

Fifty Years of Engineering Excellence

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The Formative Years

This evening's story begins in a small village in the Bohemian forests, in 1875. For at least five generations the Porsche family had lived and worked in this area, as skilled tradesmen...weavers, carpenters, tailors, and tinsmiths...around the local market town of Reichenberg, later the Czech town of Liberec. Anton Porsche had been born in 1845, finished his apprenticeship, and established himself in Maffersdorf, as a tinsmith. Anton and his wife Anna had five children. The first, a son Anton, was to eventually run the family business. As a young apprentice, son Anton was injured in an accident at work and died soon after. The role of learning the family craft and carrying on the family business then fell to Anton and Anna's second son (third child), Ferdinand, born in September of 1875. Ferdinand's apprenticeship began when he was fifteen.

It was a source of great frustration to Anton that Ferdinand's true interest was not in the metal fabrication work of the tinsmith. Instead, he spent much of his time (wastefully, in his father's eyes) conducting experiments with electricity. At this time, they did not even have electricity in Maffersdorf's peasant surroundings...not even in the nearest sizeable city of Reichenberg! No one could understand why Ferdinand wanted to spend time with electricity...or even how he knew that electricity existed. Anton Porsche was a harsh and strict father, and he forbade Ferdinand everything that was unrelated to the tinsmith's craft. In kind, Ferdinand had a fierce temper and devotion to his interests. He continued to carry on his experiments in battery construction after work hours in the attic of the family home (some have said with his mother's tacit approval, although it is unlikely that she would have challenged Anton directly by openly encouraging Ferdinand's interest).

When Anton finally discovered Ferdinand's attic works, he destroyed all the batteries by stamping on them. Acid squirted out from the batteries and severely burned both his new boots and his skin. You can imagine that Anton was then madder than ever. At this point mother Porsche tenderly managed the question of whether perhaps Ferdinand should be sent to a special school in Vienna, to pursue what appeared to be his true interests. Anton continued to believe that Ferdinand should remain apprenticed to him and become a tinsmith. His compromise was that Ferdinand could take evening classes at the Imperial technical school in Reichenberg and that his experiments would be tolerated. One evening a bit later Anton returned home after work to find his house ablaze with light. At eighteen, Ferdinand had designed and built a generator, a switchboard, distribution network, incandescent lighting, door chimes, and even an intercom system. The only other electric light available in the village was at the large carpet factory. At this point Anton began to groom Ferdinand's younger brother, Oskar, as his successor in the family business, and Ferdinand was freed to move to work and study in Vienna.

Apparently Ferdinand had been paying more attention to his experiments than his studies. His grades at the technical school in Reichenberg were not sufficient to gain him admission to the university in Vienna. There he worked for a manufacturer of electrical equipment and machinery, keeping the machinery oiled and the floors swept. After work he would sneak into the lectures at the university, and was repeatedly recognized and thrown out. Eventually he was promoted to the design office at work, and university officials were sufficiently impressed with his determination that they let him stay for the lectures. He was not allowed to take exams and officially receive a degree, however.

Rise to Fame

Jacob Lohner owned an Austrian firm and was coachbuilder to His Royal and Imperial Majesty (of Austria). He had begun to switch from horse drawn carriages to automobiles. In 1898 Lohner decided that the internal combustion engines were too noisy and smelly for his customers, and he wished to switch to a battery powered electric car. This was right up Ferdinand's alley, and he applied and was hired.

One difficulty of battery powered automobiles in 1898 was the same as today...the weight of the batteries. To address this, Porsche came up with a design that would eliminate the weight and inefficiencies associated with power transfer to the driving wheels, i.e. transmission, gears, and driveshafts. Porsche came up with an idea of putting individual electric motors directly on the driving wheels. He then constructed a Lohner Electric with this design. Lohner sent Porsche and the car to the 1900 Universal Exposition in Paris. Porsche demonstrated the car on a test run to Versailles and back, and his design was awarded a grand prize. At 25, Porsche was famous. I would also like to note that this 1898 design of Ferdinand Porsche was also used in the General Motors EV-1. You may recall this futuristic looking two-seater introduced with great fanfare in 1996. I saw and had the opportunity to drive one of these cars at a special display at the Atlanta Olympics. While not officially claiming the concept of hub mounted electric motors as their own, the GM engineers did describe it as one of the car's innovations and certainly did not describe it as a design first created and implemented nearly 100 years before.

Later in 1900, Porsche developed and personally drove a racing version of what had become known as the Lohner-Porsche car. The best known test in Austria for motorcycles and cars was at that time a section of the Semmering road, near Vienna. This road was exactly 10km long, had an altitude differential of 400 m, for a 1 in 25 average incline, was dusty, and had a number of sharp curves. The record prior to Porsche's run was 23 minutes and 27 seconds. His time was 14 minutes and 52 seconds, for an average speed of more than 40 kph. This was widely viewed as a sensational achievement and further contributed to Porsche's fame.

At this point I would like to add a couple of observations about the role and nature of automobile racing early after the turn of the century. The design and development of automobiles was very much an arena of experimentation. There were many radically different designs. There were literally hundreds of

manufacturers. The race track at the time was an opportunity for the designs to be compared directly and for the winning designs and designers to gain fame and financial support for their production operations. That is a far cry from the rolling billboards of today. In Daytona, for example, the cars running under the manufacturers' names are far from anything being produced. Today's "stock cars" are different from their production namesakes in that they are driven by rear wheels instead of front, have fewer doors, different engines, electronic, and fuel systems, all have the same tube chassis, irrespective of manufacturer brand, and even sport paste-on headlight decals instead of the real thing. While there is certainly a contest underway in today's racing, it is a contest against rules written to provide equal performance. The effectiveness of those rules is seen in many cars being literally inches apart on the last lap of a 500 mile race. In contrast, Porsche believed in the value of auto racing as a testbed for engineering solutions. It is my guess, however, that he must also have enjoyed the sport of it to be as good a driver as he was.

As I noted earlier, one of the disadvantages of electric autos was the weight of the batteries. Batteries for one street model of the Lohner electric weighed four thousand pounds. This problem of battery weight led Ferdinand Porsche to one of his great early automotive breakthroughs. He installed an ordinary gasoline engine and a generator to feed current to the wheel-hub electric motors. This car was lighter, quicker, and more compact, and it still avoided the power and reliability losses of gear trains and drive belts. Porsche called this a "mixed drive" design. In today's market we see many manufacturers offering their version of a "hybrid" design, with an electric generation system and electric motors mounted to the hubs. Like GM in the case of its EV-1, these manufacturers do not give Ferdinand Porsche credit for developing the hybrid design concept nearly one hundred years ago.

Porsche's mixed drive car was a great success. Orders came from as far away as England and Prussia. German generals drove them. Porsche took great pride in the fact that as a reservist in the Fourth Regiment of the Imperial Infantry he chauffeured the Austrian commander-in-chief, Archduke Franz Ferdinand, in 1902, in a car of his own design (and at the age of 27). Lohner was happy, orders were rolling in, and he saw little need for the cost of additional improvements. Porsche split.

Corporate Design Engineer

Porsche then went to work for Austria's biggest firm Austro-Daimler. Their best selling car was called the Maja, and here another bit of digression is in order. In 1898 a well-established Austrian firm decided to build and sell motor cars. Since they had no experience, they went to Daimler, in Stuttgart, and negotiated construction under license, under the name of Austro-Daimler. There was also at that time a wealthy man by the name of Jellinek, who elected to invest in the promising motor industry. His investments included the Daimler works. Mr. Jellinek had two daughters, of whom he was very proud. The Austro-Daimler works named a new model after one of them, the Maja. The central

Daimler works, in Stuttgart, introduced a new model named after the other, the Mercedes. It is this latter sister whose name decorates our parking lots today.

The Maja was Porsche's first experience with a purely gasoline-powered car. He completely redesigned the car, and sales began to take off (the name was changed at about this time). He also developed a racing version, and three of these cars were first raced in 1909, with Porsche driving one of them. It was a long distance race and rally. The team did not win the event, but it was awarded a prize for reliability. There was a banquet after the event to award prizes, but Porsche was absent. The team owner later found him in a small room, chewing a dry bread roll while he sketched a new design for next year's event. (I might add here that Porsche seemed somewhat famous for always carrying a dry bread roll in the pocket of his jacket, so that he could more easily work through meal time). In this new design, Porsche developed a compact, high speed racing engine from the Austro-Daimler airship engines he had designed two years before. It had 5.7 liter capacity, compared with engines in many racers of more than twenty liters. The valves were operated by a single overhead camshaft, a feature that finally was adopted by American automobile manufacturers in their sportier models in the late 1980's. The top speed of this new model was 87 miles per hour. It placed first, second, and third of the 170 entrants in the 1910 event, with Porsche himself driving the winning car.

In 1913 Austro-Daimler took over Skoda, a manufacturer of armaments, and Porsche began to develop artillery for the Imperial Army. Three of these works are especially notable. First, he developed a tractor capable of moving the 420mm mortar, whose barrel alone weighed twenty-six tons and whose shells weighed one ton each. To move this gun, Porsche designed a tractor-trailer combination, with the tractor carrying a gasoline engine and generator which fed electric power to a hub-mounted electric motor on each wheel of the tractor and the trailer. From the same basic idea Porsche developed a cross-country wagon train. The tractor carried the engine and generator, and each wagon was driven by its own electric motors. One description of this device said that it was possible to disconnect the wagons from each other and then drive them separately across bridges that would be unable to carry the weight of multiple, connected wagons. This machine was valuable in delivering supplies through the mountains of Italy during the winter. Porsche's third wartime effort was further development of an airplane engine that he had originally designed in 1912. It was a four cylinder, air cooled, horizontally opposed engine with overhead valves driven by pushrods. I mention this design because it was the forerunner of the engine used in Volkswagens and Porsche automobiles until very recently. In 1917 Porsche received an honorary doctorate from the Technical University of Vienna, his first college degree.

After the war, Austro-Daimler was struggling. Armament contracts were gone. The economic ruin of four years of war had greatly diminished automobile orders. It attempted to develop luxurious cars that would appeal to the few individuals with enough money to afford them. Porsche began seriously to work on development of a smaller car that could be made available to the general population. He was permitted to pursue this design development under the guise

of a new racing program. Its success is demonstrated by the fact that in 1920 Austro-Daimlers started in 51 events in 15 countries and won 43 of them. The design clearly was sound. The company managers were facing increasing financial pressures, however, and they cut Porsche's development budget and refused to pursue commercial production of his small, successful racing vehicle.

Porsche moved to Daimler, in Stuttgart, as technical director. The firm merged with Benz three years later. Here he continued the development of the monstrous six-liter Mercedes with efforts both to reduce their two ton weight and to increase their power, in part through supercharging. While not at all practical, these cars are still seen as stunning examples of quality and sophistication without regard to cost. These models regularly sell for seven figures today.

Porsche's interest in developing a smaller, less expensive car for the general population continued. America was said to have a car for every six people; Germany had a car for each 200 people. Porsche wanted to change all that, but his ideas were seen as radical by the Daimler-Benz directors and he fell out of favor. Just before leaving Daimler-Benz in 1928, Porsche sketched out a new design for a racing car. It had twin overhead camshafts, a gearbox integrated with the differential, and swing axles in the back. None of these features existed then and all are common practice today, seventy years later.

After a brief tenure with the Steyr factory which he quickly found was in financial ruin, Porsche returned to Stuttgart, to open his own firm: Doctor Engineer F. Porsche Incorporated, Construction Bureau for the Manufacture of Motors, Motor Vehicles, Aircraft, and Ships. Here he worked on projects with the automobile firm Wanderer and motorcycle manufacturers Zundapp and NSU. These led to refined designs for a small, reliable car. Prototypes were constructed, but there were no funds for putting them into production. It was at this point that Porsche had to borrow against his life insurance to pay his workers. Also during this period (1932) Porsche continued to work on the design for an "ultimate" racing car. It would be light-weight, have a V-16 engine producing 600 horsepower, coolant flowing through the tube frame, independent suspension on all four wheels, and torsion bars. The rear engine design of this car and its manually controlled supercharger did not exist at the time and are among today's state of the art features at the highest levels of automobile competition.

There was an incident in 1932 that demonstrates the high respect for Porsche's engineering skills. He was invited to Russia to see their technical progress during their reconstruction. Porsche was surprised at their openness and curious about their intentions with him. At the end of his visit he received a contract. If he would sign it, all of Russia was before him...the motor vehicle industry, tank production, electrical works, and the productive power of millions of Russians. He would be "State Designer of Russia", and he would find a blank check at the Bank of Moscow for any research work he wanted to undertake. Given his financial straits, this must have been a very enticing offer. It would have required him to cut off his contacts and relationships with Germany, however.

It was at this point that Porsche described three ideas he wanted to see become the crowning efforts of his life's work:

- a cheap and useful small car, for the people
- a racing and sports car with which he could push the limits of technical possibility, and
- a simple but useful tractor.

Work for the Government

It was also at this time that Adolph Hitler came into power. He wanted to establish auto racing supremacy in Germany and was providing an enormous grant for that purpose to Daimler Benz. Auto Union had been formed from the firms of Horch, Audi, Wanderer, and DKW (the origin of the four rings symbol on today's Audis). Porsche's old friends at Wanderer wanted him to come and present his racing car design to Hitler, so that they might receive a similar grant. Before he could make his presentation, Porsche was told that there was no reason for a second grant and that the request was denied. Porsche's fury came forth, and he launched into a thirty-minute flood of technical argument. Hitler changed his mind completely and awarded Auto Union the same government grant. This unleashed a fierce competition between Auto Union and Daimler-Benz, with both firms using racing cars designed by Ferdinand Porsche. A series of further developments of Porsche's Auto Union design resulted in 545 horsepower and a five kilometer average speed record of 251.2 miles per hour...in 1937.

A few months after the racing car presentation, Porsche was again summoned to meet with Hitler, this time to discuss the people's car. An impossibly ambitious project for its design and manufacture was undertaken. To meet the impossible schedule, Porsche constructed the first three prototypes in the garage of his home, in Stuttgart. Each of these three prototypes successfully covered 30,000 miles of testing. Because they had the construction facilities, Daimler-Benz was contracted to build an additional thirty experimental cars of the VW series. I had the good fortune to see one of these cars on exhibit a few years ago. It was a bit larger than the eventual VW configuration, but was clearly recognizable. If you can imagine, it was a VW produced in the armor-like black steel and chrome often associated with Mercedes, and a Mercedes star on the hood. These cars also passed their tests with flying colors.

A new automobile plant was constructed in Wolfsburg for the production of VW's, and Porsche was to oversee the plant operations in addition to his role as design chief. Just as production started, the war began. Porsche first had to adapt his VW to wartime use. This resulted in the amphibious "Schwimmwagen" and the jeep-like "Kubelwagen", some of which were in the configuration of a "half-track". Porsche was then engaged in tank design. He designed the air-cooled (his favorite method) Tiger tank, a self-propelled 88mm gun named the "Ferdinand", and the Maus. The latter was Hitler's dream of an invincible mobile fortress. It was twenty feet high, weighted 180 tons, carried ten-inch thick armor and a 180 mm gun. Since no bridge could carry it, the Maus was designed to be able to wade underwater to cross rivers. As with Porsche's earliest designs, it

was powered with electric motors. Unfortunately, the Maus would crush foundations in cities through which it went, and it often sank in its own weight in soft terrain. It was a stupid disaster, and only two were built, neither of which ever fired a shot in anger.

In June of 1945 Ferdinand Porsche was taken by the Americans to an interrogation center which had been set up for people of prominence. They were convinced that his efforts centered on engineering and not politics and released him. Then in November of 1945 Porsche was invited to the French Headquarters in Baden-Baden, to discuss the development of an air-cooled French people's car. Porsche was arrested on charges that he had mistreated forced laborers working at the Peugeot plant, when it had been captured and placed under the control of Wolfsburg operations. My readings indicate different motivations, however. Louis Renault had recently been arrested on charges of collaborating with the Germans and had had his plant confiscated. The French government wanted to talk with Porsche about bringing the Wolfsburg operation to France and setting up a factory to produce inexpensive, rear-engined, air-cooled French cars. The other French carmakers were very uncomfortable, and they convinced Jean-Pierre Peugeot to bring charges against Porsche, to get him out of the way. There was later evidence that Porsche had actually prevented the Peugeot workers from being deported to Germany, he had prevented the Peugeot directors from being arrested after the plant had been sabotaged, and he had even saved Jean-Pierre Peugeot's life when the Gestapo arrested him on a visit to Wolfsburg. Peugeot had been selling parts to Germany throughout the war. Porsche and his son in law were taken to Paris and then to Dijon, where at the age of 72 he was paraded through the streets in chains and locked up in unheated dungeon.

Porsche's son Ferry had been an active participant in his engineering work for his entire life. Ferry was imprisoned by the French for only a short while. He then set up an engineering design shop in an old Austrian sawmill and was able to sign a contract with an Italian industrialist for design of a new racing car and thereby raise the million franc ransom for the release of his father and brother in law. Ferdinand Porsche was subsequently tried in his absence and acquitted on all the charges by the French, but his health was broken.

The Porsche Automobile

Shortly after Ferry was released from prison and had returned to Austria, he also developed the final designs for a sporting car based on some 1939 VW sports prototypes and the earlier Wanderer. He constructed the first of these Porsche automobiles in his garage in 1948, and the photos show his father's obvious pride. Porsche's doctors had forbidden him to work, and his life had lost all purpose. Sadly, he took little part in the design of the only cars to bear his name, although they were based on designs he had developed twenty years earlier. At one point he paid Ferry the high complement that these cars were as if he had designed them.

Most of the parts for the early Porsche automobiles came from VW. Payment for parts was very difficult, and there are stories of the Bosch spark

plugs for the first cars being obtained from Germany by one of the employees filling his pockets with them and then returning home. Ferry had estimated that the total world demand for the Porsche automobile would be 500 units. By 1951 they celebrated the 1000th car, and by the end of this model run, 15 years later, 78,000 cars had been built. The following Porsche design, the 911, had a model run of thirty-five years and its offspring are still in production.

It was very difficult for the Porsche plant to keep up with demand in the early years. One of the production limitations was their highly skilled panel beater. This man's job was to form the aluminum bodies by hammering sheet metal over wooden forms. This artist was also given to excessive drinking, and when he would take one of his frequent leaves, the production line stopped until he recovered and returned. There appears to have been a product allocation practice to offset the lack of supply, however. One report suggests that the key mechanics at Porsche tested a customer who might come into the works, to find out if he was a good enough driver to change gears without making a noise. If he could not, the mechanics would conclude "We shan't sell him one, he doesn't deserve it."

Final Success

As described in Automobile Quarterly:

"Only in his final months was he (Ferdinand) able to see that all his work had not been in vain. In September 1950 he went for the first time since the war to Wolfsburg. On the way, he and his son Ferry passed shoals of VW's crowding the autobahns, and for Porsche, coming at the end of his captivity and illness, it was too much. The old man broke down and wept. Yet if Porsche was an artist – and he was- he was unusually fortunate. Not many artists are lucky enough to see their work valued at its true worth before they die." In fact, however, Ferdinand Porsche was not able to see the unbelievable success of his "people's car". It became the most popular automobile in the world.

Ferdinand Porsche died in January of 1951. His eulogy included:

"We are not only standing at the bier of a great designer, but we are burying with him the heroic epoch of the motor car. Ferdinand Porsche was the last of the great designers whose name was famous all over the world...Today's designers remain anonymous, their names being only known to their colleagues in the same line. The public today knows much better the names of the organizers and financial bosses of the companies – he who rests before us here was blessed by a kind fate which handed the motor car to his inventive genius and on which his creative ability could find complete fulfillment."

- and thus ended the "Fifty Years of Engineering Excellence" of Ferdinand Porsche

There is a brief post script:

Over the next fifty years, the Porsche automobile had unmatched success in competition. Since 1949, Porsches have won the 24 Hours of Le Mans 15 times, the Daytona 24 hour race 19 times, the Sicilian classic Targa Florio 11 times, and Porsche is the only sports car to have won the Paris to Dakar desert

rally. Porsche has been crowned World Endurance Champion in sports car racing 14 times. The most powerful sports car ever was the 1,000 plus horsepower Porsche 917-30. Following Ferdinand's belief, this competition success was reflected in the Porsche production automobiles. Until his death in 1998, Ferry Porsche claimed that quality always came before production numbers and cost. Whatever was necessary to produce the highest possible quality and the highest possible state of technical advancement is what was done.

- so we now know that Ferdinand's life was followed by yet another "Fifty Years of Engineering Excellence" in the form of the Porsche motorcar.

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