

Tragedy and Triumph on the Track: The Indianapolis 500-Mile Race

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Race cars lined the track in eight rows of five, waiting for the pacesetter to head down the straightaway. It was Memorial Day 1911, the first running of the Indianapolis 500-Mile Race. Engines roared, exhaust shooting out of the cars like bullets, making the entire grandstands smell of petrol. As the pace car began moving through turn one, fans cheered in excitement. Within minutes, their cheers turned to silent horror. On the twelfth lap, driver Art Greiner lost control as he raced around the backstretch, slamming his car against the wall and throwing riding mechanic Samuel P. Dickson into the wood plank fence that bordered the track. Dickson died later from the wounds. Greiner told reporters, "I was perfectly conscious when we whirled through the air, turning over, and it is nothing short of a miracle that I escaped with my life. Dick - poor boy - I guess he never realized what happened, it was all done so quickly."<sup>1</sup> Spectators rushed onto the track to see the accident scene up close as drivers swerved to avoid hitting them.<sup>2</sup> Seven hours later, Ray Harroun claimed victory as the winner of what would become the "largest attended single day sporting event in the world."<sup>3</sup>

Since 1909, when the Indianapolis Motor Speedway opened with a five-mile sprint, forty-one drivers and fourteen riding mechanics have been killed at the track, 20 during the 500-Mile Race (Appendix A).<sup>4</sup> Over the same period, the automobile has evolved from an open-air buggy to a sleek motorcar with rearview mirrors, seatbelts, and all-wheel drive. From tragedies such as Dickson's death to the triumphs of Victory Lane, the Indianapolis 500 has

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<sup>1</sup> "Battered Racers Are Still Game," *The Indianapolis Star*, June 1, 1911, 9.

<sup>2</sup> Charles Leershen, "One Hundred Years of the Indy 500," *Smithsonian Magazine*, June 2011.

<sup>3</sup> Tino Belli interview, March 15, 2019.

<sup>4</sup> Dan Vielhaber, "Indy 500 Memorial Index," *IndySpeedway.com*, July 24, 2012.

brought about significant innovations in racing and consumer car safety.

It all began with the birth of the automobile. In the early 1900s, Indiana was home to many of the country's first carmakers, including Cole, Marmon, Studebaker, and Stutz.<sup>5</sup> Businessman Carl Fisher and three colleagues dreamed up a plan to create a test track in Indianapolis for the burgeoning auto industry. After pooling their money, the men started construction in February 1909 on more than 320 acres northwest of the city. By the end of August, there was a large oval, 2.5 miles long, which they named the Indianapolis Motor Speedway (Appendix B).<sup>6</sup>

Fisher was considered the "P.T. Barnum of the Automobile Age."<sup>7</sup> Born in Greensburg, Indiana, he dropped out of school at age 12 and at 17 bought a bicycle shop. Fascinated with speed, Fisher broke a record in 1904 by driving an automobile two miles in 2.02 minutes.<sup>8</sup> That same year he co-founded Prest-O-Lite Co., which produced car headlights nationwide, one of the early inventions that made night driving possible.<sup>9</sup> Fisher and his partners hoped the Speedway would be used for occasional races to test cars from different manufacturers against each other and to show off models to potential buyers. (In 1927 Fisher went bankrupt and sold his share of the facility, the first of several ownership changes.)

The Speedway was plagued with problems from the start. The owners wanted the track operational by Fourth of July 1909, but grading and drainage issues posed by Dry Run Creek in the corner of the property delayed construction. The original track was built of tar and crushed

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<sup>5</sup> "Indiana, a State of Change," The History Museum.

<sup>6</sup> "Aerial View of the Indianapolis Motor Speedway Track and Surrounding Area," Bass Photo Co. Collection, Indiana Historical Society.

<sup>7</sup> Dawn Mitchell, "Retro Indy: Carl Fisher was the 'P.T. Barnum of the Automobile Age.'"

<sup>8</sup> "Tracy's Record Broken," *The Philadelphia Inquirer*, Oct. 2, 1904, 14.

<sup>9</sup> Mitchell.

stone. Steamrollers compressed each layer of the track together. It took 500 workers, 300 mules, and a fleet of steam-powered machinery to reshape the landscape (Appendix C).<sup>10</sup>

Catastrophe struck the first racing event, a five-mile dash on August 19, 1909. Rubbing of the tires caused the track surface to crumble, resulting in multiple accidents at speeds of 57.4 miles per hour. Because of the poor track conditions five people died, including a driver, two mechanics, and two spectators. In the fall of 1909, the track's surface was replaced with bricks, deemed sturdier than gravel and less slippery than concrete but still fraught with problems. "The rough brick surface took a terrific toll as far as shaking up the cars is concerned and was responsible for countless mechanical failures."<sup>11</sup> Over the years, asphalt patches were added, and in 1962 the entire track was paved with asphalt except for a strip of brick at the start-finish line.

The Speedway hosted its first 500-mile race on May 30, 1911. Forty-six drivers from the United States and Europe came to compete for a prize of \$27,550, and fans traveled from across the country. After the forty drivers qualified, they were organized in rows of five, in contrast to current practice of 11 rows of three. Three ambulances and emergency cars were on hand to rush onto the track for any incident.

Even prior to race day, accidents sidelined participants. On May 18, Teddy Tetzlaff's No. 34 Lozier hit the concrete retaining wall, though luckily he and his riding mechanic were uninjured. On May 25, "tuning up day," Joe Horan broke his leg and ended up in Methodist Hospital when his car flipped over.<sup>12</sup> Talk around town centered on who was favored to win. Two days before the race *The Indianapolis Star* published an article written by Harroun predicting

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<sup>10</sup> "Plan and Views of Motor Speedway, One of Best in World," *The Indianapolis Star*, April 4, 1909, 4.

<sup>11</sup> "Jep Cadou Calls 'Em," *The Indianapolis Star*, April 26, 1962, 50.

<sup>12</sup> "Arthur Greiner Not Afraid of 'Hoodoo,'" *The Indianapolis News*, May 25, 1911, 12.



victory. He discussed the mechanics of his bright yellow and black six-cylinder Marmon - nicknamed the Wasp - and explained his fondness for it. "I chose the Wasp against a dozen new cars I was asked to drive simply because I know it to be in better shape for this race than any new racing car that could be built."<sup>13</sup> Harroun, in car No. 32, was one of two drivers for the Marmon team and sometimes referred to as "King of the Speedway."<sup>14</sup>

Harroun was responsible for a key innovation, the rearview mirror, which made its debut at the 1911 race, a development that some drivers said posed both safety risk and unfair advantage (Appendix D).<sup>15</sup> His car, which he designed himself, was a single seater, the only car at the race without a riding mechanic. In the early 1900s, mechanics sat alongside drivers to help with navigation and inform the driver where other cars were. Harroun came up with the idea of a mirror to replace the mechanic when he saw something similar on a horse-drawn taxi in Chicago. "You could save the weight of the second person, and the body (of the car) could be more narrow," explained race historian Donald Davidson. Passenger cars introduced rearview mirrors shortly thereafter.<sup>16</sup>

Race day dawned with cool spring weather, unlike the scorching heat that had plagued practice days. Around 6:45 a.m., Speedway officials greeted several thousand people waiting in line for the turnstiles to open. By 7 a.m., crews were stationed in the pits, and drivers and their cars reported to starter Charles P. Root at 8 a.m. sharp. By 9 a.m., only an hour before the race,

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<sup>13</sup> Ray Harroun, "Tells Why He Uses 'WASP,'" *The Indianapolis Star*, May 28, 1911, Auto Section 2.

<sup>14</sup> "Racing in Blood of Harroun, the Arab," *The Decatur Daily Herald*, June 18, 1911, 10.

<sup>15</sup> "1911 Indianapolis 500 Winner," Museum Placard, Indianapolis Motor Speedway Museum, and photo by Sabrina Ackley.

<sup>16</sup> Victor Mather, "How the First Rearview Mirror Won the First Indy 500," *The New York Times*. May 16, 2016.

both north and south bleachers were filled, leaving downtown looking like a “ghost town.”<sup>17</sup>

Nearly 100,000 spectators were in attendance, far exceeding predictions.

A 15-minute parade kicked off race day. Drivers’ names were called as they toured the track at twenty miles per hour. At 9:55 a.m. aerial bombs alerted the drivers the race was about to start. “The unmuffled exhausts began to pour forth smoke as the mechanics turned the great motors over.”<sup>18</sup> The drivers got into their cars, and the pace lap commenced. The cars kept speeding up until Lewis Strang, the car in the first position, passed the start-finish line and the “double bombs” exploded while the starter’s flag waved rapidly.<sup>19</sup>

The Greiner-Dickson accident early in the race demonstrated the intensity of this new sporting event. “The horror of the accident stole upon the crowd, and thousands gazed as if hypnotized upon the endless chain of roaring cars that sped by the grandstand at such terrific speed.”<sup>20</sup> Harroun remained undaunted. As reported in the *The Richmond Palladium and Sun-Telegram*, “He picked a path and held to it, reeling off mile after mile at from 75 to 100 miles per hour without making a single mistake. In the midst of all the tragedy, danger and excitement, the grim face of the ‘Wasp’ pilot did not change expression. He was at the wheel to win...”<sup>21</sup>

Around 4:45 p.m., Harroun completed his 200th lap in six hours, forty-one minutes and eight seconds, an average speed of 74.62 mph. *The Indianapolis Star* reported that as Harroun “finally lifted his face from the car, scores of persons saw his bloodshot eyes, his parched lips, his

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<sup>17</sup> Belcher Foundation, *Fastest of the First* (Belcher, Kentucky: Belcher Foundation, 2011), 134.

<sup>18</sup> H.G. Deupree, “Harroun in WASP Wins,” *The Indianapolis Star*, May 31, 1911, 1.

<sup>19</sup> Belcher 139.

<sup>20</sup> Deupree.

<sup>21</sup> “Harroun Wins Classic Race; Harry Knight Is Quite Low,” *The Richmond Palladium and Sun-Telegram*, May 31, 1911, 1.

sun-blistered face, and noticed the trembling muscles of his body.”<sup>22</sup> By evening, Harroun recovered enough to attend a dinner party hosted by Dorian Rim Company at the Claypool Hotel.

Like the rearview mirror, car innovations arrived at the track in quick succession. The seat belt, introduced by Barney Oldfield in 1922, offered immediate lifesaving potential; ejections from vehicles had been a common cause of injury. Oldfield, who drove the pace car that year, asked a parachute maker to make him a harness to strap him into the car.<sup>23</sup> Automobile companies began offering seatbelts in the 1940s; their installation was mandated by the federal government in 1968.<sup>24</sup> Jimmy Murphy won that year’s race and subsequently asked engineer Harry Miller to design a front-wheel-drive car to pull rather than push him through turns. By the late 1930s, all-wheel drive was under development. Both systems are commonly used today in passenger cars.<sup>25</sup>

As the 500 grew into a premier sporting event, it stayed true to its roots as a test track for car makers. Manufacturers sought to capitalize on Indy 500 successes to sell their latest models. In 1933, Studebaker placed full-page advertisements in metropolitan newspapers touting, “From the Speedway comes their stamina, from the skyway comes their style.” At the time, the President model sold for \$1,045 and up, the Commander for \$845, and the Dictator for \$645 or about \$12,000 in today’s dollars. The ad noted that only 14 out of 42 starters had completed the 1932 race, and seven of the top 12 were powered by Studebaker engines.<sup>26</sup>

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<sup>22</sup> “Ray Harroun, Modest as Ever, in Hour of Greatest of Triumphs,” *The Indianapolis Star*, May 31, 1911, 6.

<sup>23</sup> Earl Swift, “Fifteen Ways the Indy 500 Changed How You Drive,” *Popular Mechanics*, May 27, 2011.

<sup>24</sup> “Seat Belt Laws,” U.S. Department of Transportation.

<sup>25</sup> Swift.

<sup>26</sup> “Startling New Studebakers,” advertisement in *The Evening Star*, Washington D.C., Nov. 6, 1933, A16.

The year 1958 would become the Speedway's most notorious, so much so that it is the subject of a book, *The Curse of the Indy 500 - 1958's Tragic Legacy* by Stan Sutton. A crash in the third turn at the start of the race involved 15 cars, killed driver Pat O'Connor, and badly injured Jerry Unser. It was a stunning scene as cars careened into each other. With 14 cars in the wreckage, O'Connor came to the pileup and had no options. Unable to avoid the accident, his car went soaring over the others, landing upside down and on fire. The next year the track put in place two new rules: Cars must have roll bars, and drivers must wear fireproof uniforms.<sup>27</sup>

Three years later, Tony Bettenhausen was killed during a May 12 practice run, the result of "mechanical failure."<sup>28</sup> Bettenhausen was helping a fellow driver, Paul Russo, whose car had been giving him problems. On the front straight Bettenhausen lost control of the car, and it slammed into the wall. It rolled 325 feet, then turned into flames. His son Merle said in regards to the crash, "I remember the day he died, May 12, 1961. I was 17 years old. When they told me what happened I was very upset, but I remember listening to the race that year and saying to myself that I still want to drive in the Indy 500 someday."<sup>29</sup>

Wall accidents like Bettenhausen's were often fatal until the early 21st Century when IndyCar introduced a new wall module to absorb the impact of a high-speed crash.<sup>30</sup> The Steel and Foam Energy Reduction (SAFER) Barrier System was designed at the Midwest Roadside Safety Facility at the University of Nebraska-Lincoln with funding from the Indianapolis Motor

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<sup>27</sup> Stan Sutton, *The Curse of the Indy 500* (Bloomington, Ind.: Red Lightning Books, 2017), 22.

<sup>28</sup> Michael Jesse and Dawn Mitchell, *100 Years, 500 Miles* (Indianapolis: The Indianapolis Star, 2016), 110.

<sup>29</sup> Sutton 49.

<sup>30</sup> Keith McGuffey, "MwRSF team earns SAE award for SAFER barrier," University of Nebraska, Lincoln, College of Engineering, May 31, 2018.

Speedway (Appendix E).<sup>31</sup> Since its unveiling in 2002, there have been no driver fatalities resulting from wall crashes at NASCAR or IndyCar tracks where the safety feature is installed. Technology developed during barrier research led directly to improvements in roadside safety, including a 31-inch guardrail system that is “considered the standard barrier used along American highways, and the RESTORE barrier that reduces the impact of truck crashes.”<sup>32</sup>

The 2016 race was celebrated as the 100th running of the Indianapolis 500 (the race was not held during some war years) and officially pronounced a sellout with more than 350,000 spectators. Harroun’s “Marmon Wasp” made a guest appearance on the ceremonial lap. Using a smart fuel strategy, Alexander Rossi went 36 laps at the end without a pitstop to claim the win, an “incredible triumph” in the eyes of race car commentator Marshall Pruett.<sup>33</sup> Rossi, a 24-year-old newcomer from Nevada City, became one of 10 drivers to win the race as a rookie.<sup>34</sup> Although his car sputtered to the finish, he completed the race in exactly three hours. In 2018, Will Power crossed the finish line first, in two hours and 59 minutes, almost four hours faster than Harroun in 1911.

Such moments are every IndyCar driver’s dream. Zach Veach, a 24-year-old from Zionsville, Indiana, watched his first 500 on television at age 3 and began racing when he was just 12. He made his rookie appearance at Indy in 2017. “We know that the sport we love is dangerous, but we love it so much that the risk is worth it,” he said, noting that the Speedway is like no other track because of its high speeds and 90-degree angles. “We all visualize pouring

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<sup>31</sup> “SAFER Barrier,” Museum Placard, Indianapolis Motor Speedway Museum, and photo by Sabrina Ackley.

<sup>32</sup> Karl Vogel, “Nebraska engineers expand research into saving lives on roadways,” University of Nebraska, Lincoln, June 6, 2018.

<sup>33</sup> Marshall Pruett, “Indy 500 Winner Alexander Rossi,” Podcast, May 30, 2016.

<sup>34</sup> “Indy 500 Traditions and FAQs,” Indianapolis Motor Speedway.

milk over our heads on a date in late May,” a reference to a winner’s tradition that goes back to 1936 when Louis Meyer drank buttermilk to refresh himself.<sup>35</sup> Another tradition is posing for the Borg-Warner Trophy, “one of the most coveted trophies in the world of sports.”<sup>36</sup> A bust of each victor is sculpted onto the five-foot trophy kept on display at the Indianapolis Motor Speedway Museum (Appendix F).<sup>37</sup>

While individual triumphs are memorialized in silver, the broader 500 contribution is seen in technological innovations that have protected race car drivers and ordinary motorists alike. As a result of accidents like Dickson’s in 1911 and less devastating mechanical breakdowns, the Indianapolis 500 has led the way to advances in automobile safety and efficiency. “We watch these cars going 230 miles an hour on an oval,” Jake Query observed during a February 2019 interview on Fox Sports Radio with 1969 Indy champion Mario Andretti. “Ultimately the testing, the information, the data that comes from racing ... translates down to safety for somebody who’s driving on a rainy Binford Boulevard on their way to work on a Tuesday morning in Indianapolis”<sup>38</sup> Tino Belli, director of aerodynamic development for IndyCar, noted that tragedy is inevitable at the track, but design innovations have made it less common. “We don’t like the death part of it. We do everything in our power to make it as safe as possible.”<sup>39</sup> Even when accidents happen, there are lessons to be learned. Tragedy in the month of May has made transportation safer for everyone.

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<sup>35</sup> Zach Veatch interview with author, March 18, 2019.

<sup>36</sup> “Borg-Warner Trophy,” Indianapolis Motor Speedway.

<sup>37</sup> “Borg-Warner Trophy,” Museum Placard, Indianapolis Motor Speedway Museum, and photo by Sabrina Ackley.

<sup>38</sup> “Query and Schultz,” Fox Sports Radio, Feb. 6, 2019.

<sup>39</sup> Belli interview.

## Appendix A

Race driver and riding mechanic deaths during the Indy 500 at the Indianapolis Motor Speedway, 1911-2018

Year	Fatality	Cause
1911	Sam Dickson (riding mechanic)	Flew out of the car and slammed into the wall
1919	Arthur Thurman (driver)	Car flipped over
1919	Louis LeCocq (driver) Robert Bandini (riding mechanic)	Car flipped over and his fuel-tank erupted
1926	Herbert Jones (driver)	Car flipped over trapping him and giving him a fractured skull
1929	Bill Spence (driver)	Thrown from car and left with fractured skull
1930	Paul Marshall (riding mechanic)	Car crashed
1931	Wilbur Brink (driver)	Car tumbled over hitting the wall
1933	Mark Billman (driver)	Car hit outside wall
1933	Lester Spangler (driver) G. L. Jordan (riding mechanic)	Ran into Malcolm Fox's spinning car
1935	Clay Weatherly (driver)	Car hit wall, throwing him onto the track
1939	Floyd Roberts (driver)	Car ran into Bob Swanson's car

1947	Shorty Cantlon (driver)	Car swerved to avoid hitting another car and ran into wall
1953	Carl Scarborough (driver)	Car caught on fire and Scarborough inhaled too much CO <sub>2</sub>
1955	Bill Vukovich (driver)	Car's axle broke causing him to hit another car and go airborne, landing his car upside down in spectators' parking lot
1958	Pat O'Connor (driver)	15-car pile-up caused him to go flying, landing upside down and on fire
1964	Dave MacDonald (driver)	Sach's car hit MacDonald's, ending with both cars in flames
1964	Eddie Sachs (driver)	
1973	Swede Savage (driver)	Lost control of car causing it to spin and hit wall

Source: Dan Vielhaber, "Indy 500 Memorial Index," IndySpeedway.com, July 24, 2012.



## Appendix B

Image of watercolor painting providing an aerial view of the Indianapolis Motor Speedway after its opening in 1909.



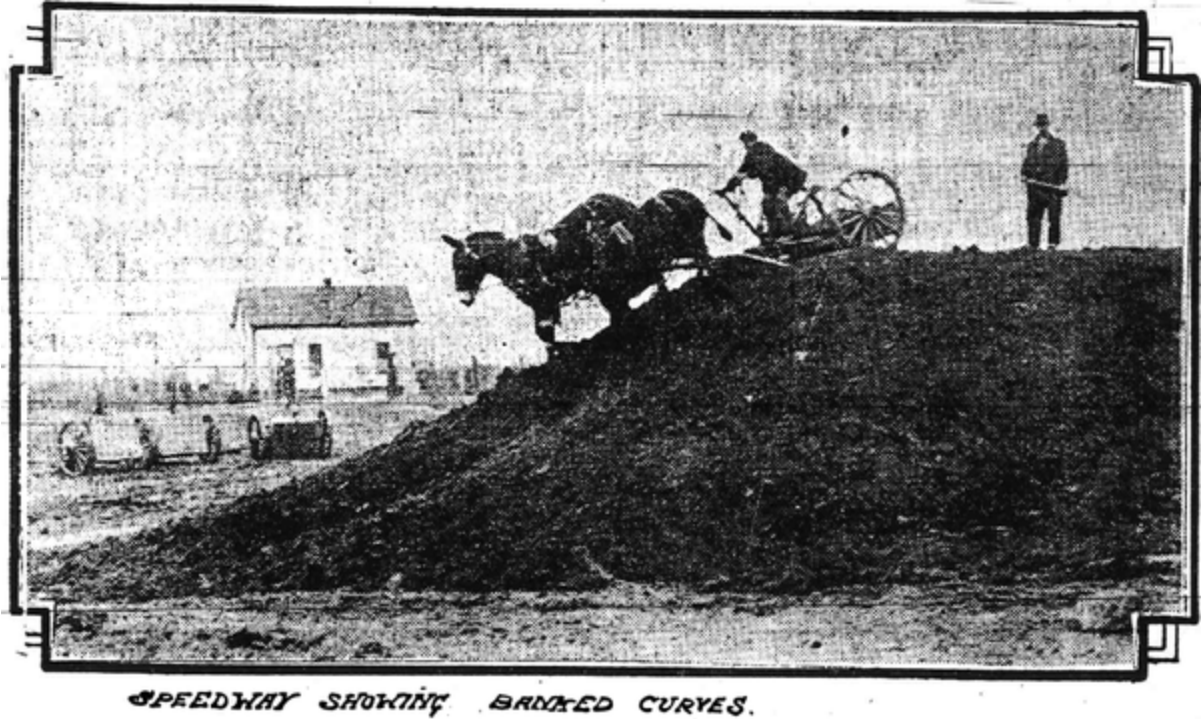
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Digital image © 2004 Indiana Historical Society. All Rights Reserved.

Source: "Aerial View of the Indianapolis Motor Speedway Track and Surrounding Area," circa 1909, Bass Photo Co. Collection, Indiana Historical Society.

## Appendix C

The image from *The Indianapolis Star* shows two mules pulling a man on a wooden wagon steering over a mound of dirt during the track's construction.



SPEEDWAY SHOWING BANKED CURVES.

Source: "Plan and Views of Motor Speedway, One of Best in World," *The Indianapolis Star*, April 4, 1909, 4.

## Appendix D

Ray Harroun crafted a rearview mirror in his garage and attached it to his Marmon Wasp for the 1911 Indy 500. It was believed to be the first use of a rearview mirror on a motorcar.



Photo by Sabrina Ackley, Indianapolis Motor Speedway Museum, April 25, 2019.

## Appendix E

Motorsports historian James Craig Reinhardt stands beside a piece of the SAFER Barrier wall system that has dramatically reduced injuries resulting from high-speed wall crashes at the track.



Photo by Sabrina Ackley, Indianapolis Motor Speedway Museum, April 25, 2019.



## Appendix F

The Borg-Warner Trophy memorializes the triumphs of all 102 winners of the Indy 500. After each race, the victor sits for a silversmith, who crafts the busts in sterling silver.



Photo by Sabrina Ackley, Indianapolis Motor Speedway Museum, April 25, 2019.

## Annotated Bibliography

### Primary Sources

“Aerial View of the Indianapolis Motor Speedway Track and Surrounding Areas.” Bass Photo Co. Collection, Indiana Historical Society.

<http://images.indianahistory.org/cdm/ref/collection/dc012/id/13419>, accessed May 6, 2019.

This photo of a watercolor painting drawn shortly after the track’s opening in 1909 showed the 2.5 mile oval and infield. I included this in my appendix so the reader would have a visual image of the track.

“Arthur Greiner Not Afraid of ‘Hoodoo.’” *The Indianapolis News*. May 25, 1911, 12.

From newspapers.com: <https://www.newspapers.com/image/37773712/>, accessed March 1, 2019.

This newspaper article reported on a driver who ended up in the hospital due to a pre-race accident, which I described in the text. Newspaper accounts were an ideal primary source because they allowed me to see the race and its accidents through the eyes of the people who were there.

“Battered Racers Are Still Game.” *The Indianapolis Star*. June 1, 1911, 9. From

newspapers.com: <https://www.newspapers.com/image/6690610/>, accessed Feb. 1, 2019.

This newspaper article quoted driver Art Greiner whose crash on the 12th lap of the first Indy 500 led to the death of his riding mechanic. The quotation seemed ideal for my introduction.

Belli, Tino. Telephone interview with author. March 15, 2019.

I interviewed Mr. Belli by phone about technological advances that have made racing safer. He is director of aerodynamic development for IndyCar and has previously worked for Panther Racing and Andretti Autosport. This interview helped me understand the connection between accidents and track safety enhancements.

Deupree, H.G. “Harroun in WASP Wins: One Death is Race Toll.” *The Indianapolis Star*. May 31, 1911, 1. From newspapers.com: <https://www.newspapers.com/image/6689559/>,

accessed Feb. 1, 2019.

This article provided both facts and colorful details about the inaugural race.

Harroun, Ray. “Tells Why He Uses ‘WASP.’” *The Indianapolis Star*. May 28, 1911, Auto Section, 2. From newspapers.com: <https://www.newspapers.com/image/6685967/>, accessed Feb. 1, 2019.

These are Harroun’s own words predicting victory and praising his car.

“Harroun Wins Classic Race; Harry Knight Is Quite Low,” *The Richmond Palladium and Sun-Telegram*, May 31, 1911, Page 1. From the Library of Congress, *Chronicling*

*America: Historic American Newspapers:*

<https://chroniclingamerica.loc.gov/lccn/sn86058226/1911-05-31/ed-1/seq-1/>, accessed Feb. 1, 2019.

This article described Ray Harroun's poise under pressure during the inaugural 500. It also demonstrated the dramatic way that newspapers covered the first-time event.

"Jep Cadou Jr. Calls 'Em." *The Indianapolis Star*. April 26, 1962, 50. From newspapers.com: <https://www.newspapers.com/image/106394998/>, accessed Feb. 1, 2019.

This column described the updating of the track surface from bricks to asphalt and explained why bricks were so hard on oil lines, fuel tanks, and shock absorbers.

"Plan and Views of Motor Speedway, One of Best in World," *The Indianapolis Star*, April 4, 1909, 4.

<https://www.firstsuperspeedway.com/sites/default/files/IMSconstruction040409.pdf>, accessed Feb. 1, 2019.

This article featured photographs of the speedway under construction. I included in my appendix a picture of mules smoothing out the banked curves.

Pruett, Marshall. "Indy 500 Winner Alexander Rossi." Podcast. May 30, 2016.

<http://marshallpruett.com/podcast-indy-500-winner-alexander-rossi/>. Accessed Feb. 14, 2019.

I liked this podcast because the commentator used the words "incredible triumph" to describe 2016 winner Alexander Rossi's win, which affirmed my paper's connection to the NHD theme.

"Query and Schultz." Fox Sports Radio. Feb. 6, 2019.

This interview between Jake Query and Mario Andretti provided a current example of the ways IndyCar racing benefits ordinary motorists.

"Racing in Blood of Harroun, the Arab." *The Decatur Daily Herald*, June 18, 1911, 10. From newspapers.com: <https://www.newspapers.com/image/91084543/>, accessed May 1, 2019.

This article documented Harroun's nickname, "King of the Speedway."

"Ray Harroun, Modest as Ever, in Hour of Greatest of Triumphs." *The Indianapolis Star*, May 31, 1911, 6. From newspapers.com: <https://www.newspapers.com/image/6689745/>, accessed May 1, 2019.

This newspaper story covering Harroun's victory provided a vivid description of the driver's exhaustion at the end of the first 500.

Reinhardt, James Craig. Personal interview with author. April 25, 2019.

Reinhardt is the author of two recent books on Indy 500 history and a long-time tour guide at the Speedway Museum. I interviewed him about the many automobile safety improvements that had their genesis at the Indy 500. The interview helped give focus to my thesis: that tragedy at the Speedway has contributed to technological triumphs in auto safety.

“Startling New Studebakers,” advertisement in *The Evening Star*, Washington D.C. Nov. 6, 1933, Page A16. From the Library of Congress, *Chronicling America: Historic American Newspapers*:

<https://chroniclingamerica.loc.gov/lccn/sn83045462/1933-11-06/ed-1/seq-16/>, accessed May 1, 2019.

This full-page newspaper ad demonstrated the way carmakers marketed models with engines that powered Indy 500 cars, which I discussed in the text.

“Tracy’s Record Broken.” *The Philadelphia Inquirer*. Oct. 2, 1904, 14. From newspapers.com: <https://www.newspapers.com/image/169005600/>, accessed May 1, 2019.

This article documented that Carl Fisher drove two miles in a record 2.02 minutes.

Veach, Zach. Telephone interview with author. March 18, 2019.

I interviewed Veach, a current driver, about how he deals with the ever-present risk of tragedy at the track. Veach told me that he doesn’t think about it but focuses on the prospect of winning.

## Secondary Sources

Belcher Foundation. *Fastest Of The First*. Belcher, Ky.: Belcher Foundation, 2011.

This source was a book on the very first Indy 500. It had every detail from that race, which was very useful in the start of the report.

“Borg-Warner Trophy.” Indianapolis Motor Speedway.

[www.indianapolismotorspeedway.com/events/indy500/history/borg-warner-trophy](http://www.indianapolismotorspeedway.com/events/indy500/history/borg-warner-trophy), accessed March 13, 2019.

This Indy 500 website explained the history of the Borg-Warner trophy, which is discussed near the end of the paper.

“Borg-Warner Trophy.” Museum Placard, Indianapolis Motor Speedway Museum. Visited April 25, 2019.

The placard tells the history of the Borg-Warner Trophy, which bears the likeness of every 500 winner. I cited this as the symbolic representation of individual triumph and included a photograph I took in the appendix.

History.com editors. “First Indianapolis 500 Held.” *History.com*. A + E Television Networks, December 5, 2018.

This website provided useful information about the inaugural race.

“Indiana, a State of Change.” The History Museum.

<https://historymuseumb.org/indiana-a-state-of-change/>, accessed April 15, 2019.

Published by a history museum located in South Bend, the home of Studebaker, this article listed the most prominent Indiana automakers of the early 1900s.



“Indy 500 Traditions and FAQs.” Indianapolis Motor Speedway.

<https://www.indianapolismotorspeedway.com/events/indy500/history/indy-500-traditions-faqs/faqs>, accessed Feb. 13, 2019.

This website included important bits of information, such as that only 10 rookies have won the Indy 500.

Jesse, Michael and Mitchell, Dawn. *100 Years, 500 Miles*. Indianapolis: The Indianapolis Star, 2016.

This book published by *The Indianapolis Star* for the track’s centennial race was a year-by-year account with race highlights and pictures of articles and headlines.

Leershen, Charles. “One Hundred Years of the Indy 500,” *Smithsonian Magazine*, June 2011.

[www.smithsonianmag.com/history/one-hundred-years-of-the-indy-500-158836397/](http://www.smithsonianmag.com/history/one-hundred-years-of-the-indy-500-158836397/), accessed April 20, 2019.

I had assumed that the first 500-Mile Race was halted after a fatal accident; this article indicated that the race continued even with spectators on the track.

Mather, Victor. “How the First Rearview Mirror Won the First Indy 500.” *The New York Times*. May 16, 2016.

[www.nytimes.com/2016/05/17/sports/autoracing/at-indianapolis-500-innovation-began-with-a-look-back.html](http://www.nytimes.com/2016/05/17/sports/autoracing/at-indianapolis-500-innovation-began-with-a-look-back.html), accessed Feb. 14, 2019.

This article discussed the aerodynamic and safety benefits of Ray Harroun’s invention of the rearview mirror, a technological advancement that I mentioned early in the report.

McGuffey, Keith. “MwRSF team earns SAE award for SAFER barrier,” University of Nebraska, Lincoln, College of Engineering. May 31, 2018.

[engineering.unl.edu/mwrsf-team-earns-sae-award-safer-barrier/](http://engineering.unl.edu/mwrsf-team-earns-sae-award-safer-barrier/), accessed April 30, 2019.

This news release provided details about the collaboration between the Speedway and University of Nebraska that led to development of the SAFER Barrier used at race tracks.

Mitchell, Dawn. “Retro Indy: Carl Fisher was the ‘P.T. Barnum of the Automobile Age.’”

[www.indystar.com/story/news/history/retroindy/2014/07/15/Carl-Fisher-Indianapolis-Motor-Speedway/12666435/](http://www.indystar.com/story/news/history/retroindy/2014/07/15/Carl-Fisher-Indianapolis-Motor-Speedway/12666435/), accessed January 21, 2019.

I learned from this news story that Carl Fisher’s nickname was “P.T. Barnum of the Automobile Age” and also gained information about the headlamps manufactured by his company.

“1911 Indianapolis 500 Winner,” Museum Placard, Indianapolis Motor Speedway Museum.

Visited April 25, 2019.

This exhibit features Ray Harroun’s 1911 Marmon Wasp with the rearview mirror mounted on the dashboard. I photographed the car and included the picture in my appendix.

“SAFER Barrier.” Museum Placard. Indianapolis Motor Speedway Museum. Visited April 25, 2019.

This exhibit text explained the technology behind the SAFER barrier wall modules. I photographed the exhibit to include in the appendix.

“Seat Belt Laws.” U.S. Department of Transportation. Oct. 26, 2015.

<https://www.transportation.gov/mission/health/seat-belt-laws>, accessed May 3, 2019.

This federal government website explained the history of seat belts laws and enforcement, which came about after Barney Oldfield’s use of a safety harness in 1922.

Sutton, Stan. *The Curse of the Indy 500*. Bloomington, Indiana: Red Lightning Books, 2017.

One of the most recent books to be written about the Indy 500, it recounts the tragic 1958 race and examines what happened to the drivers who raced that day or had family members who raced that day. The accident involving Pat O’Connor was one reason the Apeedway implemented new rules the next year.

Swift, Earl. “Fifteen Ways the Indy 500 Changed How You Drive.” *Popular Mechanics*, May 27, 2011.

[www.popularmechanics.com/cars/a6680/15-ways-the-indy-500-changed-how-you-drive/](http://www.popularmechanics.com/cars/a6680/15-ways-the-indy-500-changed-how-you-drive/), accessed May 1, 2019.

This article explained the first use of the seat belt at the track by driver Barney Oldfield and its subsequent adoption for use in passenger vehicles.

Vielhaber, Dan, ed. “Indy 500 Memorial Index.” IndySpeedway.com. July 24, 2012.

<http://indymotorspeedway.com/idx-memorial.html>, accessed Dec. 5, 2018.

This website provided the most authoritative list of Indy 500 fatalities, which appeared in Appendix A.

Vogel, Karl. “Nebraska engineers expand research into saving lives on roadways.” University of Nebraska, Lincoln, June 6, 2018

[news.unl.edu/newsrooms/today/article/nebraska-engineers-expand-research-into-saving-lives-on-highways-racetracks/](http://news.unl.edu/newsrooms/today/article/nebraska-engineers-expand-research-into-saving-lives-on-highways-racetracks/), accessed May 3, 2019.

This article described improvements in highway safety barriers that were developed as a result of research into the SAFER barrier used on race tracks, a design improvement that supported my thesis.