCE: COLLECTION FLAVIEN MARÇAIS



SOURCE: VICTORIA & ALBERT MUSEUM

1 The sleek Costin-Nathan racing car.

2 The Harris-Costin Protos Formula 2 racing car with spare plywood body as shown at the Victoria and Albert Museum in 2017.

1 The Amigo featured aero-dynamically shrouded door hinges, a testament to Frank Costin's attention to details.

2 Interior has been upgraded over the decades.

1

PHOTO: LYNDON MCNEIL

2

3 Stock Vauxhall Victor engine was retained.

4 The Amigo creates the feeling of lightness, like floating above the ground in an airplane.

3

4

coupé roof for 1967 in order to be able to start in the GT class. Costin provided the external aluminum door hinges with aerodynamic panels. Fresh air flowed into the interior through the upper hinge. Roger Nathan set 14 new lap records in the Costin-Nathan GT in 1967 and won the 1968 Motoring News and Total National GT Championship. However, sales were slow. Costin passed the molds and tools to Nathan, who continued to build a few cars under his own name, developing the concept further as the "Astra" with a Ford FVA engine. Costin meanwhile turned to a new project.

COSTIN PROTOS F2, 1967

In 1966, Costin met Brian Hart at the London Racing Car Show. Hart was not only an excellent racing driver but also, as a former apprentice at De Havilland, endowed with great technical and manual skills. Hart introduced Costin to Ron Harris, a former Lotus Formula Junior and F2 racing manager, who wanted to conquer the 1967 Formula 2 championship with a self-built car. Costin mentioned his plywood chassis to Harrris, who enthusiastically commissioned Costin to build an F2 monoposto. It had to be ready for the first race at Silverstone, which took place just 127 days later. There was no room for large torsion boxes in a monoposto, so ring-shaped transverse bulkheads and the body shell were responsible for the strength and torsional rigidity of the chassis. A vacuum baking process with mahogany strips developed by Ferry Aviation could not be used in the short time available. The body, made of 3.5-mm-thick birch plywood, was bonded to the chassis structure with high-strength glue and clamps. The V-shaped upper wishbones operated internal shock absorber spring units at the front, and the profiles of the front links were not round but elliptical for better aerodynamics. The side aluminum tanks were only attached to the chassis with narrow ribs so that they could break away from the vehicle in the event of an accident. However, the aerodynamically sophisticated "Protos" (Greek: "The First") was 30 kg over the weight limit. Its tanks were placed too high. The car's high center of gravity meant slow cornering speeds. Nevertheless, the competition could hardly keep up with the Protos on the straights. Its lap record at Hockenheim remained unbeaten for a full three years. No matter how hard Hart and other team drivers Pedro Rodriguez, Eric Offenstadt, and Kurt Ahrens tried, the airplane cockpit racer with the cut-out eye slit never really got off the ground. The season was disappointing. Costin and Hart wanted to further develop the car and eliminate its errors, but Harris lost interest in the project before the end of the season and dissolved the team.

COSTIN AMIGO, 1971

As early as 1968, Costin began designing a sports car aimed at a highly demanding clientele who were looking for a car with crystal-clear construction principles and the best aerodynamics. Perhaps Costin's previous constructions put the competition in fear and terror, but the friendly "Amigo" concept had to be regarded as the summary of all his experiences and as the highest goal of his automotive career. Financier Paul Pyecroft gave Costin a free hand in every aspect of the design. The Amigo was planned as a fast street sports car, with the best aerodynamics and the best handling with the best driving comfort. It was to have a large trunk, good ventilation and heating, plus perfect seating comfort. At a cruising speed of 160 km/h (100 mph), the engine should have a sonorous sound with a maximum of 5000 revolutions per minute. Long and wide torsion boxes not only made the front-mid-engine car particularly crash-safe, but were also responsible for the impressive overall length of 4140 mm. Because the car was just 1 meter tall, Costin designed a streamlined roof pylon accessory with running lights mounted at the top so that others could see the car when it was behind a medium-high hedge. For the technology and chassis, Costin relied on proven and reliable Vauxhall Victor components, which meant that the car was to be cheap and easy to maintain. Spare parts were available at almost every corner. Despite a rather weak 100-hp performance, the aerodynamic lightweight could come up with extremely sporty driving performance.

It sprinted from 0 to 100 km/h in just 7.5 seconds, had a top speed of 220 km/h (137 mph), and was fuel efficient at 12 l/100 km (around 30 miles per gallon). With standard shoulder harness straps strapped tightly into the seats, you felt like you were in an airplane cockpit behind the adjustable steering wheel and pedals. Additional instruments above the windscreen or on the dashboard informed the driver about the health of the engine, and tinted glass protected the interior from overheating.

The outboard door hinges were aerodynamically shrouded, as on the Costin-Nathan, with the upper shroud providing additional interior ventilation when needed. The spare wheel was hidden behind a cover in the rear wood section. The jack and crank were easily accessible from the outside in the right rear fender. The Costin Amigo with the sliding side windows was £3,326 in 1972, the same as an air-conditioned Jaguar E V-12. Only seven Amigos found a buyer. Two unfinished chassis were sold to settle outstanding claims.

Looking back on his career, Frank Costin concluded: "My religion is engineering, but I've often dealt with people whose religion is money, and there have been conflicts when each of us has been true to our own creed. In fact, my main problem seems to have been that although my charges have been stupidly low, I have mixed with people who have had just, but only just, enough cash for the project but my keenness to do the technology blinds me to the 'cold hard look.' " ♦

COLOMBO 1175, 1975

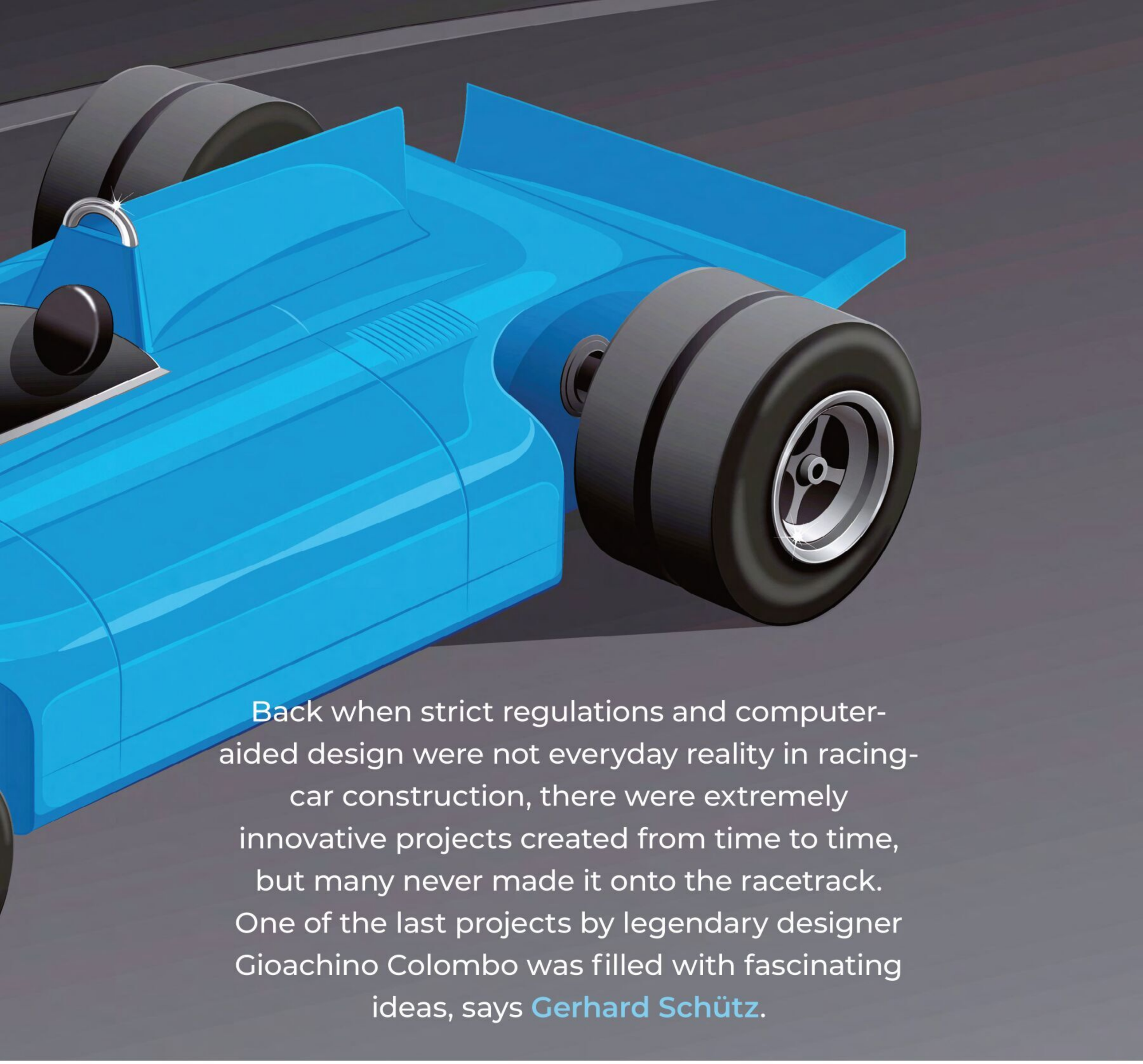
PHANTOM OF THE RACE-TRACK

This is what the Colombo 1175 would have looked like.

A lot of engineers considered ways to reinvent the racing car. One of the most radical concepts belonged to Gioachino Colombo, who came up with the Project 1175 Formula 1 racing car in 1975/76. These were the times when Ferrari finally returned to top form with the 312 T after nine unsuccessful years in the 3.0-liter Formula 1. The 312 T was innovative in many ways, but 74-year-old Colombo had even more daring dreams. He was a doyen of his guild, he had achieved great things, and "retirement" did not exist for him. So he constantly worked independently on new projects, and the 1175 was his most innovative to date – the result of an uncensored radicalism of maturity. Simultaneously it was also a reminiscence of his Bugatti 251, from 1956, which failed through no fault of his own and therefore was all the more painful. The project touched upon two highly topical themes of the 1970s. First, the problem of an ideal suspension for the ever-widening tires; and second, the issue of aerodynamic downforce. For the first, he found two solutions: a well-known one with a new look and a completely new one. For the second, he envisaged something absolutely new.

THE WELL-KNOWN SOLUTION: A DE DION SUSPENSION

Colombo had always been a supporter of the De Dion suspension. In late 1950 he converted the prewar Alfetta 158 to



Back when strict regulations and computer-aided design were not everyday reality in racing-car construction, there were extremely innovative projects created from time to time, but many never made it onto the racetrack. One of the last projects by legendary designer Gioachino Colombo was filled with fascinating ideas, says Gerhard Schütz.

a De Dion axle, and the new Alfetta 159 dominated the race season. This was the car which gave Farina his second world championship in 1951. Later the very successful Maserati 250 F that Colombo worked on also received a De Dion axle. And then came the Bugatti T 251 project in 1956. Unusually, Colombo installed a De Dion axle at both the front and the rear. In the Seventies, the De Dion returned to the scene: Chaparral used it in its 2H Can-Am racer, then Ferrari and Lotus employed it in their Formula 1 racers in 1976.

In 1976 Ferrari worked hard on a De Dion version of the T2, which was in danger of falling behind due to problems with the hard Goodyear tires. Even a De Dion front axle was tested, with a new system designed not to affect steering. The Italian trade press speculated on a debut in Monza. But the T2 DD or even DDD (Double De Dion) never reached fruition. The De Dion system was originally invented to reduce unsprung mass by separating the weight and function of the drivetrain from the suspension. In a De Dion design, the drivetrain, including the differential and driveshafts, is rigidly attached to the chassis and becomes sprung weight. The suspension, brakes, wheels, and the connecting tube that mounts the wheels are the only unsprung weight. Suspension and guidance are thus cleanly separated, and the result is more clearly defined handling. The De Dion suspension ensures that the wheels are always vertical to the road and that the tread has full contact with the ground. But if a front axle is not driven, is it really a De Dion design? A De Dion system must be located by trailing arms and limited from

movements in the transverse direction by a Panhard rod or Watt's linkage. A traditional solid front axle, on the other hand, had no lateral control, and most had no longitudinal control either. This was mostly taken over by longitudinal leaf springs. Colombo believed the De Dion could have advantages at the front axle as well, by separating the functions of suspension and steering.

THE DE DION SUSPENSION ON THE 1175

On the rear axle, the rigid connection between the two wheels is formed by two slightly curved tubes that converge at the ends to form an ellipse when viewed from the rear. Seen from above, the tubes are slightly bent forward. A single tube is provided on the front axle. A transverse leaf spring is used for the suspension, which had not been seen in Formula 1 since 1960. These are supported internally and externally on casters. The dampers are installed vertically. It was an unusual approach.

Revolutionary Solution: Double Wheels with Differential

Colombo came up with this novel idea to adapt to wide tires when he attended Ferrari's test drives in Fiorano in 1975. He watched the 45-cm-wide (17.7 inch) rear tires wear out and wondered if this could also have something to do with the fact that with very wide tires the outside of the tire corners quite a bit more than the inside. This creates sliding and creeping movements in the tread. Colombo designed twin wheels, each consisting of two individual tires and rims, each eight inches wide. And thanks to friction discs between the two rims and a ZF radial differential between the axle carrier and the wheel disc, these twin wheels could rotate at different speeds in the curves.

In race cars, double wheels without a differential had appeared before, as on the Bugatti 53 racing car in 1932. Ferrari revived this idea for the T2 in 1977, having abandoned trials of the De Dion axles in 1976. In contrast to Colombo's project, the two tires were mounted on a common rim, and the rear dual wheels were the same diameter as the front ones. Colombo's design was favorable for air resistance and the inflow of the rear wing. The total tread width of a double wheel was 19 inches, which is significantly more than the 15 inches of conventional rear tires. The contact area thus increased by 20-25%, while at the same time the cross-sectional area decreased by 15%.

NEW BRAKES

Colombo newly developed a kind of combination of drum/disc brakes. The cast brake drums had a U-shaped profile. The braking surfaces were on the inside. A locking ring was screwed onto the brake drum toward the center of the vehicle. From the inside, the brake pads arranged in a ring were pressed laterally against the inner walls of the brake drums. The brake housings were radially perforated and were ventilated in this way.

CHASSIS

The chassis was not a monocoque construction, but instead, a tubular frame made of titanium, with a subframe behind the driver's seat made of square tubing that supports and encloses the engine.

AIR-COOLED EIGHT-CYLINDER INLINE ENGINE

The air-cooled eight-cylinder 3.0-liter i-line engine was coupled with a transversely installed six-speed gearbox. The concept was clearly reminiscent of Colombo's design of the Bugatti 251 from 1956, although the engine there was water-cooled. The engine was set in at a strong forward tilt.

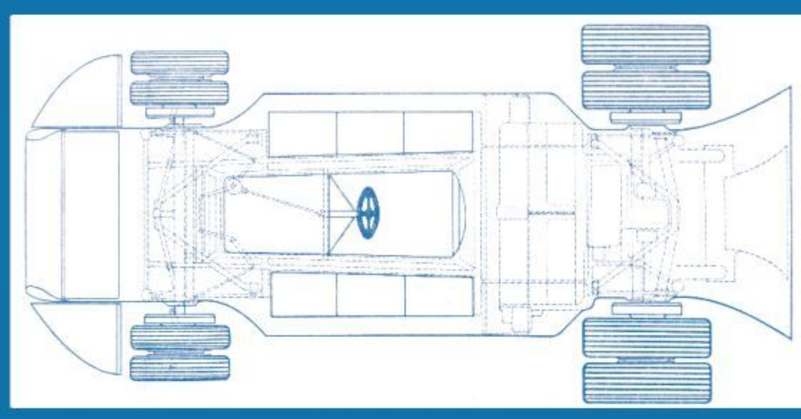
AIRFLOW

The most revolutionary area of the 1175 project was the airflow inside the vehicle. Yes, you read it correctly: in the vehicle. The Seventies were the era in which downforce became the big topic. And this downforce was usually generated via wings and the wedge-shaped top of the car body. Colombo had a new idea: since the engine was air-cooled, it had to be supplied with air, and why not in a targeted manner? The air was captured at the front and guided to the rear of the engine by dynamic pressure inside the body. But the trick comes first: the exhaust gases from the engine drive a turbine, similar to a turbocharger. A second turbine

Gioachino Colombo (center) with Pasquale Cassani and Luigi Bazzi in the Ferrari pits at the 1949 Monza race.

SOURCE: DOUG NYE

The Colombo 1175 would have been the first eight-wheeler Formula 1 racer.



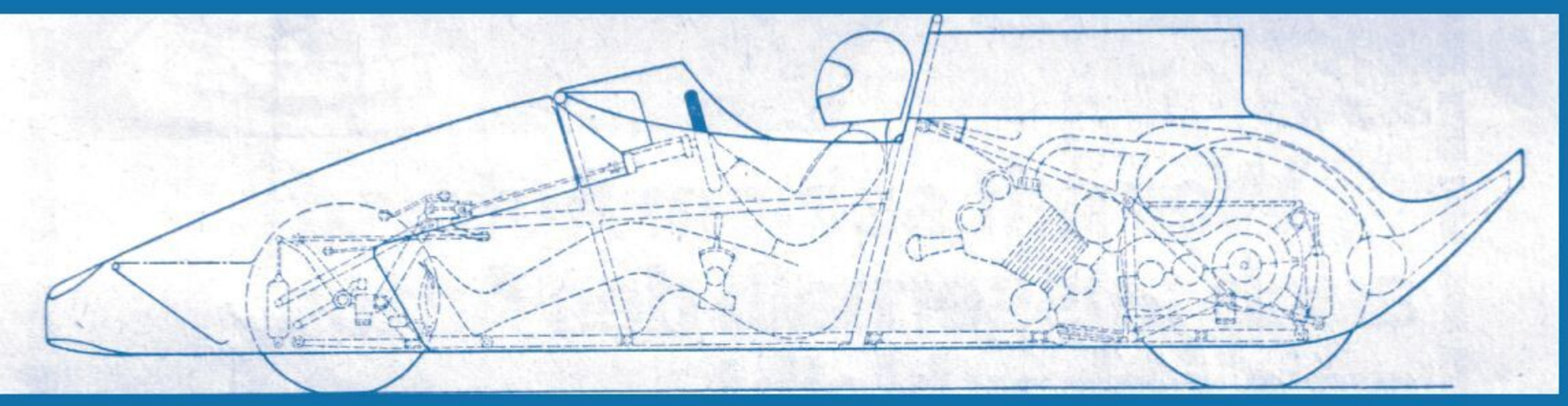
rotated on the same axis, which pressed the exhaust gases, mixed with fresh air, into a duct in which afterburning was to take place. The unburned parts were then accelerated backward over a wide wedge, generating downforce and leaving the vehicle through an opening into the vacuum zone at the rear of the car. The amount of air entering the body was controlled by two flaps under spring pressure. Jim Hall installed something similar in the front end of his Chaparrals in the 1960s. However, no matter how effective the concept would have been, one thing is certain: it would never have achieved the unbelievable downforce effect of the ground effect introduced by Lotus two years later and which is still an integral part of racing-car construction today. Colombo's system would have become a dead end. This is also indicated by an experiment that Gordon Murray made at Brabham in 1978 after his "vacuum cleaner" had been excluded: he had the exhaust system flow into 36 small tubes that blew on a rear diffuser. Tests resulted in an amazing amount of downforce, but also a motor power loss of 40 to 50 hp – too much loss in exchange for the gain in downforce. The loss was related to the new exhaust routing, which created more drag and disturbed the pulsation of the exhaust gases. Later, in Formula 1, the exhaust gases were actually used to accelerate the airflow in the ducts of the rear diffuser close to the ground or to seal the diffuser laterally, thus promoting downforce. In this respect, the utopian Colombo was not only on the wrong track, but he still knew nothing about the great effect of air currents close to the road. In response to the Brabham BT46B, Lotus had their "vacuum cleaner," a new project on paper for 1979, which showed certain parallels to Colombo's idea: instead of using fans to generate negative pressure directly, one fan each on the left and right in the side box behind the wing profile should accelerate airflow so that the profiles would have generated downforce even at low speeds. On paper, anything is possible. One should give Colombo credit for having been involved in very successful racing cars since the late 1920s. The failure of the Bugatti 251 in 1956 was a bad blow to his career. "The Bugatti should have been my best piece. Unfortunately, it was allowed to debut far too early because Bugatti wanted to collect the ACF's bonus for using a local car at the French Grand Prix in Reims. And Bugatti didn't have the right managers," Colombo recalled later. Maybe with the appropriate development time and the necessary budget, something would have come of it. After all, the car was the first Formula 1 central-engine car to be put on the racetrack after the war, and two years later it was the Cooper with a central engine that triggered the great turning point in racing-car construction. It could also have been Colombo with his Bugatti … Was the 1175 project a late attempt to deal with the Bugatti 251 debacle? That must remain speculation. "Woulda, coulda, shoulda," the realist will say. But what would the history of racing-car technology up to the Seventies be without such creative technicians as Colombo or Colin Chapman (Lotus), Mauro Forghieri (Ferrari), Jim Hall (Chaparral), Gordon Murray (Brabham), Derek Gardner (Tyrrell), and others? Not to mention many more before their time. They created many fascinating projects, most of which they also took to the racetrack, racing cars that we no longer see today, and for two reasons: first, the tightly worded regulations in favor of accident safety severely limit the possibilities, and second, CAD and simulation programs eliminate many designs before they can ever prove to be flops on a racetrack.

Fortunately, there are sometimes a few plans for a phantom racer, and when we delve into them, and thereby think a little inside the head of their creator, we suddenly feel the refreshing breeze of reinvention or discovery blowing toward us … ♦

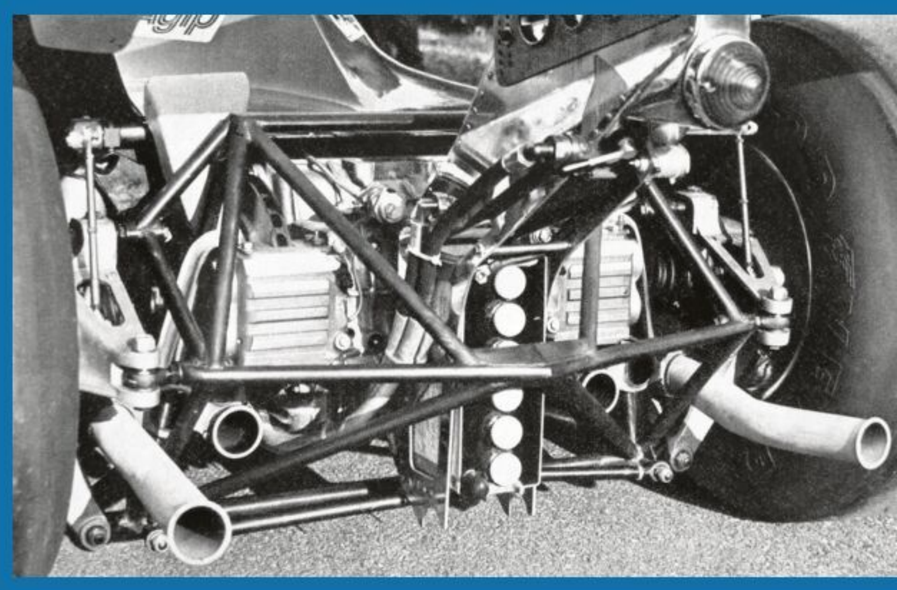
"I CAN'T STOP CONSTRUCTING, NOT EVEN AT THE AGE OF 74. THERE IS NO REST FOR ME."

Gioachino Colombo

Colombo tried to find a novel way to control downforce.



The De Dion setup of the Ferrari 312 T2.



This 1954 Taylor Aerocar was sold for US$250,000 by Barrett-Jackson in 2020.

SOURCE: BARRETT-JACKSON

AIR ROUTE

FLYING CARS

Earlier this year a Slovakian company received the green light from local authorities for its flying car to take to the skies. This provides the perfect opportunity to look at previous attempts from the past 100 years. **Alexander W. Trimmel** is your steward.

Traian Viuia's second airplane-automobile with its wings folded.

VUIA NOs. I AND II

In 1902, Trajan Vuia, who was born in the Banat region of the Austro-Hungarian Monarchy, presented his invention, the "airplane-automobile design," to the Science Academics in Paris. His "Vuia No. 1" airplane car consisted of a triangular tubular steel frame with a wheel on each corner, wings on top of the frame, and a huge propeller which was propelled by a 20-hp Serpollet engine. Viuia's first trial fight took place on March 18, 1906, at Montesson, near Paris, where it hopped to about one meter high and then traveled through the air for about 12 meters. Then the engine cut out, and the wind hurled the car-plane against trees. But Viua was the first to demonstrate that a flying machine could rise into the air by running on wheels on ordinary ground.

Just as the nascent aircraft industry started to blossom in the first years of the 20th century and as the automobile started its expansion at the same time, there were those visionaries who wanted to combine the two types – air and land – into one. These flying cars have been the subject of a few books already, which are listed at the end. Here let me invite you to a panoramic "sightseeing."

GLENN CURTIS AUTOPLANE

The Pan American Aeronautical Exposition was held in New York's Grand Central Palace exhibition hall in 1917, where 12 airplanes were shown. It was here that famed aircraft pioneer Glenn Curtis presented his "Autoplane."

"One of the most interesting exhibits in the Pan-American aeronautical show was the Curtiss Autoplane, a unique combination of an automobile and an airplane, which will not only run over the ground, but at approximately forty-five miles per hour (72 km/h) is designed to leave the surface of the earth and fly … The machine is equipped with an eight-cylinder, 100-hp Curtiss motor, which will drive the autoplane at a maximum speed of 65 miles per hour (110 km/h) through the air. The wing spread is 40 feet (12 meters)," said a contemporary newspaper report, which probably based its account on an official company statement. If we study sources and read witnesses' accounts, it becomes obvious that this vehicle was more of an airplane than a car and it probably never flew high in the sky.

Glenn Curtiss designed his Autoplane in 1917, but it wasn't until 1919 that he received a patent.

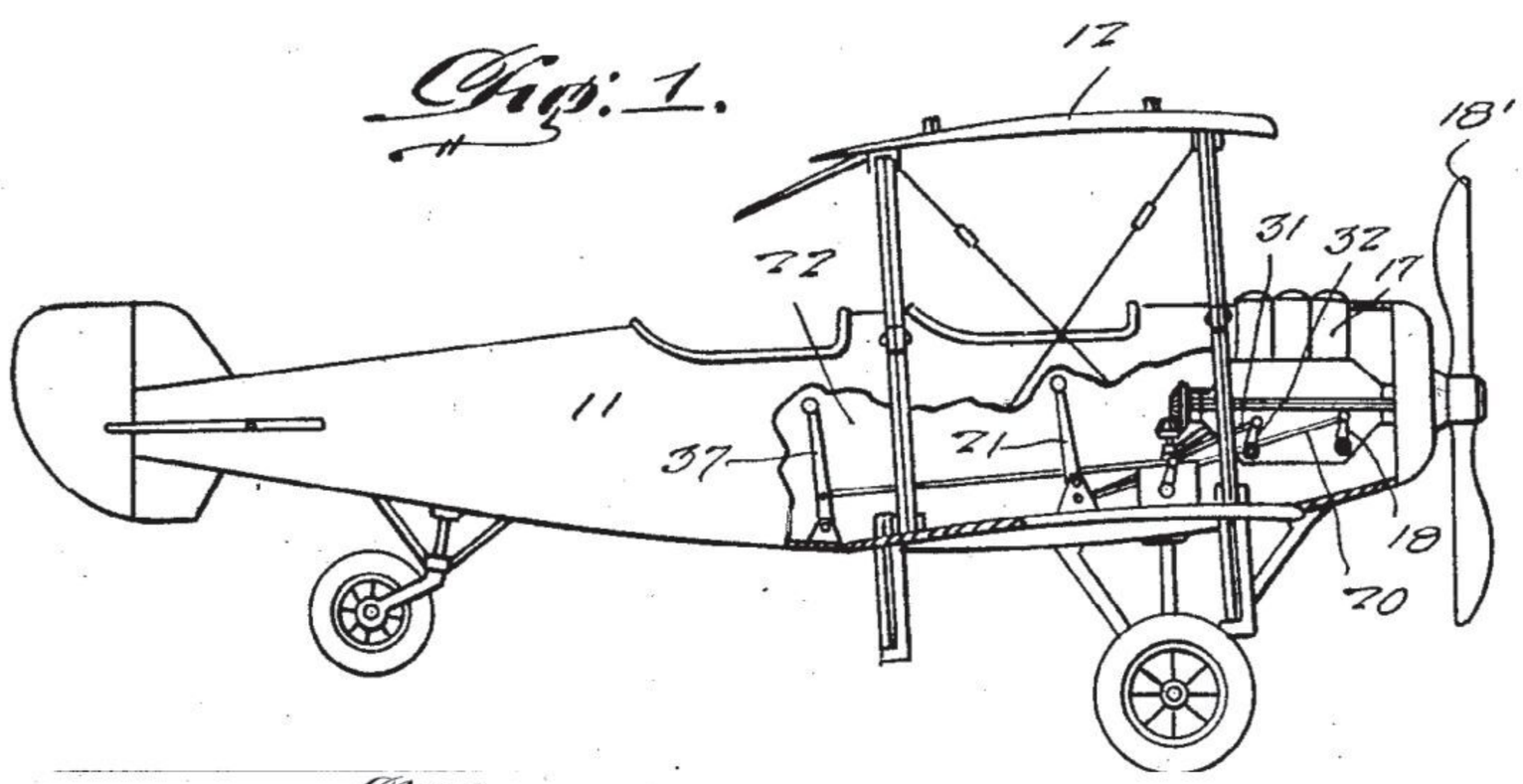
SOURCE: GLENN H. CURTIS MUSEUM

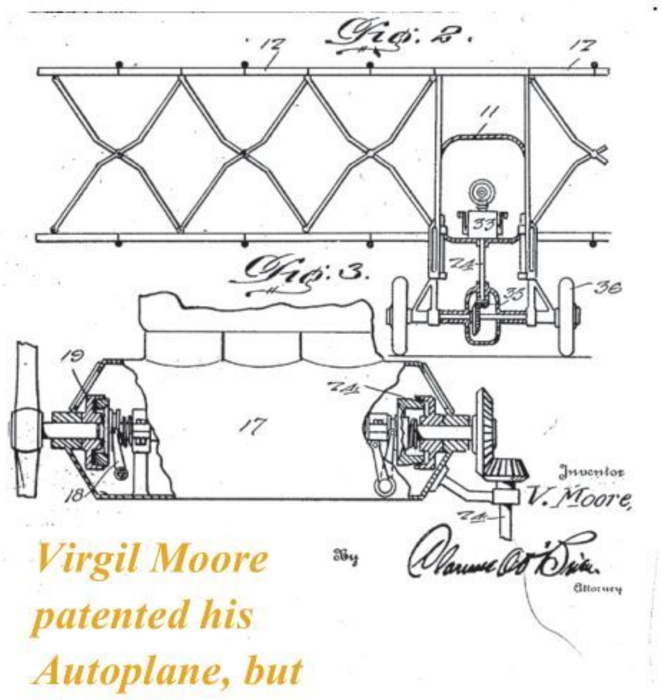
SOURCE: AIRWAR.RU

René Tampier built several versions of his L'Avion-Automobile, which he drove and flew.

RENÉ TAMPIER L'AVION-AUTOMOBILE

René Tampier was born in 1885 in Bordeaux, France. At the turn of the 20th century his father, Charles Tampier, became an officer at the Automobile Club de France and infected his son with the automobile craze. Later René met Wilbur Wright on his French tour in 1908 and became fascinated by flying machines. Later he patented the block-tube-type carburetor, which became widely used in rotary-engined planes. In fact, he worked at his Bloc-Tube company, which at later times made parts for airplanes, until his death in 1944. His claim to automotive fame is the L'Avion-Automobile from 1921. It was basically a four-wheeled biplane with foldable wings. Tampier opted for two separate powerplants: a small four-cylinder motor driving the vehicle's rear axle, and a 300-hp Hispano-Suiza V-12 aero engine to get it airborne. The biplane wings folded back alongside the fuselage for motoring. The pilot sat facing the tail when driving. Between 1922 and 1925 Tampier built several different versions of the Avion Automobile, all of which he drove and flew, but as a vehicle it was cumbersome and awkward and the idea was never adopted commercially. His folding wings remained influential for decades for designers of flying cars.





Virgil Moore patented his Autoplane, but the idea never caught on.

MOORE AUTOPLANE 1925

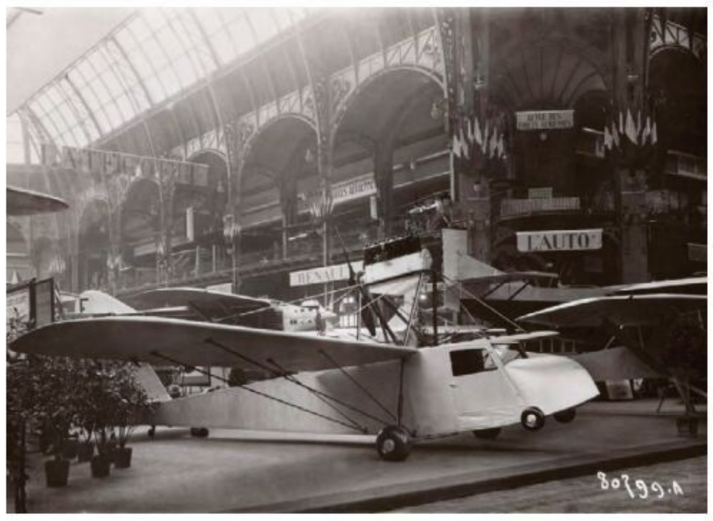
In the early 1920s, Virgil Moore, an inventor in Los Angeles, tried to bring his patented Autoplane to the market. It was a combination of an automobile and an airplane with folding wings. There were plans for three versions: a taxi, a truck, and a salesman's version that could be used to get to customers as quickly as possible. The plans were never realized.

AEROCAR AD2000

This concept of a land, sea, and air vehicle was exhibited at the 1928 Ideal Home Show in London. It is more than uncertain whether the vehicle was ever further developed.

A combined boat, plane, and car was only realized as a life-size model.

SOURCE: LONDON DAILY EXPRESS



SOURCE: AIRWAR.RU

A half-baked idea was shown by Charles Weymann and George Lepère at the 1930 Paris Aero Show.

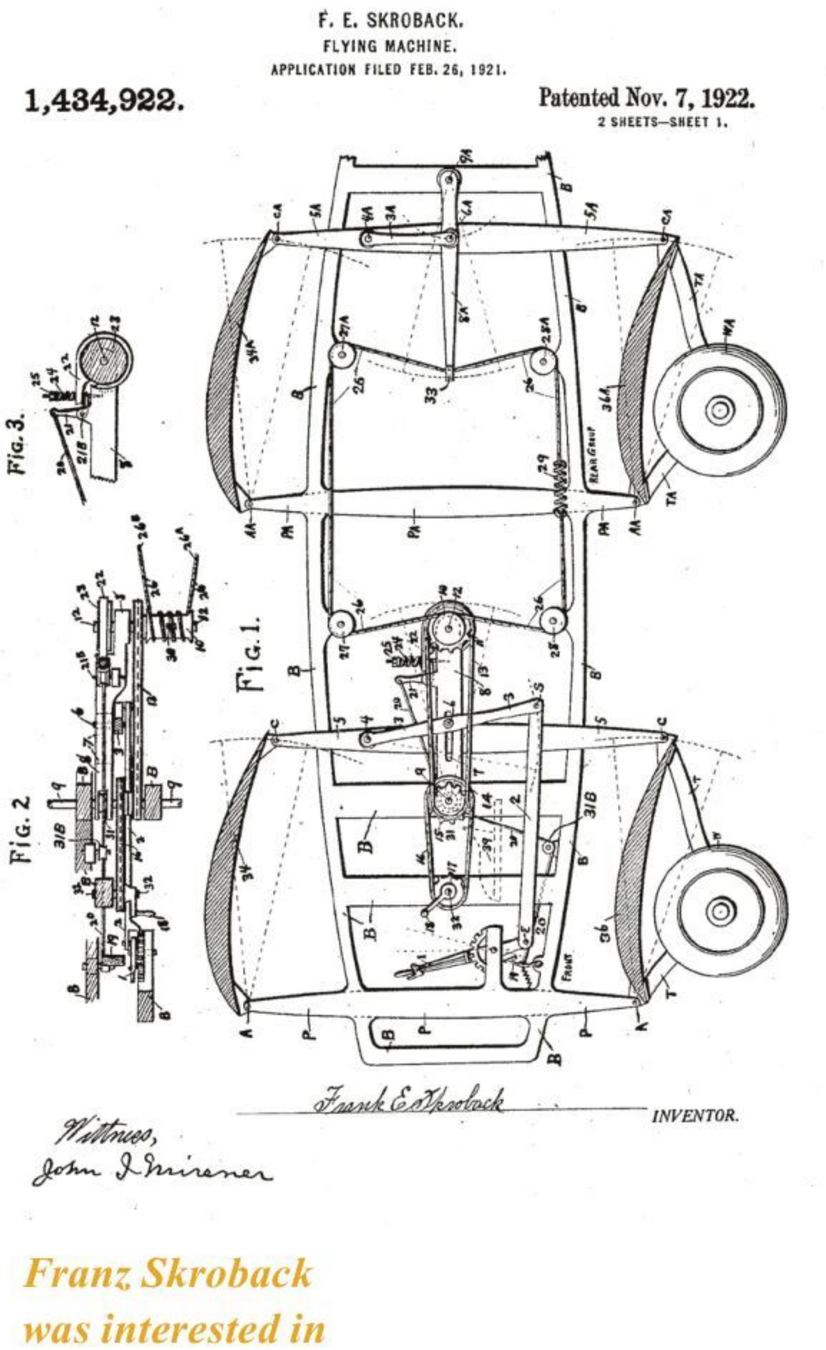
WEYMANN LEPÈRE 52 AEROMOBLIE

Charles Weymann was an early pilot who also developed a system for making fabric bodies in the 1920s. Later he teamed up with Captain George Lepère to build airplanes. At the Paris Aero Show in 1930, they presented the Aeromobile, a supposed "flying boat on wheels." The project was not fully developed, and it disappeared without a trace.

STOUT SKYCAR

The Stout Skycar is the collective name for a series of four American light aircraft, the first of which made its maiden flight in 1931. The planes, collectively called Skycar or Sky Car, were designed and invented from scratch by designer William Bushnell Stout, who contributed to the development of the Ford Trimotor. The designer assumed that the Skycar planes would be mass-produced, as cheap as possible to operate, and very easy to pilot. Of course, it was assumed that they would be used on the civilian market, mainly in the U.S. Perhaps William Stout assumed that his machines would make a similar revolution in aviation as the Henry Ford Model T in the automotive industry. Ultimately, however, only four Skycar machines were created. William Stout went on to design the revolutionary Scarab (see Rare & Unique Vehicles No. 1).

Four variations of the Skycar were built between 1931 and 1944 by William Bushnell Stout.



Franz Skroback was interested in flying machines all his life.

SKROBACK ROADABLE AIRPLANE

Inspired by Henri Mignnet's Tandem Flügler "Pou-De-Ciel" (Flying Flea), Frank Skroback, an industrial engineer in New York, wanted to build a vehicle in 1935 that was drivable for shorter distances but could be transformed into a flying machine for longer trips. The vehicle had a roughly 6.5-meter-long linen-covered steel hull and three pairs of wings in double decker format. The wingspan was just 2.1 meters to keep the aircraft within a reasonable width for driving with fixed wings. First tests were conducted in 1945, but the vehicle never fulfilled its promise. It was put into storage, then driven a few times. It was last seen in 2010, when it was auctioned off.

SOURCE: DETROIT HISTORICAL SOCIETY

SOURCE: FLORIDAMEMORY.COM

The only known photograph of Jess Dixon on his flying automobile.

VLACHOS TRIPHIBIAN

In 1935, inventor Constantinos Vlachos built a prototype of a "tri-phibian" vehicle that could navigate through air, water, and on land, he claimed. It caught fire after the engine exploded while Vlachos was demonstrating it in Washington, D.C.

HAFNER ROTABUGGY

Designed by Austrian Raoul Hafner of the British Airborne Forces Experimental Establishment during World War II, the Rotabuggy was essentially a Willys MB Jeep converted into an autogiro as a way of giving airborne forces some ground transport. Though initial test results were deemed "highly satisfactory," the availability of vehicle-carrying gliders rendered further development unnecessary.

A Russian airplane fan built a 1:72 scale model of the Hafner Rotabuggy in 2011.

SOURCE: KAROPKA.RU

JESS DIXON

Jess Dixon (1886–1963) of Andalusia, Alabama, was a man continuously investigating mechanical or experimental fields, and he tinkered with almost anything mechanical. Even before receiving any formal flight training, he constructed and flew a glider of his own design that was flown successfully from Dixon airport. Tired of being tied up in traffic jams, he then devoted his efforts in 1936 to the development of a unique flying machine, a combination of automobile, helicopter, autogiro, and motorcycle. The "Flying Ginny," as Dixon liked to call it, was designed to allow for the transfer of engine power from the rotor blades to the wheels, which enabled its operation on surface roads. For flight and hover, it had two large lifting rotors in a single head, revolving in opposite directions, with cyclic and collective pitch control. Powered by a 40-hp air-cooled engine, the Dixon helicopter could reach speeds up to 160 km/h and was supposedly test-flown in 1940–1941. However, only one photograph of the type is known to exist, and although it appears that the machine is actually flying in that picture, no records have survived of the test flights.

PITCAIRN AUTOGIRO AC-35

In 1935, the Experimental Development Section of the Bureau of Air Commerce commissioned the Pitcairn Autogiro Company to build a roadable aircraft based on their PA-22 helicopter. The Autogiro AC-35 was able to fit into any larger garage with the rotor blades folded and should have been able to reach speeds of up to 40 km/h on the road. However, the main domain of the two-seater with the steerable front wheels was up in the air. On October 2, 1936, test pilot James G. Ray landed the AC-35 in a downtown park in Washington, D.C., to present the vehicle to the public there for a few days. He then folded up the rotor blades and drove to the main entrance of the Commerce Building, where he was warmly welcomed by the head of the Aeronautics Branch, John H. Geise. Further successful tests were carried out until 1942. Despite this, the Autogiro AC-35 never went into production.

SOURCE: SAN DIEGO AIR & SPACE MUSEUM

After WW2 Theodore Hall continued his experiments and developed a new flying car with Tommy Thompson in 1946 for Consolidated Vultee Aircraft (later Convair). The Model 116 was followed by the Model 118, which was equipped with a Crosley engine, powering the plastic-bodied car and a Lycoming engine for the aircraft part. It remained in the prototype stage.

TED HALL

Theodore Parsons "Ted" Hall, an aeronautical structural engineer, designed the Hall XCP1 autoplane in 1939. The "Roadable Airplane" had one wheel at the front, two driven wheels at the rear. With a Mercury V-8 fitted, the machine reached a top speed of 110 mph in flight. Wings and the twin-boom tail could be unbolted in only four minutes with a spanner for road use. He managed to make it fly in 1940 at the Linda Vista airport in San Diego, California. Hall then sold the rights to his invention to the Southern Aircraft Corporation and took a job with the firm, allowing him to continue working on the product's development. Three prototypes were produced, but due to a lack of funding, the project was dropped before commercial units were built.

FULTON AIRPHIBIAN

Robert Edison Fulton Jr. (1909–2004) was an American inventor and explorer. Between 1932 and 1933 he completed a solo round-the-world tour on a two-cylinder Douglas motorcycle. After World War II, he designed a flying car, which he called the Fulton Airphibian. This was the first roadable aircraft to receive a type certificate from the Civil Aviation Administration. While a technical success as a flying car, the Airphibian did not become a marketable design due to the inherent compromises of air and car technologies and financial difficulties. Today one of the four prototypes built has been restored and is part of the National Air and Space Museum's collection.

In 1946 Robert Edison Fulton jr, built four prototypes of the Airphibian roadable aircraft. This was the first vehicle of its kind which received a certificate from the Civil Aeronautics Administration. However financial concerns prevented Fulton from completing its development.

SOURCE: SAN DIEGO AIR & SPACE MUSEUM

SOURCE: SAN DIEGO AIR & SPACE MUSEUM

Over the decades Waldo Waterman built a series of prototypes including the Whatsit, Arrowbile (pictured), and the Aerobile.

WALDO WATERMAN

Waldo Waterman (1894-1976), a U.S. West Coast pilot, built a tailless plane prototype in 1932 called the Whatsit. This was followed by the Arrowplane, which was developed as part of the Department of Commerce "Safe Airplane" competition in 1935, aimed at finding someone who could build a U.S. $700 aircraft. Though the competition ended without a winner, Waterman took home plenty of valuable lessons. Two years later he completed the Arrowbile, a true flying car where a Studebaker engine was mounted in the rear of the fuselage with a radiator up front. Power could be transmitted to a pusher prop or the two rear wheels. The prop was not removed for ground operation. A tailless fuselage and quickly detachable wings allowed a three-minute conversion from flying to road configuration. Ailerons/elevons and wingtip rudders were interconnected, and turns were made by turning the steering wheel (no rudder pedals). The wheel was also used to control pitch. A three-wheel (tricycle) landing gear configuration allowed registration as a motorcycle in California.

Three Arrowbiles were built, but planned production was never realized. Waterman returned to the subject with the Aerobile, which took ten years to build between 1947 and 1957. However it remained a prototype, which garnered zero interest, so it was donated to the Smithsonian in 1961.

ZUCK-WHITAKER PLANEMOBILE (1947)

"Your automobile is a low-flying airplane. Let's take the car off the road and fly where flying is safe – in the wide blue yonder! … An impractical dream? So was flying not so long ago … so was motoring … [as] the modern car has slavishly imitated the plane in everything except the wings, let's put wings on it and make it fully functional," said Daniel R. Zuck in his book "An Airplane in Every Garage," which was published in 1947.

His Planemobile was built together with Stanley Whitaker in 1947, and it looked more like an aircraft than a car. No wonder: Daniel R. Zuck had a hand in designing structural and mechanical details of many top-secret military and commercial aircraft professionally. By means of a shaft, the air-cooled Continental A40 four-cylinder engine set an oversize tail wheel in motion for driving the Planemobile at the ground. There were no rudders or elevators at its tail; instead the wings had "ailerators," a combination of ailerons and elevators.

Daniel R. Zuck wanted to put "An Airplane in Every Garage" as the title of his 1947 book suggested.

SOURCE: THE JIVE BOMBER

SOURCE: BARRETT-JACKSON

AEROCAR

Moulton Taylor founded Aerocar International in the late 1940s, a time when civil aviation was booming thanks to a new generation of pilots trained in World War II. Inspired by Fulton's Airphibian, he also set out to develop his own practical flying car. Aerocar International's first effort was the Aerocar I in 1949, which was first flown in 1950. It had a small two-passenger cabin with wheels housed in external airplane-like spats. A Lycoming O-320 horizontally opposed four-cylinder aircraft engine, mounted in the rear of the cabin, produced 143 horsepower and drove the front wheels through a three-speed manual transmission. The Aerocar had a top road speed of 67 mph (107 km/h), while in the air it had a top speed of 110 mph (177 km/h), a 12,000-foot service ceiling, and a range of 300 miles (460 km). What set the Aerocar apart from the Airphibian was that its wings and tail did not have to be left behind at the airport—they folded into a self-contained package that could be towed behind the car like a trailer.

Taylor was able to secure funding from investors, leading to CAA certification for the Aerocar II in 1956, but while Taylor sold prototypes for $15,000, he was unable to secure a deal for volume production. Only five were constructed, plus a sixth that was built as a flying-only model.

The Taylor Aerocar had detachable wings which could be folded and towed behind the car.

In 1968 Taylor built one more Aerocar, the Aerocar III based on a damaged Aerocar I. It had a more streamlined fiberglass body with enclosed fenders. The wheels were retractable and would be fully extended for take-off and landing, partially retracted for road use and completely retracted in flight. Airspeed was increased to 135 mph (217 km/h). This vehicle is now exhibited at the Museum of Flight in Seattle, Washington.

LUIGI PELLARINI AERAUTO

Luigi Pellarini (1913 – 2001) was an innovative Italian aircraft designer. By his own account, he built his first flying car right after World War II. He "had made the world's first flying car in 1945 and for each of the next five years he made a new model," according to a portrait of him in 1952. He claimed he had sold all the models but made very little profit. His last model used its pusher propeller for propulsion not only in the air but also on the road. The Aerauto PL-5C drove and flew across Italy from late 1949 to early 1950, 1800 km in the air and 2200 km on the ground. At the promotional tour's end, Pellarini allowed the Archbishop of Milan, Cardinal Schuster, to get a look at this sensational flying car.

One of Luigi Pellarini's Aerauto prototypes from around 1950.

SOURCE: SMITHSONIAN

One of the few very unfortunate experiments, testing of the AVE Mizar resulted in a fatal accident.

SIMCOPTER

China-born David Dobbins, whose family moved to San Francisco shortly after his birth, was employed by various aeronautical companies. In the 1950s the family moved to Mexico, where David taught mathematics at the American school. In his free time he built his Simcopter, which was based on a 1948 Simca 5 combined with a 300-hp Lycoming aircraft engine and a welded superstructure to operate a rotor. On August 15, 1957, Dobbins flew his creation for the first and last time. Possibly the Simcopter didn't work as he had expected.

HALSMER AERO CAR

Joseph L. Halsmer of Lafayette, Indiana, a captain with Seaboard World Airlines and the father of 11 children, designed his own unique roadable two-seat aircraft, known as Aero Cars. His last effort, the Aero Car 3, was completed in August 1963. It was powered by a 85-hp Continental flat-four engine, driving a four-blade pusher propeller for propulsion both in the air and on the ground. Wings were able to be folded by one person in just a few minutes. When folded, they lay vertically against the tail-booms, enclosing the propeller to enhance safety while it is driven on the ground.

WAGNER ROTOCAR III

In 1961 Josef Wagner, a German engineer who previously worked for Messerschmitt, set up Wagner Helikopter Technik (WHT) to offer an easy-to-fly Volks-helicopter-car for the price of a Volkswagen Beetle. This machine was developed according to a coaxial scheme with two counterrotating propellers, giving the ability to move and maneuver the helicopter very easily. The Rotocar III's air-cooled 120-hp four-cylinder radial engine was installed directly on the lower rotor hub, which made a gearbox unnecessary. Ground movement was provided by a Goggo engine and rear-wheel drive. The Rotacar remained a prototype.

Wagner's helicopter-car, the Rotocar is today part of the Hubschraubermuseum collection in Bückeburg, Germany.

SOURCE: ZEPPELIN MUSEUM

AVE MIZAR

In 1971 Henry Smolenski and Harold Blake founded Advanced Vehicle Engineers with the aim of producing the AVE Mizar, a modular roadable flying machine. It was a Ford Pinto mated to the rear engine, wings, and tail unit of a Cessna Skymaster. By mid-1973, two prototypes had been built and three more were under construction. For takeoff, the Mizar was intended to use both engines to shorten takeoff roll. On the ground, telescoping wing supports would be extended and the airframe would be tied down like any other aircraft. The Pinto could be quickly unbolted from the airframe and driven away. On September 11, 1973, the vehicle disintegrated during testing, killing both of its creators. Development work was immediately stopped.

Despite dozens of failures, the idea of the flying car never died. Paul Moller spent over 30 years trying to bring his life's work to fruition. In 2017 he even had to sell his original prototype, but there was little interest. Lately Terrafugia in the U.S. and Aeromobil in Slovakia have come close to a working model. Terrafugia had to shut down its operations in 2021. But the Aeromobil was certified by the Slovakian authorities recently and it is hoped that by 2024 it will be available commercially. ♦

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- National Air and Space Museum

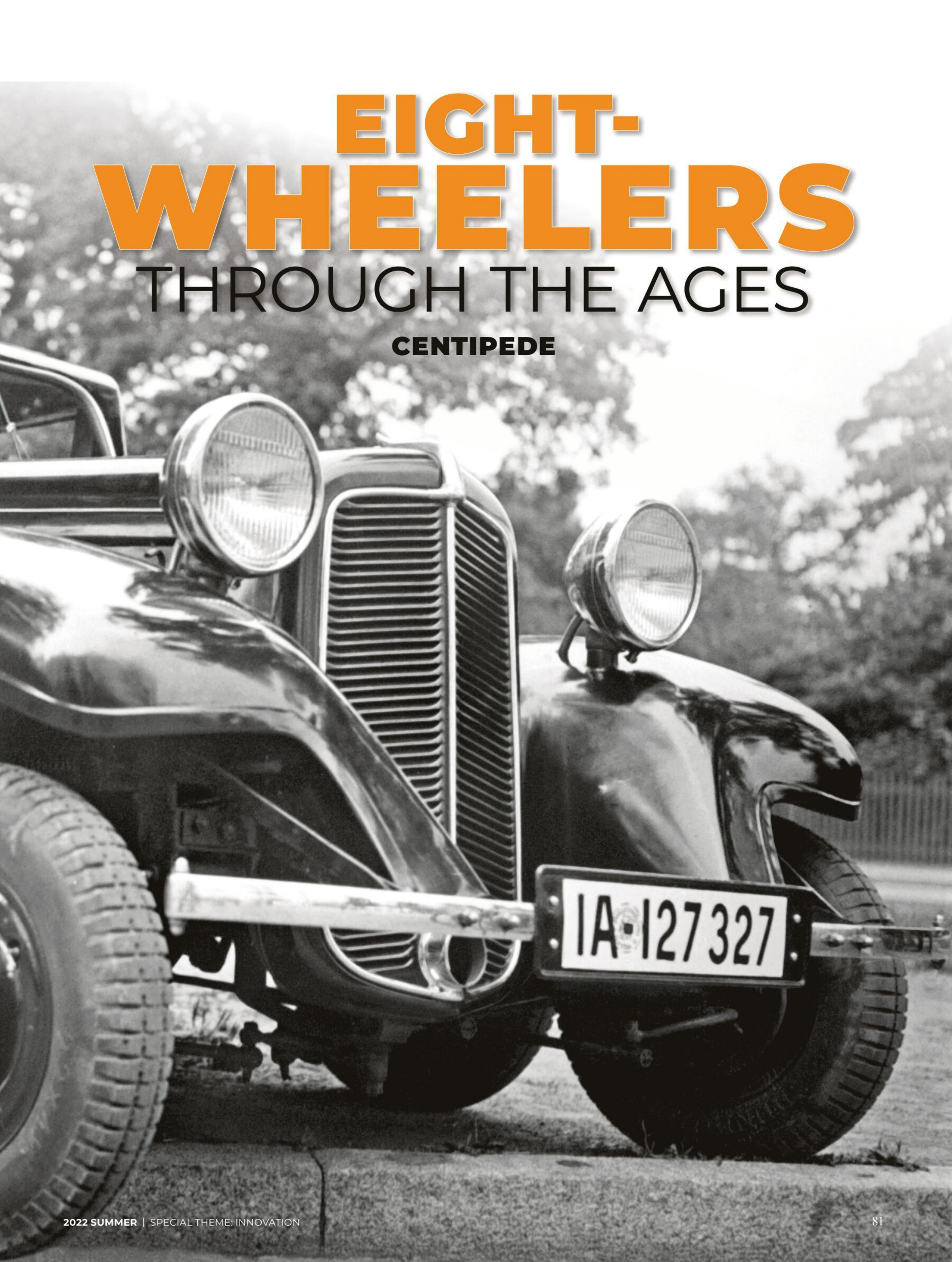
Gotthard Rimmek's eight-wheeler Adler was all about safety.

Eight-wheeled passenger cars have always existed and still exist; their origin lies in the comfortable multi-axle railway carriages, explains **V. Christian Manz**.

SOURCE: SÜDDEUTSCHE ZEITUNG/ALAMY

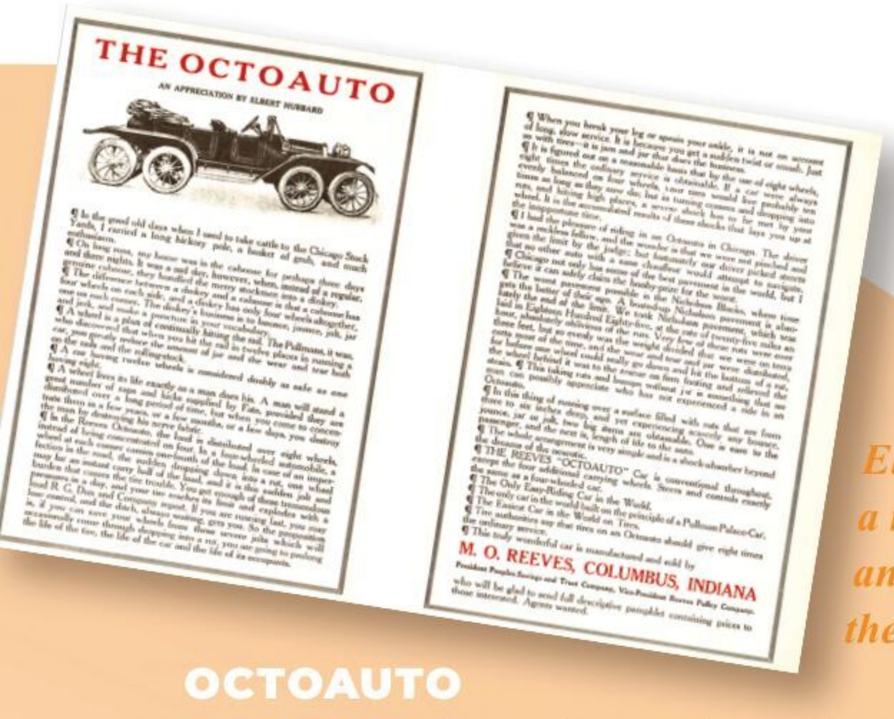
EIGHT-WHEELERS THROUGH THE AGES

CENTIPEDE



MULTIPLIED

Innovation


THE OCTOAUTO

AN APPRECIATION BY ELBERT HUBBARD

¶ In the good old days when I used to take cattle to the Chicago Stock Yards, I carried a long hickory pole, a basket of grub, and much enthusiasm.

¶ On long runs, we home was in the caboose for perhaps three days and three nights. It was a sad day, however, when, instead of a regular, genuine caboose, they hoisted the merry stockmen into a dinky.

¶ The difference between a dinky and a caboose is that a caboose has four wheels on each end, and a dinky has only four wheels altogether, one on each corner. The dinky's business is to hustle, jounce, jolt, jar and jerk, and make a spectacle of itself.

¶ A wheel is a plan of continuous hitting the rail. The Pullman, it was discovered that when you hit the rail in twelve places in running a car, you greatly reduce the amount of jar and the wear and tear both on the rails and the rolling-stock.

¶ A car having twelve wheels is considered double as safe as one having eight.

¶ A wheel lives its life exactly as a man does his. A man will stand a great number of raps and light supplied by Fate, provided they are distributed over a long period of time, but when you come to concentrate them in a few years, or a few months, or a few days, you destroy the man by destroying his nerve force, or a few days, you destroy instead of letting concentrated on four. In a four-wheeled automobile, a wheel at each corner carries one-fourth of the load. In case of an imperfection in the road, the sudden dropping down into a rut, one wheel may for an instant carry half of the load, and it is this sudden jolt and burden that causes the tire trouble. You get enough of these tremendous pressures in a day, and your tire reaches its limit and explodes with a loud R.G. Dun and Company report. If you are running fast, you may lose control, and the ditch, always waiting, gets you. So the proposition is, if you can save your wheels from these severe jolts which will occasionally come through dropping into a rut, you are going to prolong the life of the tire, the life of the car, and the life of its occupants… We took Nicholson pavement (in Chicago) at the rate of twenty-five miles an hour, absolutely oblivious of the ruts. Very few of these ruts were over three feet, but so evenly was the weight divided that we were on terra cotta most of the time, and the wear and tear and jar were distributed, for before one wheel could really go down and hit the bottom of a rut, the wheel behind it was to the rescue on firm footing and relieved the strain. This taking ruts and bumps without jar is something that no man can possibly appreciate who has not experienced a ride in an Octoauto."

¶ Where you break your leg or sprain your ankle, it is not on account of long, slow service. It is because you get a sudden twist or smash. Just so with tires—it is jars and jar that does the business.

¶ It is figured out on a reasonable basis that by the use of eight wheels, eight times the ordinary service is obtainable. If a car were always evenly balanced on four wheels, four times as long as they now do, but in turning corners and stopping into ruts, and letting high places, a severe shock has to be met by your wheel. It is the accumulated results of these shocks that lays you up at the inopportune time.

¶ I had the pleasure of riding in an Octoauto in Chicago. The driver was a reckless fellow, and the wonder is that we were not pinched and given the limit by the judge; but fortunately our driver picked streets that no other auto with a sane chauffeur would attempt to navigate. Chicago not only has some of the best pavement in the world, but I believe it can safely claim the leading place for the worst.

¶ The worst pavement possible is the Nicholson Blocks, where time lately the end of the line. We took Nicholson pavement is almost hit Eighteen Hundred Eight-five, at the rate of twenty-five miles an hour, absolutely oblivious of the ruts. Very few of these ruts were over three feet, but so evenly was the weight divided that we were on terra cotta most of the time, and the wear and tear and jar were distributed, for before one wheel could really go down and hit the bottom of a rut, the wheel behind it was to the rescue on firm footing and relieved the strain. ¶ This taking ruts and bumps without jar is something that no man can possibly appreciate who has not experienced a ride in an Octoauto.

¶ In this thing of running over a surface filled with ruts that are from three to six inches deep, and yet experiencing scarcely any bounce, jar or jolt, how big drops are obtainable. One is easy to the passenger, and the next is, length of life to the auto.

¶ The whole arrangement is very simple and is a shock-absorber beyond the dreams of the eccentric.

¶ THE REEVES "OCTOAUTO" Car is conventional throughout, except the four additional carrying wheels. Steers and controls exactly the same as a four-wheeled car.

¶ The Only Easy-Riding Car in the World.

¶ The only car in the world built on the principle of a Pullman Palace Car.

¶ The Easiest Car in the World on Tires.

¶ The authorities say that tires on an Octoauto should give eight times the ordinary service.

¶ This truly wonderful car is manufactured and sold by

M. O. REEVES, COLUMBUS, INDIANA

President Peoples Savings and Trust Company. Vice-President Reeves Pulley Company.

who will be glad to send full descriptive pamphlet containing prices to those interested. Agents wanted.

Elbert Hubbard, a renowned writer and editor, praised the Octoauto.

OCTOAUTO

SOURCE: V CHRISTIAN MANZ

Milton Owen Reeves is usually credited with being the first to build an eight-wheeler passenger car. He was inspired by George Mortimer Pullman's multi-axle railway carriages, which provided much better travel comfort.

Reeves believed that multi-axle passenger cars could offer far better handling characteristics compared to cars with just two axles.

Owen Reeves fitted an additional axle to the front and another one to the rear of a normal Willys Overland car – and so the Octoauto was born. Some people hailed the idea, saying that travel would be much safer as the car could handle bumps and potholes more effectively, reducing the number of tire blowouts. Elbert Hubbard, an American who, according to his own statements, enjoyed a ride in an Octoauto as a passenger, wrote about this experience enthusiastically:

"In the Reeves Octoauto, the load is distributed over eight wheels, instead of being concentrated on four. In a four-wheeled automobile, a wheel at each corner carries one-fourth of the load. In case of an imperfection in the road, the sudden dropping down into a rut, one wheel may for an instant carry half of the load, and it is this sudden jolt

While multi-axle construction is commonplace in trucks and off-roader vehicles, it was unusual among passenger cars. Over the past 110 years, several people worked on eight-wheeler cars, which remained curiosities.

However, soon problems emerged, especially during cornering as tire wear became uneven.

Interest in the Octoauto quickly waned, and the project was abandoned. However, the idea for a four-axle car reappeared on the scene in the 1930s.

The Octoauto was based on a Willys Overland – The Octoauto was inspired by Pullman railway carriages.

The four front wheels turned together.

SOURCE: V CHRISTIAN MANZ

Otto Rimmek with his converted Adler. He hoped to offer a safer alternative to conventional cars.

SOURCE: BPK

RIMMEK ADLER

In the mid-Thirties, Gotthard Rimmek from Berlin patented an eight-wheeled passenger car. While his first design was based on a Brennabor, the prototype was based on an Adler Diplomat. Again, this model was all about absolute safety, especially with a view to the increased speeds on the new motorways built in Germany. “The eight-wheel car avoids accidents caused by broken axles, broken wheels or springs, rolling of a wheel, and burst pneumatics. Due to this arrangement, the car is skid-free to the highest degree,” was the headline in the relevant press at the time. Its designer went one step further and said: “Why put yourself in danger negligently with today’s cars when for the same money you can have a car that will protect the occupants from harm. No life insurance can protect the occupants of a two-axle car from a fatal accident, but this new car can.”
However, this vehicle was also quickly forgotten.

Diego Serrano’s graphics show eight-wheeler arrangement.

The Octo-Rod was a spiritual successor to the Octoauto – both were inspired by railcars.

SOURCE: SIXMANIA.FR (2)

ENOCH JOHNSON'S OCTO-ROD

In the 1950s Enoch Johnson in Red Wing, Minnesota, had the same train of thought (pun intended) as Milton Owen Reeves 40 years earlier: "If railroad coaches have eight wheels … why shouldn't automobiles?" His Octo-Rod was completed in 1961 and was featured in both Hot Rod magazine and Popular Science:

"Every component, except for a few he made himself, stems from Dodges up to 46 years old. Trimmed with mahogany and painted a dazzling yellow, the 2200-pound machine makes an arresting sight. The eight wheels glide over bumps and dips like a snake crawling over the ground."
The car has survived and was once part of the Pioneer Auto Museum's exhibition in Murdo, South Dakota.

Ari Koskinen's shocking custom car was based on a Volkswagen Golf.

ARI KOSKINEN

Bilsport, a Swedish custom-car magazine, held a yearly custom car-building competition. The best examples were presented at the Bilsport Custom & Motor Show in Jönköping. In 1988 the centerpiece was an eight-wheeler gullwing car which had hints of Mercedes at the front and Audi lights at the back, but in fact it was based on a 1985 Volkswagen Golf. It was built by Ari Koskinen in Västerås. He set up a workshop in 1983 to repair cars, trucks, and buses. Occasionally he also built custom cars such as this one. Its fate is unknown.

It took five years to build the Donatini MB8.

Complex canopy aided entry and exit.

The MB8 was designed as a sports car with a targeted maximum speed of 300 km/h.

SOURCE: SIXMANIA.FR (3)

RAUL DONATINI MB8

Raul Donatini graduated from the Universidade Nacional de Mar del Plata in Argentina as an engineer in the 1980s. He was always curious about suspensions since he was a little kid. As a side job he fiddled with motorcycles and racing cars, but as he had to make ends meet he became a restaurant owner, then ran a bakery. In his spare time he dreamed about a three-axle car. For health reasons he had to give up his day job, so in 1993 at the age of 44 he decided to fulfill his dream.

The car was designed around a special suspension that had to be conceived in order to achieve great stability in a sports car that could reach a speed close to 300 km/h. The basic idea was similar to that of a three-legged table – in this case a three-axle design with a two-two-four wheel arrangement. According to its creator, the MB8 "functions as a three-legged table, each foot divided into two legs which in turn are hinged together … The front wheels are suspended independently from each other with rocker arms that pivot at a point of the monocoque … The rocker arm is attached to the front wheel carriers, specially made with a ball-joint offset from the center of rotation by two turnbuckles, so that when turning, the distance changes and the car goes up on the support side in a curve and down on the other side."

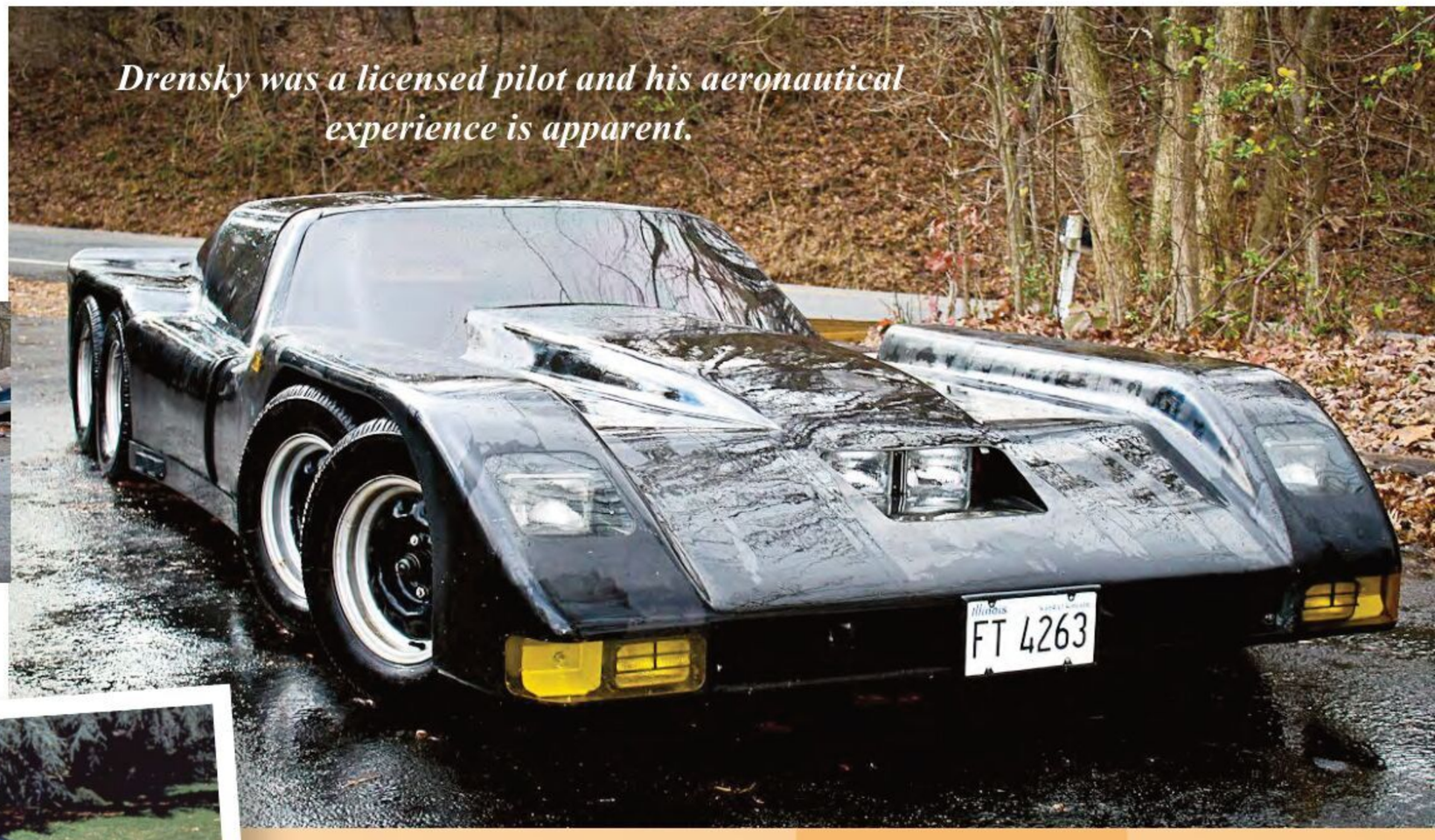
The 1.05-meter-tall prototype was named MB8 because of its Mercedes-Benz engine. Getting in and out of the vehicle is through an airplane-like canopy.

The MB8 was completed in 1998, but it was only shown to the public five years later. It made the show rounds, then was used by the family. At one time it was damaged, but it has now been repaired.

MULTIPLIED

Innovation

Steve Drensky spent 17 years building his own exotic car.



Drensky was a licensed pilot and his aeronautical experience is apparent.

The sleek KAZ was a forward-looking eight-wheel-drive electric MPV from Japan.

KAZ & ELIICA

A futuristic eight-wheeler concept was unveiled at the 2001 Geneva Auto Show. Called KAZ, which is short for Keio Advanced Zero-Emission Vehicle, the project was instigated by Hiroshi Shimizu, a professor at the prestigious Keio University in Kanagawa, Japan. He started studying electric vehicles in 1978 and participated in numerous projects, including the IZA in 1991, which had a maximum speed of 176 km/h and a range of 270 km, and the Luciole high-performance electric minicar in 1997.

The KAZ concept was supported by the Japan Science and Technology Corporation, a government agency aimed at the promotion of science and technology. The prototype was realized by the I.DE.A. Institute in Turin.

"KAZ means peace and it is the first prototype to come out of this important research project into highly functional electric vehicles for the 21st century. KAZ is very stable and comfortable. No tail squat in acceleration and no dive in braking because of a low center of gravity and eight-wheel drive," read the introductory blurb.

The 6.7-meter-long, eight-seater vehicle weighed almost 3 tons. It rode on a brand-new platform called the Component Built-in Frame – predating General Motors' similar "skateboard" chassis by a few months. It used lithium-ion batteries, which were also quite new at the time.

The KAZ featured a sleek, MPV-like styling. An eight-wheeler configuration was chosen to represent the performance of the car – as a maximum speed of 300 km/h was targeted! As Professor Shimizu highlighted in an article: "An ICE (internal combustion engine) car [needs] … a long extended hood [to enhance] … the image of the car … The KAZ concept shows the image and the power of the car with the amount of wheels on the chassis."

The KAZ was followed by an updated version in 2004. Called the Eliica (Electric Lithium-Ion battery Car), the concept was based on the same integrated platform as the KAZ, featuring eight 60-kW in-wheel drive motors to provide the equivalent of 800 horsepower! The motor, reduction gear, wheel bearing, and braking systems have been integrated into a single unit, and the suspension arm adapter was attached to the outer motor casing. Naturally, lithium-ion batteries were employed.

The Eliica was all-wheel-driven, and its Speed version reached 370 km/h (230 mph) on Italy's Nardò high-speed track in 2004. Additionally, there was an Acceleration version which was claimed to be road legal with a top speed of 190 km/h and a range of 320 km.

Since the Eliica there have been no other eight-wheeler passenger cars, but we can be sure that the idea will be used again in the future.

SOURCE: V CHRISTIAN MANZ

STEVE DRENSKY'S ROTARY

Steve Drensky had a masters in physics and was a licensed pilot. He loved fast cars, having owned a Jaguar XK-E and a couple of Ferraris. In around 1982 he set his mind to build his own car in which he could fit his 1.90-meter-tall body. There were plenty of different cars donating parts – Chevy Monza front suspension, windshield from a 1973 Buick, Jaguar rear end. He opted for Mazda rotary engines because of the car's ground clearance. The two engines churn out a combined 450 hp. The car was built in his garage. He passed away in 1999 and never saw the car moving under its own power.

In 2010 an ad appeared on eBay for the car. Jeff Bloch, a police officer in Washington, who is also known as Speedycop is a fun-loving car enthusiast and an adrenaline junkie with a very creative and competitive spirit. He bought the car with the intent of endurance racing. However once he bought the car he abandoned the idea: " I discovered I'd purchased a stellar, one-off exotic car of utterly amazing craftsmanship and mind-numbing ingenuity! I cannot bring myself to endanger it in an actual race," he wrote in 2011. Restoration/completion of this very complex exotic is still ongoing.

PHOTOS: RON VICKERS JR. (2)

SOURCES:

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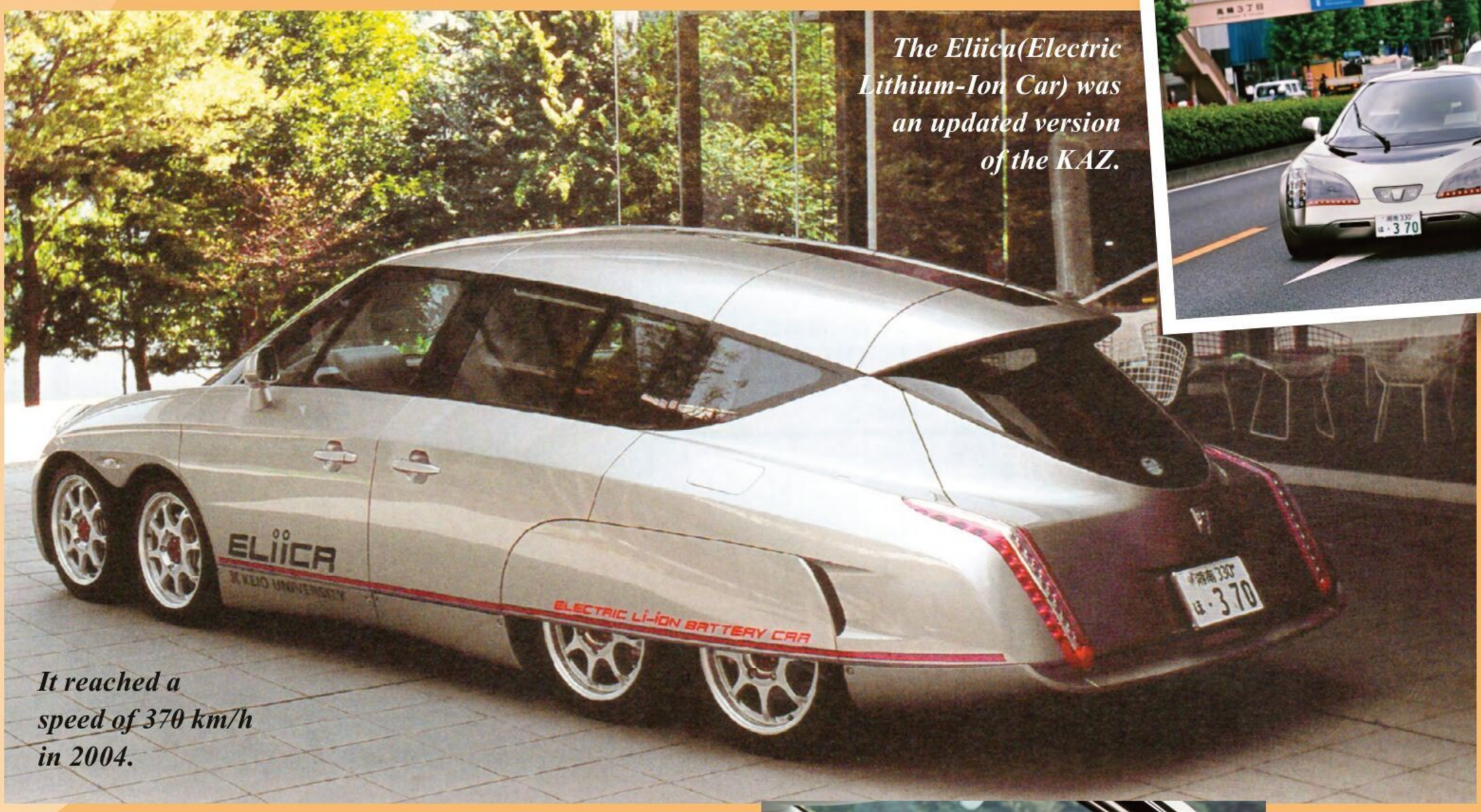


The Eliica(Electric Lithium-Ion Car) was an updated version of the KAZ.

It reached a speed of 370 km/h in 2004.

SOURCE: V CHRISTIAN MANZ (3)

On-board computer paved the way for future electric vehicles.

MAY *NOT* BE *A* DIAMOND...

RHOMBIC VEHICLES

In 1960 Pinin Farina introduced the Pininfarina X featuring a single steering wheel at the front, a single driving wheel at the rear, and two outrigger wheels on the sides.

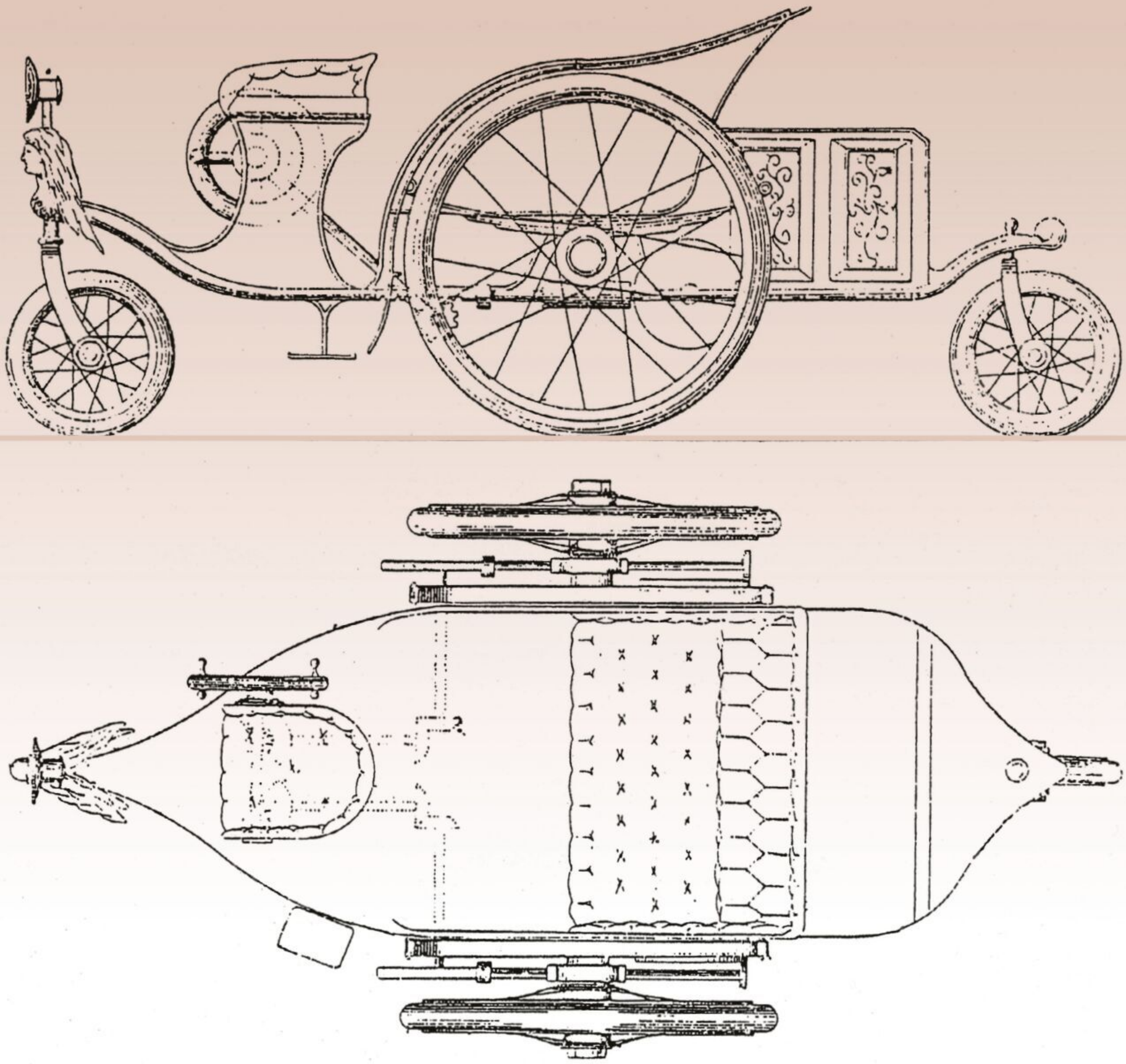
Pininfarina

PHOTO: GABOR MAYER

Trendy fins were added to the tear-drop shape.

Rhombic vehicles are four-wheeled vehicles that have one wheel at the front, one at the rear, and two in the middle. **Thomas Ulrich** offers an overview of those who worked on such designs.

SOURCE: ALESSANDRO SANNIA



J. Périssé's vehicle concept was featured in La France Automobile in 1898, but it is doubtful whether it was ever built.

EARLY ATTEMPTS

When it comes to rhombic vehicles typically, the front and rear wheels are in line, though in some designs they are offset from each other. The advantages of a rhombic layout are the very small turning circle and small frontal area for better aerodynamics. In some rhombic vehicles, passengers sit back to back with the rear passengers facing rearward. Otherwise, the disadvantages are a smaller body volume and possibly less stability.

At the beginning of the 19th century, the first rhombic designs were developed for steam carriages. Dr. William Church used rhombic steam buses on the London-to-Birmingham route around 1833. This was probably the first drivable rhombic vehicle.

One of the first with a petrol piston engine was a vehicle of a man named Larrieu, who, together with the company Jiel-Laval, both from Bordeaux, built a rhombic vehicle based on a De Dion tricycle to which a single rear wheel was attached. The vehicle was mentioned in the French magazine La France Automobile. There were some other rhombic vehicles based on De Dion tricycles, too, but all remained single examples.

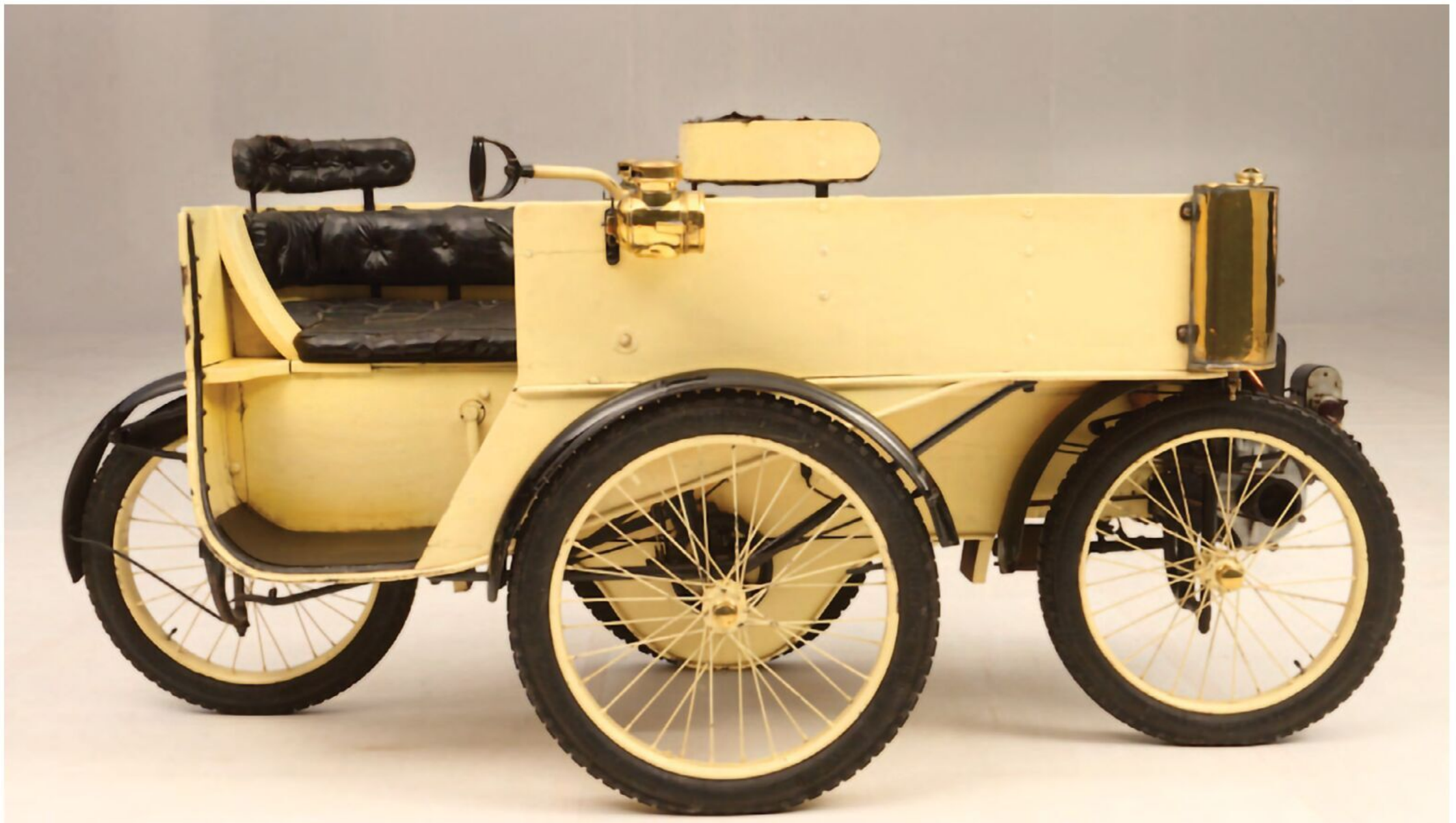
SUNBEAM MABLEY

In 1901, the “Sunbeam” Mabley was the first series-production rhomboid vehicle. Designed by Maxwell Maberley Smith, the vehicle was mass-produced by the English bicycle manufacturer Sunbeam, and at least 130 units found buyers. The unique feature about this Sunbeam was the front and rear wheels did not run in the same line. The driver sat in the back and steered the front and rear wheels with a handlebar. Unusually, both wheels steered in the same direction and not in opposite directions, which would have greatly reduced the steering circle.

The Mabley was the cornerstone for the automotive production of Sunbeam cars and motorcycles. In the USA, the Vandergift Automobile Co. in Philadelphia launched the Autocycle in 1906. The air-cooled single-cylinder engine had its place under the seats and drove the individual rear wheel with belts. In 1907, production was discontinued.

Vandergrift Autocycle

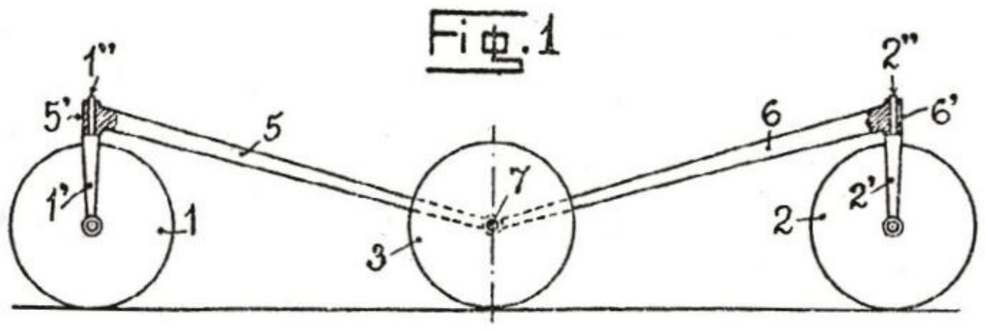
The Autocycle was rear-wheel drive, with both the front and side wheels turning during steering.

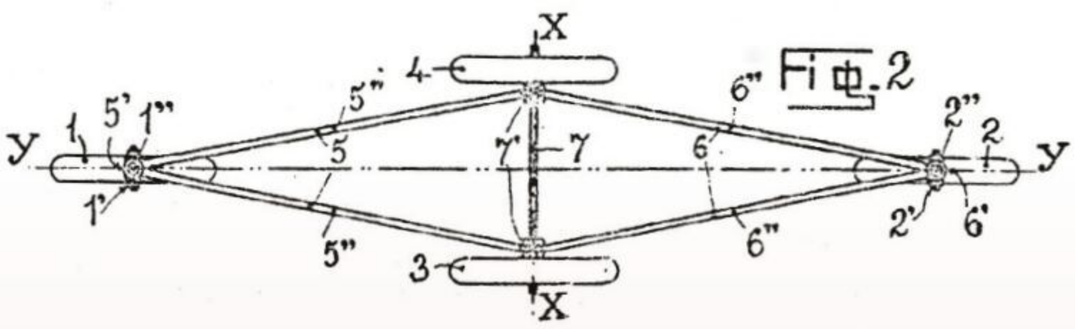


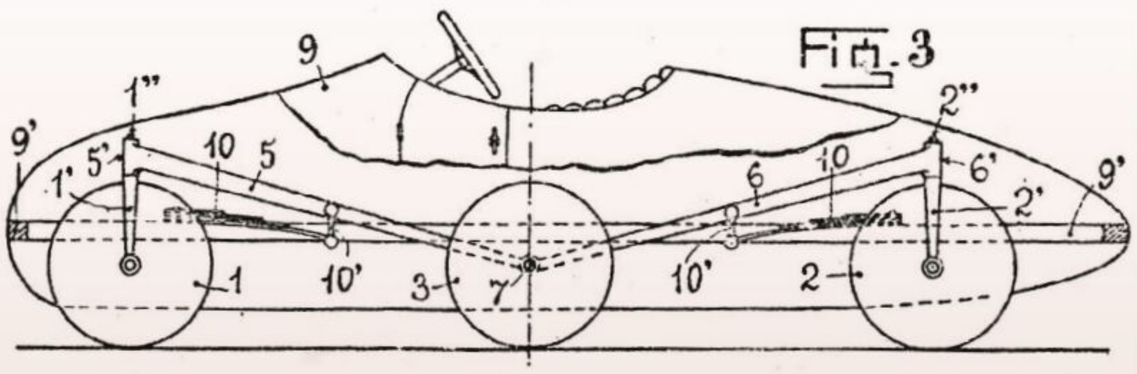
Sunbeam Mabley

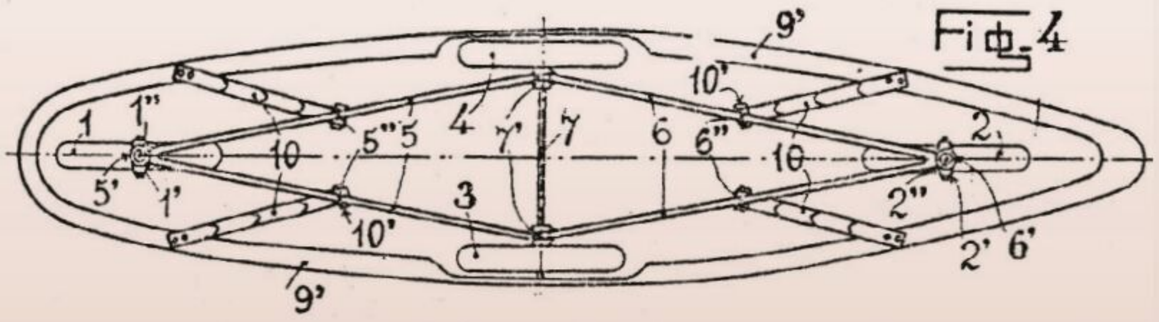
The Sunbeam-Mabley was the first Sunbeam to enter series production. Both front and rear drives were for steering.

Ottavio Fuscaldo worked on rhombic vehicles for 30 years. His first patent was granted in 1913.









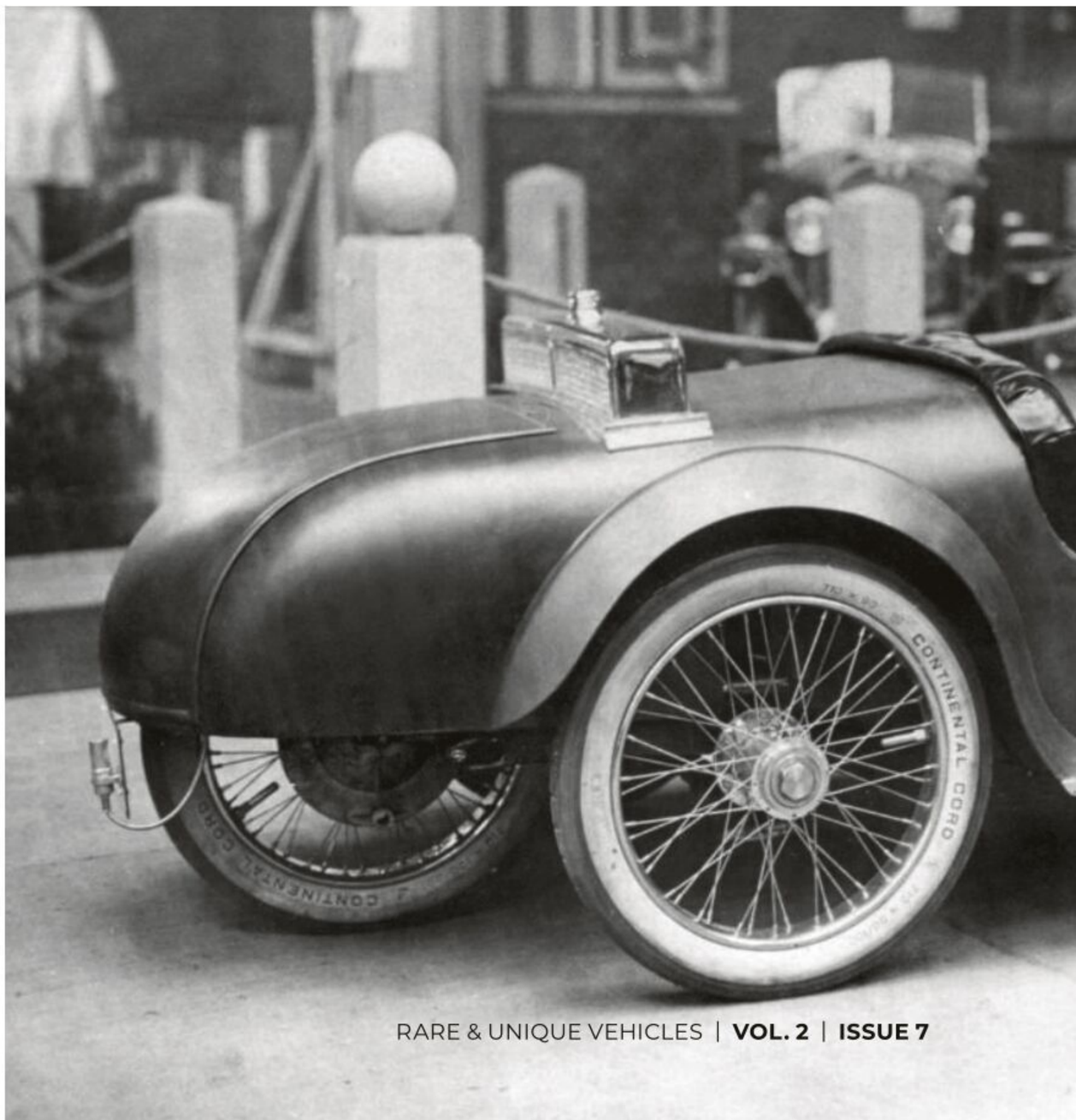
OTTAVIO FUSCALDO

In Italy, the talented inventor and engineer Ottavio Fuscaldo explored the rhombic vehicle concept for 30 years, beginning in 1912. While he was working for Züst in Brescia, he applied for a patent, but due to lack of money, the patent was not granted until 1913. The patent was listed under the name of his colleague, the inventor Claudio Mezzacasa, in France.
In 1913, Fuscaldo and Mezzacasa had a prototype built by the newly founded company Chiribiri, which was extensively tested. In 1914 the vehicle was exported to the United States. The car was marketed there under the name Serpentina by Mezzacasa.
In 1920, Fuscaldo founded the company Rombo Brevetti Fuscaldo to market his inventions. He had his rhombic vehicle patented in several countries. The OM company in Italy was interested in his ideas and hired Fuscaldo as technical director. In addition to his other developments, a rhombic prototype was built at OM, which was extensively tested. Despite racing successes with Fuscaldo designs, in 1926 OM dropped the rhombic project. For Fuscaldo, however, this was not the end for the rhombic vehicles. Starting in the mid-1930s, he designed both a military vehicle and an amphibious vehicle with rhombic wheel assembly for Isotta Fraschini. In 1941 he worked on a small-car project and an armored reconnaissance vehicle. These turned out to be his final rhombic projects.

SOURCE: FONDAZIONE NEGRI

Ottavio Fuscaldo

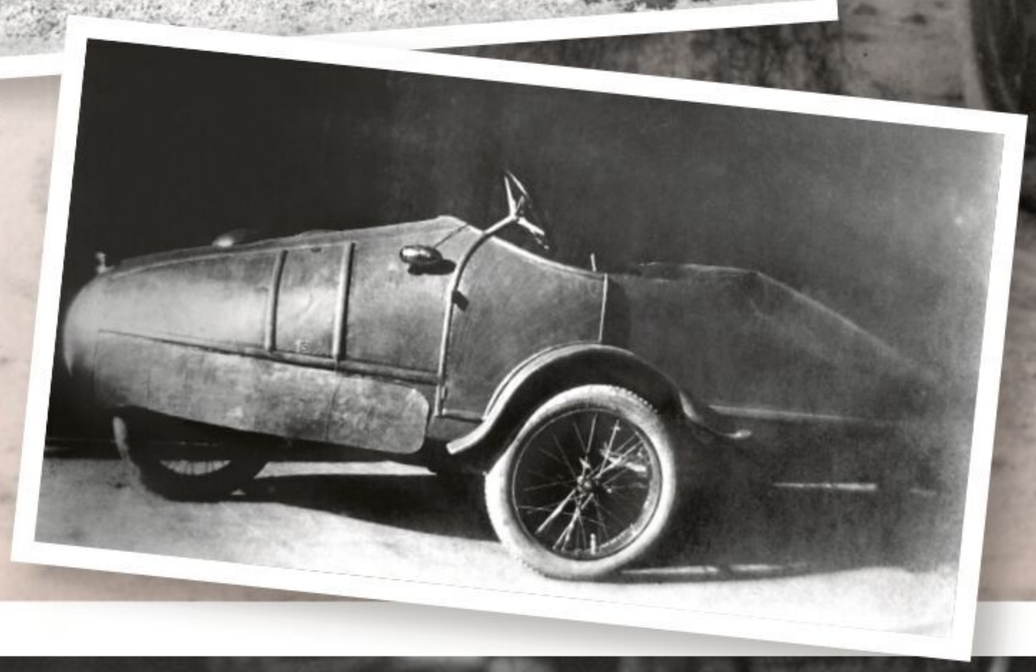
One of Fuscaldo's OM-built Rombo cars.



SOURCE: SWISS CAR REGISTER

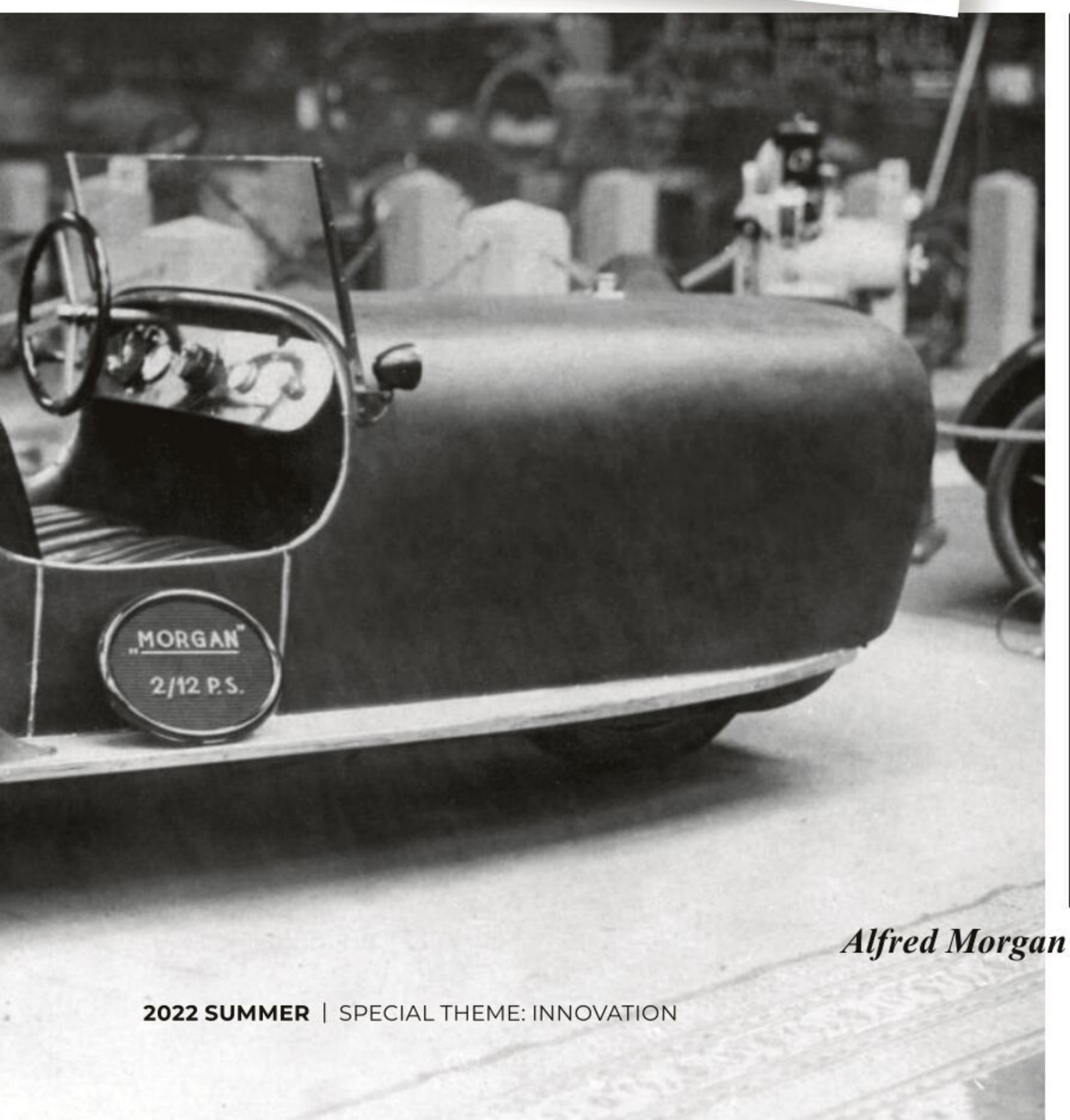
The Rombo was extensively tested.

SOURCE: FONDAZIONE NEGRI (2)



Another Rombo from around 1922, which was also made by OM.

A later design from Fuscaldo.



GERMANY

In Germany in 1921, Alfred Morgan patented a two-wheeled vehicle with lateral training wheels, which in 1924 became a “four-wheeled car with two similar side wheels and one front and rear wheel in the longitudinal median plane.” This car, first with a 500-cc BMW boxer engine and later with a water-cooled two-cylinder engine, was produced in 1924-1925 and was also presented in 1925 at the motor show in Berlin. A very similar vehicle was patented in 1925 by Reinhold Boehm, also in Berlin. Whether at least one prototype was produced is not known.

Alfred Morgan

Alfred Morgan’s patented idea became a reality in 1924.

Philippe Charbonneaux

In 1992 Philippe Charbonneaux presented his first Ellipsis which was turned into a working prototype with the help of Franco Sbarro in 1997.

SOURCE: RETROMOBILE (2)

Marcel Alamagny developed a prototype for a small four-wheeled car in 1947, which was inspired by a "car of the future" project dreamt up in 1934 by Gabriel Voisin.

Marcel Alamagny

The prototype had sliding doors, and remained a concept.

Louis Vannod

Louis Vannod was primarily known for his sidecars, but he also built a small car with rhombic wheel arrangement in 1958.

SOURCE: THE REVS (2)

FRANCE

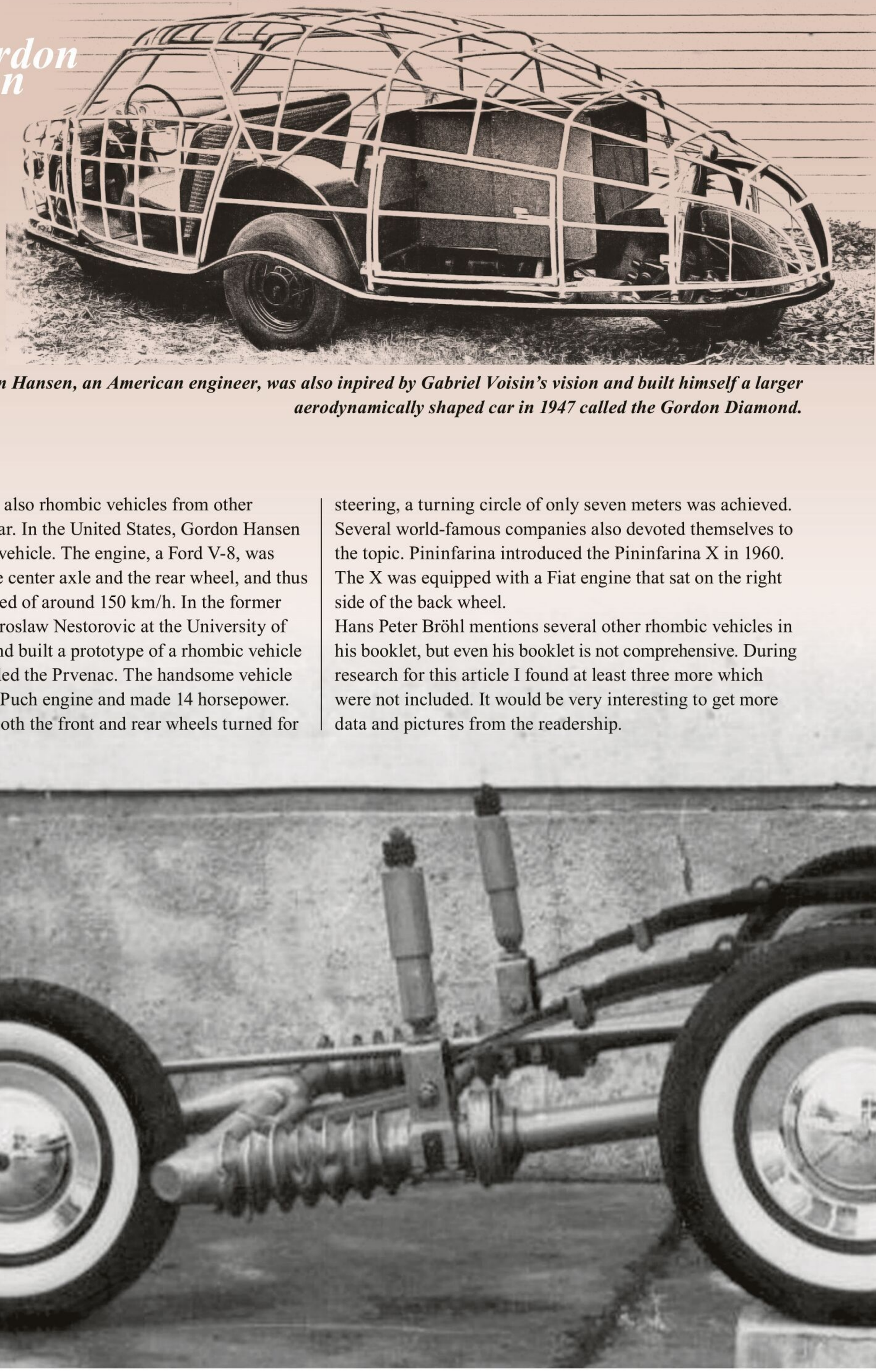
Probably the most famous person who dealt with rhombic vehicles was Gabriel Voisin, one of the French aviation pioneers and after the First World War a manufacturer of exclusive vehicles with sleeve-valve engines. Starting in the mid-1930s, Voisin designed several rhombic vehicles, but only one, a small single-seater with a 100-cc engine, made it onto the road. The last draft from 1967, however, remained only a drawing. There were several other French engineers fascinated by the rhombic wheel arrangement.

The Sociéte des Ingenieurs de l'Automobile (SIA) announced a competition for small cars in November 1934. Among the more than 100 submissions was the design of P. Seyot, who presented a rhombic vehicle in which the drive was to be made via the central axis. Louis Vannod in France developed a vehicle for the military in 1939, where four small caterpillars could be connected to increase off-road capability, though it only made it to the design stage.

At the Paris Salon de l'Automobile in 1958, Vannod presented a small car with a rhombic arrangement. The roadworthy prototype had a 200-cc Sachs engine, and the vehicle had sliding doors. It never went into series production. Another vehicle from France was the Alamagny, designed and built by Marcel Alamagny, a Renault engineer, based on an earlier concept by Voisin. The vehicle had a symmetrical design. Front and rear parts were the same and could be folded forward to the entrance. The occupants of the four-seater vehicle sat back to back. Between them sat the engine. Alamagny used a Simca 5 engine. The well-known French designer Philippe Charbonneaux designed several rhombic vehicles from 1960 to 1997, and some of them were also realized. The artist Berhard Palissy and Jean-Pierre Ponthieu designed and built a vehicle which they moved over the streets of Paris. A two-stroke engine served as a generator for two batteries, which again supplied power to two electric motors. Other than the prototype, no other vehicle was created.

The L'Automodule was designed by Jean-Pierre Ponthieu, a fashion designer, as a promotional vehicle. It is claimed that 10 were built between 1968-1970. Its 250-cc engine powered the rear wheel.

SOURCE: RETROMOBILE



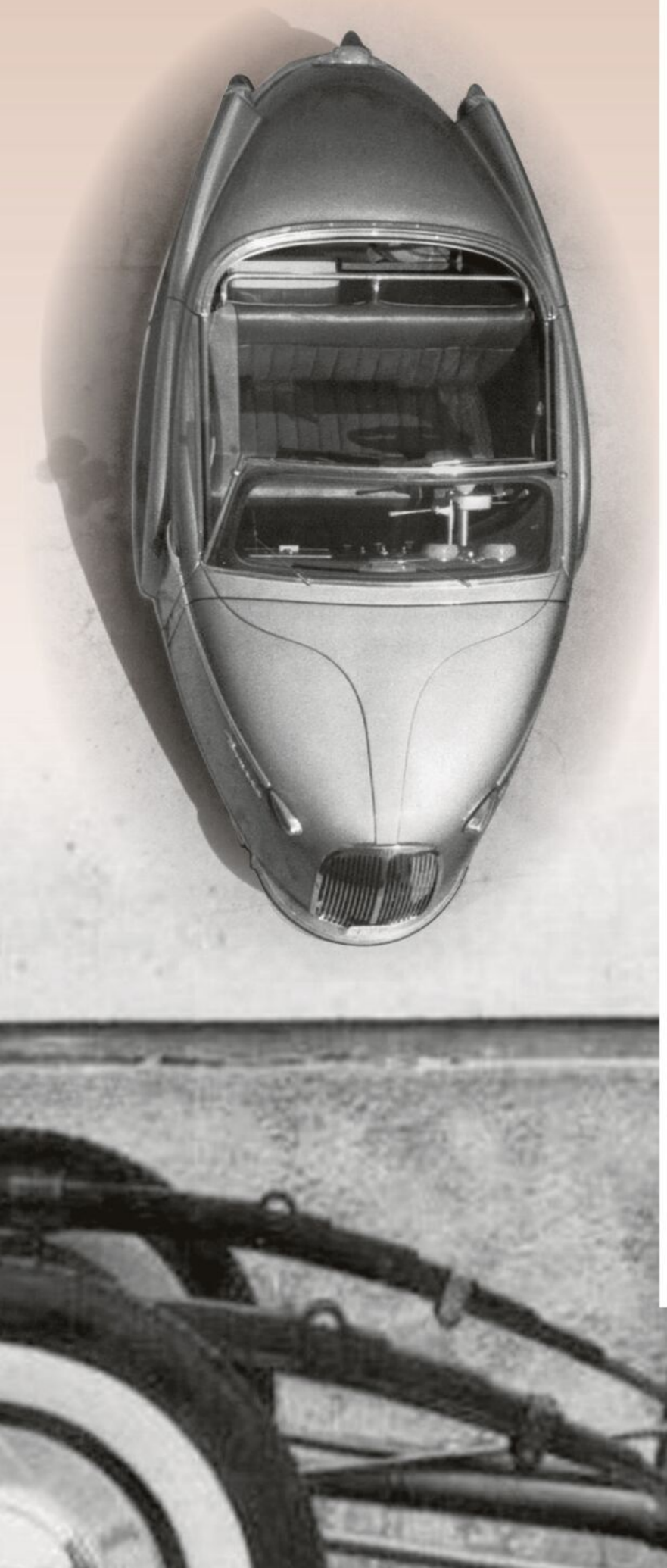
Gordon Hansen, an American engineer, was also inpired by Gabriel Voisin's vision and built himself a larger aerodynamically shaped car in 1947 called the Gordon Diamond.

ELSEWHERE

Of course there were also rhombic vehicles from other countries after the war. In the United States, Gordon Hansen built himself a large vehicle. The engine, a Ford V-8, was mounted between the center axle and the rear wheel, and thus the car reached a speed of around 150 km/h. In the former Yugoslavia, Prof. Miroslaw Nestorovic at the University of Belgrade designed and built a prototype of a rhombic vehicle in 1959 which he called the Prvenac. The handsome vehicle had a 250-cc Tomos-Puch engine and made 14 horsepower. Due to the fact that both the front and rear wheels turned for steering, a turning circle of only seven meters was achieved. Several world-famous companies also devoted themselves to the topic. Pininfarina introduced the Pininfarina X in 1960. The X was equipped with a Fiat engine that sat on the right side of the back wheel.

Hans Peter Bröhl mentions several other rhombic vehicles in his booklet, but even his booklet is not comprehensive. During research for this article I found at least three more which were not included. It would be very interesting to get more data and pictures from the readership.

The Prvenac was built in Yugoslavia by David Pajic Daka, an elevator company.



IN MEMORY OF HANSPETER BRÖHL

More than 30 years ago, I met the Swiss automotive historian Hans Peter Bröhl. At first, we only communicated by letter, and later also by telephone. I had previously purchased his self-published book on Paul Jaray and then his book on rhombic vehicles. We talked about these and other strange vehicles. Hans Peter had a penchant for different kinds of vehicles. During the telephone conversations with him, a question often came up: Do you know this car … or what do you know about the automobile firm … and it was something special every time. Very often he came up with a name that I had never heard of before.

This article about rhombic vehicles cannot be as comprehensive as Hans Peter Bröhl's booklet (Rhombic vehicles since 1897 by H.P. Bröhl, ISBN 978-3-9523241-0-3), but it offers an overview of the most interesting vehicles.

Miroslaw Nestorovic

Do you have experiences with RHOMBUS CARS? Please post:

The teardrop-shaped bodywork was made of aluminum.

If one judges an invention according to its technical status and the time at which it appeared, it may arrive too early, just right, or too late in the development history. Because the level of knowledge, materials science, and manufacturing methods lagged far behind his designs, Leonardo da Vinci's inventions came too early – as did Georg Lankensperger's Ackermann steering, as Erik Eckermann notes.

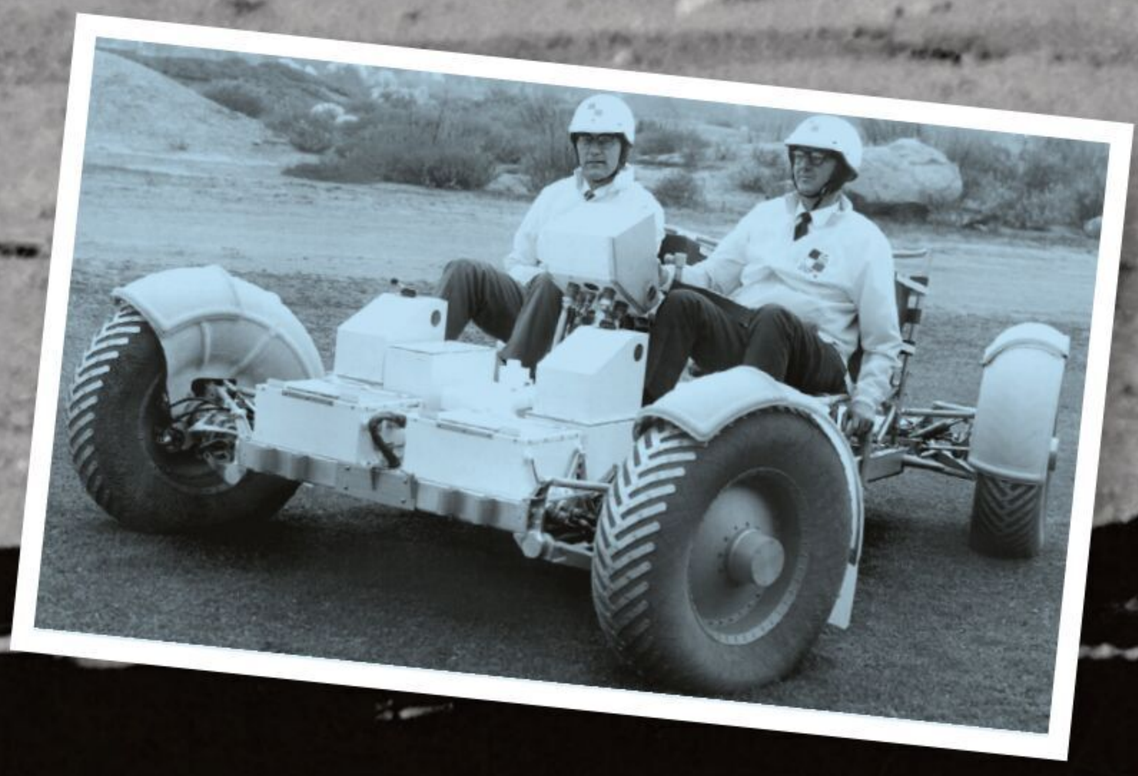
Even the original Lunar Rover featured Ackermann steering on all four wheels.

SOURCE: NASA (2)

SAFE & EFFECTIVE STEERING FOR CARS?

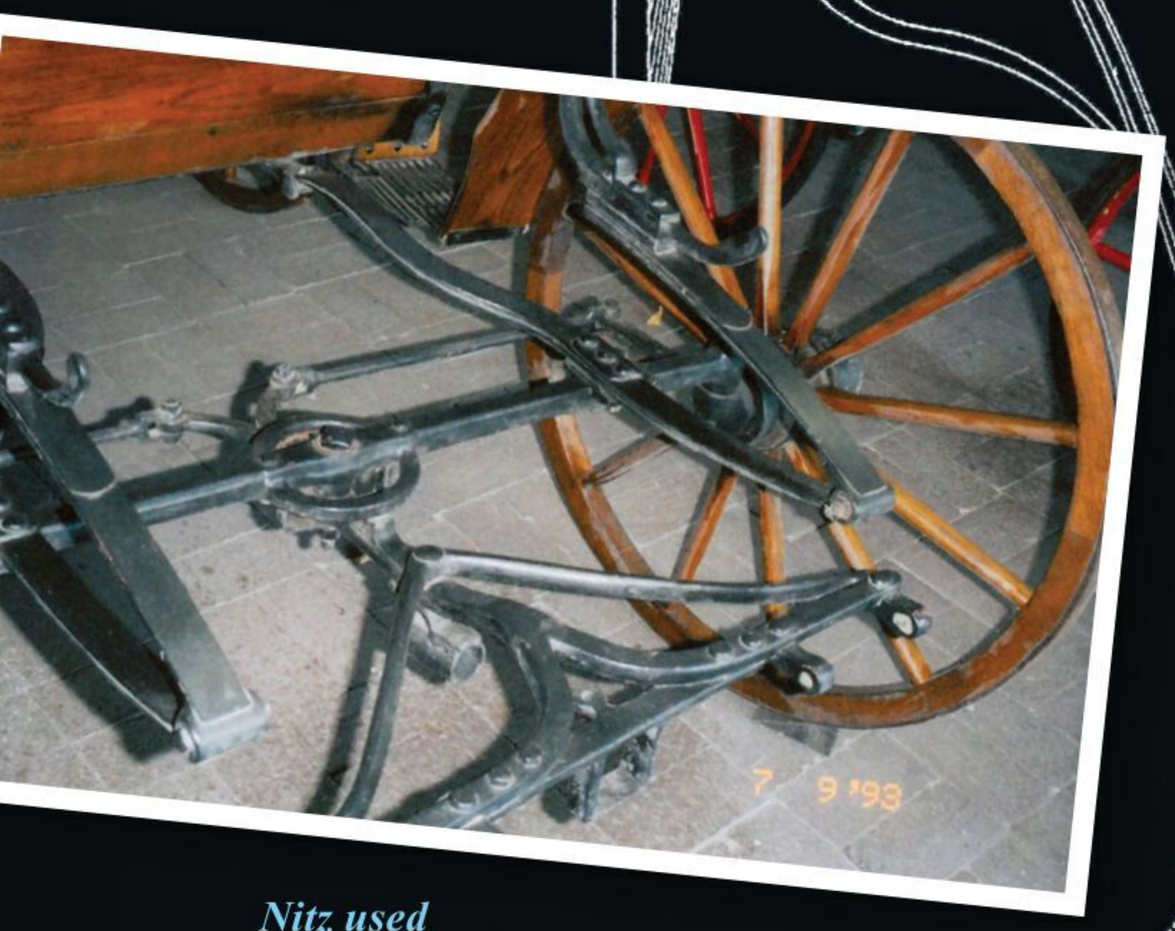
ASK FOR

ACKERMANN

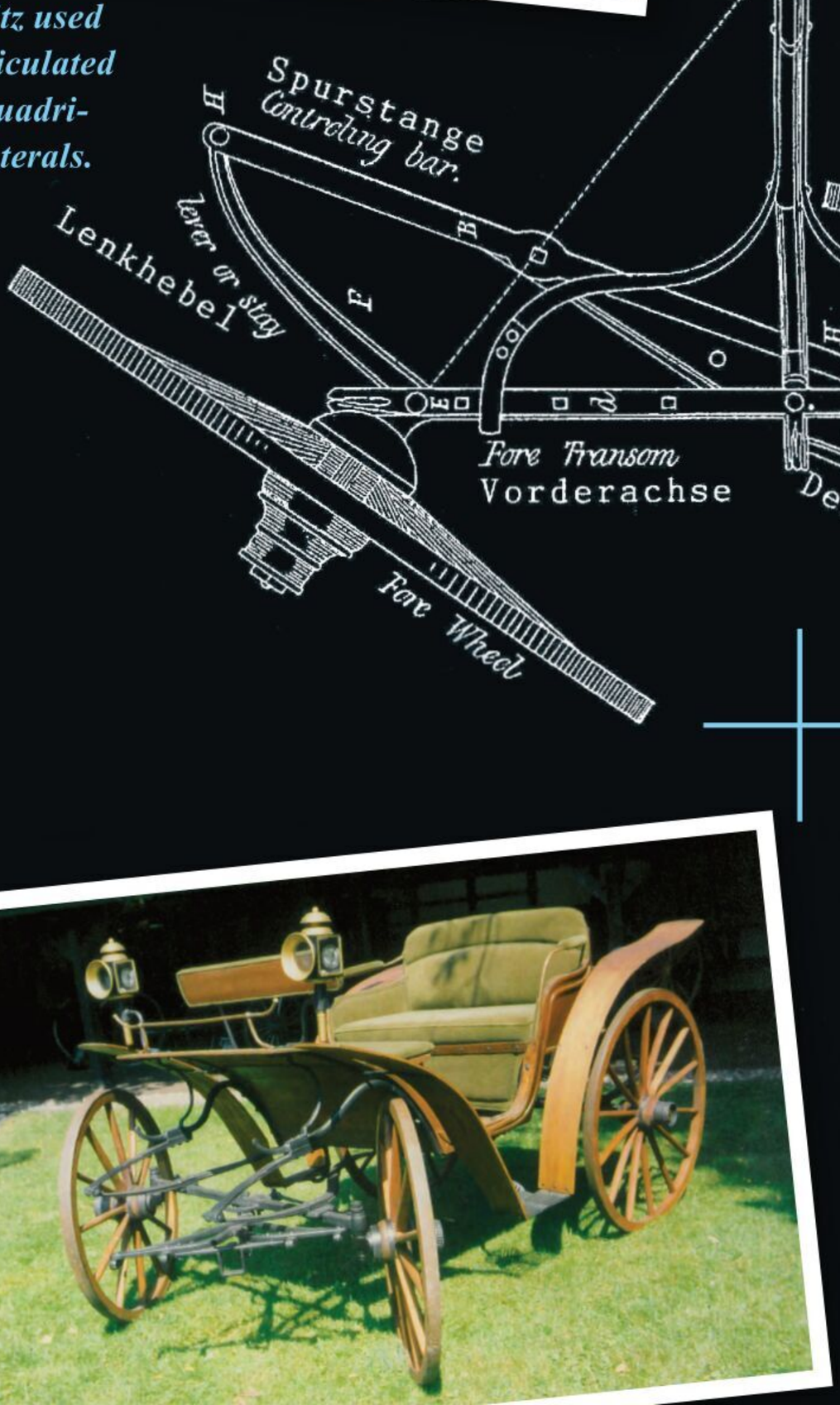


Each wheel had its own electric drive. Both sets of wheels were able to turn in opposite directions.

Original drawing from Rudolph Ackermann's original British patents showing the trapezoid steering linkage of Georg Lankensperger.



Nitz used articulated quadri-laterals.



A variant on the theme: Paul Nitz was granted a patent in 1912 in Germany for his version of the trapezoid steering linkage.

One of the first motorized vehicles to utilize the Ackermann steering was Amédée Bollée's La Mancelle steam car in 1878, which featured a steering wheel as well!

Georg Lankensperger (1779-1847), a carriage builder in Munich, invented his individual wheel steering at a time when there were no mechanically driven vehicles on the roads. In horse-drawn carriages, the front axle traditionally swivels around a pivot located in the middle, called a friction nail, which the Celts supplemented with a crossbar (friction log) to keep the front frame horizontal and relieve the horses of its weight. This was improved in the 1600s by the installation of an axle stick above the front axle, which was firmly connected to the long boom and the rear axle. The improved version, called turntable steering, allowed a greater steering angle and therefore tighter turns. Steerable four-wheelers helped Rome in their imperial expansion. The Romans used steerable four-wheelers as city or overland vehicles, freight, postal, or even rental vehicles, depending on their design, on roads originally designed for fast troop movements. With the fall of the Western Roman Empire in 476/480 AD, the road traffic of that time came to a standstill, the streets fell into disrepair, and wagon construction technology stagnated. Instead, the horse became a status symbol, and a large royal stable was a symbol of wealth and power.

PIVOTING-AXLE STEERING AS A UNIVERSAL CONSTRUCTION PRINCIPLE

From the second half of the 16th century, the European nobility again started using horse-drawn passenger carriages, and further development of the carriage began, albeit hesitantly. Inadequate stability and high frictional resistance from the friction disc led to turntable or bogie steering, which was probably first used in its early form in 1637. In turntable steering, a continuous or divided turntable made of wood, later made of iron, replaced the wooden friction disc. Bogies were manufactured industrially from around 1870. These replaced the previous swivel axle systems, which were used on some motor vehicles and are still utilized today in carriages and marathon carriages as well as truck trailers. An ancient construction principle has thus been in continuous use up to the present day.

A feature of all swivel axes is the danger of tipping. As the steering angle of the front axle increases, the rectangular contact area is reduced to an approximate triangle, which means that the center of gravity of the cargo can be outside the contact area. Then the vehicle is unstable. This is exacerbated on some carriages because, for tighter turns, the steering wheels tuck under the body, requiring a high center of gravity. Other disadvantages that affect faster vehicles are the transmission of disruptive forces from one wheel to the other, the larger mass, and the greater effort and space required.

TECHNICAL PROGRESS: HARDLY ANY RECOGNITION

The disadvantages of the swivel axis prompted Lankensperger to look for a better solution. He found it in what became known as Ackermann steering. The seemingly simple invention from 1816 could be constructed with the tools and materials of the time.

However, there was no suitable area of application, because the swivel axle steering was sufficient for slow carriages. Lankensperger thus shared the fate of Robert William Thomson from Stonehaven in Scotland and Hugo Mayer from Rudolstadt near Erfurt. One invented the pneumatic tire

in 1845, the other the hydraulic brake in 1895, each for use in carriages. Neither Lankensperger's steering system, nor Thomson's pneumatic tires, nor Mayer's brakes were adopted by wagon builders, primarily for economic reasons.
In all three cases, the construction costs were significantly higher, the theory behind them was difficult to understand, and they were not needed for everyday use at the time. From this point of view, the invention dates were too early. The later reinventors, Amédée Bollée père 1878, Panhard & Levassor and Peugeot (1891, steering), John Boyd Dunlop (1889, tires) and Malcolm Loughead/Lockheed (1917, brakes), were commercially much more successful. Incidentally, the economic choices that were prioritized over technical progress at the time continue in the automotive industry to this day. These not only affected steering, tires, and brakes but also self-supporting bodywork, four-wheel steering, roller bearings, accident safety, and other components and assemblies, whose advantages and indispensability only became clear when these were applied to the automobile.

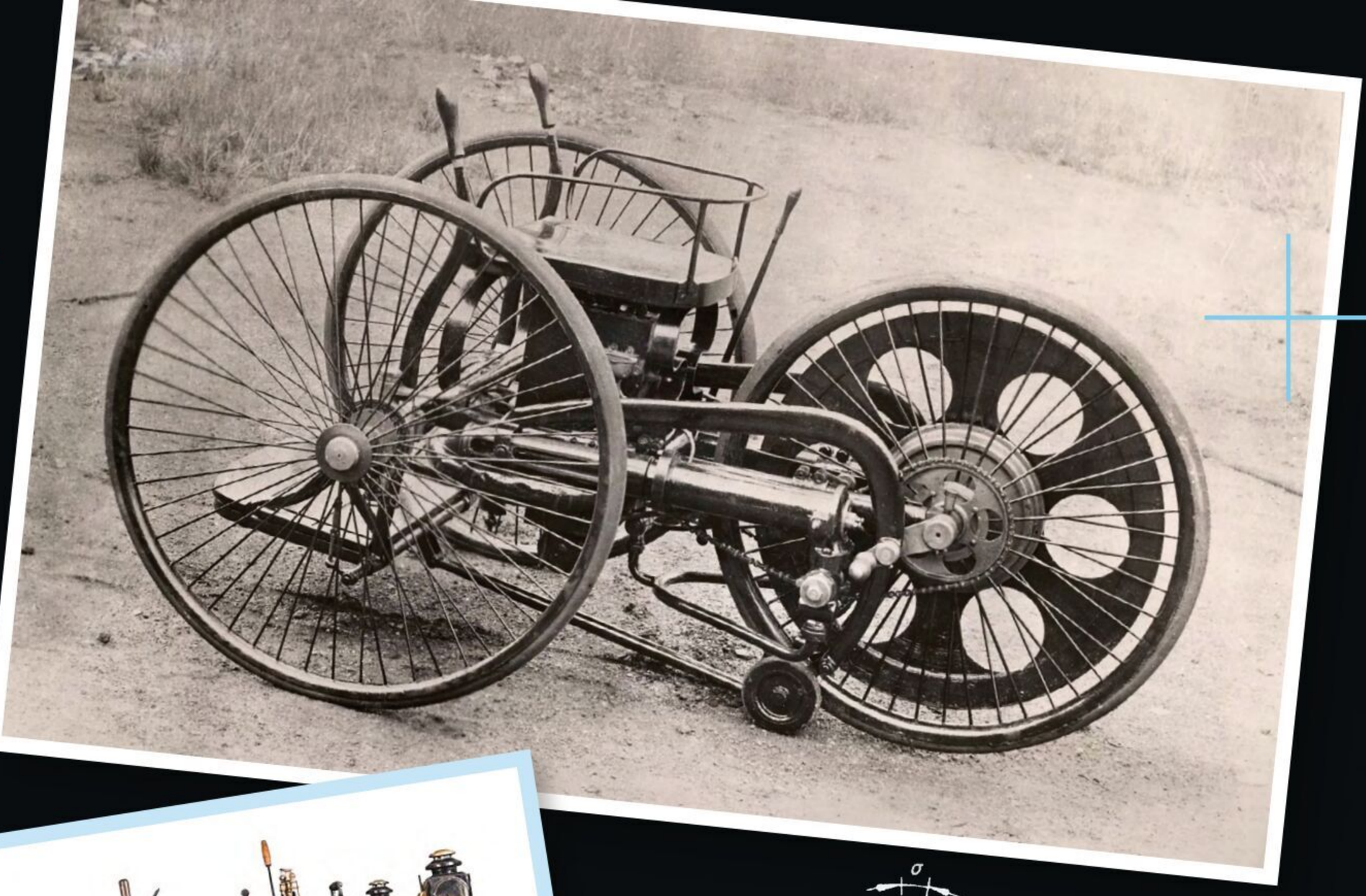
GEORG LANKENSPERGER AND HIS PATENT

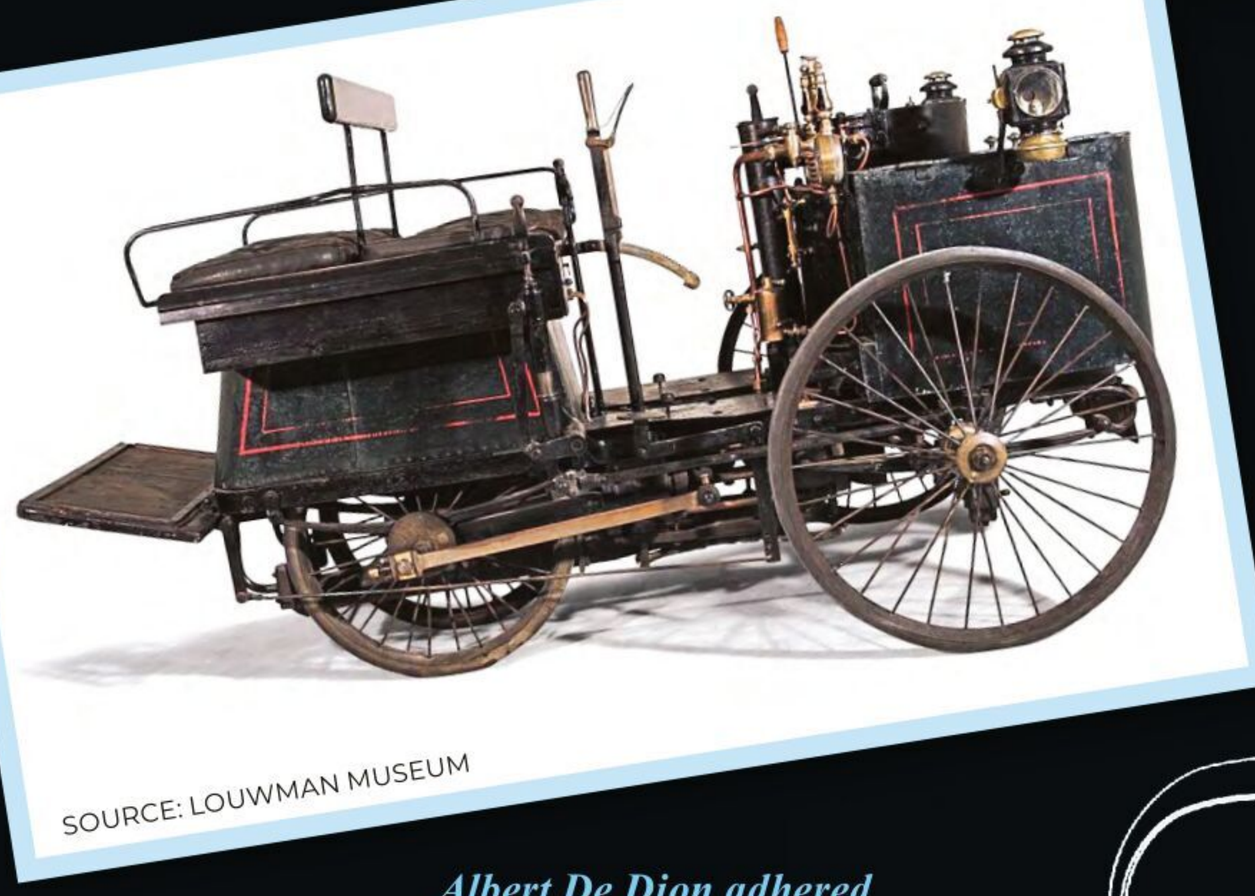
Who was Georg Lankensperger? He was the 11th child of a wagoneer in Marktl am Inn, Bavaria. In 1802 he worked as a journeyman for Wenzeslaus Rebhan, a master carriage builder in Munich. When Rebhan died suddenly, Lankensperger acquired Rebhan's carriage construction company by marrying his widow. He delivered his first carriage as early as 1811 to the royal stables in Munich.
On May 25, 1816, the Academy of Sciences in Munich granted a privilege (patent) for "Hofwagner (Imperial Carriage Builder) Georg Lankensperger because of the newly invented carriage, springs, and friction of the front carriage." However, this protection only extended to Bavaria and the Rhine Palatinate, because there was no national patent law in the small German states at that time. Lankensperger contracted Rudolph Ackermann (1764-1834), a Munich upholsterer, publisher, and art dealer who lived in London, to obtain inventor protection at least "in England, the country which cares about travel comfort the most," reported an article in Dingler's Polytechnisches Journal in 1820. Thus the system was also patented in England – but this time it was registered in Ackermann's name.
Ackermann became the owner of British Patent 4212, dated January 27, 1818, which was titled "Improvements on Axletrees applicable to Four-wheeled Carriages," with the note: "...the invention communicated to me by George Lenkensperger, of Munich, in the Kingdom of Bavaria... "
As a result, though Lankensperger has been mentioned as the inventor of the Ackermann steering system, the term Ackermann or A-Steering became commonplace in the English-speaking world. The same applies to the theoretically correct steering angles of the front wheels, which are referred to as the Ackermann angle or Ackermann steering geometry. Even in German textbooks, the passage "Ackermannsche Steuerung" appeared. The name Lankensperger was forgotten.
Lankensperger may have hoped that patenting of the Ackermann steering system in London would draw attention to his invention throughout Europe. At the same time, should he have intended to do so, he could with a clear conscience have pointed to London as the place of origin – a practice of many domestic factories at the time because of the inferior quality of German products. Two years later, in 1818, Lankensperger published the German-French brochure "Movable Axles and Other Improvements to Wagon Frames" to publicize his steering and the improvements that had been made in the meantime.
A little later, Ackermann traveled in a Barouche built by Lankensperger with single-wheel steering. At that time, Barouche was a prestige carriage aimed at the nobility and upper middle class. Features included four wheels, the entire carriage suspended on C-springs, an open body with a folding roof over the rear seats, a lackey seat at the back, and driven à la Daumont (jockey on the left horses, no coachman's box). On his journey from Munich to Hamburg "...(he) defied all dangers of German country roads, and wherever he went the wheelwrights and tradesmen gathered around this marvelous carriage..."

SIMPLE MECHANICS, SOPHISTICATED KINEMATICS

What was Lankensperger's concept, and how did it work?
It is technically simple as far as the steering knuckle is concerned: a vertical sleeve screwed to each side of the front axle accommodates a bolt (king pin). A horizontal stub (stub axle) rotates on the king pin, allowing the wheel on the stub to turn. The steering knuckle can be swiveled and the wheel steered in the desired direction with a steering lever attached to the top of the king pin, which is connected to a drawbar or, in the case of a car with steering gear and steering wheel, via linkage.
It gets more complicated with the steering transmission. While the pivot axle (rigid axle) of conventional horse-drawn carriages allowed for wheel slippage to compensate for the different path the inside and outside wheels take in a turn, Lankensperger realized that a steering system should mechanically correct for the different paths the wheels take. He envisioned a triangle of the tie rods connecting to each of the wheels intersecting on the axis of the rear axle. That way, when the wheel turned, the wheel to the inside would be turned more strongly than the outside wheel. To put it another way, the steering angle (Ackermann angle) of the wheel on the inside of the curve is greater than that of the wheel on the outside of the curve. This is the only way to ensure that the

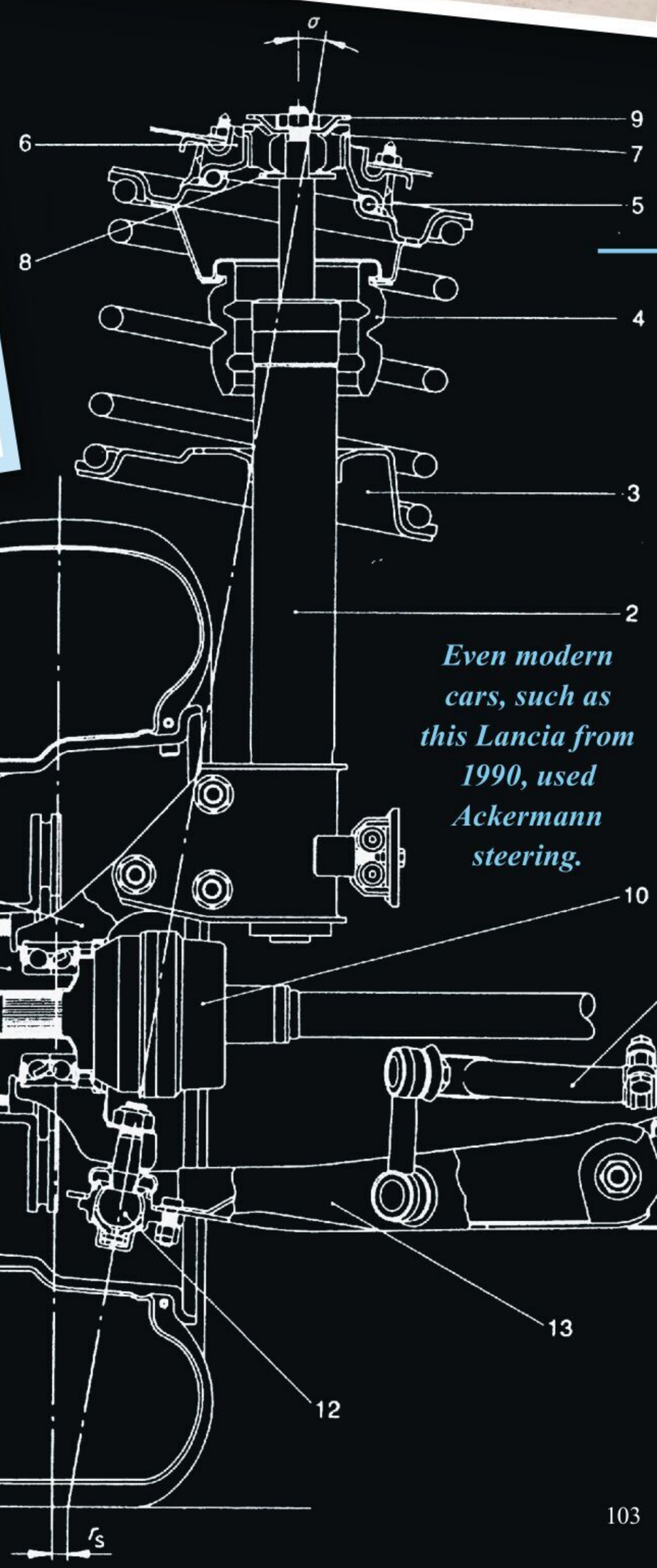
Edward Butler's revolutionary Petrol Cycle featured a carburetor and Ackermann steering in 1888!





SOURCE: LOUWMAN MUSEUM

Albert De Dion adhered to the Ackermann principle in his early vehicle experiments, such as this steam quadricycle, which was completed in 1887.



Even modern cars, such as this Lancia from 1990, used Ackermann steering.

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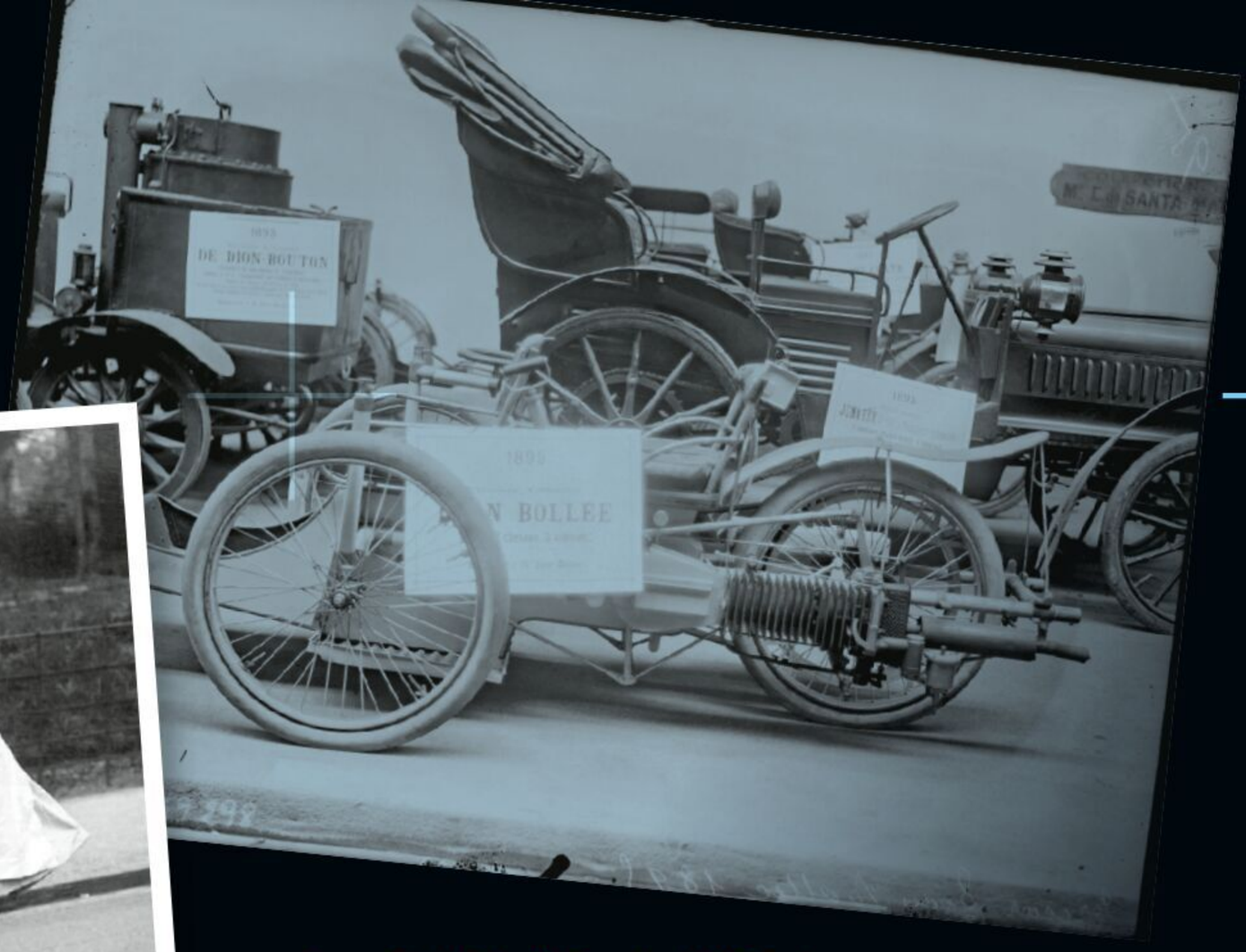
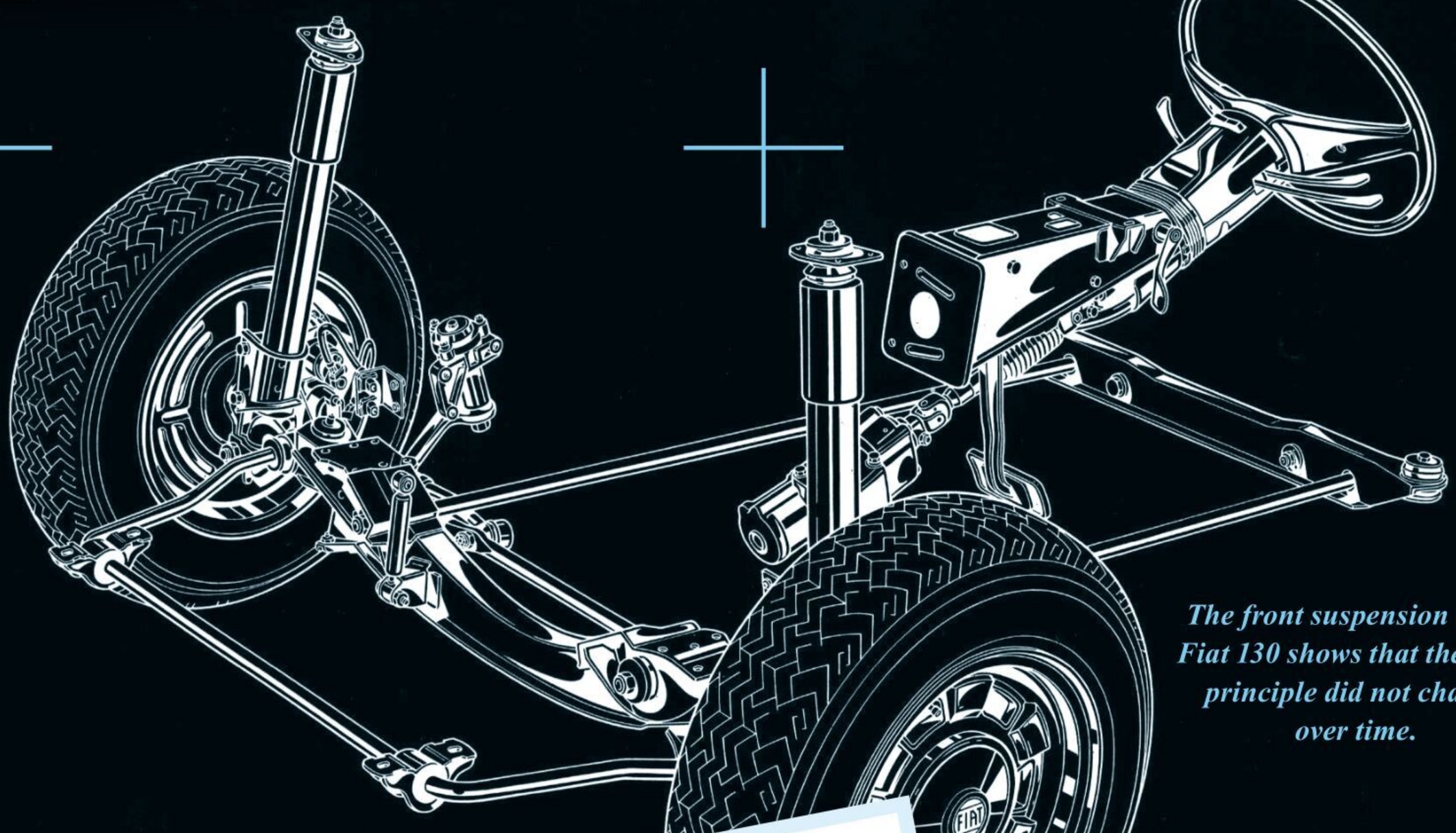
The Dunkley motorized pram from 1923 is an illustration of how Ackermann steering was employed in a wide range of devices.

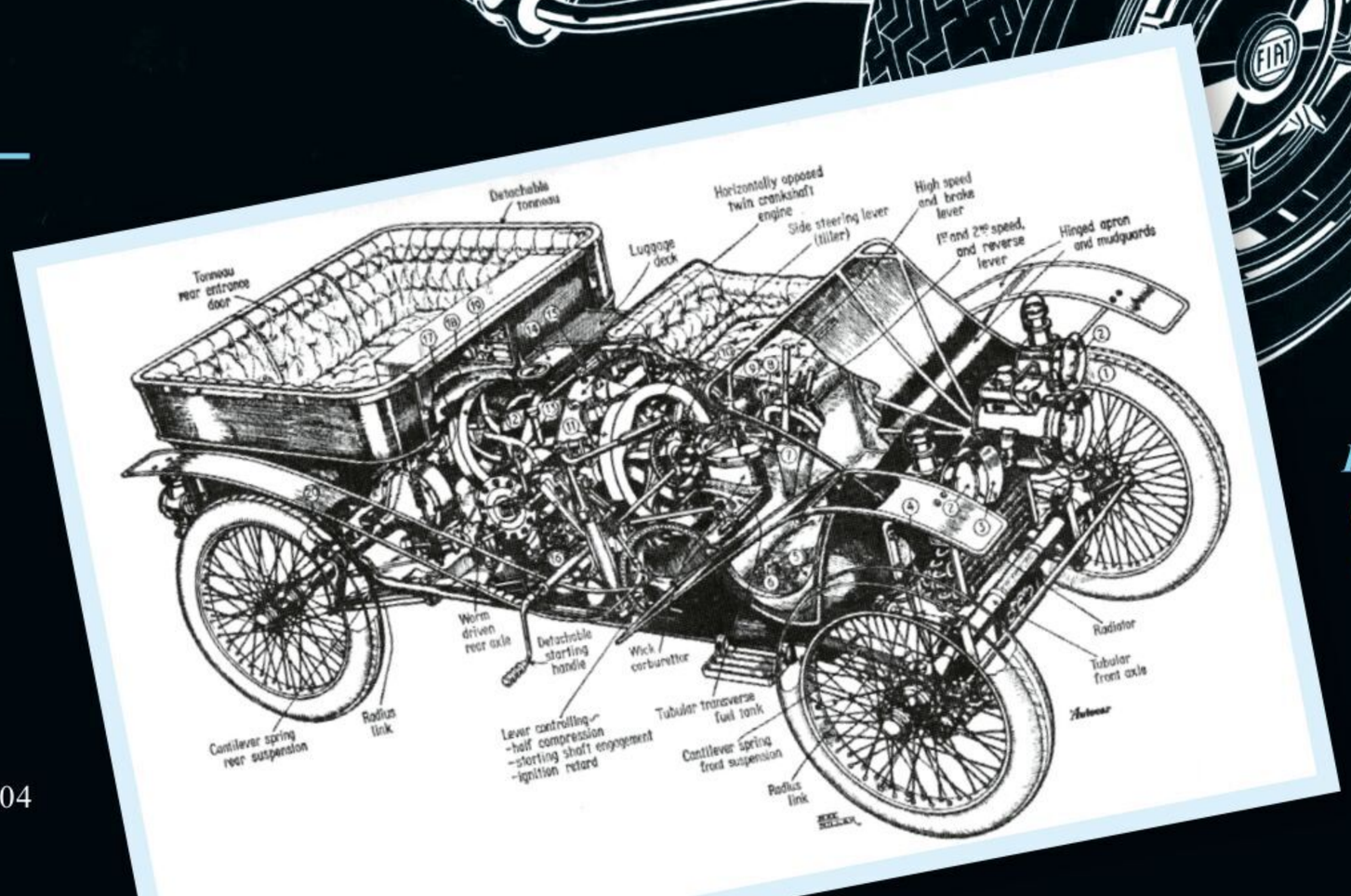


SOURCE: GALLICA

Leon Bollée's Tricar in 1895 introduced the new steering method to a wider audience.



The front suspension of the Fiat 130 shows that the basic principle did not change over time.



Frederick Lanchester built his first horseless carriage in 1895. He and his brothers together produced advanced cars as this 1903 cutaway shows, but the steering followed the proven method.

wheels roll and avoid sliding while turning (with iron tires or "erasing" with rubber tires), thus reducing wear and effort. It is to Lankensperger's credit that he recognized the problem and solved it.

The steering trapezoid was soon broken up into two steering quadrilaterals. In the case of the independent wheel suspension of today's vehicles, in addition to caster and camber in horse-drawn vehicles, toe-in, splay, steering roll radius, and, after the introduction of medium-pressure balloon tires in 1926, tire slip angle were all also taken into account.

Lankensperger and Ackermann listed the advantages of the A-steering:

- *increased security against tipping when turning the steering wheel,*
- *no through-passage [from one side to the other],*
- *material savings,*
- *shorter and therefore lighter construction,*
- *lower tractive forces for the horses because of the bigger front wheels that were made possible;*
- *and a light and pleasing appearance "for the man with taste."*

Even if Ackermann stated in the aforementioned 1820 article that, "... in England itself, the first-class coachmakers have already voted in favor of it, and (one) can rightly... exclaim: these patent axles will come into general use," his and Lankensperger's expectations were not fulfilled. In England up to 1820 about 40 wagons with axle steering are said to have been built; in Germany up to 1818, there were 34, including for the Bavarian, Prussian, and Russian courts. But the historian Johann H.M. von Poppe came to the conclusion in his History of All Inventions, which was published in 1847, that "the movable axes invented by Lankensperger in Munich a few years ago ... initially (excited) a lot of attention ... but soon again (faded) into oblivion."

A total of perhaps 100 horse-drawn carriages with Ackermann steering were built. Incidentally, Lankensperger also offered his steering system to other wagon builders as a kit. A wagon with A-steering is said to have survived. Another wagon, with A-steering built around 1912 by wagon builder Paul Nitz in Neustettin (today Szczecinek in Poland), is kept in the Axle Wheel and Wagon Museum of BPW Bergische Achsen KG in Wiehl.

DID LANKENSPERGER HAVE PREDECESSORS AND IMITATORS?

Lankensperger was not the first to subdivide a continuous axis. In 1714, Du Quet, a French engineer, patented a sailing chariot (FR patent 152 Chariot à Voilles), in which each of the two front wheels was to be steered by a cable via a post serving as a king pin. Because a cable can only transmit tensile forces, and because there is no tie rod connecting the wheels, its function can be questioned. The Parisian wagon builder Arnold-Haucisz had the Lankensperger steering protected with FR patent 911 of November 24, 1818, without mentioning the inventor at all. He garnished his patent application with drawings that were faithfully reproduced from Lankensperger's publications, making this a pirated copy. Because the information possibilities were underdeveloped at that time, there were often second and third inventions or repetitions of inventions of technical problems that had already been solved. Pirated copies and patent circumvention cannot always be assumed.

This also happened with the double-pivot steering, which was invented several times with and without an Ackermann angle. When it comes to steering constructions with an A-angle, i.e., with Lankensperger's steering trapezoid, Bollée should be mentioned, who in 1878 built a steam car with axle steering, rack-and-pinion steering gear, and a divided and adjustable tie rod. Carl Benz followed several years later. He only had a steering device intended for motor vehicles using Lankensperger's geometry protected with DE patent 73515 on February 28, 1893. Both Benz and Daimler/Maybach applied this solution relatively late – Daimler did it only in 1897. It can be explained by their professional orientation: all three were focusing on engine designs, not on car design. Nevertheless: apart from Bollée, the motor cars from Panhard & Levassor and Peugeot were already driving with A-steering as early as 1891, as were English and French tricycles (three-wheeled bicycles) at about the same time.

THE BREAKTHROUGH CAME WITH THE CAR

Since that time, A-steer has been common on all multi-track on-road and off-road vehicles, except for specialty versions of compact tractors and earth-moving, construction, and military vehicles, for which articulated steering is recommended. The articulated steering also comes from carriage construction.

The invention of Ackermann steering had neither technical nor economic effects on horse-drawn carriage construction – it almost had no effect whatsoever. Its value only materialized on horseless carriages and motorized vehicles.

Lankensperger may have built 30 to 50 carriages (and sleighs) for the court of the Bavarian kings Max I Joseph (r. 1806-1825) and Ludwig I (r. 1825-1848), mostly with turntable steering and often designed by Johann Christian Ginzrot (1764-1831), a designer, coachbuilder, and author. In 1839 Lankensperger handed over his business to his stepson Joseph Rebhan and retired to Birkenstein, near Fischbachau. There he founded, among other things, an institute for the education of young girls. There doesn't seem to be a portrait of him, but since 1982 a commemorative plaque on the house at Pacellistrasse 8 in Munich, his former company premises, has commemorated Georg Lankensperger, the royal Bavarian court carriage builder and the inventor of the Ackermann steering. ♦

ART AND DYNAMICS

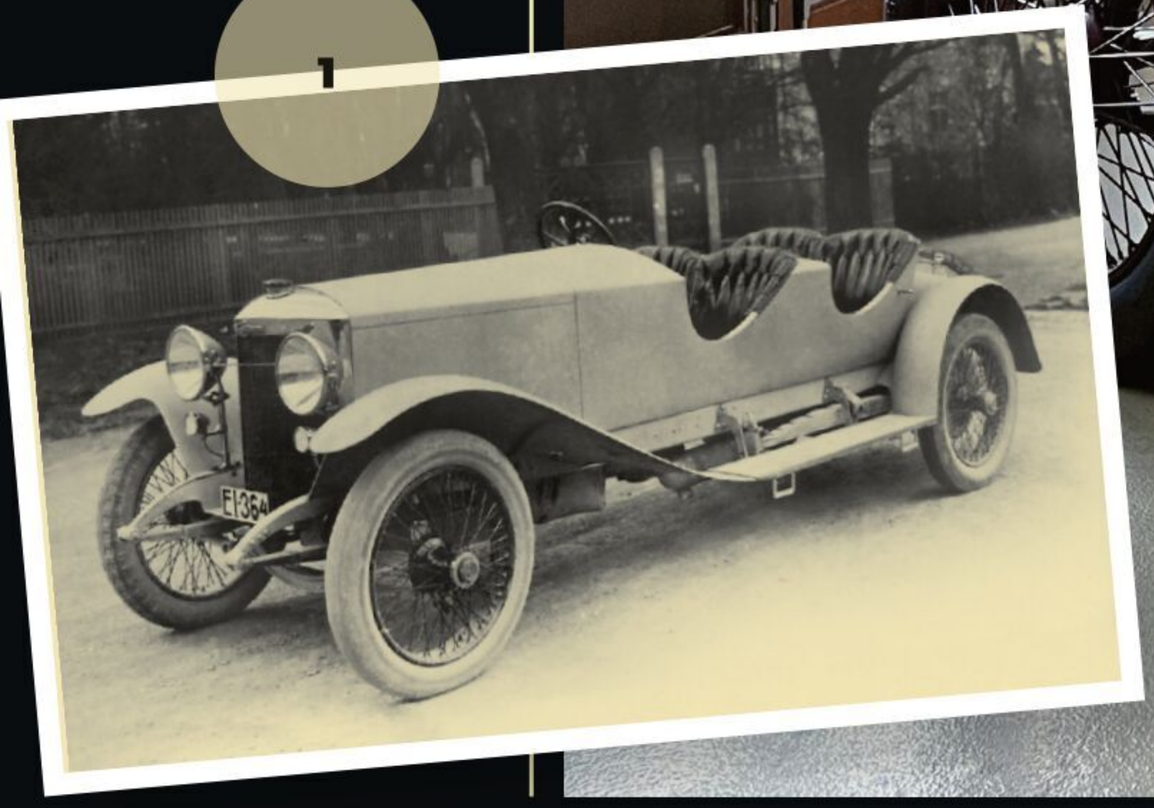
AUSTRO-DAIMLER AD617

The staff of Auto Veteran in Prague, Czech Republic, have long been admirers of the cars Ferdinand Porsche designed at Austro-Daimler. Recently they had the opportunity to bring an early six-cylinder model back to life.

2 Restoration work was completed by the end of 2019, but due to Covid-19 regulations the car was only out for a few occasions.

3 The car participated at the 2021 Czech 1000 Miles classic car rally.

1 Parts of this Übersee (Overseas) body remained, which aided the restoration.



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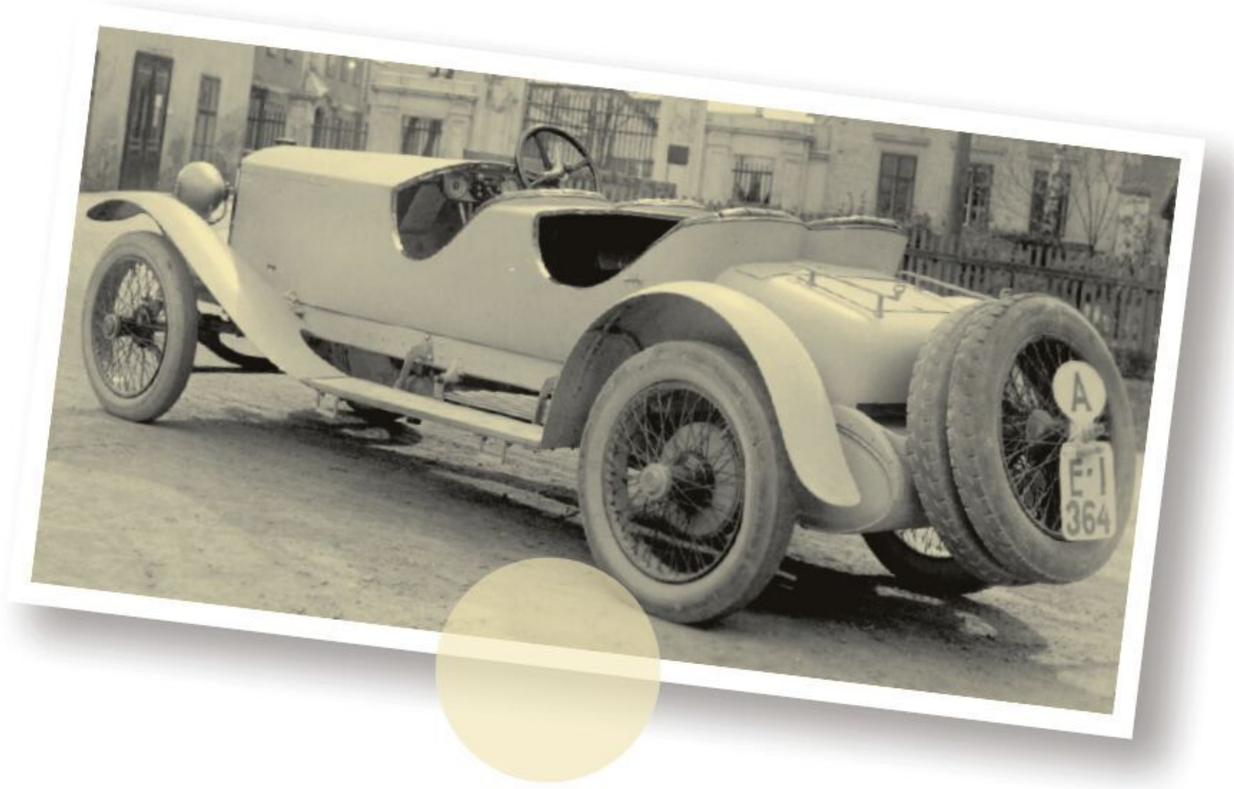


Köllensperger built just a few passenger car bodies.

In 1910 the Austro-Daimler factory team, led by Prof. Ferdinand Porsche, won the region's best-known automobile race, the Prinz Heinrich Fahrt. This weeklong tour with a length of 1940 km was named after Prince Henry of Prussia. It allowed the participation of touring cars only, which attracted the attention of all the leading German carmakers. Having a 1-2-3 victory at the event boosted Austro-Daimler's sales considerably.

In addition to being its technical director and occasional race car driver, Ferdinand Porsche also had a say in the everyday running of the company. By 1913, the Wiener Neustadt-based company became independent from its German founder. Porsche got Škoda on board to finance investments.

With the outbreak of the First World War, Austro-Daimler focused on its truck production (see our story on some of these on p. 12), participated in the founding of a new airplane factory, and supplied engines for those planes.

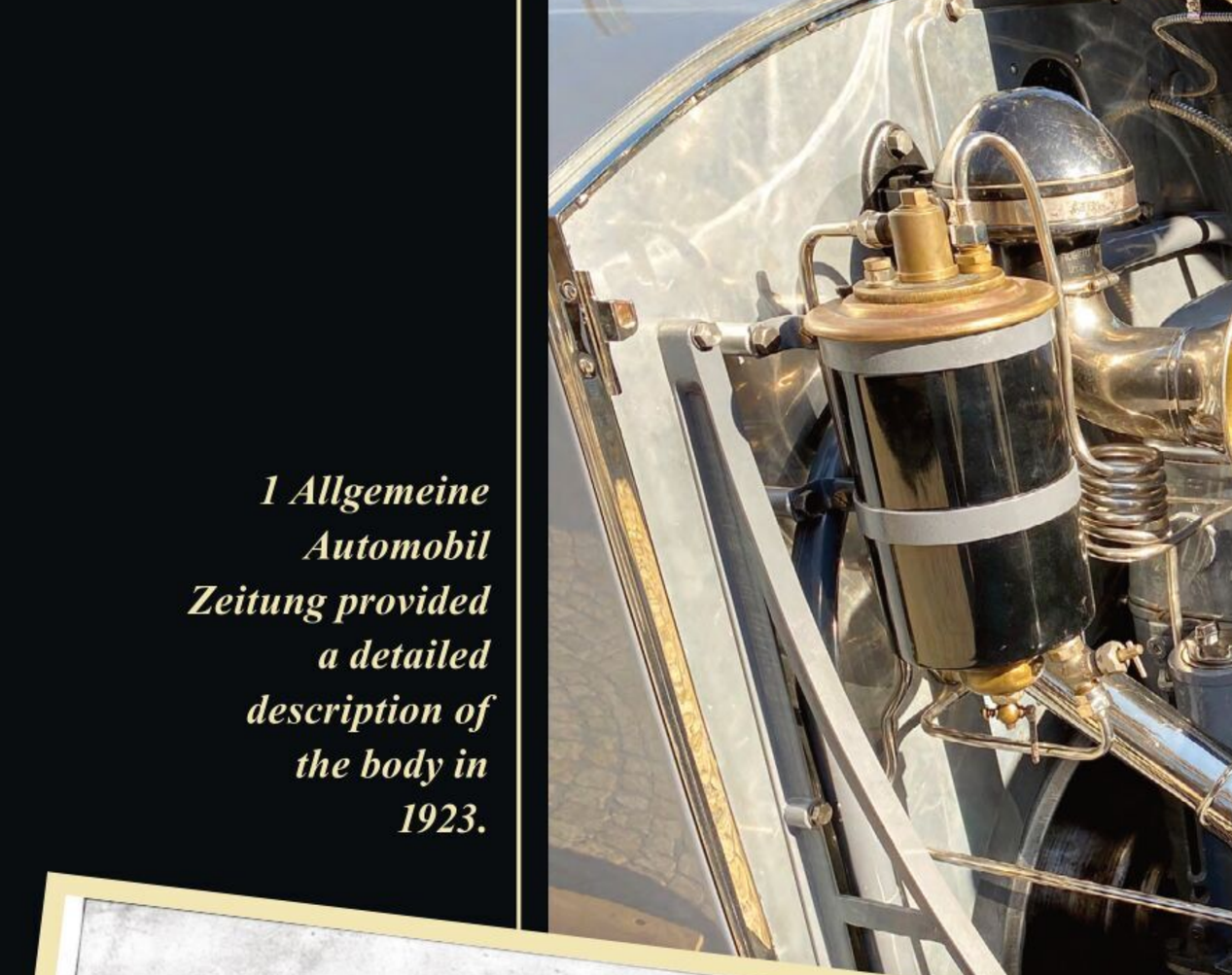
In 1917 the Vienna University of Technology awarded Porsche his first honorary doctorate, and in the same year he became general director of the plant, which now had 7,000 employees.

After the end of the war, the Austro-Hungarian Monarchy was dissolved. The shares of Škoda in Austro-Daimler were taken over by Camillo Castiglioni, an Italian-Austrian banker who had been a director at the company since 1909. He also took over Puch and MÁG, a Hungarian company, forming a small-car-making empire which lasted for just a few years.

At Austro-Daimler, Porsche quickly resumed production of prewar four-cylinder models, equipped the old chassis with modern-looking bodies, and presented these as the new luxury cars at the 1920 Prague Motor Show.

At the same time he was busy developing a brand-new

1 Allgemeine Automobil Zeitung provided a detailed description of the body in 1923.


1

Austro Daimler Sechszylinder mit Karosserie Köllensperger, Sporttype „Uebersee".

Unser Bild zeigt eine von der Karosseriefabrik Köllensperger (Innsbruck-Wien) hergestellte Sporttype „Uebersee" auf Austro Daimler Sechszylinder-Chassis, mit der Herr Köllensperger, wie uns mitgeteilt wird, an der Oesterreichisch-Ungarischen Wertungsfahrt teilnehmen will. Die Bauart der Koffflügel ist auf möglichste Verminderung des Luftwiderstandes berechnet. Durch Anordnung der Hintersitze einen halben Meter vor der Wagenachse wird ein stoßfreier Lauf erzielt. In dem großen Fach des Heck befindet sich die Beleuchtungsbatterie, ferner können dort Reservesschläuche, Schneeketten, Werkzeuge, die seltener gebraucht werden, wie auch das Gepäck für den Chauffeur untergebracht werden. Die Handwerkzeuge sind in eingepaßten Kästchen unter der Motorhaube verstaut. Außerdem befindet sich unter jedem Sitz ein Behälter für Reserve-Benzinschläuche, Oel usw., so daß mit dem Benzinquantum im Hauptreservoir 120, Reserve 40—50 Liter, insgesamt 170 Liter auf die Fahrt mitgenommen werden können. Die Karosserie Köllensperger lehnt sich an keine bestehende Karosserieform an. Die Fabrik arbeitet fast ausschließlich nach Angaben auf Bestellung, so daß jeder Wagen eine persönliche Note trägt.


2

2 The first six-cylinder engine of Austro-Daimler which greatly improved the brand's image.

3 Doorless body oozes sportiness.

3

4 There are individually sculpted seats at the front and at the back.

Technical Data

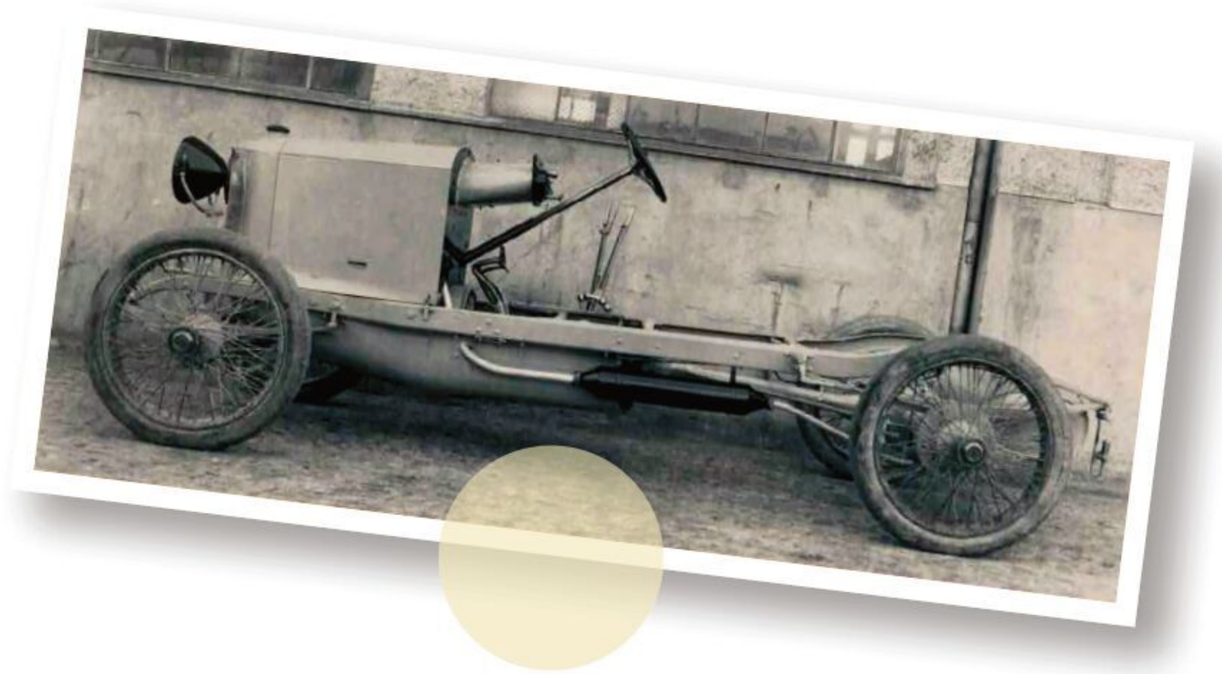
AUSTRO-DAIMLER AD617

ENGINE:

In-line, six-cylinder • 4424 cc • 60 PS @ 2000 rpm
Bore: 85 mm • Stroke: 130 mm
Transmission: four-speed, manual

DIMENSIONS:

Wheelbase: 3450 mm • Length: 4624 mm
Chassis width: 900 mm • Chassis height: 637 mm
Front/rear track: 1360/1360 mm
Chassis weight: 1240 kg
Max speed: 100 km/h



The AD617 had the same wheelbase as a Voisin C1.

model, which was to be called the AD 6-17 – for six cylinders and 17 tax horsepower. The light alloy cylinder block was cast together with the upper part of the engine as one piece. Also the pistons were made from light alloy, while cylinder liners were made of steel. The 4424-cc engine had a maximum power of 60 hp. Max speed was claimed to be 100 km/h.

In 1923 the 6-17 was replaced with the ADM II, which was largely identical to the larger model in terms of design and size, but its six-cylinder engine was reduced to 2.6 liters.

KÖLLENSPERGER

The origins of this Innsbruck-based company go back to the 19th century. It was primarily a wholesale trader of hardware products. After the First World War, the Köllensperger brothers branched out to build bodies for trucks and buses. Occasionally a few passenger-car bodies were completed. In 1923, Köllensperger took over the Tirol area distribution rights for Ford. The workshop existed until the 1980s.

Ivo Smutny is particularly fond of the Übersee (Overseas) body, an attractive four-seater torpedo, which first appeared at the 1923 Austrian-Hungarian Reliability Tour. According to a description in Allgemeine Automobil Zeitung: “The design of the fenders is calculated to reduce air resistance as much as possible. By placing the rear seats 50 cm in front of the rear axle, the car runs smoothly. The lighting battery is located in the large compartment at the rear. Also the driver’s luggage, spare hoses, snow chains, and tools that are used less often can also be stored there. The hand tools are stowed in fitted boxes under the hood. There is also a container for reserve fuel hoses under each seat.”

When a chance emerged to resurrect an old Austro-Daimler AD 6-17, he chose to clothe it with this elegant and striking Köllensperger body. The car has recently been finished. ♦

LIVING LARGE

DAIMLER DE-36 "GREEN GODDESS"

Daimler unveiled its jaw-dropping Green Goddess prototype at the 1948 London Motor Show. Built at the behest of **Sir Bernard Docker**, chairman of the company, it was later turned into an exclusive series of six specimens. This is one of three survivors.

The Green Goddess prototype was the star of the 1948 London Motor Show.

British Daimler, which had a turbulent beginning, had been controlled by Birmingham Small Arms since 1910. It was a producer of luxury automobiles, but it was only moderately successful. From time to time it offered advanced technical solutions such as the sleeve-valve engine in the 1910s and the Fluid Flywheel, a forerunner of the fully automatic transmission in the 1930s.

BSA was managed by F. Duncan Docker, a successful industrialist, who groomed his son Bernard as successor. In 1944 Sir Bernard, a recipient of a KBE for his service to hospitals, was made Managing Director of BSA. A month later his father died.

Sir Bernard enjoyed living large both figuratively and literally. His yacht, the 863-ton Shemera, was the most massive privately owned boat of its type in England, and his personal Daimler was similarly unsurpassed on the roadway.

Plethora of Bakelite switches operate the lights, demister, hood, and starter among other functions.

Sir Bernard Docker and his wife in the 1950s (Jaguar-Daimler Heritage Trust).

DAIMLER DE-36

The Daimler DE-36 chassis, with its 3.7-meter (147 inch) wheelbase, was the largest model in Daimler's postwar range and the last Daimler to be fitted with a straight-eight engine, of 5,460 cc and 150 horsepower. The large, silky-smooth engine was coupled to a Daimler Fluid Flywheel transmission, controlled by a pre-selector mechanism. Launched in 1945, the car was intended for limousine coachwork and was supplied by Daimler in chassis form, with bodies available from several coachbuilders including Hooper. Examples of the DE-36 were supplied for the use of HM King George VI, both as state cars and for royal tours abroad. By the time production ceased in 1953, 215 chassis of this type had been built.

THE GOLDEN GODDESS

In early 1948 Sir Bernard commissioned a very flamboyant Daimler from its subsidiary, the Hooper coachworks, and it was set to be introduced at the first postwar London Motor Show. Hooper & Co. were among Britain's oldest coachbuilders, with a continuous history from 1805. They specialized

The DE36 was the last Daimler to feature a straight-eight engine.

Spare wheel is hidden in luggage compartment.

in coachwork of the highest quality, earning their first Royal Warrant in 1830 and serving as coachbuilder both to Queen Victoria and her successor King Edward VII. Hooper was quick to recognize the potential of the automobile, supplying the Prince of Wales with a Hooper-bodied Daimler in 1900 and continuing to supply the Royal Mews as well as owners of prestigious chassis from Rolls-Royce, Bentley, Hispano-Suiza, Daimler, and others.

The DE-36 based show car made a huge impact at the show. It was over six meters long and 2.1 meters wide and sparkled in brilliant jade green. Its appearance and luxury, presented on austere bare wood floors and an otherwise unadorned display, was mesmerizing in contrast to manufacturers that were showing warmed-over prewar cars. Its "Green Goddess" name, it is said, was conferred by an enraptured journalist. It was passed on to its successors no matter what colors their buyers specified.

The total cost for the prototype amounted to £7001 – with 70 percent of the budget spent on the coachwork and the government purchase tax on luxury goods. The Green

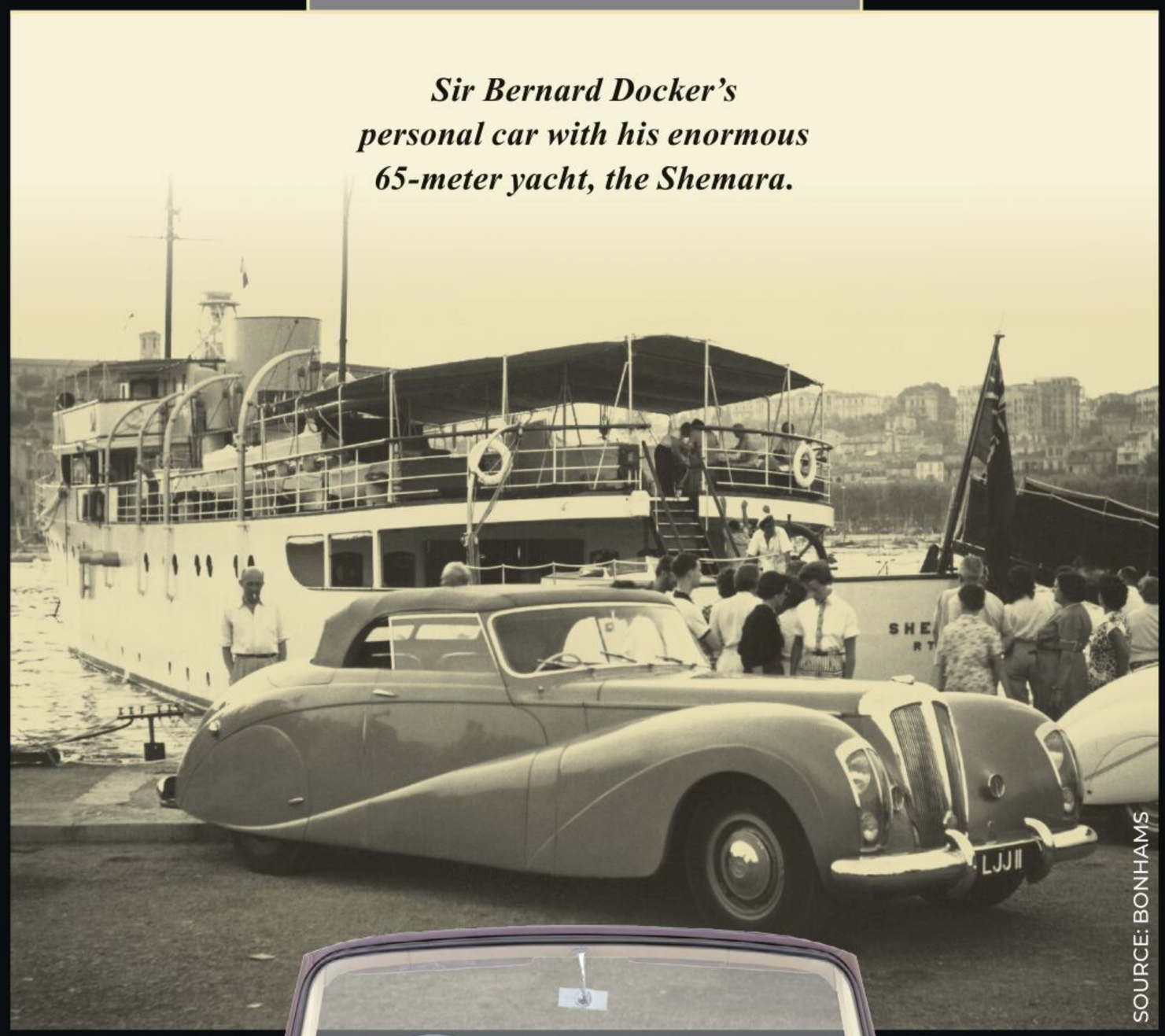
Rear wheels are hidden behind low fender skirts.

Hooper enclosed the power folding top below a hydraulically operated rigid rear deck.

Goddess introduced what would become known as “the Hooper line,” a prolonged sweeping front fender that merged into skirted rear wheels and was repeated in the voluptuous slope of the extended rear deck and fenders that curved together into the body's trailing edge. The rear wheels were hidden behind low fender skirts and the body rested perilously close to the ground, almost completely obscuring the presence of any rear wheels.

The fluted radiator grille that had distinguished Daimlers since 1904 was raked, and its shape and fluting were repeated in the surround of the covered headlights encased in the fenders’ fronts. The interior accommodated three-abreast front seating in individual chairs, with the two rear passengers regally ensconced in individually adjustable armchairs. Hooper masterfully enclosed the power folding top below a hydraulically operated rigid rear deck so it was invisible when retracted.

The Green Goddess prototype soon became the personal car of Sir Bernard, who married Norah Turner, a twice-married, twice-widowed millionaire, in 1949. She was ten years



Sir Bernard Docker's personal car with his enormous 65-meter yacht, the Shemara.

SOURCE: BONHAMS

The fluted radiator grille which had distringuished Daimlers since 1904 is raked.

younger than Sir Bernard and came from a modest background but had worked her way upward through dance halls and a succession of wealthy admirers. She had also been married and widowed twice and had inherited each time. After her third marriage, she became Lady Docker and was appointed to the board of Hooper.

Sir Bernard already lived a lavish lifestyle, which was amplified by his wife. As a first sign, six magnificent DE-36 drophead coupes were ordered to be built by Hooper in the style of Sir Bernard's 1948 show car. This was followed by a series of one-off Daimlers commissioned by Lady Docker and known as the Docker Daimlers.

52802

According to Daimler records, chassis 52802 was completed in September 1949; but its first buyer has not been registered. The car was at one time held in the Harrah's Club Collection in Reno but apparently passed from their hands in 1982. A Texas-based collector became its next custodian in the 1990s, who commissioned a comprehensive restoration. It took

Built-in storage for wine was part of the standard equipment.

12,700 man-hours of shop time, in addition to a great deal of subcontractor effort, to complete the process. Essentially, all of the car's components and systems were rebuilt, restored, or replaced. Every nut, bolt, washer, bushing, bearing, and gasket was restored or renewed. Each aluminum body panel was stripped bare, repaired, primed, hand sanded, painted, color sanded, and rubbed out in Glasurit Urethane.

The eight-cylinder engine was totally disassembled and then rebuilt with new crankshaft bearings, pistons, and valves. The twin carburetors were rebuilt, as were the fuel and water pumps, starter, generator, and distributor. The suspension, electrical, and hydraulic systems were restored to full functionality. Even the original Motorola radio was completely rebuilt. The quality of the finished car was recognized at the 1994 Pebble Beach Concours d'Elegance, where the Daimler took class honors. Later the Daimler became part of the LeMay Collection. Today the car is located in a private collection that is managed by Hyman Limited Classic Cars. The car was voted "Best of Show" at the 2022 Boca Raton Concours d'Elegance in March. ♦

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SPEEDING STAR

MERCEDES-BENZ 710 SS TOURER

Central Garage in Germany houses an impressive collection of supercharged Mercedes-Benz cars. This 710 SS Tourer was the first one. It was acquired in 1995.

COLOUR PHOTOS:
RENÉ STAUD STUDIO

1

2

1 Edward Louis Mayer at the wheel of his first Mercedes, a 60 PS, in 1904.

2 This 710 SS had a very event-ful life in the United Kingdom, Australia, and then in Germany.

EDWARD LOUIS MAYER

Today few people remember Edward Louis Mayer (1877-1962). You don't find his name in books about the history of Mercedes. Sometimes when a rare specimen from the three-pointed star appears at an auction, it is mentioned that it was once owned by the "legendary" Mayer. However, one can safely say he was a very important customer of the German Daimler company for the first 50 years of their existence: he bought his first Mercedes in 1904, which was followed by 114 (!!!) others.

In 2013 the official magazine of the German Mercedes-Benz Kompressor club put together an extensive feature on his life and on the cars he bought.

Mayer was born in Hitchin, Hertfordshire, England. He was probably somehow attached to the revenues of a local farm. His family's financial situation allowed him to do what a lot of British young gentlemen did in the 18th and 19th centuries: complete a grand tour around the world lasting several years. Before TV and the internet, this was the only way to get to know the world.

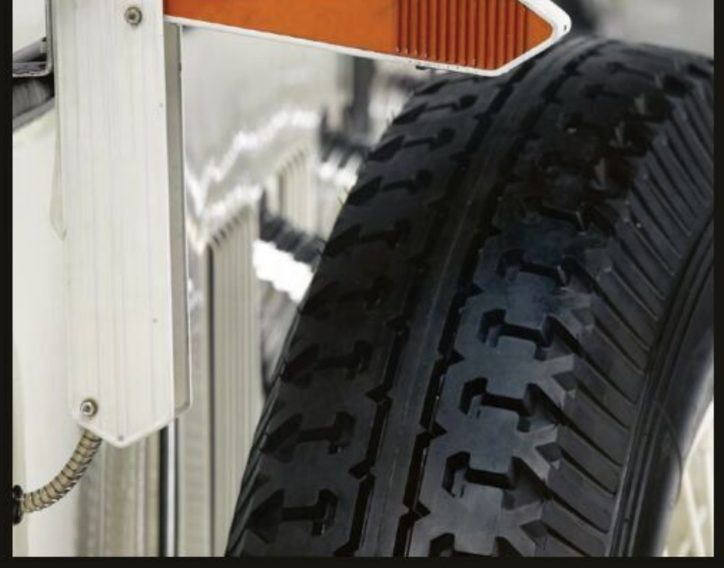
Mayer went to the Wild West, rode broncos, appeared in Australia as a gold prospector, and fought among the Zulu Impi warriors in South Africa. Luckily he kept a diary, which charts his travels.

Against this backdrop, he enjoyed adventures with the new sensation of the world – the automobile. His first one was a Mercedes Simplex 60 HP, which he bought in 1904. Among his notable purchases was one of the "Kaiserpreis" racing Mercedes models in 1908, similar to the one which won the Semmering race that year in Austria.

He particularly liked the S, SS, and SSK family and talked a lot about them in his diary: "The new open sports car 36/220 was presented at the Olympic Exhibition in October 1927. This one was very different, very long and low, with a supercharged six-cylinder engine, two carburetors, a sporty four-seater body, and two spare tires at the rear – top speed about 110 miles per hour. The English representation kindly brought one car with her test driver over to my house for a test drive and the acceleration with the supercharger on was

3 The super-charged engine enabled a max. power of 225 hp.

4 Trafficator is a traditional touch on an otherwise modern car.



nothing short of remarkable in any gear. Once I bought one of these models and got used to the car, I found it very easy and comfortable to use, and the motor very flexible, and with a 2.76 to 1 ratio you could drive the fourth gear from about 12 to 15 mph (15-20 km/h) to top speed without going that the engine worked hard. The bigger 38/250 from 1929/30/31 is in my opinion one of the best models that were ever built. I owned a very elegant cream-coloured 38/250 with maroon fenders. It was an open four-seater with a large trunk in the back of it, which contained two suitcases lined with calfskin. I currently have a very fast open semi-racing four-seater with a racing supercharger and a host of other special features, since prepared for the 1939 Le Mans race but withdrawn at the last moment. A total of 15 Mercedes S, SS, and SSK cars belonged to me." Today his cream-colored 38/250, a.k.a. 710 SS, is part of the Central Garage collection.

THE MERCEDES SS

In 1926 Daimler and Benz merged to better weather Germany's post–World War I depression together. This brought integration between the two product lines, manufacturing, and management, but it also brought an end to racing endeavors. Competition was sidelined, but performance remained paramount and a key ingredient in Mercedes products. The engineering talents of Ferdinand Porsche, Hans Nibel, and Fritz Nallinger were instrumental in the development of the Mercedes-Benz Type S, a successor to the 6,256-cubic-centimeter Model K, and a model that was paramount in establishing the credentials of Mercedes-Benz as the pinnacle of high-performance luxury automobile manufacturing.

The Mercedes-Benz S-Type was based on the prior 400 and 630 models, which had been given their names based on the displacement size of their engines. The 630, benefiting from improvements by Ferdinand Porsche, resulted in the 680 S in 1927. It was brought to the first race at the Nürburgring, where it emerged victorious.

Larger engines soon followed, resulting in the 700 SS and the 710SS, which were intended for road use, and the SSK and SSKL racing versions. Their supercharged engines were

1

2

1 Edward Louis Mayer enjoyed the company of the 710SS, often doing over 190 km/h.

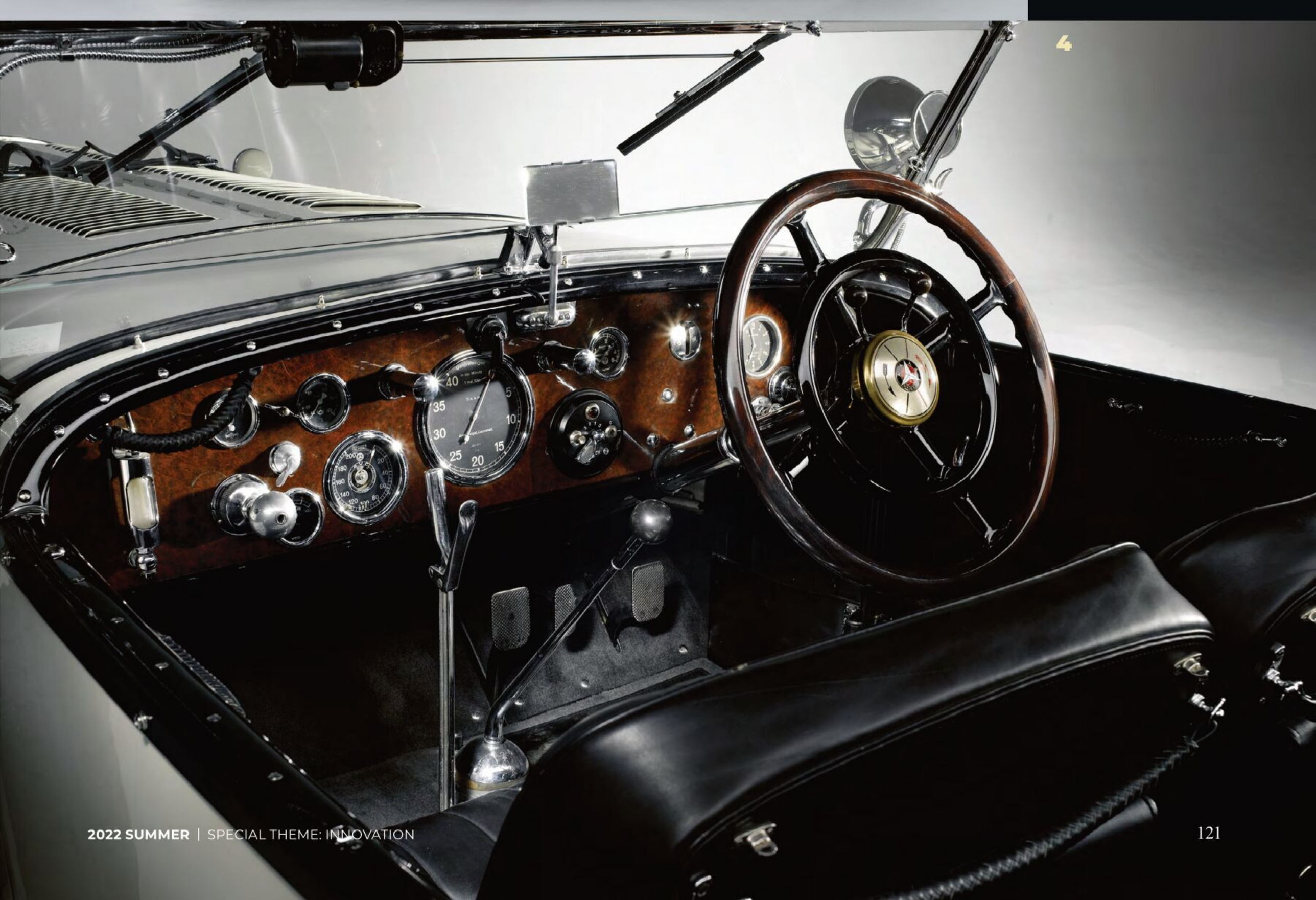
2 Exhaust pipes emerged from the side of the bonnet.

3

3 Electric Zeiss lighting was extra equipment.

4 A feature that still distinguishes every Mercedes-Benz today is the oversized rev counter as a central part of the dashboard.

4

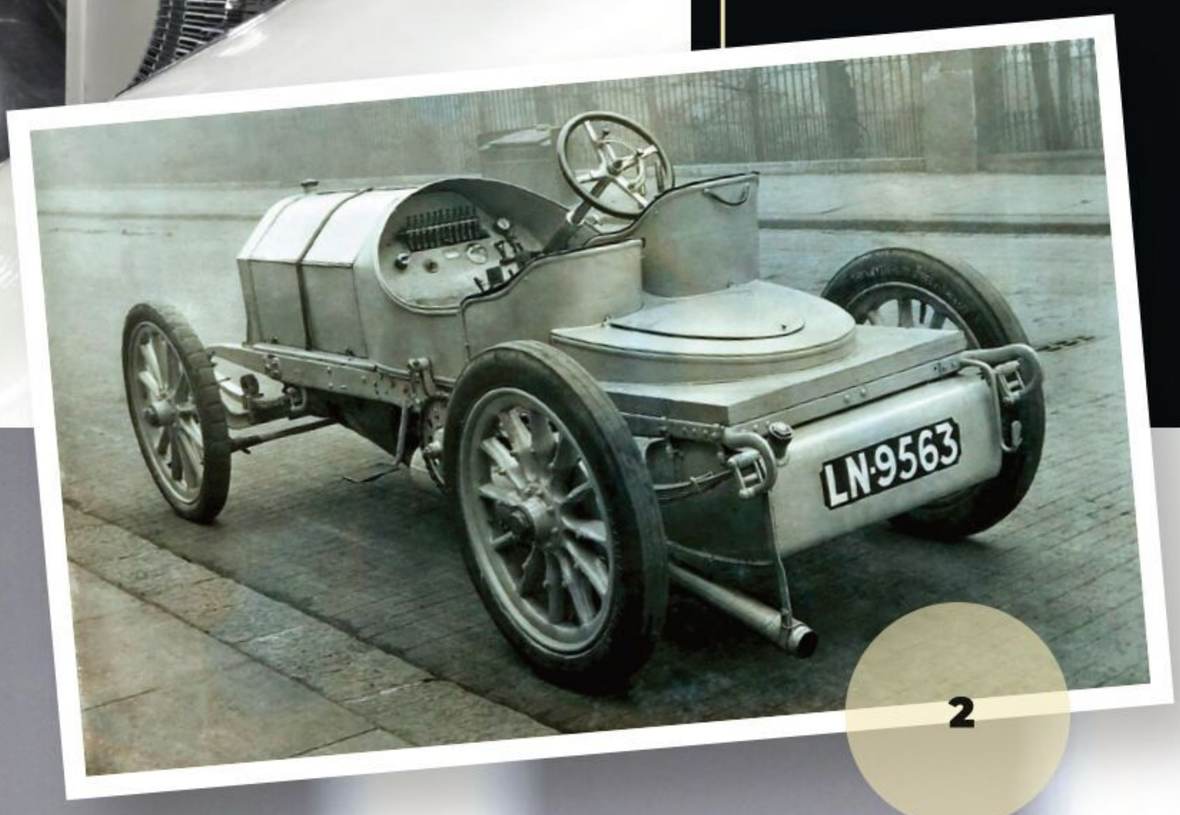


1

1 The current owner never dared to verify Mayer's claims about the claimed max. speed.

2 A Mercedes 60 HP from the early 1900s.

3 Mayer also had a racing S in his fleet, which was he favoured because of its "Elephant Blower."



2

capable of producing around 225 horsepower, which made them well suited to handle the driving demands of the road and track. Many of the cars were constructed of aluminum to help reduce overall weight. Altogether, 115 SS models were built with a 170 engine – which was able to achieve 225 hp with the help of a supercharger.

77630

This 710 SS Tourer was ordered on October 9, 1929, and delivered to London in 1930 as a demonstration car. Its first owner was Edward Louis Mayer. According to his diary, he often traveled with the car between London and Hertfordshire with the speedometer needle hovering at the 120-mile mark (193 km/h).

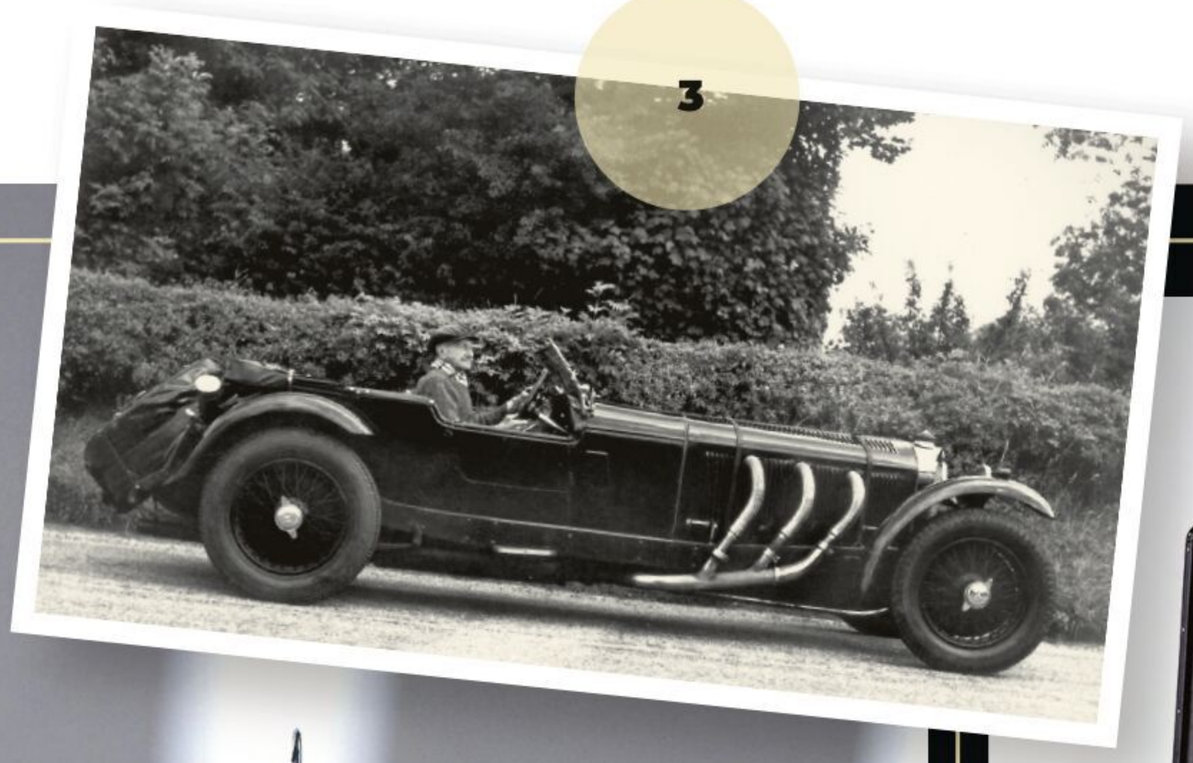
In 1948 it was purchased by a certain Bernard Dowd, who originally bought the car for Miss Australia's European tour. His idea was to promote Australia as a travel destination, and he had considered sending Miss Australia on a European tour in this spectacular car. This tour never took place, but the car was shipped to Australia and spent the next few decades there. In the process, the car underwent numerous changes. Among other things, the headlights and the soft top were either replaced or incorrectly repaired.

Leather seats were patched up with artificial leather. Someone even replaced the three-pointed star with the well-known swan from Packard.

When "Mercedes-Benz All over the World" magazine featured a report on this spectacular vehicle in 1956, this inappropriate radiator mascot was removed by the editors and replaced with the correct Mercedes star.

One of the previous Australian owners, a certain Jack Jeffery, wrote to the English Mercedes-Benz Club: "My car was imported with engine number 77630, together with a spare engine, no 77628" – which confirms that there was a spare engine attached to the car.

It was Central Garage where the car was brought back to its correct shape and all those parts that were improperly fitted over the years (including a VW rearview mirror and false headlights) have been replaced with original parts, such as Zeiss headlights. ♦



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4 This SS wears a comfortable touring body with a light soft top.

5 There was an even proper space available for luggage.

THE PIANO MAN'S CAR

BRENNABOR 6/18 PS

Brennabor produced bicycles, motorcycles, cars, and prams. It was the first German automobile manufacturer to work with an assembly line. There are only a handful of early Brennabor cars still around. **Dr Pál Négyesi** looks at a 6/18 PS from 1911 which has spent most of its life in Australia.

COLOUR PHOTOS: MÁTÉ BOÉR

1

1 Brennabor was once the biggest pram producer in Europe.

2

2 Despite numerous claims, Brennabor is not the old Slavic name of Brandenburg.

3 After 1910 the range consisted of four-cylinder models.

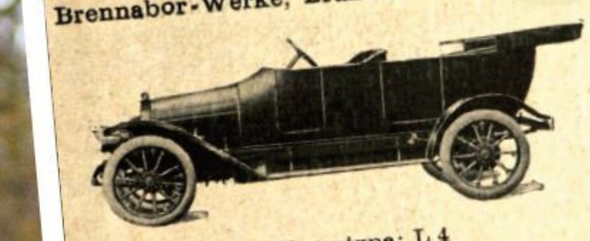
BRENNABOR HISTORY

In 1835 Eduard Reichstein settled in the German town of Brandenburg and opened a small workshop for the production of baskets. His sons, Adolf, Carl, and Hermann, used these baskets to develop prams. At the 1873 Vienna World's Fair, the Brennabor stroller received an award, which put the company on a fast track.

In the 1890s, the Reichsteins achieved their goal of mass-producing functional, stylish, and affordable prams.

In a short time, their plant blossomed into the largest pram factory in Europe and held this position until the 1930s. In 1896 alone, the factory sold around 75,000 prams. Pram production continued well into the Second World War. In addition to prams, the Reichstein brothers experimented with bicycles from the 1880s. Serial production was launched in 1893. They had to choose a brand name for this production. Thus Brennabor was born, which despite many claims is not the old Slavic name of Brandenburg, but a more modern construction.

By the turn of the 20th century, Brennabor bicycle production reached 40,000 units a year. Based on this solid foundation, the company launched its first production motorcycle in 1903, followed by small cars in 1905. In 1908 a separate



Brennabor-Werke, Brandenburg a. Havel

Bezeichnung der Wagentype: L 4
Art des Wagens: Turenwagen
Karosserie: Zweisitzer, Torpedowagen
Länge über alles: 3,800 m
Breite " " 1,600 m } des fertigen Wagens
Höhe " " 1,400 m
Sitzplätze für 2—4 Personen
Höchste zulässige Belastung: 500 kg
Gewicht des Wagens mit Wagenkasten: 900 kg
Gewicht des Wagens ohne Wagenkasten: 700 kg
Rahmen: Gepresster Stahlrahmen, vorn verjüngt, gekröpft
Achsstand: 2800 mm
Spurweite: 1300 mm
Motor: 4 Zylinder
Zylinderbohrung: 70 mm
Kolbenhub: 102 mm
Leistung nach der Steuerformel: 5,9 PS
Gebremste Leistung: 18 PS
Einlassventile: gesteuert
Steuerung: Ventil

Zündung: Kerze
Einstellung des Zünd (automatisch)
Zündstrom: aus Magne
Vergaser: Brennabor-Sy
Betätigung der Gasd Accelerator
Kühlung: Thermosyph
Kühler: Lamellen mit
Kuppelung: Lederkon
Getriebe: Schubvorge
Schaltung: Kulissen
Schalthebel: aussen
Geschwindigkeiten: 3
Direkter Eingriff bei
Uebersetzungsverhalt kleinste Geschwind :3,46
Uebertragung: Carda
Uebert agungsverhäl = 1) 1 : 5
Höchstgeschwindigk Strasse: 60 km i. S
Radachslager: Kuge
Oelung: automatisch
Handbremsen: Zah bremsen
Fus bremsen: Zah bremse
Reifenabmessungen Hinterräder 760
Abn hmbare Felge
Abnehmbare Rä

4 This car spent most of its life in Australia.

5 Interior is rather spartan.

6 Lucas lamps remained with the car for most of its life.

automobile department was set up, led by Carl Reichstein Jr. Over the years a wide range of passenger cars and small trucks were developed. From 1910 every part was produced in-house. The Type M, which appeared in 1914, was presented as the most advanced car from Germany at the time. In favor of armaments production, the company put automobile construction on hold during World War I. In the early to mid-1920s, the company developed into the largest German automobile factory. In 1923/24, the Reichsteins were one of the first German automobile manufacturers to introduce assembly-line production. However, their success proved to be short-lived as competition from other companies eroded their market share. The Opel "Laubfrosch," another mass-produced small car, pushed Brennabor to second place. Serious problems arose with the world economic crisis in 1929. Automobile production stopped in 1933, and the last cars were delivered in 1934. A total of around 70,000 automobiles were manufactured. Brennabor vehicles have been exported worldwide, including the German colonies, England, Russia, the Netherlands, Denmark, Sweden, Norway, France, Italy, Spain, the Austro-Hungarian Monarchy, and the Balkan states, Argentina, Uruguay, Brazil, Australia, British South Africa, and even to faraway China.

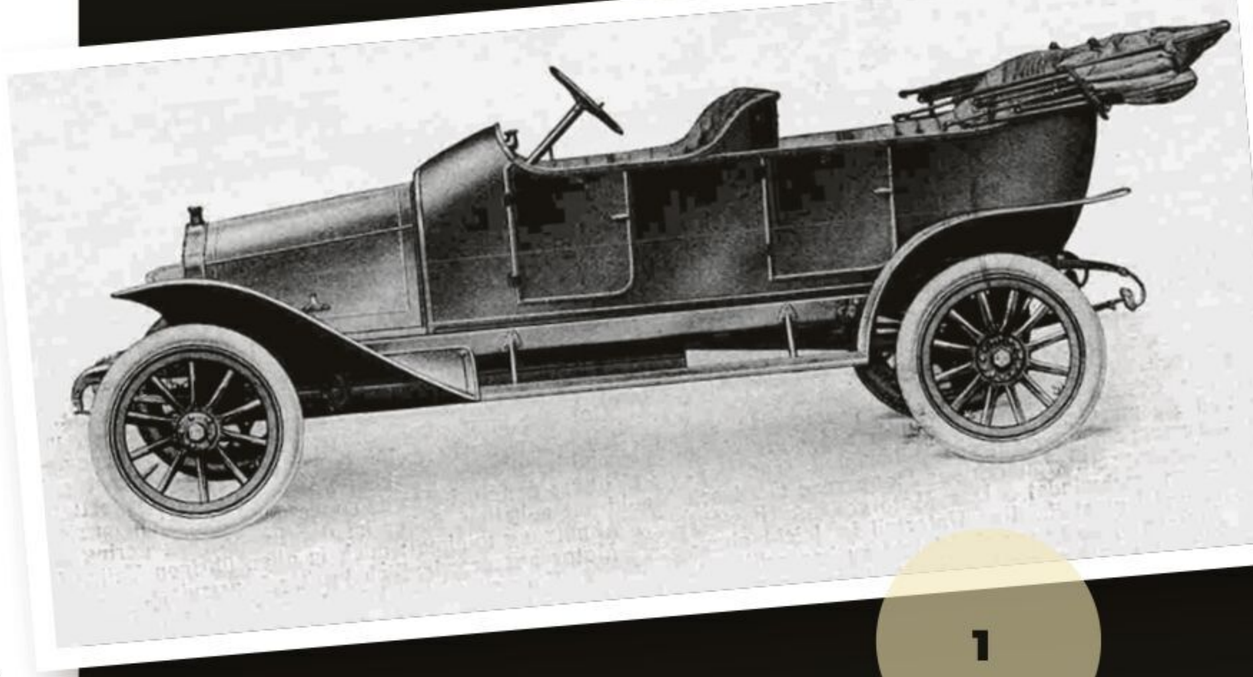
Today around 60 survivors are known; this 6/18 PS is one of the earliest.

THE BRENNABOR 6/18 PS

Brennabor produced its first four-cylinder car in 1909. Carl Reichstein Jr. participated in numerous competitions, such as the 1909 Prinz-Heinrich-Fahrt (Prince Heinrich Tour), a long distance reliability tour organized by Prince Henry of Prussia. Brennabor subsequently developed a range of more powerful models equipped with a variation of the four-cylinder engine, which were exported. Brennabor's fame outside Germany was aided by sporting successes such as winning the long-distance trip from Königsberg (East Prussia) to Riga (Latvia) in 1911. In 1911 the new 6/18 PS model, also known as Type C, was unveiled at the Berlin Motor Show alongside the more powerful 10/24 PS version. Allgemeine Automobil Zeitung, the official magazine of the German Automobile Clubs' Association and the Association of German Motor Vehicle Manufacturers, featured a lengthy overview of the new model, which is the equivalent of publishing a press release today with details like: "The 18 PS four-cylinder engine has a bore of 70 mm and a stroke of 102 mm. It produces 24 hp. It is made from the most appropriate materials in our own workshops with great precision and care. The engine is water-cooled. The circulation of the water is automatic. The cylinders are arranged vertically in pairs. The engine has controlled intake and exhaust valves, placed on one side. The crankshaft of the engine has three bearings and is made of very strong special material."

1 Allgemeine Automobil-Zeitung always covered the brand extensively.

2 Fittings were refurbished during restoration.



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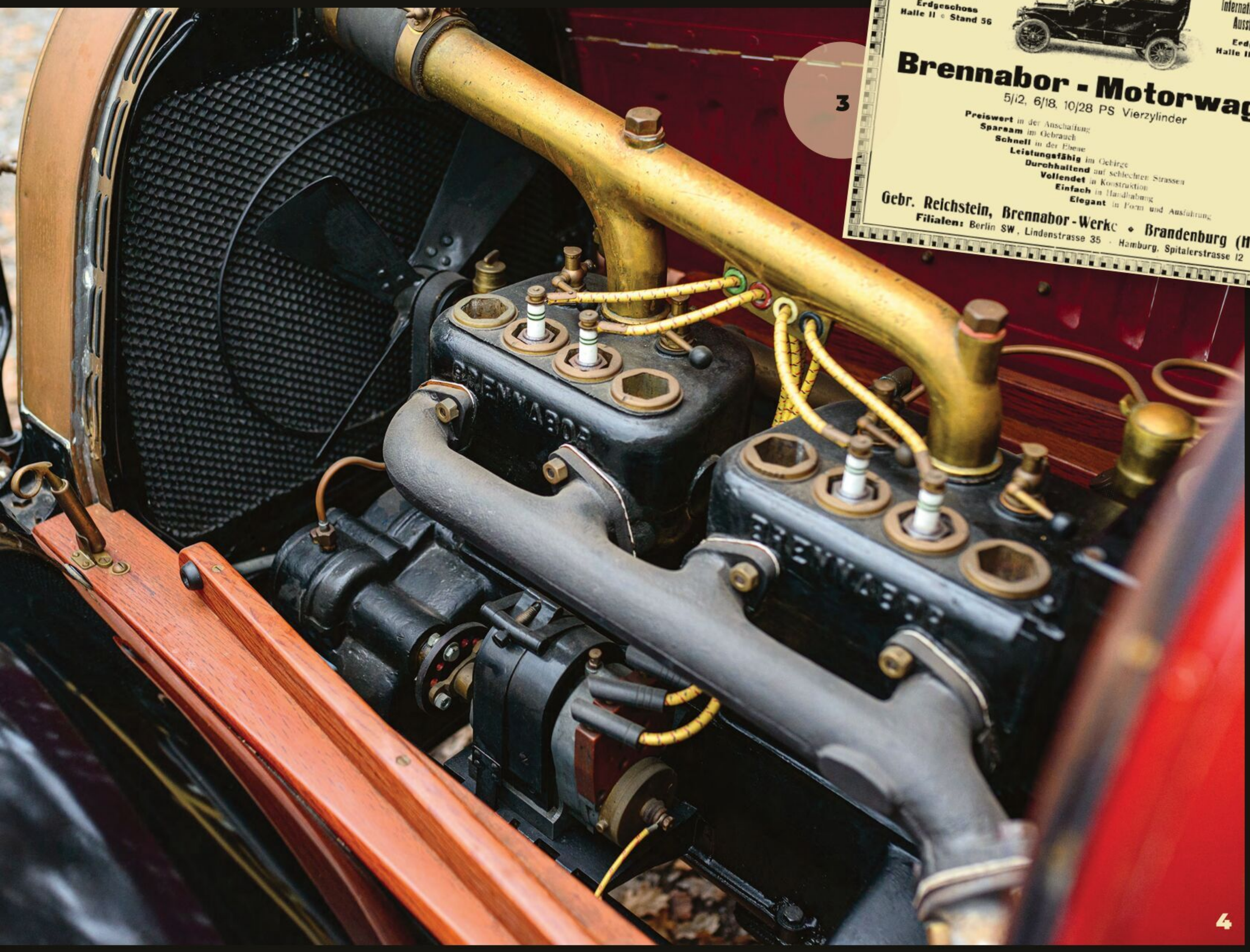

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3 This 1911 ad highlighted the car's suspension among other virtues.

4 Most of the components were produced in-house.

5 Brennabor cars were exported all over the world.

1 The Brenna brand name was mostly used in the United Kingdom.

2 David Read with the restored Brennabor.

3 The car underwent a frame-off restoration.

SOURCE: JENNY MACKAY (2)

3

4

4 There is an additional seat which can be folded out.

5 Every part was repainted during restoration.

5

BRENNABOR 6/18 PS, CHASSIS NUMBER 6187

The two-seater red Brennabor with chassis number 6187, engine number 2059, spent most of its life in Australia before returning to Germany in 2019. There is no known record of how many Brennabor cars were exported to Australia. Brand expert Mario Steinbrink assumes less than 100. In Melbourne, Glennferrie Motor Garage sold Brenna cars, a brand name used mainly in Great Britain for certain Brennabor models. One of the most valuable resources is the Holderness Motorists Guide, which was published in 1915 and 1916 and lists every vehicle owner in New South Wales. The Holderness guide features just one Brennabor, with the number plate NSW 7541, which belonged to a Patrick Maloney. His death certificate in 1931 listed him as a piano importer. His residence was at 33 Johnston Street. According to an account by George A. Roberts, chairman of The Veteran Car Club of Australia: “No 33 Johnston Street, Annadale, the adjoining suburb. is precisely where Ron Grant, Ken Bolger, Brian Marsland, and I met one Sunday morning in 1955 equipped with a mobile crane to extract the Brennabor from a garage or hose table where it had been housed since purchased by Mr. Maloney. The building and its internal courtyard, with access through an arched passage, had accommodated horses and horse-drawn vehicles, the passage in time becoming closed to provide additional living space, thus trapping the Brennabor within the enclosure. The alternatives to its removal were 1. dismantle the vehicle or 2. utilize a mobile crane. We chose the latter and hoisted the car from the courtyard, over the two story building into Johnston Street, where the tyres were inflated. As was the case at this time many cars were found, stored away in going condition, when no attempt was made to undertake complete restoration, the result being that Ken Bolger drove the car the following year, March 1956 on the first Blue Mountains Rally conducted by the Veteran Car Club of Australia. Club records show the owner as Ron Grant (No. 1 Foundation member) and list the Brennabor in his name in the club roster until 1963. Thereafter it is not recorded and it is probable that around 1964-65 it came into new ownership in Colac, Victoria, to again be locked from sight. In 1986 David Read found the car in Bordertown, which is situated near the eastern border of South Australia, close to the Victorian border. He then transported it back to Adelaide, South Australia, and did a complete restoration. According to his daughter, Jenny Mackay: “Dad fully restored the vehicle and in doing so the body was removed from the chassis and all other parts were removed for painting, etc. He did considerable work on the motor to get it running again. Dad’s notes are clear on the fact that there is no indication on any part of the car that there was any change to the original. All attachment holes were where they needed to be.” Following Read’s death, the car was sold in 2019 and became part of the Sammlung K collection. ♦

In terms of sales numbers, the Porsche 914 was a huge success, but its design remains controversial to this day. In the mid-1960s, when Porsche decided to broaden its range with a new entry-level sports car, it solicited design ideas from Giorgio Giugiaro, Pietro Frua, Jacques Cooper, and Albrecht Graf von Goertz. Ultimately the Goertz design remained a fascinating one-off, reports **Jan-Henrik Muche.**

SOURCE: BMW

Albrecht Graf von Goertz with his most famous design, the BMW 507.

ANOTHER BREADVAN

Spin the Globe

UPDATED GEOMETRY

PORSCHE 914/6 BY GOERTZ

PHOTOS: ANDREAS BEYER

There were plans to produce car in this small series.

ANOTHER BREADVAN

Spin the Globe

There was not much room left for luggage.

WHEN Porsche unveiled the VW-Porsche 914 as an entry-level sports car in 1969, marketed as a Porsche in the U.S., purist fans of the German sports-car manufacturer voiced their disapproval. The angular, flat design of the new model with hidden headlights was very far from the soft, organic, curvy shapes the brand cultivated with both the 356 and the 911. And there were a few designers who thought they could do a better job than Porsche did. One of them was Albrecht Graf von Goertz.

ALBRECHT GRAF VON GOERTZ

Albrecht von Goertz was born on January 12, 1914, in Lower Saxony. His father was a German aristocrat who married a Jewish woman. Goertz worked as a bank clerk, but he was afraid after Hitler's rise to power. First he went to London, then in 1936 he emigrated to the United States. He settled in Los Angeles and opened a shop where he customized various Ford models and created a one-off sports car, based on a 1940 Mercury chassis, that he called the Paragon. He had a chance meeting with Raymond Loewy, who admired the Paragon and ultimately got him a job at the Studebaker design studio. In 1952, Goertz moved to New York and set up a design studio.

Goertz, like his former boss Raymond Loewy, Brooks Stevens, Henry Dreyfuss, Giorgio Giugiaro, and Butzi Porsche, was an early industrial designer working on a wide range of products including clocks, watches, bicycles, kitchen appliances, and cameras in addition to his automotive designs. At the 1954 New York Auto Show, Goertz met Max Hoffman, the important importer of post-war European cars into the U.S. Hoffman was discussing new models with BMW that would appeal to the U.S. market. Through Hofman's connections, Goertz was commissioned to design two cars: the legendary BMW 507 sports car and the BMW 503 in both coupé and cabriolet versions. These designs led to Goertz's work with Toyota, Nissan, and obviously Porsche. Goertz died at the age of 92 in November 2006.

CONNECTION TO PORSCHE

Goertz was friends with the Porsche family. Upon seeing the BMW 507, Ferry Porsche asked him to design a four-seater sports car for them. The result, a 1:1 scale plaster model featuring front dual headlights, had strong U.S. influences. Both Ferry Porsche and Louise Piëch, the children of Ferdinand Porsche, thought that it looked more like a Goertz than a Porsche, so the design was not developed.

In 1957 Von Goertz competed with in-house designer Heinrich Klie regarding a bigger Porsche model. Again, the Goertz design was not developed. This was the first time the two designers were pitted against each other.

A decade later Klie and Goertz competed again. This time, to keep costs down, Porsche had collaborated with Volkswagen on the new 914 model with bodies built by Karmann to replace the aging Karmann-Ghia. Because the new car was to be marketed as a Volkswagen, it could not resemble an existing Porsche model. Heinrich Klie worked around these parameters while designing the 914's unique shape.

While the 914/6 stumbled, the Volkswagen-powered 914/4 became quite suc-

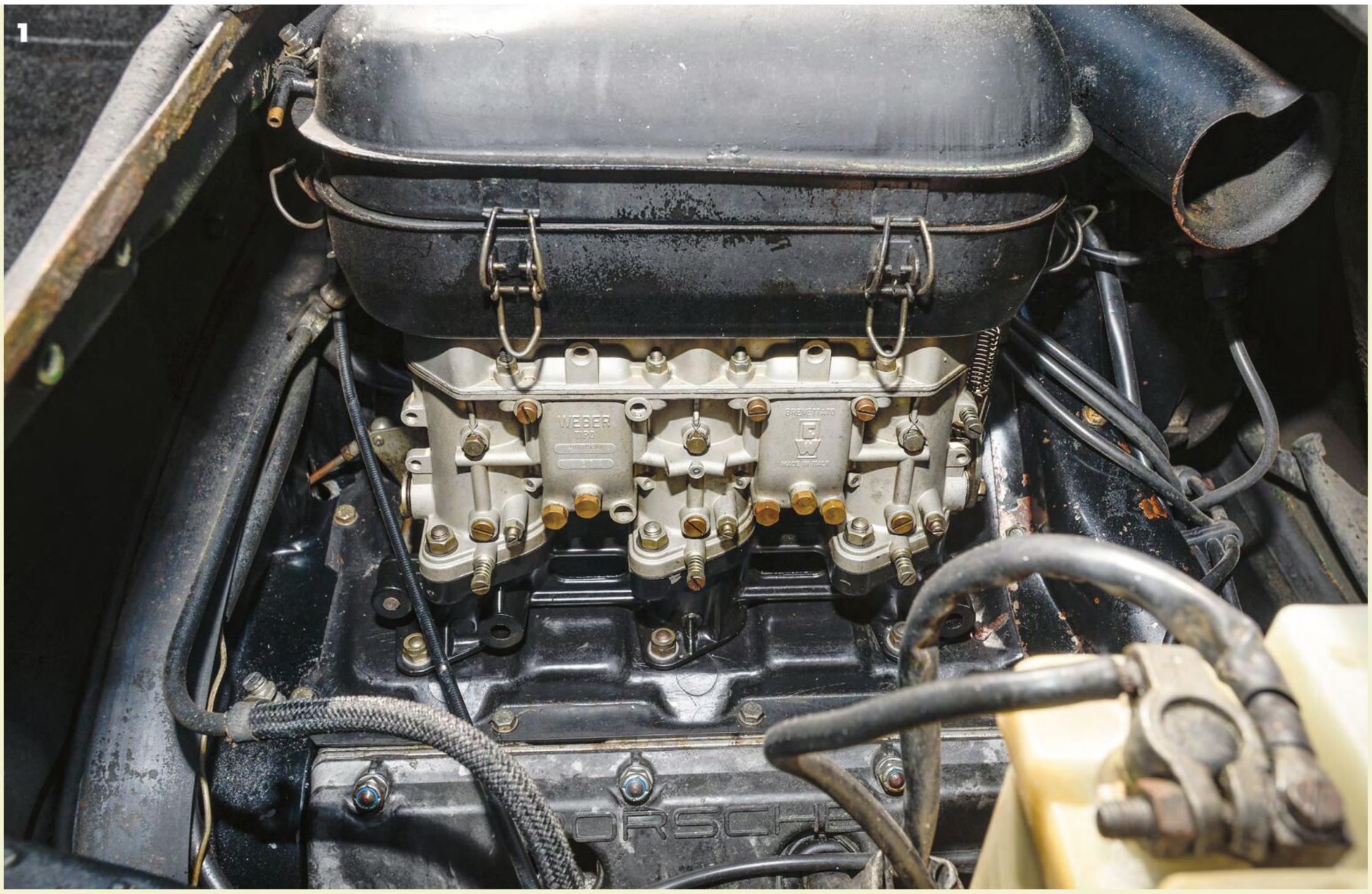
1 The low hoodline with folding headlights was a radical departure.

2 Quarter and side windows were original Porsche items.

3 This shape was made trendy by the Lotus Europa in 1966.

ANOTHER BREADVAN

Spin the Globe



cessful, outselling the 911 by a wide margin with over 118,000 units sold worldwide between 1969 and 1976.

GOERTZ TOUCHES THE 914

Goertz was not officially commissioned by the Stuttgart-based company to come up with an alternative body design for the 914, but he was given the Porsche family's tacit approval and encouragement to reinterpret the mid-engined sports car. Goertz received a 914 in 1970, relatively soon after the car had gone on sale. Unbeknownst to him, it was a race-oriented GT, or 'R' Works, version which was previously used by the factory to try out new parts.

Goertz's method was to rough out a few sketches and then make a model from plasticine. This was all swiftly dispatched to Turin coachbuilder Eurostyle, along with the 914, with instructions to modify it to his design so that it could be unveiled at the upcoming Turin Motor Show.

SOURCE: PORSCHE

A four-seater Porsche prototype, claimed to be designed by von Goertz.

1 The six-cylinder engine remained untouched.

2 This prototype predated the similar-looking Jensen GT by five years.

3 The stock interior was retained.

4 A clever rear spoiler also aided engine cooling.

5 Fuchs wheels are telltale signs that there is a Porsche underneath.

The unnamed prototype debuted at the Turin show in October 1970. It featured a radical new look with a low hoodline, folding headlights, 911-like fenders, and a rear that looked more like a shooting brake from the sides. The rear window was deeply recessed. This styling was popular since the unveiling of the Lotus Europa in 1966. Goertz cleverly retained the original 914 quarter and side windows along with the stock interior. The car looked more substantial, more purposeful, and decidedly more exotic.

While contemporary reviewers, such as Rallye Racing, hailed the "brave" direction Goertz took, Volkswagen-Porsche was quick to point out the one-off nature of the work. Porsche engineers at Zuffenhausen led Goertz to believe there was a possibility for a limited-edition production run, and sales brochures were printed. But for business reasons, VW-Porsche was unable to pursue development of any new design, and the plans were quickly shelved.

Goertz used the strikingly painted Porsche prototype until 1994, when he donated it to the Deutschen Automobilmuseum (German Automobile Museum) which resides at the Langenburg Castle. ♦

Technical Data

VOLKSWAGEN-PORSCHE 914/6

ENGINE:

Front-engine, rear-wheel-drive
Engine 6-cylinder, flat
Bore: 80 mm • Stroke: 66 mm • Capacity: 1991 cc
Maximum power: 110 hp @ 5800 rpm
Maximum torque: 157 Nm @ 4200 rpm

DIMENSIONS:

Length: 3985 mm • Width: 1650 mm • Height: 1240 mm
Wheelbase: 2450 mm • Weight: 940 kg

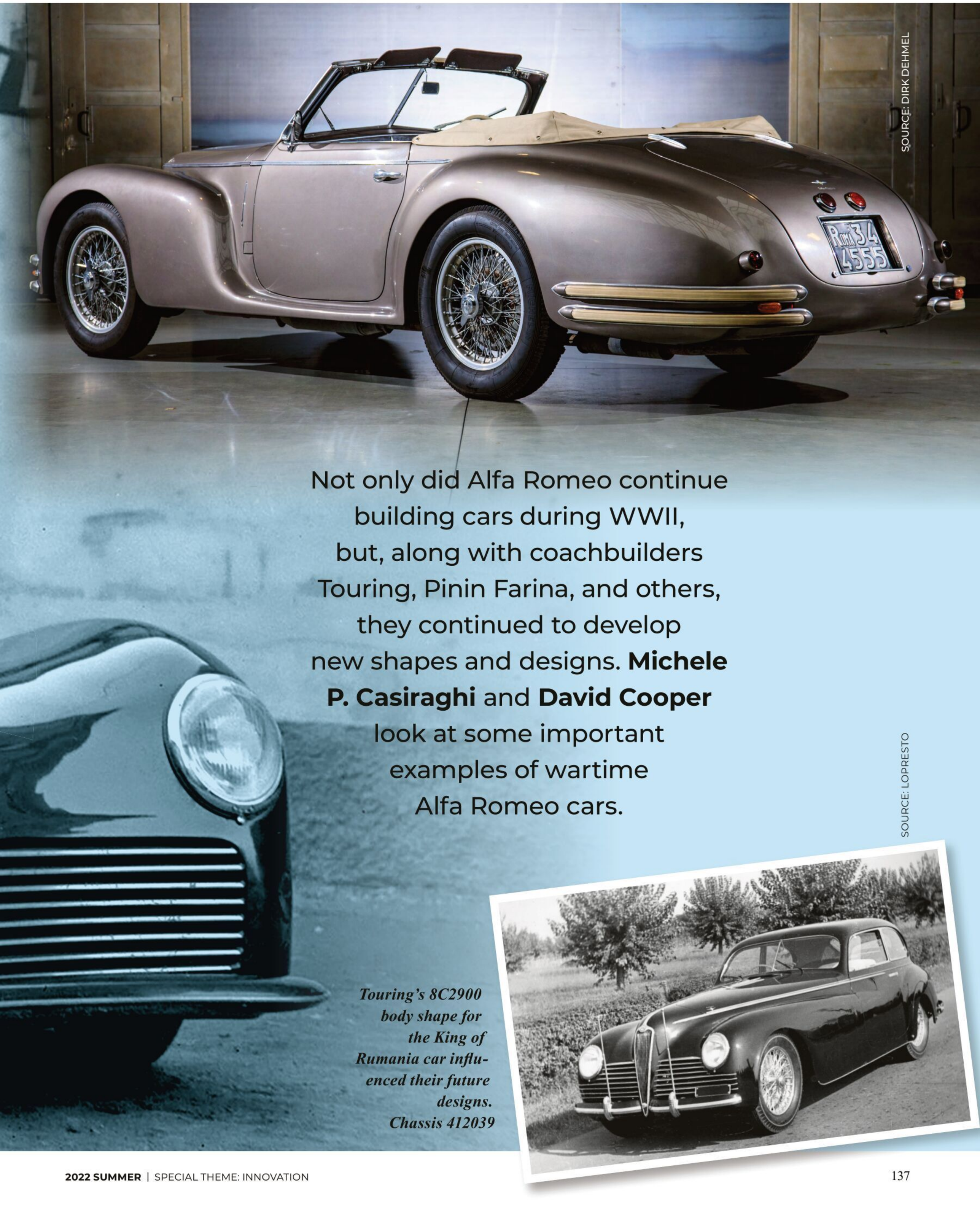
Von Goertz donated his prototype to the Deutschen Automobil-museum in 1994.

LIGHTWEIGHT AHEAD

ALFA ROMEO DESIGN INNOVATIONS DURING WW II

A streamlined design by Mario Revelli built just after the war by Bertone. Chassis 915516

Chassis 915527 is now on display at Thiesen Automobile Raritäten in Berlin.

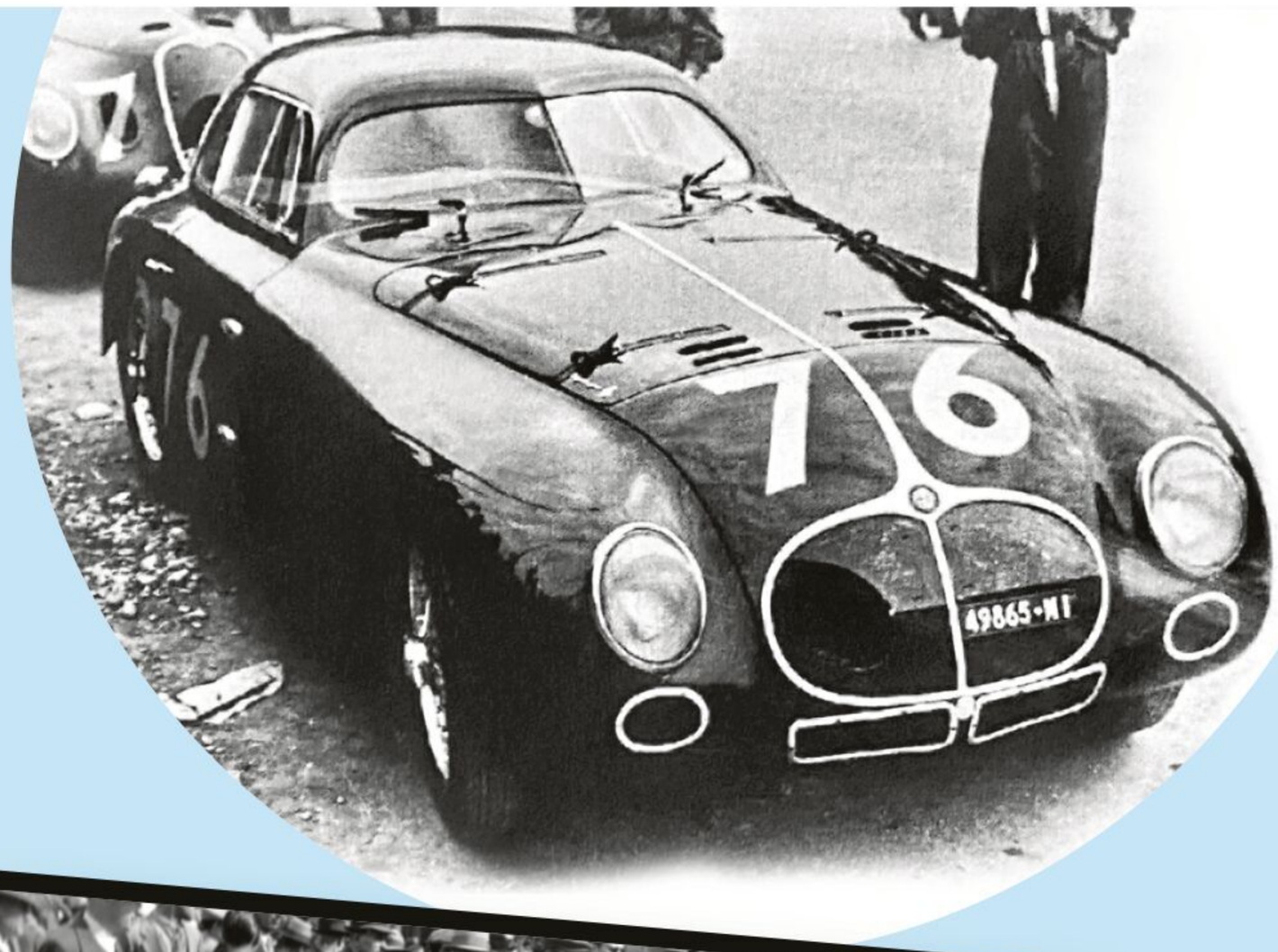


SOURCE: DIRK DEHMEL

Not only did Alfa Romeo continue building cars during WWII, but, along with coachbuilders Touring, Pinin Farina, and others, they continued to develop new shapes and designs. **Michele P. Casiraghi** and **David Cooper** look at some important examples of wartime Alfa Romeo cars.

SOURCE: LOPRESTO

Touring's 8C2900 body shape for the King of Rumania car influenced their future designs. Chassis 412039



SOURCE: LOPRESTO

Trossi and Lucchi finished 8th in the 1940 Mille Miglia in this streamlined Berlinetta by Touring. Chassis 915007

SOURCE: LOPRESTO

Following the success of the Mille Miglia cars, Touring moved the head-lights out to the fenders. Chassis 915029

IN THE 1930s, Alfa Romeo was not only a car manufacturer, but an industrial company producing many items, with fine automobiles being the jewel in their manufacturing crown. After the sanctions imposed on Italy after the Ethiopian war, they converted their main production to aero engines, military trucks, and components. Still, before the war in 1939, Alfa Romeo produced more than 300 passenger cars. During the war, remarkably, they managed to produce roughly 200 cars.

Even in those tough conditions, they were able to evolve new engineering and designs that established postwar automobile styling around the world. The debut of Alfa Romeo's new model, the 6C 2500, at the 1939 Berlin Motor Show marked the beginning of a design revolution for the Milanese brand. While the normal four-door sedan on the turismo chassis was kept unchanged over the years, the evolution of the sportier versions never stopped, even during the war, thanks to the work of Touring and Pinin Farina. Dressed by Touring in both berlinetta (a comfortable two-door hatchback) and cabriolet versions, the new model incorporated the fenders as part of the main body for the first time, blending the headlights into the fenders in a new aerodynamic shape.

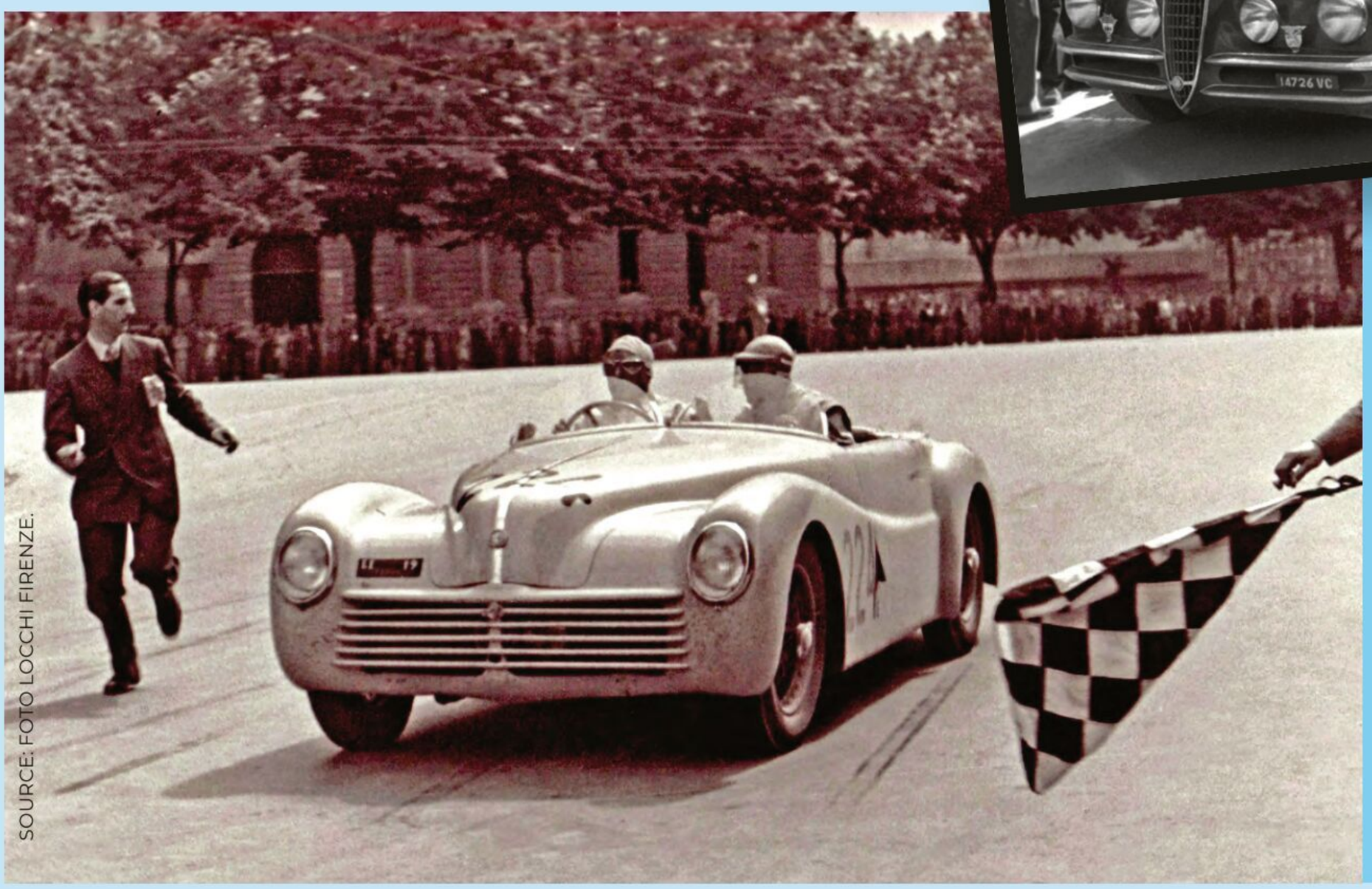
The result made the two-year-old 6C 2300B MM look suddenly outdated, but it was only the first step on the road to the "pontoon" style. In the next years, Touring evolved the design of its Alfa Romeos many times, and the design changes were not halted even by the war.

Production in those hard days is not easy to track, and some chassis were completed even years after production, making research more difficult, but some general steps can be identified. Already at the beginning of 1940, one year after the unveiling of the 2500, the headlights were moved to a wider position, following the success of the Mille Miglia race cars built the same year.

Soon the war forced Alfa Romeo to a stop. Production started again only in the second half of 1942, and Touring updated its design a second time. Headlights moved back to the original position, but the large front grille was replaced by a narrow shield: Alfa Romeo's most dis-

1944 saw the introduction of a larger front grille with the introduction of the shield trademark Alfa Romeo shape. Chassis 915207

SOURCE: FINARTE



SOURCE: FOTO LOCCHI FIRENZE.

As the fenders were incorporated into the body, Touring evolved the front view with four headlights- Chassis 915510

A Pinin Farina design built for Wolfram von Richthofen raced in the 1948 Mille Miglia. Chassis 915522

SOURCE: FONDAZIONE CASSA DI RISPARMIO DI BIELLA

Touring's streamlined cabriolet incorporates the fenders in the body, anticipating the Jaguar XK-120.

SOURCE: LOPRESTO

SOURCE: FONDAZIONE NEGRI

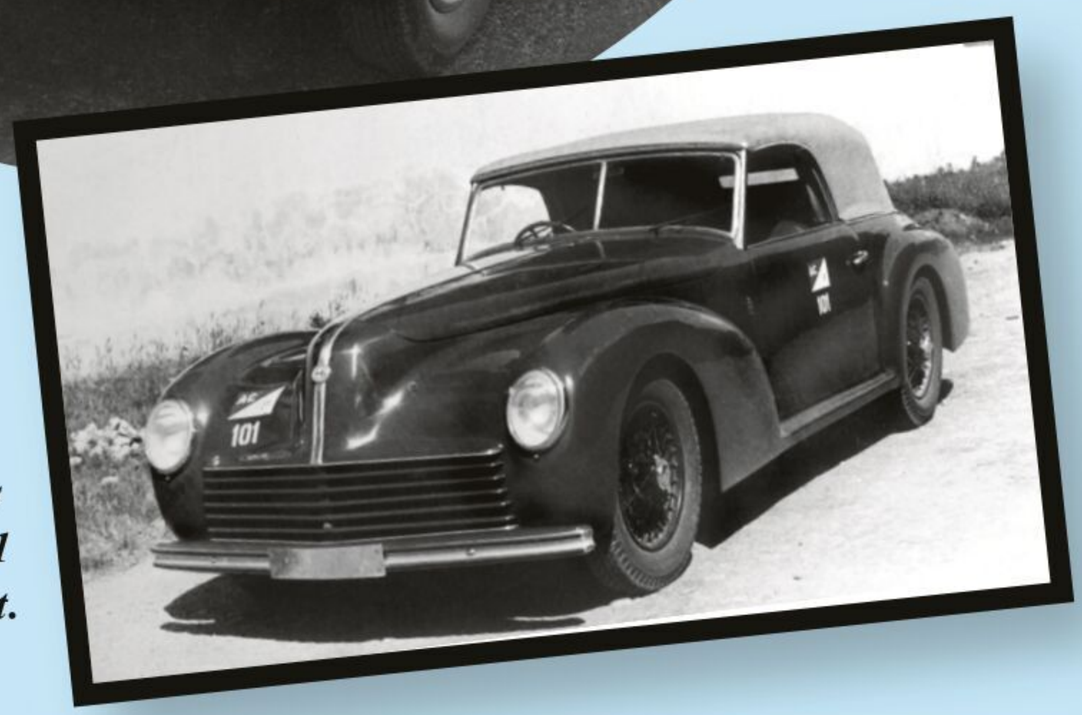
The front fenders were fully incorporated into the body design instead of being a separate design element. Chassis 815001

Just after the war, Pinin Farina designed a car with a higher side profile and simplified front clip.

SOURCE: MICHELE P CASIRAGHI

SOURCE: LOPRESTO

A Le Mans race car was rebodied by Pinin Farina with their wide horizontal grille. Chassis 915007



SOURCE: LOPRESTO

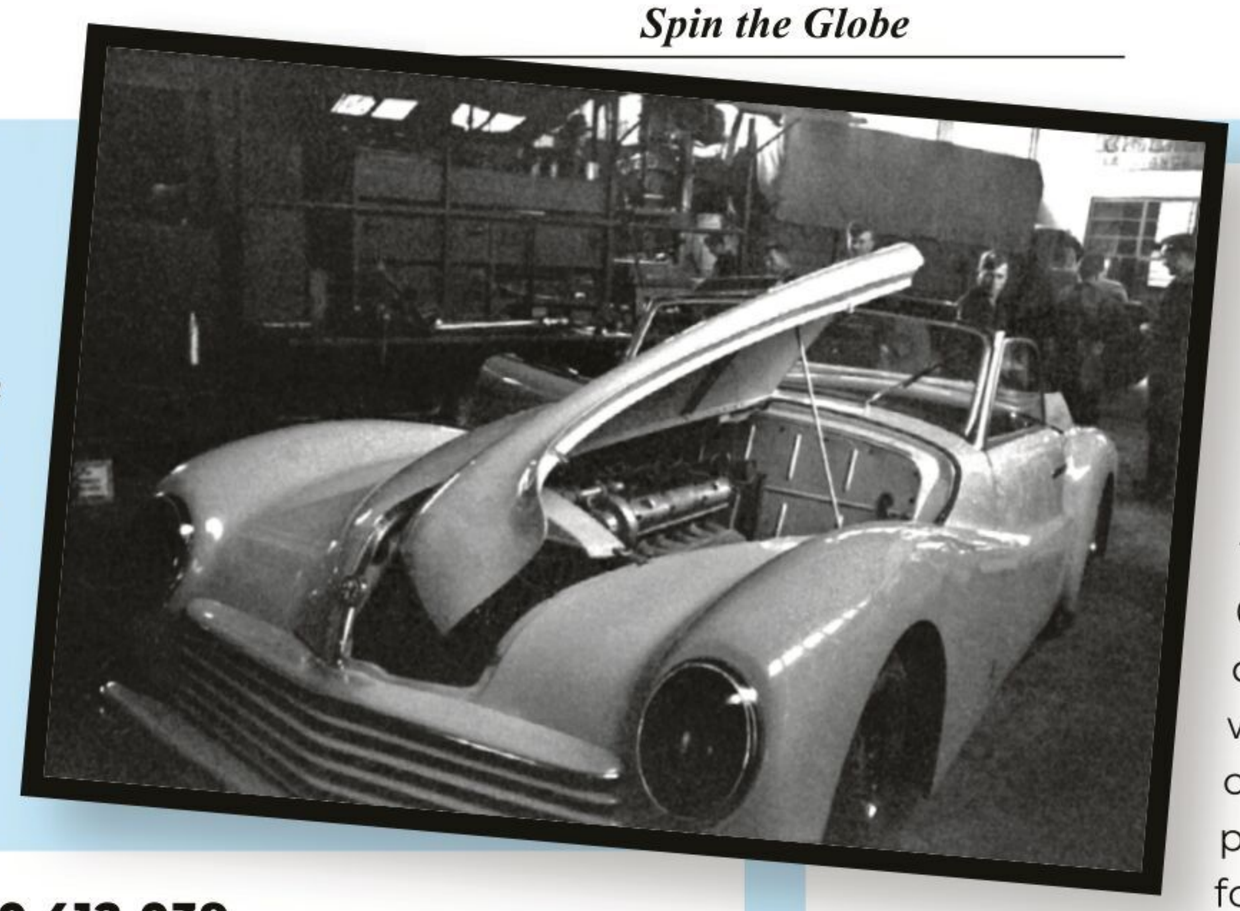
A different solution for the fenders can be seen on this Sport-based 1941 Cabriolet.

tinctive trademark was born. In 1944 a small face-lift saw the introduction of a larger front grille. In the meantime, a big revolution had been anticipated by a one-off 8C 2900B, a berlinetta built for the king of Romania in 1942 (chassis 412039). With a giant step forward, the car had the front fenders fully incorporated into the side of the car, instead of being a separate design element. The same body concept was made into a coupe on the 6C 2500 chassis, but only in 1946 was it produced in series. The new Berlinetta had four smaller headlights, a solution to fill the space created by the lack of the silhouette of the fenders in the front view.

This new design was soon adopted also by a coupé version on the shorter SS chassis, which would soon evolve into the legendary "Villa d'Este." Ten years after the debut of the 6C 2500, the new model had an entirely new look, despite the old mechanicals. While Touring was an established supplier for Alfa Romeo already in the 1930s, Pinin Farina started to work with the brand in an official way just before the war. In 1939 the famous coachbuilder had built a few beautiful roadsters on the 6C 2500 chassis, with a sleek design by Mario Revelli de Beaumont. The sloping front fender was a modern and elegant solution, which soon evolved when the 1939 Le Mans race car was rebodied.

Pinin Farina moved the headlights to a wider position, just like Touring's models, and added a horizontal grille with a central chrome decoration. The installation of a new body for old racing cars, at a time when finding a new chassis was not easy, was a common practice. Another older race car, chassis 815001, was given a new body evolved from the same design. This car also saw the introduction of the Alfa Romeo front shield, soon to be adopted by all models, but also a new shape of the side, along with a higher profile of the fenders. Between 1942 and 1944 the Pinin Farina cabriolet grew in success, with a small number of units built, mainly for German officers, all with differences in details.

Some of them had a more traditional design, with the fenders having their own volume, but the evolution of the front grille continued, with a wide range of solutions. The general shape was then updated at the end of the war, with an even higher side profile and a simplified front clip. Alongside the official models, both Pinin Farina and Touring (and many other coachbuilders) also built special bodies on the 6C 2500 chassis, sometimes with a more traditional approach, sometimes with very modern shapes. The evolution didn't stop after the war, but the biggest step toward a modern design was already done. ♦



SOURCE: AGENCE D'IMAGES ECPAD

The Pinin Farina design was finished and delivered in October 1943 for Wolfram von Richthofen.

1942 8C2900 412.039

BERLINETTA BY TOURING – FOR KING OF ROMANIA

The passion for Alfa Romeo of King Mihai I of Romania was probably passed to him by his uncle, Nicola, who also raced in Pescara in 1935 in a 6C 2300. In 1941 Mihai came to visit the Alfa Romeo plant and ordered a unique 8C 2900. The car was completed in the second half of 1942 and sent to Romania by train. Touring, entrusted with the building of the body, saw the opportunity to experiment with new shapes, giving birth to the innovative side design adopted by the 6C after the war. The car, with Touring body number 2750, was later sold but remained in Romania for most of its life. Sadly in the 1990s the car was brought to Germany and rebodied with a replica spider coachwork, removing the original one, a true milestone in Alfa Romeo design.

6C2500 SS 915.527

CABRIOLET BY TOURING

Known as one of the cars in the "Sleeping Beauties" collection of Michel Dovaz, 915527 was produced in August 1943 for Baron Gourgaud du Taillis, a French nobleman. Later the car was sold to André Held of Lausanne, Switzerland, and it stayed there for a decade, changing a few Swiss owners, until it landed in the Dovaz collection in the 1960s. When the unique collection was discovered in 1983 the car was in poor condition but still highly original. In 1992, 915527 came back to Italy and the new owner undertook a full restoration, which ended four years later, bringing the car back to its former glory. The car is now on display at Thiesen Automobile Raritäten in Berlin.

6C2500 SS 915.522

CABRIOLET BY PININ FARINA – FOR WOLFRAM VON RICHTHOFEN

This was one of the 28 6C 2500 Super Sports produced during the war. Many were custom built for German officers serving in Italy. This particular chassis was built for Wolfram von Richthofen, a German Field Marshal in the Luftwaffe managing the air campaign over the Mediterranean. Pinin Farina built the cabriolet body with their then characteristic horizontal grille and aggressive bulldog shape. The car was finished in Italy in October 1943, but by then von Richthofen was serving in the Soviet campaign, planning the ultimately unsuccessful airlift to support Field Marshal Paulus's army surrounded at Stalingrad. Von Richthofen died of a brain tumor in an American hospital just after the war ended. Shortly before, he sold the Alfa to an American army air corps officer stationed in Livorno. The American then sold it to an Italian racer who entered the car in the 1948 Mille Miglia, finishing third in class and 22nd overall. Afterward it competed in several races in Italy before being sold to another American officer, who imported it to the States. The car is currently in restoration.

SOURCE: DIRK DEHMEL

A Touring cabriolet built during the war. This car was in the Michel Dovaz "Sleeping Beauty" collection.

Streamlined design by Mario Revelli built by Bertone.

SOURCE: LOPRESTO

6C2500 SS 915.516

COUPE BY BERTONE – DESIGN BY MARIO REVELLI

This chassis was sold new to Oreste Peverelli, Alfa Romeo dealer in Como, in December 1942. The car was later bodied by Bertone with a beautiful one-off coupe coachwork. The design was by Mario Revelli de Beaumont, who wasn't shy about recycling the fender profile he created in 1939 for Pinin Farina. The car was then bought by the owner of Scuderia Milan, an important racing team born just after the war. Later sold to Switzerland and then to the United States, the car came back to Italy only in recent years. It is now one of the gems of the Lopresto collection, after a careful restoration which brought it back to the original configuration.

A wartime Alfa chassis with a Pinin Farina design from 1946 incorporating the fenders and a new front clip shape.

6C 2500 SS 915.510

COUPE BY TOURING – FOR COUNT FELICE TROSSI

Carlo Felice Trossi was a wealthy nobleman and successful gentleman driver who owned several important Alfa Romeos. Just after the war, he bought one of the Super Sport chassis assembled in 1942, number 915.510. The car was bodied by Touring in the winter between 1945 and 1946, with coachwork number 2873 and a very modern design. A similar shape is known to have been used also on chassis 915.505 (body 2875) and 915.507 (body 2872), both with cabriolet coachwork. The car remained in Italy for many years. It was discovered by Raoul San Giorgi with the roof cut off. Thanks to the photos found in the Trossi family archive, 915.510 was restored to the original shape, also with the original unpolished gray paint.

6C2500 SS 915.511

CABRIOLET BY PININ FARINA – DESIGN BY FEDELE BIANCO

The chassis was built during the war, but the car was not bodied until 1946. A young designer at Pinin Farina, Fedele Bianco, built two cars with similar designs. This is the one survivor. The design strongly influenced the Jaguar XK150, which debuted ten years later, as William Lyons and the designers at Jaguar spent a lot of time studying Pinin Farina's 1940s designs. 915.511 was sold to an Italian businessman, Arturo Fumagalli, and resold to an American in 1951. The car had an

SOURCE: ALFA ROMEO

accident in early 1951. It was crudely repaired and converted to left-hand drive. Shortly after, it was shown at Watkins Glen at the car show during the road race. It was purchased by an Ohio collector who owned it for many years. The current owner acquired it in the 1970s. It is currently in restoration and will be brought back to its original elegant right-hand-drive configuration and colors.

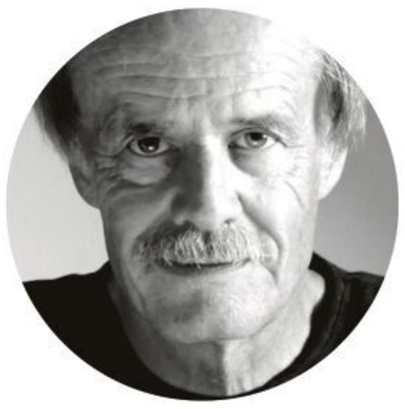
BIOGRAPHIES

Authors

DR. WERNER BEISEL

DR. WERNER BEISEL was born in 1950. He studied mechanical engineering at the Technical University of Berlin, specializing in automotive engineering. His dissertation focused on the operational behavior of oil-cooled power-shift multi-plate clutches. For 25 years he worked at ZF Friedrichshafen on the development of automatic transmissions for passenger cars, with focus on series development for all-wheel-drive transmissions with integrated transfer gear and front axle drive. For several years now, one of his research topics has been the Soden transmission, a preselector gearbox introduced 100 years ago, and the vehicles that were equipped with it. He is a member of the German Automobilhistorische Gesellschaft (AHG), a group of automotive historians.

New authors in this issue:



GERHARD SCHÜTZ

GERHARD SCHÜTZ was born in Bern, Switzerland, in 1949. He worked as a history and Italian teacher. Since his youth he has been building up an archive of automobile history, which is now a great help for his journalistic work. In 1990 he set up Freie Print Edition, a freelance agency. Today he works for German, French, and Italian magazines as well as zwischengas.com, a Swiss classic-car website. His specialties are racing-car technology between 1958 and 1981 and the history of aerodynamics. He is also researching the early history of electric mobility.

J. MICHAEL HEMSLEY

J. MICHAEL HEMSLEY had careers as an officer in the US Army and as a civil servant with the U.S. National Oceanic and Atmospheric Administration. Starting in 1980, he has written part-time about U.S. motorsports. Since his civilian retirement, his primary focus has been writing about classic cars as Associate Editor of Vintage Road & Racecar magazine, although he is also an occasional contributor to Sports Car, the magazine of the Sports Car Club of America. He is a member of the Society of Automotive Historians, the Motor Press Guild, and the International Motor Press Association.

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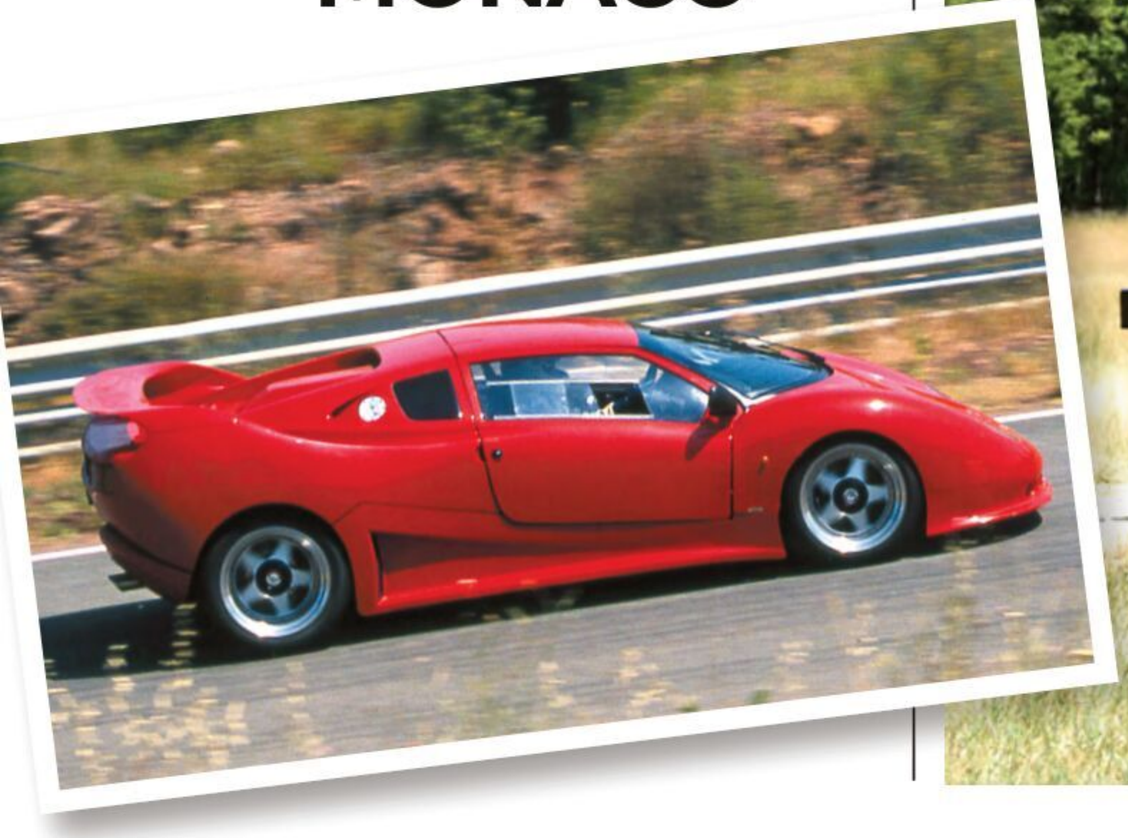

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