The Diesel Came to Indiana in the Horse-and-Buggy Days

*John W. Rowell**

Advertising and publicity of diesel automobiles during the last decade sometimes have made the diesel engine appear to be a new technology. Diesel engines, however, have been manufactured in Indiana since the horse-and-buggy days. From a shaky start in the 1910s, 1920s, and 1930s, diesel engine manufacturing has grown into one of Indiana's largest industries. More heavy-duty diesels of the type used in trucks and industrial machinery are built in Indiana than in all the rest of the United States. They are built at the Cummins Engine Company plants in Columbus and Seymour, the Caterpillar Tractor Company engine factory in Lafayette, and the Navistar International and Detroit Diesel-Allison plants in Indianapolis. In addition there are an unknown number of component plants, some owned by the above companies but mostly independent companies, that supply parts to the engine factories. Cummins also has its principal offices for both international and domestic business in Columbus.

The principles of the diesel engine were conceived by Dr. Rudolf Diesel, a German engineer who received a patent from Germany for his design of a compression-ignition, internal combustion engine in 1892. In 1893 Diesel publicized the theory behind his new engine in a paper entitled "Theory and Construction of a Rational Heat Engine to Replace the Steam Engines and

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the Currently Known Combustion Engines." Diesel's theory began with the fact that air temperature rises when air is compressed in an engine cylinder. If the air was compressed to a high pressure, Diesel thought, it would become hot enough to ignite the fuel without using a spark or any other igniter. To avoid a premature explosion of the fuel it would be introduced into the cylinder after the compression of the air was completed. Diesel postulated that if the rate of fuel injection was controlled, the fuel would be burned at a constant pressure and any extremely high pressures in the engine cylinder would be avoided.[1]

Diesel's first two experimental engines were failures. In 1897, however, he succeeded in building an engine that produced 17.8 horsepower at 154 revolutions per minute while working with Maschinenfabrik Augsburg (now Machinenfabrik Augsburg-Nurnberg or MAN). Although heavy and bulky for the amount of power developed, Diesel's engine was twice as efficient as other contemporary internal combustion engines. In 1898, Diesel's licensees, MAN, Krupp, and Deutz, marketed twenty-horsepower diesel engines. That same year Adolphus Busch, the St. Louis brewer, acquired the North American rights to the diesel, and the first American-built diesel engine was installed in the Busch brewery.[2]

In Diesel's early engines the fuel was injected into the engine cylinder with a blast of air, a method that required a bulky air compressor apparatus that absorbed 7 percent of the engine's developed power and added to its complexity. Diesel soon began work on other injection schemes, and with the expiration of his patents in 1907 other inventors also began to search for simpler means of injecting the fuel. The goal then and through the early decades of the twentieth century was to find a method whereby the fuel could be introduced into the cylinder more rapidly. A more rapid introduction of fuel would increase engine speed which in turn would permit the development of engines which were both more powerful and smaller and lighter.[3]

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[1] W. Robert Nitske and Charles Morrow Wilson, *Rudolf Diesel: Pioneer of the Age of Power* (Norman, Okla., 1965), 77-82, 87-90, 93-101, 105-10.

[2] Freidrich Schildberger, "50 Years of Mercedes-Benz Diesel Engines" (n.p., n.d.), 1-3; C. Lyle Cummins, Jr., "Early I. C. and Automotive Engines," Society of Automotive Engineers *Transactions*, Vol. LXXXV, paper 760604 (Warrendale, Pa., 1976), 1966-67; Nitske and Wilson, *Diesel*, 104-10, 124-26. On Busch's failure to successfully exploit and develop Diesel's engine in America, see Richard H. Lytle, "The Introduction of Diesel Power in the United States, 1897-1912," *Business History Review*, XLII (Summer, 1968), 115-45.

[3] Nitske and Wilson, *Diesel*, 80-81, *passim*; Hans L. Knudsen, "History and Development of Cummins Engines," manuscript, circa 1972 (Cummins Engine Company, Columbus, Indiana). Knudsen became Cummins's chief engineer in 1922 and retired as vice-president of engineering in 1947.

Most of the early injection schemes involved the use of a cup, called a precombustion chamber, located next to the cylinder and connected to it with one or more holes. A measured amount of fuel was metered into the cup during the engine's air intake stroke. As the air was compressed in the cylinder during the compression stroke, some of it passed through the hole or holes into the cup and vaporized the light fractions of the fuel. At the top of the piston stroke the air became hot enough to ignite the vapor thereby causing an explosion in the cup which drove the remainder of the fuel into the engine cylinder where the main combustion took place.[4]

One of the most promising of these early precombustion systems was patented by Jan Brons, founder of present-day Brons Industrie of Appledam, The Netherlands. When properly adjusted the Brons engine operated on a true diesel cycle with constant pressure during combustion. This fact made it a smooth running engine. Rasmus M. Hvid, a Dane, obtained the U.S. rights to the Brons engine—probably as Brons's agent—and began to license American companies to build oil engines, as diesels were then called.[5]

A Brons/Hvid engine was probably the first diesel engine seen in Columbus, a city where more than a million diesel engines would eventually be made. The engine was installed in the Schaefer and Schwartzkopf flour mill at Third and California streets in 1915. In an article in the *Evening Republican* it was described as "a strange new engine" that had no ignition system and burned "any kind of fuel that will run." Called an H and O engine, it was built in St. Marys, Ohio. The engine could generate sixty horsepower and was about the size of a gasoline engine. This early diesel engine the Columbus paper described was one of a line of engines ranging in size from two to sixty horsepower designed by Hans L. Knudsen, chief engineer of the St. Marys Machine Company and later a major figure in the development of the Cummins diesel engine.[6]

While the diesel engine was undergoing these early developments, two chains of events began in Indiana that ultimately led to the establishment of diesel manufacturing in the Hoosier state. The first chain began in 1902 when William H. McCurdy organized the Hercules Buggy Company in Evansville and be-

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[4] Knudsen, "History"; Schildberger, "50 Years," 5-8.

[5] Knudsen, "History"; Brons Industrie, Appledam, The Netherlands, letter to author, June 18, 1980. The only information found on Hvid Engineering Co. was its listings in various Chicago city directories.

[6] Columbus *Evening Republican*, July 22, 1915; Knudsen, "History."

gan to build buggies and other horse-drawn vehicles; eventually, offering seventy-two styles ranging from simple carts and wagons to surreys with fringe on the top. McCurdy was born in Washington, Pennsylvania, in 1853. His first profession was that of journeyman millwright, but he gave it up at the age of twenty-two to become a traveling salesman. In 1879 he established a successful real estate and insurance business in Kansas City, Missouri, but ten years later he left this business to take the job of secretary of the Favorite Carriage Company in Cincinnati. In 1894 he started the Brighton Buggy Company in Cincinnati and operated it until he organized the Hercules company, moving his Brighton company's assets and key people to Evansville. McCurdy chose Evansville as the location of the new company because of the abundance of hardwood in the area and the availability of skilled labor since Evansville was a furniture manufacturing center.[7]

Hercules was originally capitalized at three hundred thousand dollars and began operations in a new thirty-two thousand square foot, three-story brick factory at the intersection of Morton Avenue and the Southern Railroad tracks. The company's first buggy was completed on January 31, 1903. The nucleus of the work force was forty executives and craftsmen that McCurdy brought with him from Brighton. Additional workers were hired in Evansville as the business expanded. Skilled craftsmen were paid $3.00 to $4.00 a day; laborers, about $1.75. Hercules made all of the parts for the buggies and other vehicles except for the axles and springs, which were purchased from Hess Spring and Axle Company of Carthage, Ohio, a company owned by McCurdy's father-in-law.[8] Most of Hercules vehicles were sold to Sears, Roebuck and Company for resale through their mail-order catalogue, although Hercules also sold through other channels.

During the next decade the buggy company expanded rapidly and in 1912 was recapitalized at $1.5 million. Also the Hercules Body Company (1906) and the Hercules Wheel Company (1909) were incorporated as separate entities but with essentially the same ownership, McCurdy being the principal owner.[9]

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[7] Ed Klinger, *How a City Founded to Make Money Made It* (Evansville, Ind., n.d.), 49-55; Evansville *Journal*, March 25, 1921; Evansville *Courier*, May 11, 1947.

[8] Miscellaneous Record Books, E (1901-1906), p. 130, Vanderburgh County Recorders Office, Evansville, Indiana; Evansville *Courier*, May 11, 1947.

[9] Miscellaneous Record Books, F (1906-1909), p. 139, Vanderburgh County Recorders Office, Evansville, Indiana; Miscellaneous Record Books, G (1909-1912), p. 20, Vanderburgh County Recorders Office, Evansville, Indiana.

HERCULES

All We Can Give for the Money,
Not All We Can Get for the Goods

HERCULES

Buggies

CAPACITY 80,000 PER YEAR

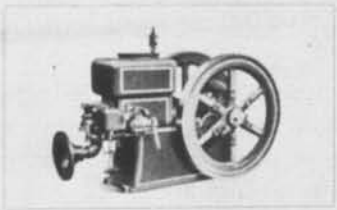
* * * *

HERCULES

Commercial Bodies

CAPACITY 40,000 PER YEAR

* * * *



HERCULES

Gasoline Engines
Kerosene Engines

CAPACITY 60,000 PER YEAR

THE HERCULES COMPANIES

EVANSVILLE, INDIANA, U. S. A.

A 1920 HERCULES ADVERTISEMENT

Courtesy University of Southern Indiana, Evansville.

At the urging of Sears, Roebuck and Company the body company was established to make bodies for automobiles marketed by Sears. Later the company also built bodies for post office trucks, for commercial trucks, and for military trucks used during World War I.[10]

In 1908 Sears, Roebuck began to sell gasoline engines of two to ten horsepower for farm and other uses. These engines were marketed under the Sears trade name Economy. Sears's 1910 fall catalogue stated, "We own and operate our own gasoline engine factory," but another, later source indicates that the engines were built for Sears by the Sparta Gas Engine Company of Sparta, Michigan.[11] Whatever their origins, Sears became dissatisfied with the quality and cost of the engines and asked Hercules to manufacture a line of gasoline engines for them.

In response to this request the Hercules Gas Engine Company was organized in 1913 with a capitalization of two hundred fifty thousand dollars. A new factory eight hundred feet long and one hundred fifty feet wide was built to produce the engines. The factory manager of this engine plant was Vincent E. McMullen, who later would become an executive of Cummins Engine Company. In its 1915 fall catalogue Sears stated, "we just recently built [this new factory] at Evansville, Ind., for the manufacture of our new Improved Model Economy Engines." The new factory was a success. It produced three hundred fifty thousand engines in its first eight years. Most of these engines were marketed through Sears, but Hercules also sold some of the engines directly to other customers.[12]

Sometime after the Economy engines went into production at the Hercules factory, W. M. Tippett, manager of Sears's engine department, concluded that there was a market for oil engines in rural America because these engines could run on kerosene, which was more available than gasoline in rural areas. Consequently, Tippett obtained a license for Sears from R. M. Hvid to manufacture oil engines and contracted with Hercules to design and manufacture a line of single-, horizontal-cylinder oil engines. Four engines, ranging in size from 1½ to 8 horsepower, were designed by Hercules's engineers under the direct supervision of an engineer from Hvid's company and under the

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[10] Klinger, *How a City Founded*, 53.

[11] Evansville *Courier*, May 11, 1947; Sears, Roebuck & Company, to the author, March 27, 1985.

[12] Miscellaneous Record Books, H (1912-1917), pp. 86, 166, Vanderburgh County Recorders Office, Evansville, Indiana; Evansville *Journal*, March 25, 1921; Sears, Roebuck & Company, to the author, March 27, 1985; Knudsen, "History."

general direction of H. L. Knudsen, who was then Hvid's chief engineer responsible for the designs of Hvid's licensees. The design and development of the oil engines proceeded rapidly, and Sears was able to list the eight horsepower model in their 1919 fall catalogue.[13]

The second chain of events that led to diesel engine manufacturing in Indiana began in Columbus in 1908 when nineteen-year-old Clessie Cummins became William G. Irwin's chauffeur. William G. Irwin was born in 1866, the son of Joseph I. Irwin. The elder Irwin had come to Columbus in 1846 with thirty cents in his pocket and built a fortune in local real estate, merchandising, and banking. William joined his father in the various family enterprises after his graduation from Butler University in 1889 and began to broaden the family's local investments to the state and national levels. The family's first venture beyond the Columbus area was an investment in the National Tin Plate Company of Anderson, Indiana, in 1894. William H. Donner, the organizer of the company, recalled that "Will Irwin, who was a close friend, agreed to put in $5,000 and Joseph I. Irwin subscribed $20,000, which pleased me as the latter practically confined all his investments to Bartholomew County." Three years later, when a second mill was built at Monesson, Pennsylvania, Mr. and Mrs. Z. T. Sweeney, Joseph Irwin's daughter and son-in-law, also invested in the firm. In 1899 the company was sold to the American Tin Plate Company, and Donner, the Irwins, and the Sweeneys made a large profit.[14] That same year the Irwins began construction of the Indianapolis, Columbus, and Southern, the first interurban electric railroad to enter Indianapolis. They operated this enterprise at a profit until 1912 when they sold the business but leased the right-of-way for 999 years.[15]

In the years following these initial nonlocal investments the Irwins continued to diversify and expand their financial holdings. Even before Joseph's death in 1910 William had assumed full responsibility for managing the family investments. During the first two decades of the twentieth century, William founded the Union Starch and Refining Company, a leading corn syrup manufacturer, and acquired large interests in the Union Trust Company of Indianapolis, the Indianapolis Gas Company, the

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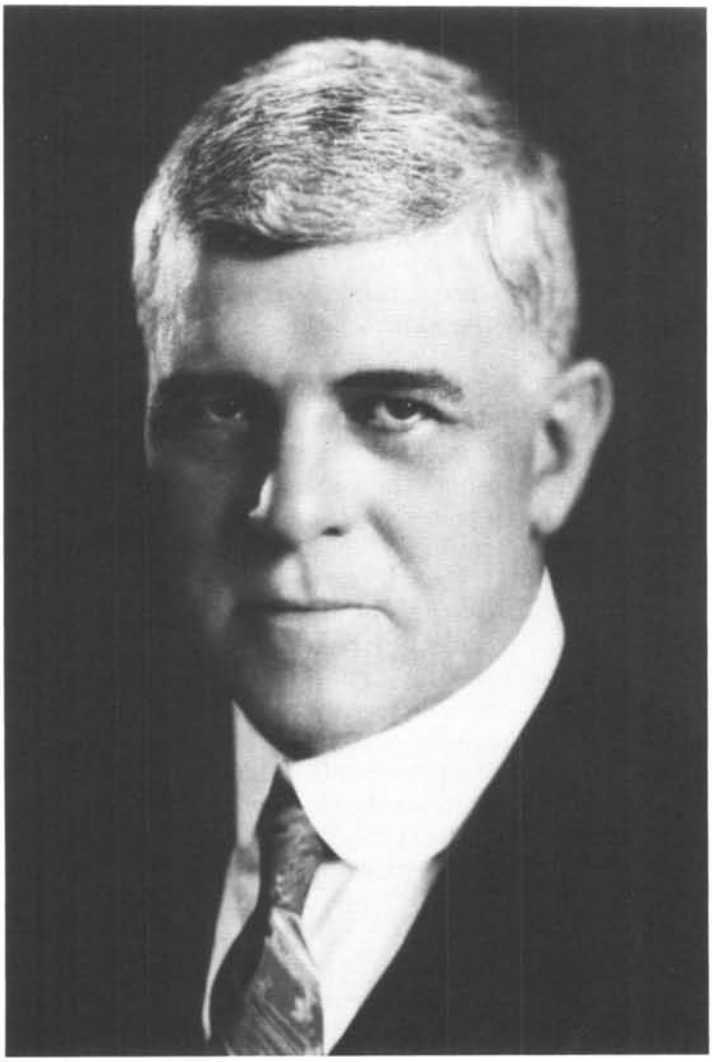
[13] Knudsen, "History"; *Sears, Roebuck & Co. Catalogue*, Fall, 1919, 1441-43.

[14] William H. Donner, *The Autobiography of William Henry Donner, 1864-1953* (San Francisco, 1973), 47-49, 72.

[15] Richard H. Gemmecke, "W. G. Irwin and Hugh Thomas Miller: A Study in Free Enterprise in Indiana" (Ph.D. dissertation, Department of History, Indiana University, 1955), 1-5, 9-11, 17-19, 99-101.

CLESSIE L. CUMMINS, ORGANIZER OF CUMMINS ENGINE COMPANY AND ITS PRESIDENT FROM 1919 TO 1947

Courtesy Cummins Engine Company.



WILLIAM GLANTON IRWIN, THE COLUMBUS BANKER AND INDUSTRIALIST WHO FINANCED CUMMINS ENGINE COMPANY THROUGH ITS FIRST SEVENTEEN PROFITLESS YEARS

Courtesy Cummins Engine Company.

Indianapolis Belt Railroad, and the Van Camp Packing Company.[16] In 1928 Clessie Cummins noted in a letter to a friend that, "Mr. [William] Irwin is one of the wealthiest, if not the wealthiest man in the State of Indiana."[17]

Clessie Lyle Cummins was born in 1888. He came to Columbus in the summer of 1904 when his father Francis, a cooper, moved his business and family there. Because barrel making required high-quality elm wood for hoops, Francis's business and family moved whenever the supply in an area was exhausted. As a result Clessie attended thirteen schools in Indiana and Ohio without completing the eighth grade and lost any interest he might have had in formal schooling. Thus, immediately after he turned sixteen on December 27, 1904, he dropped out of school and got his real education working in automobile factories in Columbus, Indianapolis, and Hagerstown, Indiana. Having a great mechanical aptitude and interest in machinery, Clessie found working in the pioneer car industry exciting.[18]

At the time Cummins became Irwin's chauffeur the occupation of chauffeuring was a warm weather occupation. Thus, when Irwin's Packard was up on blocks during the winter, Irwin employed Cummins in other jobs at Irwin's bank, on the interurban cars, and at the starch plant. During some winters young Clessie worked in Indianapolis automobile plants. In 1913 he decided to go into the automobile repair business, and Irwin gave him the use of an abandoned mill building to house his new shop. Two years later Irwin built a new family garage much larger than needed for the family's cars and suggested that Clessie use half of it for his repair shop and maintain the family's cars as the rent payment. Cummins quickly agreed to Irwin's proposal.[19]

In 1917 Cummins decided to go into the machine shop business, and Irwin financed the purchase of machinery for the new business, which was located in Clessie's half of Irwin's garage. Irwin also became a salesman and wrote letters to machine tool companies soliciting business. In his letters he told prospective customers that Cummins's shop had a screw machine with a wire feed, heavy-duty lathes with eleven-, thirteen-, and sixteen-inch swing, a milling machine, a planer, a hand miller, and drill presses. There is no record that Irwin's solicitation brought any

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[16] *Ibid.*, 18-19, 41, 65; Indianapolis *Star*, December 15, 1943.

[17] Clessie L. Cummins to A. D. Nast, May 17, 1928, Reel 48, No. 3, Vol. 121, Irwin Estate Files (Irwin Management Company, Columbus, Indiana).

[18] Clessie L. Cummins, *My Days with the Diesel* (Philadelphia, 1967), 35-45.

[19] *Ibid.*, 46-55, 62-63, 75-78.

business, but shortly after America entered World War I in April, 1917, Cummins received a large contract for the machining of artillery-wagon hubs. By September his shop was running full-blast, twenty-four hours a day. When the Irwin, Sweeney, and Miller family members returned from their annual vacation, they found that their family cars had been moved to a public garage to make more room for Cummins's work and that their yard had been stacked with castings. They decided that the shop had to be moved, and it was soon relocated into a part of the former Cerealine mill near Seventh and Jackson streets in Columbus.[20]

As his military orders dwindled during the summer of 1918, Cummins began to solicit civilian business. Among his new customers was Hercules Gas Engine Company. Being an inquisitive fellow, Cummins asked about the oil engines Hercules engineers were designing and learned that he also might obtain a license to build Hvid-type engines. Consequently, in November he visited the Hvid Engineering Company in Chicago. The performance of the engines impressed Cummins, and he learned that he could indeed obtain a license to manufacture them for a fee of twenty-five hundred dollars and a royalty of five dollars per engine produced.[21]

Cummins did not have the capital needed to equip an engine plant, but he received a promise of financial backing from Irwin after he discussed the possibilities of the oil engine business with him. He then proceeded with the organization of the Cummins Engine Company. Irwin had backed Cummins in his early, small businesses because of what the latter termed "a parental-like fondness for me."[22] Irwin, however, had an additional reason for financing Cummins's new engine company: he wanted to improve the depressed economy of Columbus by starting a new industry in the city. The city's largest industrial concern, Reeves and Company, manufacturers of threshing machines and

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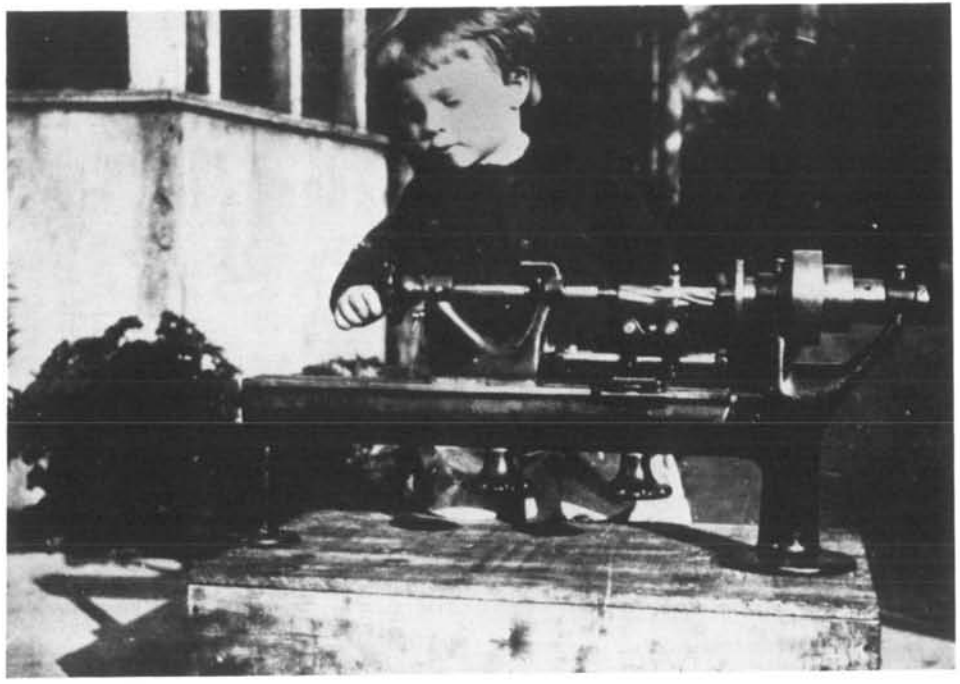
[20] *Ibid.*, 75-78; W. G. Irwin correspondence with seven machine tool companies, March 1-9, 1917, Reel 27, No. 9, Vol. 71, Irwin Estate Files; W. G. Irwin, draft of "History of Cummins Engine Co.," circa 1943, Reel 85, No. 1, Vol. 212, *ibid.* The Irwin household included W. G. Irwin, his sister Mrs. Linnie Sweeney, her daughters Nettie (Mrs. Hugh Thomas Miller) and Elsie, Hugh Thomas Miller, and the Millers' children Clementine and Joseph Irwin. Gemmecke, "Irwin," 32-42.

During the 1880s the Cerealine mill manufactured Cerealine, which is believed to have been the world's first dry breakfast cereal. See *History of Bartholomew County, Indiana* (1888; reprint, Columbus, Ind., 1976), 159. The main building of the Cerealine mill has been restored by Cummins Engine Company as part of its new corporate offices.

[21] Cummins, *My Days*, 79-80; Knudsen, "History."

[22] Cummins, *My Days*, 62.

CLESSIE CUMMIN'S SON BRAINARD INSPECTS THE FIRST MACHINE TOOL PURCHASED FOR THE MACHINE SHOP IN IRWIN'S GARAGE, IN 1917



Courtesy Brainard Cummins Collection, Columbus, Ind.

steam traction engines, had cut production and laid off employees after being sold to Emerson-Brantingham, a farm machinery conglomerate, in 1912, and the city's economy had not recovered from this blow.[23]

On January 30, 1919, Cummins publicly announced his plans to form an engine company at a meeting of the Columbus Chamber of Commerce. The next day the *Evening Republican* reflected Cummins's enthusiasm in a lead article with the headline: "COLUMBUS TO BE HOME OF ENGINE BUILT TO BURN ANY KIND OF OIL AND OPERATE REGARDLESS OF COLD." A supplementary headline claimed: "UNLIMITED DEMAND ALREADY ASSURED." The newspaper reported that the new company would occupy all three floors of the old Cerealine mill then occupied by Cummins Machine Works. The new company would benefit Columbus beyond its direct employment because all castings and many other parts were to be purchased from local companies. Additionally, the company was to be entirely locally owned, and indeed some thirty Columbus residents subscribed for the initial offering of fifty thousand dollars of common stock.[24]

Later that same year when the capitalization of the company was increased to one hundred thousand dollars, most of the original shareholders doubled their investment, and some new subscribers bought shares. When all the shares had been paid for, Irwin owned 36 percent of the company's stock. Cummins owned 20 percent of the stock, which he had received in return for the assets of his machine shop. The remainder of the stock was owned by Columbus investors except for a small number of undistributed shares. The original employees of the engine company were the eight men and one woman who had been the work force of Cummins Machine Works. Additional workers were added during 1919, including people with needed skills. In May an engineering department was started with the hiring of Cummins's brother-in-law Joseph E. McCoy as draftsman. In midsummer Carl Hertel, a tool maker, was hired to become plant superintendent. Clessie knew who he wanted to run the plant: he was at the train station to greet Hertel and offer him the job

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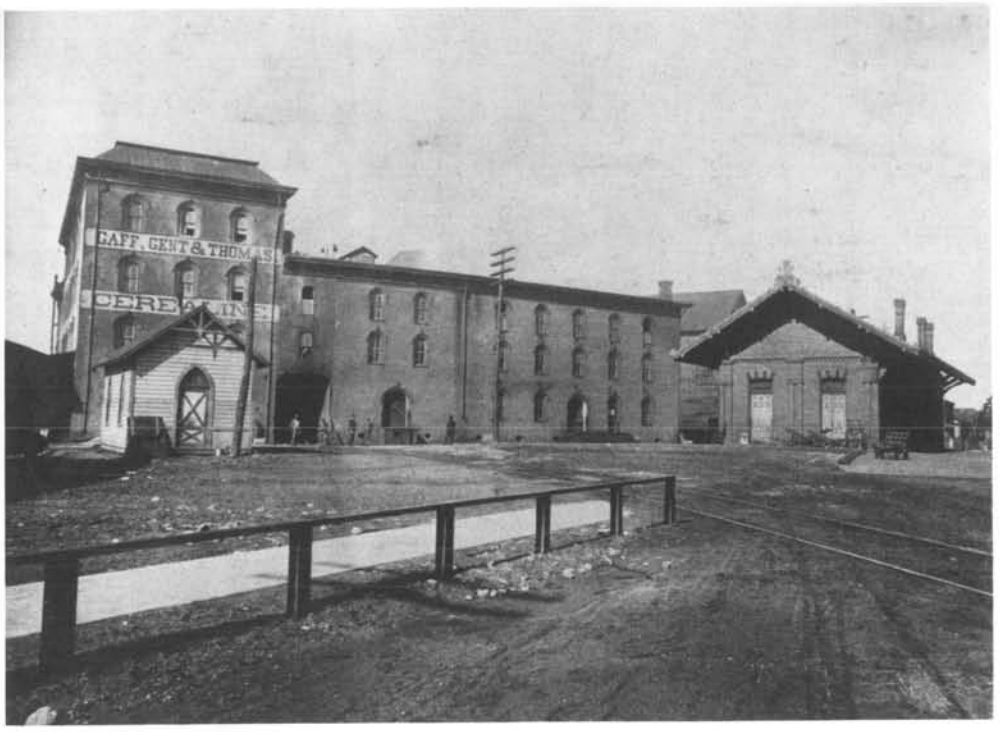
[23] Columbus *Evening Republican*, July 24, 1912.

[24] Columbus *Evening Republican*, January 31, 1919. For more on the early history of Cummins Engine Company, see Richard H. Gemmecke, "A Long, Long Pull: Cummins Diesel's Early Years," *Indiana Magazine of History*, L (June, 1954), 93-104.

THE CEREALINE MILL IN THE 1880S. IN 1919 CUMMINS ENGINE COMPANY BEGAN OPERATIONS IN THE THREE-STORY PART ON THE RIGHT. THE TALLER SECTION ON THE LEFT WAS RECENTLY RESTORED AS A PART OF CUMMINS'S CORPORATE OFFICE



Courtesy Bartholomew County Historical Society, Columbus, Ind.

of plant superintendent when the latter arrived in Columbus after his discharge from the army.[25]

As part of his license agreement Cummins received engine design plans, and by April, 1919, Cummins had built his first engine, a six horsepower model identical to the one designed by Hercules. While experimenting with this first engine, Cummins invented a means of mechanically controlling the timing of ignition in the precombustion chamber. This invention corrected the problem of erratic ignition caused by the wide variation in the quality of the fuels available at that time. Cummins was granted his first diesel engine patent for his invention. He sold this first six horsepower engine in September, and by the end of the company's fiscal year in February, 1920, he had sold a total of twenty-two engines.[26]

While Clessie Cummins was experimenting with his first engine, Sears, Roebuck was making its 1920 sales projections. When Sears informed Hercules of its requirements, the latter found that they did not have enough production capacity to build all of the diesel engines and all of the gasoline engines that they and Sears needed. To resolve this dilemma H. L. Knudsen recalled that "Mac [V. E. McMullen] recommended to Mr. Tippett that they find someone else to build the 1½ and 3 horsepower Hvid engines, and for the job he recommended C. L. Cummins." As a result of this recommendation "Mr. Tippett and McMullen . . . [went] to Columbus and met with Mr. W. G. Irwin and C. L. to discuss the matter and it was quickly arranged that C. L. would build the 1½ and 3 horsepower engines."[27]

In his memoirs Cummins recalled that Tippett was accompanied by his assistant B. F. Watson and an engineer E. B. Blakely. They were favorably impressed with Cummins's new shop and the six horsepower engine on the shop's test stand. Tippett proposed that Cummins build forty-five hundred of the 1½ and 3 horsepower engines. "The proposition nearly took my breath away," Cummins later wrote. "Visions of instant success started swimming in my head." Cummins did, however, question whether the two engine models, which had never been built or

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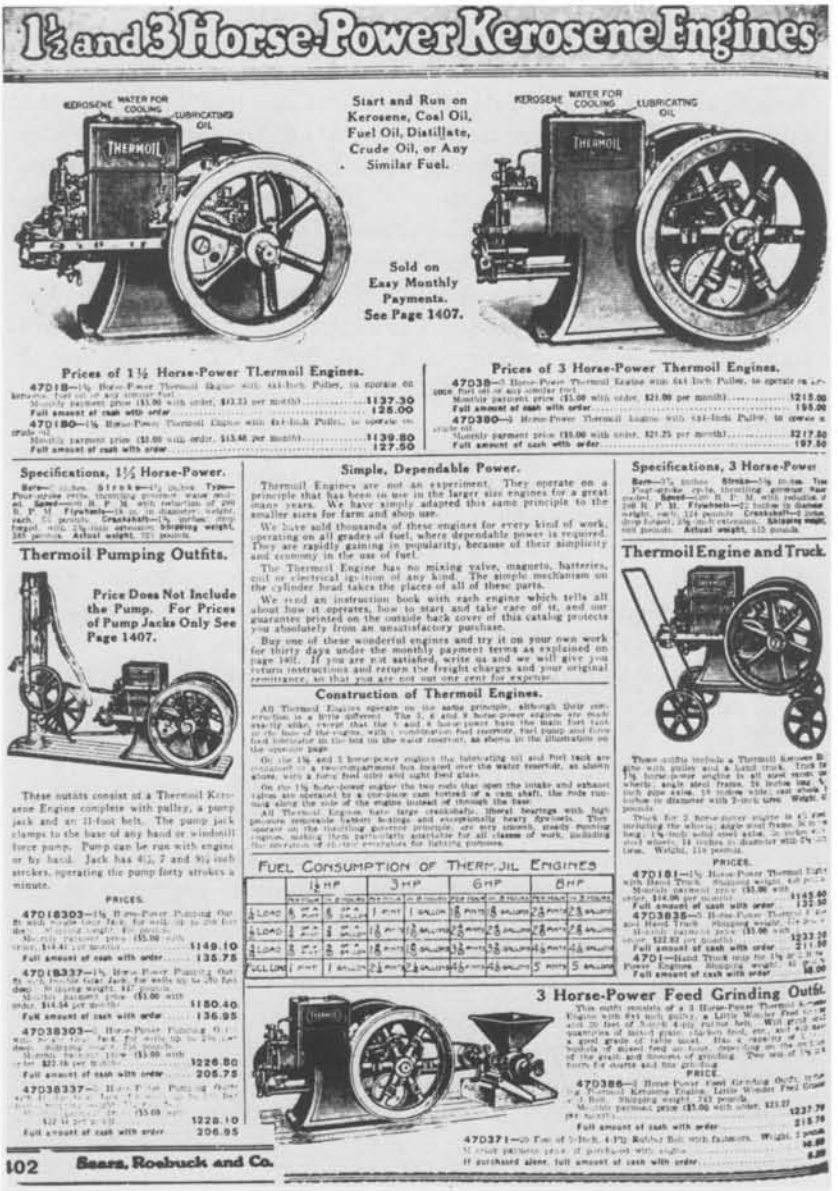
[25] Cummins Engine Company Capital Account Ledger, 1919-1925 (Cummins Engine Company); Cummins Engine Company Payroll Ledger, 1919, *ibid.*; Carl Hertel, interview with author, Columbus, Indiana, 1977. Hertel left Cummins in 1924. He later invented the sole used on the Converse basketball shoe and manufactured Chuck Taylor knee guards. Chuck Taylor was Columbus's basketball star of that era and is listed in the basketball hall of fame.

[26] Irwin to National Lead Company, April 16, 1919, Reel 27, No. 9, Vol. 71, Irwin Estate Files; Cummins Engine Company Sales Analysis Ledger, 1919 (Cummins Engine Company); Cummins, *My Days*, 89.

[27] Knudsen, "History."



ADVERTISEMENT FOR THE CUMMINS-BUILT 1½ AND 3 HORSEPOWER THERMOIL ENGINES IN THE 1920 SEARS, ROEBUCK AND COMPANY FALL CATALOGUE

Courtesy Sears, Roebuck and Company.


6 and 8 Horse-Power Kerosene Engines

$5.00 With Order—Thirty Days' Trial
Ten Months to Pay

Shipped From Warehouse Near You.

Specifications.
6 Horse-Power.

Prices of 6 and 8 Horse-Power Thermoil Engines.

Specifications.
8 Horse-Power.

Friction Clutch Pulley in Place of Regular.

Extracts From Letters We Have Received From Satisfied Thermoil Users.

6 and 8 Horse-Power Sawing Outfits.

6 and 8 Horse-Power Portable Engines.

6 and 8 Horse-Power Feed Grinding Outfits.

Sears, Roebuck and Co. 1403

ADVERTISEMENT FOR THE HERCULES-BUILT 6 AND 8 HORSEPOWER THERMOIL ENGINES IN THE 1920 SEARS, ROEBUCK AND COMPANY FALL CATALOGUE

Courtesy Sears, Roebuck and Company.

tested, would run properly. In response to his apprehension he was told, "We've sold thousands of the larger engines and we know what we're doing." Reassured by this statement, Cummins discussed the Sears proposal with Irwin, then agreed to accept it and a proposal to sell fuel injectors with his new timing device to Hercules for use on its six and eight horsepower diesel engines. As a result of the latter agreement Cummins sold fourteen thousand dollars of fuel injectors to Hercules during 1919 and 1920.[28]

Since Sears planned to sell the engines through their sales order catalogue and not offer any service, it was anxious to sell them at as low a price as possible. To meet its price objectives Sears asked Cummins to commit to his vendors for all parts for the entire order, and on this basis he calculated his production costs. After having his calculations checked, at Irwin's request, by Quentin G. Noblitt, he went to Chicago and finalized his contract with Sears.[29]

Sears was able to list Cummins's 1 1/2 and 3 horsepower engines and Hercules's 6 and 8 horsepower engines in its spring, 1920, catalogue. The basic models of these engines were equipped to run on kerosene, but an optional arrangement that allowed the engines to run on crude oil was available also. Marketed under the Sears tradename of Thermoil, the engines were sold under terms of cash with the order or "$5.00 with order—Thirty Days Trial—Ten Months to Pay." The prices and specifications published by Sears in its catalogue were:[30]

Engine size (in horsepower)	1 1/2	3	6	8
Cylinder bore (in inches)	3	3 7/8	5	5 3/4
Piston stroke (in inches)	4 1/2	5 1/2	7 1/2	9
Speed (in r.p.m.)	600	600	500	450
Weight (in pounds)	323	615	1100	1500
Cash with order	$125	$195	$265	$318
Monthly payment plan	$137	$215	$292	$350

[28] Cummins Engine Company Sales Analysis Ledger, 1919-1920 (Cummins Engine Company); Cummins, *My Days*, 83-84.

[29] Q. G. Noblitt to Irwin, October 14, 1919, Reel 27, No. 9, Vol. 71, Irwin Estate Files. In January, 1919, Noblitt organized the Indianapolis Air Pump Company, which eventually became Arvin Industries, Columbus's second homegrown Fortune 500 company. Coke Coons, *Arvin . . . The First Sixty Years* (Columbus, Ind., 1982), xii, 4.

[30] *Sears, Roebuck & Co. Catalogue*, Fall, 1920, 1402-1403.

The Sears catalogue listing brought an influx of orders before Cummins was able to produce the engines. In September, 1920, B. F. Watson complained, "Mr. Cummins is gradually building up an organization, but I don't believe he realizes the importance of the position he is in as he is holding some 400 of our orders, the oldest of which dates back to the 14th of January and yet this condition does not seem to worry him in the least." In his report on Cummins's operation E. B. Blakely suggested that some of the reasons for Cummins's slowness in starting production were: weak management; the purchase of all castings from a small, inefficient, and "thoroughly unionized" company; and the lack of tool and jig equipment resulting from Cummins's attempts to save money by having only two toolmakers to fabricate all his equipment. Eventually, however, Cummins's production levels did begin to improve. In August, 1920, 80 of the 1½ horsepower engines were produced along with 5 of the 3 horsepower engines and 305 injectors for the Hercules engines. In December, 1920, 110 of the smaller engines and a nearly equal number of the larger engines were produced.[31]

Unfortunately, the size of Cummins's organization at the height of his production for Sears cannot be known because the payroll records for this period are missing from the early ledgers. Hiring procedures were not very sophisticated at Cummins Engine Company in its early days. "All they did was write your name and clock number on a card and that was it," E. Don Tull recalled concerning his own hiring. "I went to work there running a drill press and one day the truant officer came around. He said, 'That boy isn't old enough to work in a machine shop.' I was only 14½." Tull was consequently reassigned to the task of recording data on the test block and was not allowed to operate machinery.[32]

In January, 1921, more engines were being returned from Sears than were being shipped by Cummins. One of the reasons for the high number of returned machines was Sears's easy payment plan. Many farmers realized that they could order an engine, use it for thirty days, return it, and have their down payment and freight charges refunded. One Cummins employee

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[31] Cummins Engine Company Sales Analysis Ledger, 1920 (Cummins Engine Company); W. M. Tippett to Irwin, October 20, 1920, letter with reports by E. B. Blakely and B. F. Watson attached, Reel 34, No. 6, Vol. 88, Irwin Estate Files; Cummins, *My Days*, 83-85.

[32] E. Don Tull, interview with author, Scottsdale, Arizona, 1978. Tull was laid off in 1921 but returned to Cummins Engine Company as a machinist in 1928 and became president of the company in 1959.

of that period recalled that most of the returned engines would run "just like a new one."[33] Another reason for the high number of returns was mechanical failure. In some cases the problem was that farmers failed to clean the injectors when they became clogged by an accumulation of carbon. As one Cummins employee recalled, "The farmers expected the engines to run [without maintenance] and they didn't"[34] In many other cases, however, the machines were defective. One defect in the machines was their tendency to run out of control at too great a speed and thereby come apart. Carl Hertel recalled seeing an example of this runaway defect while showing a customer how to operate the engine. "We were talking over against a horse stall when the engine ran away and the flywheel cut through the boards."[35]

The fact that the machines were defective became apparent after only a few months. Sears, however, decided to continue to try to sell the engines since both Hercules and Cummins had large inventories of components they had purchased in advance at Sears's request. In 1921 Sears discontinued installment sales of the engines and sold them on a cash with order basis only. To make the engines more attractive to potential buyers the prices of the 1½ and 3 horsepower models were cut to $79.50 and $106.50, respectively; the ratings of the 6 and 8 horsepower engines were increased to 7 and 9 horsepower; and the prices of the latter two engines were reduced to $195.50 for the smaller of the two and $259.95 for the larger. Even at the new low prices the engines did not sell in significant numbers. After the first quarter of 1921 Cummins Engine Company did not ship any engines to Sears or fuel injectors to Hercules. Sears did continue to list the Thermoil engines in its 1922 and 1923 catalogues, but whatever orders they received they apparently filled with engines already in stock.[36]

The Thermoil engine fiasco did not hurt Hercules very much because of the size and diversity of the Hercules enterprises. In fact, in 1920 the Hercules companies had a combined net profit of four hundred forty-eight thousand dollars from the sale of

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[33] Raymond Smock, interview with author, Columbus, Indiana, 1977. Smock was a machinist. Later he was owner of Southern Machine Company in Columbus.

[34] Raymond C. Frohman, interview with author, Columbus, Indiana, 1977. Frohman was Cummins's bookkeeper from 1920 to 1925. Later he was a partner in Columbus Products Company and CP Electronics.

[35] Interview with Hertel.

[36] *Sears, Roebuck and Co. Catalogue*, Fall, 1921, 1172-73; Cummins Engine Company Sales Analysis Ledger, 1920-1925 (Cummins Engine Company).

HANS L. KNUDSEN, CUMMINS ENGINE COMPANY'S CHIEF ENGINEER AND VICE-PRESIDENT OF ENGINEERING FROM 1922 TO 1947

Courtesy Cummins Engine Company.

forty-eight thousand engines, sixty thousand buggies, and twenty-nine thousand vehicle cabs and bodies. Late in the same year these companies were consolidated to form Hercules Corporation, which had a capitalization of eight million dollars. They also issued $1.5 million of notes, repayable with gold, for additional working capital and to expand engine plant capacity to eighty-five thousand engines annually. At the time Hercules occupied thirty-one acres of ground and claimed that it was the largest vehicle factory in the world. The new Hercules Corporation ceased making diesel engines and added furniture and refrigerators to the products it produced. By 1925 Hercules had discontinued its production of buggies and made household refrigerators, marketed under the tradename Serv-el, its principal product. This shift in product emphasis was reflected by Hercules Corporation's decision to change its name to the Servel Manufacturing Company in 1926.[37]

Cummins Engine Company did not weather the Thermoil disaster as well as Hercules. The company was especially hard hit because the problems with the Thermoil engines coincided with the company's difficulties with its first marine engine. During the time Cummins Engine Company was making engines for Sears, Clessie developed a single-cylinder marine engine that produced eight horsepower. Cummins personally demonstrated his engine to Gulf Coast fishermen in early 1921 and was able to sell several of them. Soon, however, it became apparent that this engine suffered from the same runaway defect as the Thermoil engines. According to Cummins's autobiography, "The crankshaft counterweights were flying off, cutting engines apart, taking out the sides of boats, and shearing tops off boat cabins."[38] Thus, by mid-1921 Cummins had nothing to sell except machine shop capacity. For the next three years Cummins's sales were usually less than one hundred dollars per month, and the company's losses were covered by loans from Irwin family funds.[39]

Naturally, the original shareholders became very discouraged during these lean years. Raymond Frohman, the Cummins Engine Company's bookkeeper, noted that when any of them brought their shares into Irwin's bank, they were paid the full one hundred dollars per share subscription price by W. G. Irwin.

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[37] Hercules Corporation Prospectus, December 20, 1920, Reel 31, No. 8, Vol. 81, Irwin Estate Files; Evansville *Journal*, March 25, 1921; Evansville *Courier*, May 11, 1947.

[38] Cummins, *My Days*, 92.

[39] Cummins Engine Company Sales Analysis Ledger, 1920-1925 (Cummins Engine Company).

According to Frohman only three of the original shareholders held onto their stock while the rest sold their shares to Irwin. As a result the Irwin family came to control 75 percent of the common stock of Cummins Engine Company. After the deaths of Irwin and his sister Linnie Sweeney the Irwin family stock was inherited by Sweeney's grandchildren J. Irwin Miller and his sister Clementine.[40]

Fortunately for the future of the diesel industry in Indiana, Clessie Cummins had not run out of ideas and W. G. Irwin had not run out of money. In late 1921 Cummins came up with an idea for an improved fuel injector. "He tried to explain the idea to me with the result that when he said that it would cost $10,000 to prove the idea, I told him that I would furnish the money," W. G. Irwin wrote many years later. "The idea turned out to be an improvement but it was not enough; so he got another idea and another $10,000 and these ideas and 10,000s continued for quite a period until he made a discovery for which he received basic patent protection."[41]

Before putting up the first ten thousand dollars, however, Irwin had Cummins invite H. L. Knudsen to Columbus to give an opinion on the feasibility of the new concept. When Knudsen told Irwin and Cummins that the idea would work but would require a lot of research to make it operate satisfactorily, they asked Knudsen to join the company as chief engineer and to develop the idea. Knudsen agreed and began his career at Cummins Engine Company in January, 1922.[42]

All of 1922 and 1923 were spent by Cummins and Knudsen developing and testing injectors. After about a year of experimenting they abandoned the precombustion chamber concept because they could not prevent carbon formation in the cup. The alternative they developed was a unique arrangement that injected the fuel directly into the combustion chamber; thus, doing away with the precombustion chamber. An engine with the new injector was placed on the market in 1924. Designated Model F, the new engine proved to be an excellent engine for marine propulsion and electric power generation. It also proved to be very durable: some being kept in use for more than forty years.[43]

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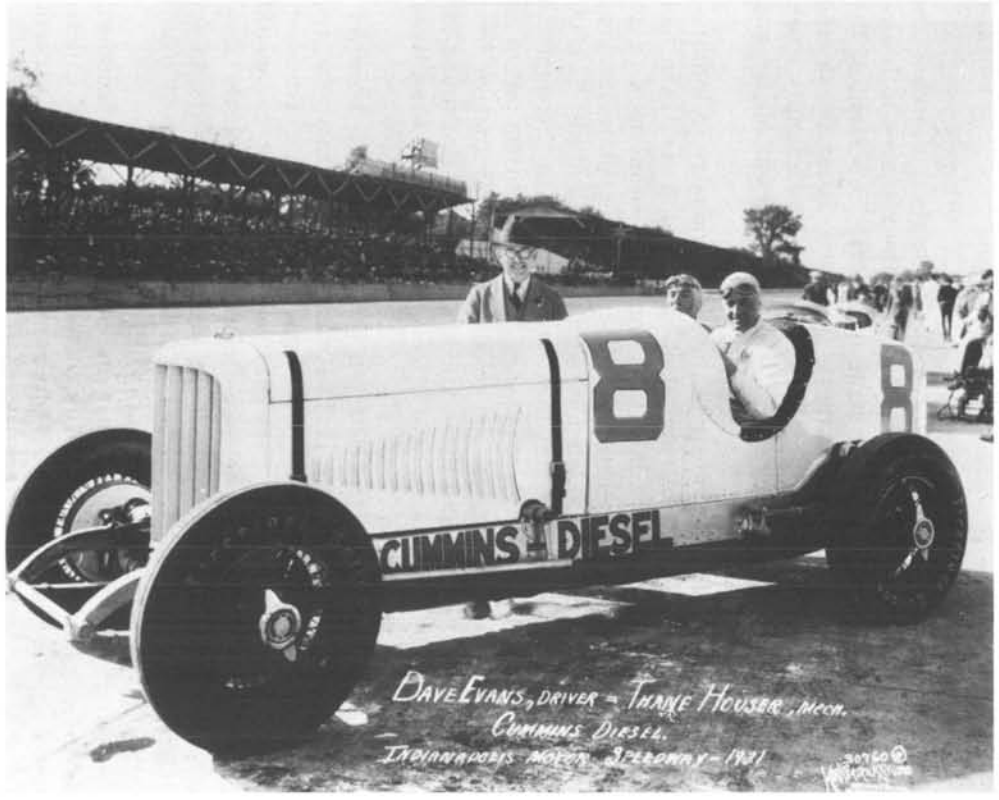
[40] Interview with Frohman; Cummins Engine Company, Prospectus for Sale of Common and Preferred Stock, 1947 (Cummins Engine Company).

[41] W. G. Irwin, draft of "History of Cummins Engine Co.," circa 1943, Reel 85, No. 1, Vol. 212, Irwin Estate Files.

[42] Knudsen, "History."

[43] *Ibid.*; John W. Rowell, "Yesterday's Restored Engines Hum All the Way to the Bank," *Power Team*, IX (November/December, 1981), 14, 18; interview with Smock. During this period Smock made all injectors tested under Knudsen's direction.



CUMMIN'S 1931 DUSENBERG RACE CAR THAT FINISHED THE INDIANAPOLIS 500-MILE RACE WITHOUT A PIT STOP. CLESSIE CUMMINS IS STANDING BEHIND THE CAR

Courtesy Cummins Engine Company.

For about the first two years of production things went very well. In 1925 J. Kuttner, editor and publisher of *Oil Engine Power* and *Motorship*, visited Cummins's plant. Kuttner had just spent three years in Germany doing consulting work and was, according to Cummins, "a hard-boiled German engineer." When this "hard-boiled" expert saw the Model F, however, "He was," Cummins wrote to Irwin, "dumbfounded when he saw the performance our engine put up. . . . He told us that he was willing to go on record that we had the finest development and the most advanced engine that he has seen or heard of."[44]

Cummins got into another fiasco, however, when he sold sixty of these engines to the Northwest Engineering Company of Green Bay, Wisconsin, during the years 1925 to 1927. Northwest used the engines in its shovels and draglines; the first ever application of diesel engines to earth moving machinery.[45] Like all diesels of the era the Model F had all of its valve and injector actuating mechanisms on the outside of the engine, and these components quickly became clogged with the dust and dirt common in a shovel's work environment. Also, the fuel system had a characteristic that delivered proportionately larger quantities of fuel when the engine was lugged down in speed. Whenever the operator dug into a bank of earth and slowed the engine, it belched black smoke and pulled harder and harder the more it was lugged down; in some cases it pulled until the shovel was tipped over![46]

Northwest discontinued the diesel experiment in 1927. Their action was perhaps premature because by the next year Cummins had developed the first diesel engines in the world that had all their moving parts enclosed and pressure-lubricated. And by 1929 Cummins Engine Company had developed a unique distributor type fuel pump that accurately controlled fuel delivery in variable-speed applications.[47]

Cummins gained another benefit from the shovel fiasco besides a better designed engine: the increased business from

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[44] Cummins to Irwin, September 3, 1925, Reel 42, No. 2, Vol. 105a, Irwin Estate Files.

[45] T. S. Smith, Northwest Engineering Company, to the author, May 31, 1977; Cummins Engine Company Engine Shipment Book, 1924-1931 (Cummins Engine Company). The machines made for Northwest Engineering Company represented 10 percent of all Cummins diesels built during the years 1924 to 1931.

[46] Cummins, *My Days*, 101; Knudsen, "History"; Don J. Cummins, interview with author, Scottsboro, Alabama, 1978. Don J. Cummins was Clessie Cummins's youngest brother and was the company's service representative at this time. In the 1950s he was vice-president of research and engineering.

[47] Cummins, *My Days*, 102-104; Gemmecke, "Irwin," 245-47.

THE CUMMINS TEST TRUCK AND ITS DRIVING CREW OF (LEFT TO RIGHT) FORD MOYER, LARRY GENNERIO, CLESSIE CUMMINS, AND DAVE EVANS BEFORE THE START OF THE TRUCK'S RECORD-BREAKING 14,600 MILE ENDURANCE RUN AT THE INDIANAPOLIS SPEEDWAY.

Courtesy Cummins Engine Company.

Northwest had forced the company to seek a larger facility. In early 1926 operations were moved from the Cerealine mill to a twenty-two thousand square foot factory building at the intersection of Fifth and Wilson streets that formerly had been a part of Reeves and Company. The company offices were moved into a frame building across Fifth Street, which employees always referred to as "the old house." The latter structure still stands amid the brick and concrete of the one and a quarter million square feet of the present Columbus Engine Plant.[48]

By 1929 Cummins's principal business had become the sale of engines for yachts being built for financiers and speculators who were riding high on the stock market boom. When the market crashed in October, Cummins's yacht engine sales crashed with it. W. G. Irwin told Cummins that he saw hard times ahead and would have to close the engine plant. Cummins knew that he had to come up with something dramatic to keep Irwin's interest alive, and so he installed one of his engines in a 1925 Packard limousine; thus, creating the first diesel automobile. He gave Irwin a surprise demonstration on Christmas Day, 1929, that restored Irwin's enthusiasm and ended all thought of closing the company.[49]

The Packard limousine experiment was followed by the installation of diesel engines in a Packard roadster and a Duesenberg race car. The Packard set and the Duesenberg broke the first diesel vehicle speed records at Daytona Beach, and in 1931 the Duesenberg became the first car ever to finish the Indianapolis 500 without making a pit stop. The publicity gained by the diesel automobiles created interest among both the general public and industrial companies. Several of the latter made offers to buy Cummins Engine Company or to enter into a royalty arrangement to manufacture the engines the company had developed. Although Irwin later said that he had had no intention of selling the engine company once the possibility of its becoming a successful venture became obvious, he did allow negotiations for the sale of the company to proceed almost to the signing state. However, after E. R. Erskine, the president of Studebaker, told him that he lacked the experience to exploit the new development, Irwin grew stubborn and told John Niven, the general manager of Cummins, that there would be no sharing of the product in America and that the time had come "to go ahead in

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[48] Cummins, *My Days*, 101-102; M. T. Harrison to E. D. Tull, May 11, 1965, Historical Record of Cummins Land and Buildings (Cummins Engine Company).

[49] Cummins, *My Days*, 1-7.

TWO OF THE FIRST TWELVE DIESEL TRUCKS TO OPERATE IN AMERICA. BUILT BY STERLING MOTOR TRUCK COMPANY OF MILWAUKEE, THEY WERE OPERATED BY VALLEY FREIGHT LINES OF FRESNO, CALIFORNIA

Courtesy William H. Fox Collection, Columbus, Ind.

manufacturing and selling. We are wasting too much time thinking about royalties."[50]

More important than the publicity created by the cars was the fact that the cars' engines could run at twenty-two hundred r.p.m., more than twice as fast as any other diesel engine.[51] With engines like these Cummins and Irwin concluded that the company had the technology needed to design a "truck and bus" diesel. After a survey was made of the market and physical requirements for such engines, H. L. Knudsen designed a six-cylinder, 125 horsepower engine that ran at a governed speed of eighteen hundred r.p.m. The engine, which later was designated Model H, went onto the test stand in late November, 1931, and after a few hours of break-in it was installed in a test truck. During December the truck and its engine were endurance tested by being run 14,600 miles nonstop at the Indianapolis Speedway, a new vehicle record.[52]

After this endurance test Cummins was ready to begin selling the engines, but W. G. Irwin insisted on more testing in different climates and by men who knew nothing about a diesel.[53] Therefore, the first diesel truck went into commercial service during May, 1932, in the fleet of Purity Stores, a California food-store chain in which the Irwin family had a large financial interest. This truck was used as a demonstrator in addition to its normal work of delivering groceries throughout northern California. After observing the truck's performance for several months, both Savage Transportation Company of San Francisco and Valley Freight Lines of Fresno bought four diesel trucks. Since Cummins had no dealers to service the engines, Don Cummins was sent from the factory to take care of them. These two trucking companies gave the new diesel trucks a most severe test by having them pull sixty-eight thousand pound truck full trailer combinations over the long, difficult routes from San

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[50] *Ibid.*, 110-27; John W. Rowell, "Joint Ventures, Licensing Deals Were Hot Topics 50 Years Ago," *Power Team*, X (March/April, 1982), 12-14; Correspondence of W. G. Irwin, John Niven, C. L. Cummins, and others, from April 1, 1930 to November, 1931, Reel 50, No. 2, Vol. 126, and Reel 51, No. 16, Vol. 128, Irwin Estate Files.

[51] Clessie L. Cummins, "Diesel Engines for Automobiles," Society of Engineers, *Transactions*, Vol. XXVII (New York, 1930), 291.

[52] Cummins, *My Days*, 135-43; Irwin to A. J. Yeats, November 17, 1931, Reel 55, No. 11, Vol. 136, Irwin Estate Files. During the 1960s V. E. McMullen sometimes stopped at my desk and expressed his admiration of H. L. Knudsen and his design of the original H engine. "Here is an industrial product that has lasted for 40 years," he said. "That is an unheard of accomplishment."

[53] W. G. Irwin to J. I. Miller, January 4, 1932, Reel 78, No. 4, Vol. 136, Irwin Estate Files.

Francisco to Salt Lake City and Los Angeles. When the diesels ran three times longer before requiring overhauling than the best gasoline engines, "word spread up and down the Coast just like wildfire," one observer recalled, and other truck fleets began to order diesel trucks.[54]

Almost immediately, cries for more power were heard from the truckers who hauled heavy loads through mountains, and Cummins began what would become a continuous program of modifications and application of new technology to the engine. In 1936 the original engine was modified to produce 150 horsepower, and the next year a supercharged version of 200 horsepower was developed, which became the standard power for the largest mining trucks of that era.[55]

Although Cummins had produced a better mousetrap, the company did not wait for the world to beat a path to its door. Instead, people were hired to make things happen. In 1934 J. Irwin Miller, W. G. Irwin's grandnephew, joined the company and directed it for the next forty years, mostly as chairman and chief executive officer. The same year Paris E. Letsinger became vice-president of sales and established a unique sales and service organization and new policies that have since become the standard of the industry. In 1935 V. E. McMullen was hired as a consultant. He changed what was little more than a job shop with secondhand equipment into an efficient, volume production facility. And H. L. Knudsen continued to direct the development of new and improved engines for another decade as vice-president of engineering.[56]

The new engine was very versatile. In addition to its use in the trucking and mining industries, it also was widely applied to oil well drilling rigs, industrial locomotives, construction machinery, and other equipment that had used steam or gasoline engines until then. As a result engine sales rose from 133 in

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[54] Interview with Don J. Cummins; Paris E. Letsinger, interview with W. M. Harrison, Visalia, California, 1972; Paris E. Letsinger, interview with author, Visalia, California, 1978; Paris E. Letsinger was the San Francisco District manager of White Motor Company. As manager he was involved with all the early diesel truck applications.

[55] Cummins Sales Literature and Catalogues, 1932-1941 (Cummins Engine Company).

[56] Columbus *Evening Republican*, April 17, 1946; Columbus *Republican*, January 21, 1973; Cummins Engine Company, Prospectus for Sale of Common and Preferred Stock, 1947 (Cummins Engine Company); "Joseph Irwin Miller," *Who's Who in America, 1984-1985*. During World War II McMullen was vice-president and general manager of the company. After retiring in 1949 he served as a consultant until he was ninety years of age. As a consultant he went through factory and office several times each week looking for and *finding* ways to improve operations.

1933 to nearly 5000 in 1941.[57] Cummins Engine Company made its first full year profit in 1937. After investing $1.8 million in loans to the company during its unprofitable years, Irwin no longer had to carry the Cummins Engine Company.[58] Diesel engine manufacturing had become an established and growing industry in Indiana.

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[57] Gemmecke, "Irwin," 291.

[58] Cummins Engine Company, Prospectus for Sale of Common and Preferred Stock, 1947 (Cummins Engine Company).