



# Built for Speed

## The Checkered Career of Race Car Designer Harry A. Miller

By Timothy Gerber

*The subject of an upcoming segment on the Wisconsin Public Television/Wisconsin Historical Society collaboration Wisconsin Stories, Harry A. Miller and his innovative designs dominated Indy car racing throughout the 1920s.*

**T**HE 1928 running of the Indianapolis 500 was spectacular in many ways. Louis Meyer, a relatively unknown relief driver, had taken the checkered flag at speeds near 100 miles an hour for every lap. The lead had changed hands three times before Meyer, who had crept all the way from ninth place, took home the coveted trophy and the \$30,000 purse. Meyer's car that day was a supercharged Miller Special. In fact, nine of the top ten finishers that day were built by Harry Miller. This was the most dominant showing of one car manufacturer in the history of the Indianapolis 500 and would be the peak of Harry Miller's career.

A native of Wisconsin, Miller was one of the most visionary designers in the history of auto racing. His designs and those of his highly skilled engineering teams compiled by far the longest string of victories and formed the first dynasty in racing history. Miller, however, was a poor businessman and manager, and these failings ultimately overshadowed his successes as an engineer and designer.

*Left: Harry Miller displays one of his 91 c.i.d. (cubic inch displacement) formula, eight-cylinder engines. The 91 was the jewel in the Miller crown.*

Miles C. Collier Collection



Courtesy of Joan Randall

*Two Harry Miller enthusiasts take a 1935 Miller/Ford out for laps at the 1998 Millers at Milwaukee Vintage Indy Car Event, an annual gathering for Miller collectors.*

Harry Miller was born in Menomonie in 1875. Miller's schoolteacher father was of German descent and spelled the name Mueller; Harry eventually changed his surname to Miller to simplify spelling. To the chagrin of his parents, who never understood his love of mechanical

things, Miller left school at the age of thirteen to take a job in a local machine shop repairing and maintaining steam "donkey" engines in the local lumber yards and quarries.

At seventeen Miller left Menomonie and moved in succession to Minnesota, Idaho, Utah, and then back to Menomonie. In 1895 he moved to Los Angeles, where he worked in a bicycle shop and built custom racing parts for factory bicycles. Like Barney Oldfield and many other early racers and designers, Miller got his start in bicycle racing. While in Los Angeles he met his future wife, Edna Lewis, and they were soon married. Shortly thereafter, the couple moved back to Menomonie to stay with Miller's parents. In Menomonie Miller took a job as foundry foreman at the Globe Iron Works and in his spare time experimented with motorcycles and with boats powered by outboard marine engines. In the shop where Miller tinkered with outboard engines, another machinist took note. He was Ole Evinrude, the inventor of the outboard motor. Miller and Evinrude

worked in the same shop, but the engine that Miller developed was a four-cylinder, four-stroke, while Evinrude's was a one-cylinder, two-stroke engine. In this early part of his career, Miller exhibited what would become a characteristic inability to concentrate on any one project a time. He always worked on multiple projects and therefore left many good ideas undeveloped.

In 1900 Miller had had enough of small Menomonie, and he and his wife left for San Francisco, where he found work in a bicycle and motorcycle shop. There Miller constructed a rudimentary car without a clutch or transmission, and he invented and patented a type of spark plug. He eventually sold the patent rights for the spark plug to the Peerless Motor Car Company and used the profits to pursue a career in automobile manufacturing. He left California in 1905 and jumped from Toledo, Ohio, where he worked for Kirk Manufacturing, to Lansing, Michigan, where he was a mechanic for the Olds Motor Works in 1906. In 1908 he was a riding mechanic during the Vanderbilt Cup Races on Long Island. The car that Miller rode in was a failure, and he never stepped into the cockpit of a race car competitively again. From then on he turned his full attention to engineering and design.

In 1907 Miller built his first Master carburetor. The carburetor had a series of extra jets that opened up when the car reached higher speeds. It was perfect for vehicles that ran at high speeds for extended periods of time, such as race cars, police cars, and fire engines. Miller managed to find investors, and by 1911 his business was booming. In May of 1911 he went to Indianapolis for the first time and talked to anyone who would listen about the Master carburetor. It was so popular that it dominated the market until 1921, when more efficient carburetors were introduced. The success of the Miller



Indianapolis Motor Speedway Museum

*Though the sleek and sophisticated 1935 Miller/Ford was beautiful, it was not successful. None of these cars that started the 1935 Indianapolis 500 made it to the finish line.*

Carburetor Company allowed Miller to substantially increase his involvement in the auto industry.

In early 1915 Bob Burman, a famous driver, hired Harry Miller to build a replacement engine for a damaged race car. The engine in Burman's car had been manufactured by Peugeot of France. Miller and his engineers rebuilt the Peugeot engine. They machined the pistons out of aluminum alloys and made them 44 ounces lighter than the steel originals, producing an engine much lighter and more powerful than before. As a result, Burman won the 200-mile Southwest Sweepstakes road race at Oklahoma City and a 25-mile race at Providence, Rhode Island, the same year. Burman ordered another rebuilt Peugeot motor from Miller, but before the duplicate engine could be delivered Burman was killed when a blown tire sent his car into a terrible spin at the Corona Grand Prize Road Race in California. Burman and his mechanic hit two utility poles

and a parked car before being thrown fifty feet to their deaths. It was a terrible tragedy at one of the last great American road races.

After Burman's death, Miller returned to building carburetors. He was then approached by Lincoln Beachey, the foremost aviator of the time. Beachey wanted to produce aircraft engines, and he enlisted Miller to help. They worked together to design a sturdy and reliable six-cylinder engine. The engine was a success, but Beachey died in a plane crash, and the project died with him.

In 1917 Barney Oldfield commissioned Miller to build a new race car. Oldfield had been driving a Delage but was interested in something different. Oldfield and Miller came up with something completely different. The car's engine was unique in that it was designed to peak at 4,000 rpm, very high for the time. But the most fascinating attribute of the car was

its body. Affectionately known as the “Golden Submarine,” it was the most aerodynamic and streamlined car in the United States. The shape of the rear end was a perfect teardrop, and its enclosed shell was equipped with a roll cage that made it “crash proof.” Oldfield had great success with the car, but its enclosed cockpit nearly killed the driver when he had an accident in a flooded infield and almost drowned. Eventually Oldfield had the shell trimmed down to the regular open cockpits of the day and raced it on dirt tracks with great success for many years. During the 1917 season he drove at many dirt tracks around the country, including the Milwaukee Mile, and broke every international dirt track record.

Late in 1917 De Lloyd Thompson contacted Miller with the proposition to build an engine for heavy military aircraft. Miller agreed, and the two began designing a V-12 engine. Like all Miller engines, it was powerful and had a clean look. In a pattern that repeated itself throughout his career, Harry Miller lost interest in this project to pursue another offer—in this case the King-Bugatti engines being built for Duesenberg Motors in New York to fill military contracts. Just as the proj-

ect was getting started, the war ended, and Miller packed up his tools one more time to return to Los Angeles. The Miller Carburetor Company was “business as usual” for a few months until another project came up. For the project, called TNT, Miller was backed by a wealthy brewer to design a racing car that could also be produced as a sports model. As they began work on the TNT engine, Miller and Fred Offenhauser, who had been working together since the Burman days, added another engineer, Leo Goosen, to their team. The TNT project was eventually dropped because of financial reasons, but it served as a dress rehearsal for a team that would work together for many years and became legends in the racing industry.

The first engine the Miller group worked on after the TNT was the Miller 183. In 1920 the Indianapolis 500 established a formula allowing only engines that had a cylinder displacement of less than 183 cubic inches, or 3 liters. Driver Tommy Milton and a colleague named Ira Vail put up the funds for the 183-cubic-inch Miller “straight eight” engine. The engine brought together the best features from engines of other man-



Indianapolis Motor Speedway Museum

*Driver Barney Oldfield raced the aerodynamic, “crash proof” Golden Submarine, designed by Harry Miller in 1917, on dirt tracks throughout the country with great success.*

ufacturers, including Duesenberg, Ballot, and Peugeot. The Miller 183, built in 1922, was an immediate success. Cliff Durant, the son of General Motors Corporation founder William C. Durant, bought six of these cars and was very successful in the 1922 and part of the 1923 race seasons. In 1922 alone, Miller engines won ten races including the Indianapolis 500. Jimmy Murphy, a popular driver of the time, won the 500 in a Duesenberg car powered by a Miller 183 at an average speed of 94.5 mph. This was at a time when the Indy race cars held two people, a driver and a mechanic. Many of the races were also held on wooden tracks, which were extremely popular in the United States from 1910 until 1931.

In 1923 Indianapolis 500 officials again shaved the size of cylinder displacement and

went to single-seaters to keep up with the current designs of racing technology. The next cars to appear on the scene accommodated the one-man, 2-liter, 122-cubic-inch formula. Once again, Cliff Durant placed an order with Miller for these engines to replace his 183s. The 122 engine proved to be one of the most successful Miller engines of all time. Tommy Milton won the 1923 Indy 500 in a Miller 122. In fact, Miller cars won nine races during the 1923 season, all with average speeds above 100 mph. Harry Miller was supplying more cars to race teams than any other manufacturer in the business, and he had expanded to building chassis. His next cars would crown the golden age of American racing.

The year 1926 ushered in yet another new formula for Indy racing: the 91.5-cubic-inch or 1.5-liter engine, which was to last until 1929. Indianapolis 500 officials kept reducing the formula in order to lower speeds, but Miller kept building engines that could sustain high speeds. He was not alone. In 1925 Duesenberg had introduced the supercharger, an enclosed fan that forces large amounts of air at high speeds into the carburetor, enabling the engine to run at an extremely high rate. Before the supercharger the amount of air forced



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*The transfer case in the Four Wheel Drive Company Miller car overheated, possibly because of inadequate lubrication or a misalignment of gears. FWD engineers, including Frank Brisko, solved the problem by building a new transfer case with its own dry sump oil pump and tank. The case also had a selector gear box that allowed front drive, rear drive, or both.*

into the carburetor was totally dependent on the speed at which the car was traveling. This invention completely changed the speeds at which races could be run. Early in the 1926 season, due to a shortage of 91 parts and engines, the rules allowed races to be run with either 122 or 91 engines. Eventually enough parts and engines were made available to everyone, and after the 1926 Indy 500, all races had to be run with 91 engines. In no time Miller engines powered almost all the cars in the field.

Besides the 91 engine, Miller and his team made other improvements that helped his machines dominate auto racing. One of these improvements was front wheel drive. In 1923 Jimmy Murphy had come to Miller with an order for a front-wheel-drive machine. Front wheel drive had been introduced many years before, but with little success on the race track. Unfortunately, Murphy was never able to race in the 122 front wheel drive. He died on September 1, 1924, at the Syracuse dirt track when his car bounced off the inside railing several times before crashing through it and he became impaled on one of the rail posts. Murphy's heirs put the car up for sale.



Auburn-Cord-Duesenberg Museum, Auburn, Indiana

*Frank Lockhart won the 1926 Indianapolis 500 in a Miller Special with a supercharged Miller 91 engine. Harry Miller also designed the chassis.*

Miller's team kept working on the concept, and finally in 1926 his 91s with front wheel drive made their debut. The cars were extremely low and had larger front wheels than rear ones. Their front-wheel-drive design allowed them to take corners faster without the noticeable skidding inherent with rear-wheel-drive cars. For the most part the front-wheel-drive cars dominated, but in the hands of a skilled driver such as Frank Lockhart—possibly the greatest of all time—the rear-drive cars still won many races. In all, Miller 91s won thirty-eight races during the formula's brief history from 1926 through 1929. The tiny engines also broke many records. Frank Lockhart set the record for fastest lap in 1927 with a speed of 147.229 mph in a Miller 91 on the board track at Atlantic City. Cliff Woodbury set another record at Daytona Beach in 1930 with a measured-mile record of 180.9 mph. The 91s represented the peak of Harry Miller's racing success, but a string of failures and disappointments were to follow.

In 1930 the 91.5 formula was finished, and Indy went back

to two-person cars and bigger engines. Eddie Rickenbacker, the greatest fighter ace in World War I, former Indy racer, and new commissioner of the Indianapolis Motor Speedway, wanted to lure the big manufacturers back to racing, so he set the formula at 366-cubic-inch displacement. This extremely controversial decision was known as the "junk formula." Rickenbacker did this to increase diversity in the cars by making them compete with more "stock" machines after the dominance of the tiny 91s. Miller engines continued to dominate, but drivers were forced to take the superchargers off their machines. Cars also had to meet a higher weight requirement, disabling them little, if at all. Miller 183s and 122s came out of storage to continue winning. That year Miller engines placed in the top four at Indy.

In 1931 Harry Miller designed and built a four-wheel-drive car. By this time he was in terrible debt because of his poor business practices, and his new project in no way helped matters. Creditors swarmed around him, while the market was not ready for a newly designed car. More of a visionary



Indianapolis Motor Speedway Museum

*Frank Brisko of Radisson, Wisconsin, drove the Four Wheel Drive Miller in the 1933 Indianapolis 500.*

than a businessman, Miller chose to pursue his four-wheel-drive concept rather than to continue producing the rear-wheel- and front-wheel-drive racers that he had been working on for the past ten years. Unfortunately, Miller's four-wheel-drive race car could not have come at a worse time than during the Great Depression. No one had the money to buy such a sophisticated piece of machinery.

Miller's team built two of the fine-looking eight-cylinder automobiles and sold one of them to the Four Wheel Drive Company (FWD) in Clintonville, Wisconsin. FWD had built a strong reputation for its tough, sturdy all-wheel-drive trucks and military vehicles and seemed like the perfect sponsor for a four-wheel-drive racing car. Miller kept the other car and raced it under his own name. The two cars were among the top qualifiers in the 1932 Indy 500, but both succumbed early in the race to oil pressure problems. Miller's own car, bought after he declared bankruptcy, raced on the European circuit and finished seventh at the 1934 Tripoli Grand Prix hosted by Mussolini. The car was eventually broken up and the parts

scattered about. In the meantime, the FWD-owned car was transformed from an eight- to a four-cylinder and raced by Frank Brisko, a resident of the tiny village of Radisson, Wisconsin, in the 1933 and 1934 Indy 500s. In 1934 Brisko led the field for the first 177 miles, lost the lead, and then regained it at 280 miles. Luck was not with him, however, and long pit stops and mechanical trouble led to his finishing ninth. In 1936 the car was driven by Maui Rose, and it finished the Indy 500 in fourth place. In the early 1950s FWD loaned its Miller to Bill Milliken, Jr., for testing and road racing. The FWD car would finally get a chance to show its true colors. Milliken won the Equinox Mountain race in Vermont and the Edenvale Airport run in 1952. Four wheel drive was dominant in what would later become the standard for rally racing cars, and this car would come to be known as the last great Miller.

Miller's bankruptcy in 1933 forever ended the phenomenal team of Miller, Goosen, and Offenhauser. In fact, many of Miller's former employees and partners harbored more than a little resentment at losing back wages and promising careers.

Miller had few friends left on the West Coast and decided to try his luck back in the Midwest. This move signaled the beginning of the fall of Harry Miller.

Miller soon entered a partnership with the controversial Preston Tucker, a successful car salesman in the Detroit area who dabbled in auto design. Miller and Tucker had worked together once before when Tucker convinced Harry to let him use the Miller name to sell aircraft engines to the government. At that time the U.S. military was years behind the Europeans in aircraft engine design. Tucker was convinced that he and Miller could build aircraft engines superior to those being used in Europe. In a letter to the Chief of the Army Air Corps, Tucker led the military men to believe that the engines had already been built. Fortunately, perhaps, his efforts failed to yield a contract.

In 1935 Miller moved to Detroit. He decided to go into a partnership once again with the visionary yet misguided Tucker in a scheme to build race cars for the 1935 Indy 500 for Ford Motor Company. The fast-talking Tucker was able to gain the ear of Edsel Ford, president of Ford and son of Henry Ford. He convinced the Ford executives that he and Miller could build ten complete race cars in four months for the paltry sum of \$25,000 and some donated parts from Ford Motor Company. The Ford company was eager to promote its new V-8 engine. The cars would be powered by the 1935 Ford V-8, and Miller would design the chassis for them. Miller set his men to work immediately and had them working long hours six days a week to meet the deadline. The first Miller/Ford arrived around the middle of May and caused quite a sensation. The cars were among the most beautiful



Auburn-Cord-Duesenberg Museum, Auburn, Indiana

*Originally designed by Harry Miller for the Gulf Oil Company, this six-cylinder, rear-engine car was bought by Preston Tucker and raced in the 1947 Indianapolis 500, three years after Miller's death. The car dropped out of the race after the thirty-third lap.*



Courtesy of Gordon White

*George Bailey's car burns after his fatal accident in 1940. Fire was the nemesis of the Miller/Gulf cars, destroying two in accidents when the side gas tanks were ruptured.*

ever to be unveiled at Indy. They looked like European roadsters with graceful lines and sleek paint jobs. The independent front suspension was an ingenious new design that was the first to be seen on any open-wheeled racing car.

Only eight of the Miller/Fords were delivered by race time. Miller had lined up some top drivers, such as Pete De Paolo. The cars, however, had a mechanical fault. Overheating in the steering box caused by heat transfer from the exhaust system made the steering seize. De Paolo and the other drivers backed out. The cars had gotten to the track so late that they hadn't even been test driven. The problem with the steering box could easily have been fixed, but there was just not enough time. Five of the cars qualified at speeds above 109 mph, with four drivers making it into the race. Three of the four cars failed before the 70th lap. The fifth car made it to the 145th lap but pulled out after the machine locked up tight in the pits.

Henry Ford confiscated the cars out of embarrassment. Miller tried to lobby for the return of at least two of the cars for further development. Miller and Tucker quarreled over who should retain ownership of the two cars. A lawsuit

seemed inevitable, but Miller had obtained voting proxies from other stockholders and seemed to be in charge. By this time, however, Henry Ford was unapproachable by either of the two former partners, and he refused to release the two cars to Miller. The cars stayed in storage for many years until they were sold and broken up by various racing factions. Tucker's unrealistic promises and Miller's trusting personality led to disappointment for all involved.

In 1937 Miller entered into his final racing venture. Ira Vail was an old friend of Miller's who had done very well with the early 183 that brought Miller his first successes in the industry. Vail wanted two cars that would be used to race not only at Indianapolis but also at dirt tracks around the country. He put all of his faith in Miller and let him have full creative control over the project. Miller was always a clever designer, ready to innovate and try new things. Unfortunately, he no longer had the cooler heads of Goosen and Offenhauser to steer him away from impracticalities. Miller left Detroit for Pittsburgh to design the two cars.

In Pittsburgh Miller came up with some radical designs, one of which was a new type of radiator that completely sur-

rounded the engine. The engine was to be based on the Offenhauser 255 four-cylinder and set upon a beautiful chassis. Another innovation Miller introduced with these cars was full disc-type brakes, the first ever used on a racing car. About this time Gulf Oil Company took an interest in racing and contracted with Miller. The operation was moved to another area of Pittsburgh where Gulf had set up a new research and development center. Miller finished the original cars, and then Gulf immediately set about commissioning a new set of six-cylinder cars.

The first two Gulf cars failed miserably due to high engine temps and the new radiator, which did not have the strength to handle the rough dirt tracks upon which it was meant to race. The cars faded into obscurity, and Miller moved on to work on the six-cylinder cars. If the first two were radical, then the second group of cars was downright revolutionary. Gulf wanted to advertise a new line of gasoline with this car, and its only restriction was that the car run on the new product. Most other racing teams were using alcohol-based fuels, which burned faster than Gulf's new gasoline. This was a large handicap for the design team, but Miller considered it a challenge.

Miller decided on a rear-engine design, placing the engine directly behind the driver's compartment. There is no documented reason for the rear-engine design, and he must have done it purely for the technical challenge. The car was also to be four wheel drive, with gas tanks in compartments on either side of the engine. The car was extremely heavy at 2,100 pounds. One car was built by race time at Indy in 1938 but never participated in the race. The car was such a curiosity that it was impossible to get it ready by race time because of the enormous crowds hanging around the garage.

The design team changed many components on the Gulf cars, and they returned to Indy in 1939. Unfortunately the cars still did not fare well. By this time Miller was fed up with his lack of success at Gulf and decided to call it quits. He got out just in time. The cars were plagued by fire because of the side-mounted gas tanks. Driver George Bailey was killed in one Miller Gulf, while many of the other cars were lost in a garage fire in 1940. It was not a fitting end for a once great designer. Preston Tucker bought the last Miller Gulf to use in promoting his innovative touring car in the late 1940s. The car, like Tucker's auto manufacturing business, was a failure.

After the Gulf fiasco, Miller faded from the racing scene.



Auburn-Cord-Duesenberg Museum,  
Auburn, Indiana

*By 1940 Miller (shown above as a young man, c. 1895) had faded from the racing scene.*

He dabbled a little in aircraft engines and even kept in touch with Tucker regarding a scheme to build engines under a navy contract. None of these projects ever came to fruition, and he drifted from Pittsburgh to Indianapolis, then to Washington, D.C., and finally back to Detroit where he set up a small shop called Miller Engine Works. Edna had left him to return to California many years before to escape the harsh winters, and Miller lived practically like a hermit in his shop. Miller was suffering from diabetes, and he had skin cancer on his face. The cancer was bad enough that he had to wear a bandage constantly. His work began to slow.

Miller died of a heart attack in May 1943.

Although he had fallen on hard times, his accomplishments were many, as were his admirers and students. Fred Offenhauser continued to make fine racing engines that were present, and quite dominant, at the Indy 500 from the 1930s through the 1970s. Today Harry A. Miller is virtually forgotten by the average race fan, but his innovations in racing engines and car design and the racing dynasty that he built in the 1920s are an indelible part of racing history. ❧

### Resources and Further Reading

There are many works that deal with the life and machines of Harry Miller for readers who are looking for more information. The most comprehensive book is *The Miller Dynasty*, written by Mark Dees. It is currently available through Vintage Motorbooks, Beaverton, Oregon. Another writer who spent a great deal of time documenting the life of Harry Miller was Griffith Borgeson. His three books, *Miller, The Golden Age of the American Racing Car*, and *The Last Great Miller: The Four Wheel Drive Indy Car*, are available through Vintage Motorbooks. Borgeson's articles include "The Pre-Conquest Millers" in *Automobile Quarterly* Vol. 19(1) and "The Miller Front Drive Story" in *AQ* Vol. 21(4). Articles about characters included in the Miller story are "Barney Oldfield" by William F. Nolan, *AQ* Vol. 1(1); "The Fifty Year Reign of the Immortal Offy" by L. Spencer Riggs, *AQ* Vol. 31(3); "The Bob Burman Story" by Russ Catlin, *AQ* Vol. 19(4); "Murphy's Duesy—Conquering Le Mans and Indy" by Frederick A. Usher, *AQ* Vol. 25(1); and "1932 Miller FWD" by Kim Reynolds, December 1999 *Road and Track*. Howard William Troyer's *The Four Wheel Drive Story* is an excellent book about a Wisconsin-based company. For photos and Indy statistics during the Miller heyday see *The Indianapolis 500: A Complete Pictorial History* by John and Barbara Devaney.

### The Author



Timothy Gerber is a researcher for the Wisconsin Public Television series Wisconsin Stories, which will feature a story on Harry A. Miller's career in July. Gerber earned a bachelor's degree in history from the University of Wisconsin—La Crosse. As a small boy he was a family friend of the brother of Frank Brisko, the Miller FWD driver in 1933 and 1934.