

CUBA AND RAILROADS

PART 2: Cuban Ore for American Rails

By MARK REUTTER

Discovery of Red Gold

When he landed on Cuba on October 28, 1492, the first question that Christopher Columbus asked the natives, according to his diary, was where he could find the gold and silver. The explorer believed that he had discovered Cipango, the fabled land of precious metals, pearls, and spices that Marco Polo had described as being located some 1,500 miles off the continent of India.¹

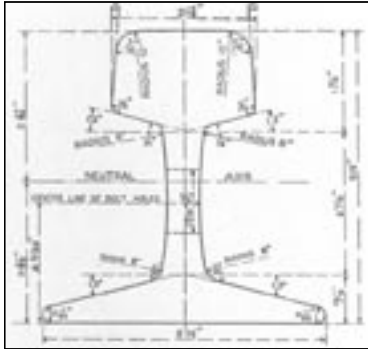
Columbus eventually found a little gold, but it amounted to nothing, and the mineral riches of Cuba remained hidden, except for the discovery of copper, for the next four centuries. The island's fate began to change in 1882 when Luther S. Bent heard reports that deposits of iron ore had been found in the coastal foothills east of Santiago. As general

manager of the Pennsylvania Steel Co., Bent was acutely interested in expanding the company's holdings of iron ore, the essential ingredient for making steel.

Pennsylvania Steel had been established 17 years earlier by Bent's father-in-law,

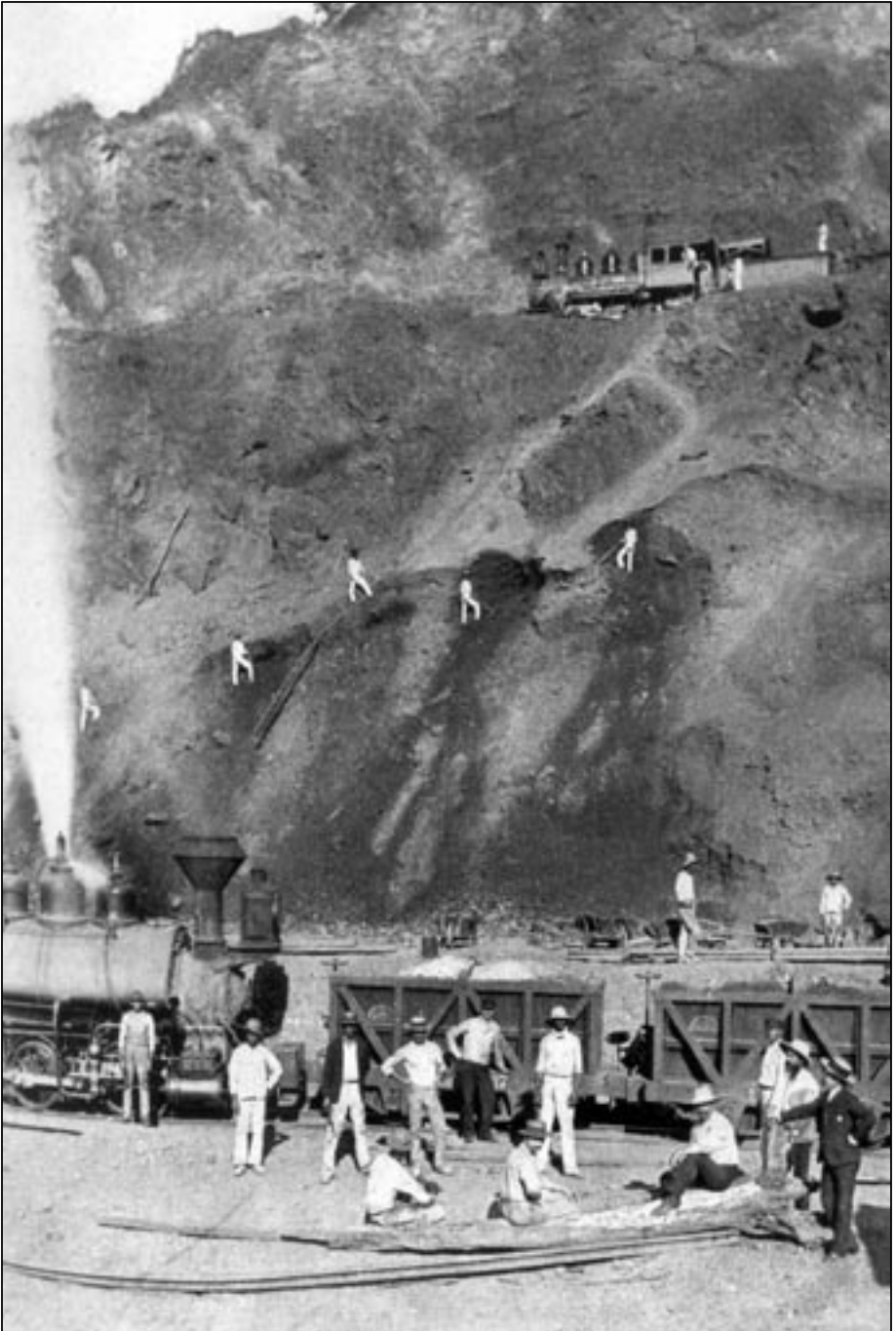
Samuel M. Felton. A veteran railroader and confidant of President Abraham Lincoln (see page 83), Felton had called upon J. Edgar Thomson and Thomas A. Scott, the president and vice president of the Pennsylvania Railroad, to help him form a company that would produce railroad rails under Henry Bessemer's new steelmaking process.

Felton resigned from the presidency of the Philadelphia, Wilmington & Baltimore Railroad to become president of Pennsylvania Steel. Thomson and Scott personally invested in the company,



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**Cross-section diagram of
100-pound Pennsylvania Railroad
rail made from Cuban ore.**



Mark Reutter Collection

Two Baldwin-built 0-6-0s work the Juragua ore banks in the 1890s. Before the 1898 Spanish-American War, most of the laborers were Spanish soldiers. They were paid miners' wages, while their regimental officers pocketed their pay as soldiers. After the war, the company imported most of its workers from Spain, offering them \$1-a-day wages.

and PRR itself subscribed to \$679,800 in capital stock to assume controlling interest of the firm.²

In April 1867, Pennsylvania Steel opened the first Bessemer steel plant in the United States at Steelton, Pa., three miles southeast of Harrisburg. The rails produced by the Bessemer process quickly proved to be superior to the iron rails used by American railroads. Iron rails fractured with chilling frequently. On main-line track, iron rails required replacement as frequently as every six months. A steel rail could last 10 years under the most punishing conditions. “Probably no other technological development has done so much to increase the capacity of the railroads and reduce their operating costs as this substitution of steel for iron rails,” was the assessment of two experts.³

While the steel rail represented an auspicious advance in railroad technology, the manufacturing system pioneered by the Steelton Works revolutionized the metal-making industry. By 1880, Pennsylvania Steel was rolling 113,000 tons of rail a year and was the largest maker of “pig” (raw) iron and Bessemer steel in the East. Other entrepreneurs had entered the steel business by this time, most notably Andrew Carnegie, who named his first rail-rolling mill “Edgar Thomson Works” in honor of the same PRR president who had helped bankroll the Steelton plant.⁴

Enjoying a seemingly endless demand for steel rails, both for the construction of new railroads and for the replacement of “railroad iron” on existing lines, Pennsylvania Steel was under pressure to find new sources of iron. Its mines around Cornwall, Pa., 20 miles east of Steelton, had been partly worked out, and efforts to obtain Bessemer-quality ore in southern

Virginia had proven to be disappointing. All of which made Luther Bent extra attentive when Alfred Earnshaw, a Philadelphia steamship owner, mentioned the rumors that his agents were hearing in Cuba.

Bent sent Frederick William Wood to investigate. Wood was just 25 years old when he walked off the boat at Santiago, Cuba, in April 1882. Born in Lowell, Mass., the son of a cotton-mill foreman, Wood had graduated from the Massachusetts Institute of Technology with a specialty in mining engineering and metallurgy. Joining the steel company in 1877, he was considered a boy wonder and was rewarded with a steady round of promotions by Bent. Earnshaw’s agents knew enough

about the young engineer’s hard-charging reputation to have guides and pack mules ready when they met him at dockside.⁵



Mark Reutter Collection

More than any other individual, Frederick Wood developed mining in Cuba.

Royal palms, densely packed and majestic, filled the lowlands before Wood and his party. A line of jagged mountains, the Sierra Maestra, rose behind, with peaks climbing two-thirds of a mile into the sky. In Cuba, Richard Harding Davis wrote, “every feature of the landscape was painted in highlights; there was no shading, it was all brilliant, gorgeous, and glaring.”⁶

The men on horseback had little interest in the scenery as they passed under the coral cliffs that separated the green foothills from the indigo blue Caribbean Sea. Wood’s first stop was at the property of José Ruiz de León. Some ore had been mined in outcroppings (the source of the rumors), but Wood wasn’t impressed with the quality.

He retraced his steps, examining the

banks of the swift streams that dropped off the Sierra Maestra. After several days of tramping through almost inaccessible jungle, he found hundreds of acres of side hills honeycombed with iron ore. The earth is full of iron ore, but most of it is commercially worthless because of its low iron content or high level of impurities. The ore that Wood discovered was just about perfect. It was hematite, the most desirable of all hard ores, and contained very little phosphorus, the bane of steelmaking. In steelman’s slang, Wood had found “red gold.”⁷

Within six months, Wood was back on the island, leading a team of engineers to the site, which was named Juragua after the stream that had led him to the deposit. Plans were made for a railroad to connect the deposit with a shipping dock to be built at La Cruz, 17 miles away. Because the ore lay in unclaimed forests, surface rights to the land were available free of charge by simply filing an application at the land office in Santiago. On April 17, 1883, the Crown of Spain added a lucrative coda—granting

Pennsylvania Steel the right to export the Cuban ore free of duties and “all other imposts” for a period of 20 years.⁸

On July 17, 1884, the two-foot, six-inch-gauge Juragua Railroad was finished, and ore shipments from La Cruz to Philadelphia commenced. Total production during 1884 amounted to 23,977 tons. In the next year, production jumped to 80,095 tons, and in 1888 to 204,475 tons.

Bent and the board of directors directed Frederick Wood to study the feasibility of building a plant on the Chesapeake Bay, 100 miles closer to Cuba than Philadelphia was. The original plan called for the new plant to smelt the ore in blast furnaces at Sparrows Point, nine miles southeast of Baltimore, and then ship the cold “pig” 90 miles to Steelton for conversion into steel. But it was soon decided that the ore could be more profitably used by directly making steel rails at the new plant. Surplus ore would go to Steelton to make specialty track items offered by Pennsylvania Steel, such as switch frogs, girder rail, and crossover assemblies.⁹



Three iron mining districts were developed in Cuba between 1882 and 1910—Juragua and Daiquiri on the south coast and Mayari on the north coast. The red lines show the railroads that linked the mines to ports, and the black lines represent the Cuba Railroad.

Steel Rail Gyration

On June 27, 1891, the Sparrows Point operation ceased to be the Maryland Extension of the Pennsylvania Steel Co., and Frederick Wood was named the president of the newly formed Maryland Steel Co. The first Bessemer steel made south of the Mason-Dixon Line was produced on August 1, 1891. Six days later, the first rail was rolled.

The Pennsylvania Railroad agreed to a highly beneficial joint-traffic rate on shipments from Sparrows Point to spur production.¹⁰ *Iron Age* lauded the new mill for its advanced manufacturing practices. But prosperity was short-lived, as the Panic of 1893 drastically changed business conditions.

Before the panic, the prices and production of rail were closely controlled by the Rail Makers Association. Comprising the “Big Six”—Carnegie Steel, Illinois Steel, Pennsylvania-Maryland Steel, Cambria Steel, Bethlehem Iron, and Lackawanna Iron & Steel—the association was bound by a solemn and secret oath:

We, the before-named companies and corporations, manufacturers of steel rails, hereby mutually agree one with the other, that we will restrict our sales and the production of steel rails of 50 pounds to the yard and upward, applying to orders taken by us and to be delivered by us or from our respective works ... as hereinafter allotted and limited.¹¹

The association, in short, was a “pool” or cartel—rival producers had come together to limit the production of steel rails and, as much as possible, to set prices. Open only to the presidents of the member companies, the association imposed its quotas with regal disregard for the 1890 Sherman Anti-Trust Act, but with a great deal of bickering among the steel presidents when they met to carve up the production allotments during their quarterly meetings at New York’s original Waldorf Hotel.

What kept the pool going was a geographical balance of power. In the Midwest, there were two giant producers of rail (Illinois and Carnegie) and in the East, four smaller producers (Pennsylvania-Maryland, Cambria, Bethlehem, and Lackawanna). In major policy matters, the two groups kept each other in check.¹²

The competitive equilibrium, already strained by the panic, underwent a decisive shift in 1896 when John D. Rockefeller, through proxies, succeeded in buying tens of thousands of acres of ore-rich wilderness 100 miles inland from Duluth, Minn. The remote Mesabi, or Mesaba, range had been discovered in 1890 by the Merritt clan (known collectively as the “Seven Iron Men”). The ore had the remarkable characteristic of lying on the surface of the land. Soft and earthlike, the ore could be scooped out by steam shovel without recourse to the hard-rock mining required to unearth hematite ores at other mines in the U.S. and at Juragua in Cuba.

Rockefeller had become master of the range, but he needed a long-term buyer to turn his ore into gold. Andrew Carnegie’s partner, coke magnate Henry C. Frick, negotiated a pact with Rockefeller. It guaranteed the purchase by Carnegie Steel of 1.2 million tons of Mesabi ore a year for 50 years, to be shipped over Rockefeller’s railway (Duluth, Missabe & Northern) and steamship lines on the Great Lakes. Mesabi ore reduced the cost of ore delivered at Pittsburgh by \$3 a ton, giving the Carnegie organization a commanding position over its competitors.¹³

Carnegie pounced. “The steel rail pool is broken,” *Iron Age* announced in its February 1, 1897, issue. A ton of rails that had been buoyed up to \$26 or \$27 by the remnants of the pool, suddenly dropped to \$20. Then \$19. Then \$17. In a single day, when a large order from a railroad company



No. 9, a Baldwin-built 2-6-2, pulls ore cars over a trestle on the standard-gauge railroad between Daiquiri Bay and Lola Hill. The nearby Berraco mines were served by 0-4-0 saddle-tank engines that were designed for working in tunnels.

Photos on pages 31-43 are from the Hagley Museum and Library, except where noted.

was placed before the steelmakers, prices could gyrate by as much as \$5 or \$6 a ton as each company tried to get a leg up on its opponents. Panic spread among steelmakers and their stockholders. In quick succession, Illinois Steel was reorganized; Lackawanna Steel decided to move its operations from Scranton, Pa., to Buffalo, N.Y., in order to secure the Upper Lakes ore; and Bethlehem re-tooled to manufacture armor plate and steel guns for the U.S. Navy, a less cutthroat line of business.¹⁴

Pennsylvania-Maryland Steel tried to outflank Carnegie by deploying Sparrows Point's position as a port to advantage. In June 1897, the mill won orders for rails from the East India Railways, followed by sales to railroads in Mexico, New Zealand, Argentina, Great Britain, and Australia. The showdown between Carnegie and Wood, though, took place when Maryland Steel wrested from Carnegie in 1898 and 1899 the largest foreign rail orders of the period—a total of 107,550 tons of 64½-pound rail for the Chinese Eastern Railway. The order was enough to lay 1,060 miles of track across Manchuria for Imperial Russia's Trans-Siberian route.¹⁵

Despite these successes, Pennsylvania Steel took a bruising loss of \$1.136 for every ton of rail it rolled. By 1901, Alexander J. Cassatt had had enough. The president of the Pennsylvania Railroad believed that Carnegie's price wars were causing the same "demoralizing" effects on the steel industry that rebates and rate cutting had inflicted on the railroad industry.

The PRR president was committed to a new form of business practice, known as a "community of interest," in which financially strong railroads purchased the stock of weaker companies, stabilized freight rates, and used the enhanced cash flow to improve the railroad plant and ultimately increase profit margins.¹⁶

Cassatt was also fiercely self-protective. Committed to extending PRR into Manhattan through a tunnel under the Hudson River, he was determined not to become dependent on an outside supplier of such an essential element as rail. Enlisting the support of Drexel & Co., Cassatt entered into negotiations that were under way to consolidate the steel industry and, not incidentally, to rid the business of Carnegie's destabilizing influence.

On April Fool's Day 1901, the United States Steel Corporation purchased all of the Carnegie steel mills, effectively retiring the "little Scotch pirate," and placed Rockefeller's Mesabi properties under the umbrella of the new conglomerate.

On the same day that U.S. Steel was formed, Pennsylvania Steel acquired the entire capital stock of Rockefeller's Spanish-American Iron Co. The company owned a huge swatch (17,000 acres) of ore grounds adjacent to the Juragua mines and had started building the same kind of advanced ore-handling system found on the Great Lakes at Daiquiri, Cuba.¹⁷

On April 29, 1901, Cassatt recapitalized Pennsylvania Steel through Drexel. A holding company, Pennsylvania Steel Co. of New Jersey, was formed with the majority of stock owned by PRR and the Philadelphia & Reading Railroad. Effingham B. Morris, a member of the PRR's board of directors, became chairman of the holding company. Edward T. Stotesbury, George F. Baer, and other Philadelphia capitalists with large stakes in railroads were placed on the steel company's board.¹⁸

The Rail Makers Association was then reconstituted under the leadership of the Steel Trust and PRR. The market share for rails was U.S. Steel (67.22 percent), Pennsylvania-Maryland Steel (10.30 percent), and four other makers (22.38 percent shared).¹⁹ The association placed a fixed price of \$28 a ton for rails, a huge improvement from the dark days of 1897.

The Big Push

With the rail wars over, Frederick Wood could concentrate on safeguarding his steel empire by building up a cheap and plentiful supply of high-grade ore. He had been named vice president of the new holding company, and his protege, Edgar Felton, grandson of the company's founder, was president.

The Juragua mines were sold to Bethlehem Steel, and a 10-mile-long narrow gauge was built to tap the Berraco fields east of Daiquiri. At the same time, plans were developed to excavate Lola Hill, a cone-shaped promontory that towered 850 feet above the surrounding jungles. Big-bucket Marion steam shovels were landed at Daiquiri's steel pier, along with crushers and tipples, three Baldwin 0-4-0 locomotives, and enough explosives to blow apart a dozen *Maines* (the incident that precipitated the 1898 Spanish-American War in Cuba).

Thus fortified, the workforce assaulted Lola Hill. Working on 11-tiered shelves, mine operations were established. Black powder was used to blast the hard rock face of the hill, while dynamite shattered the larger boulders. The Marion shovels dumped the waste rock into mine cars that were taken by the Baldwin switchers to nearby dumps. The ore, drawn down by gravity chutes to tipples in the valley, was fed into standard-gauge hopper cars for the short ride (five miles) to the Daiquiri pier and the long ocean journey (1,300 miles) from Cuba's south coast to Sparrows Point.²⁰

To the backers of Pennsylvania Steel, it was not distance between mine and mill that counted; it was the cost of extraction and freight. With a workforce in Cuba whose wages of \$1-a-day were half those of U.S. ore-mine workers, the company could make pig iron at Sparrows Point for less than one-half cent per pound.



Lola Hill took on the look of a giant corkscrew as it was stripped of its ore. Marion steam shovels worked on the different shelves, removing ore that was blasted out of the rock face by black powder and dynamite. Note the miners' barracks in the distance.



Ore is loaded into railway cars at the bottom of Lola Hill for the short ride (five miles) to the Daiquiri pier and the long ocean journey (1,300 miles) to Sparrows Point.

The economy of the transport system was apparent to the financiers and railroaders who sat on the steel company's board of directors. Between 1902 and 1906, the Spanish-American Iron Co. declared \$2 million in cash dividends to Pennsylvania Steel and held another \$1.25 million in a surplus account. Even after deducting the capital costs of opening Lola Hill and Berraco, the ore delivered at Sparrows Point averaged 10 percent below the price of domestic ores.²¹

This meant a visible saving of another \$2 million for the steel company, a factor that influenced Alexander Cassatt when he approved plans, put forward by Wood and Felton, to open up the Mayarí deposit on the north coast of Cuba. In 1907, the Pennsylvania Railroad purchased \$3.8 million in bonds issued by the Spanish-American Iron Co. to finance the venture, which *Iron Age* declared to be of "international

importance" with a potential for commercial gain on par with "the discovery of the Mesaba range."²²

Mayarí (pronounced the same as "fiery") was the name given by the engineers for a plateau of sweeping pine forests that stood between the lowland jungles of Nipe Bay and the cloud-covered peaks of the northeastern Cuban mountains.

The Spanish had known about the red pellet-like earth of the plateau for centuries. They called the area *tierras de perdigones*, or the shot grounds. What lay beneath the surface soil, however, had never been examined until Charles F. Rand, president of the Spanish-American Iron Co., began to assay the plateau in 1904. Eventually, 3,030 borings were made to a depth of 50 feet. The analyses showed

that the plateau—covering 10 miles by four miles—contained 500 million tons of soft hematite ore, with a potential worth of \$1 billion.

The company quickly secured surface and mineral rights to 27,850 acres of Mayarí from Estrada Palma, the first president of Cuba after U.S. occupation of the island had ended in 1902. The Palma government also suspended all property taxes and royalties on the property, following the precedent of granting tax-free rights to U.S. mining interests that was established by Gen. Leonard Wood, the U.S. military governor of Cuba.²³

Frederick Wood could hardly wait to open up the district. Placing his subordinates in charge of Sparrows Point, he set sail for Cuba to superintend the project. Formidable obstacles lay before him, foremost how to reach a plateau that was 1,500 feet above the surrounding valley floor.

Wood and Charles Rand weighed various options. One was to construct a regular steam railroad on a 10-mile-long gradient; another was to surmount the cliffs by means of an inclined-plane railroad. Wood submitted the options to the engineering departments of PRR and Reading. A team of PRR engineers personally visited the site, and Casimir von Phelp, who had built the haulage engines of the Ashley Plane at Wilkes-Barre, Pa., was brought in as a consulting engineer.²⁴

The decision was made to build the incline railroad. For nine months, 300 Spanish laborers and their Yankee overseers clawed a right of way up the northeast side of the plateau. The workforce braved landslides and drenching rainstorms, and gulped down quinine pills in order to protect themselves from the “yellow eyes” (yellow fever) that was prevalent in the lowlands.

In November 1909, the task was done. Two standard-gauge tracks climbed up the rugged *loma* like the steps of a ladder. The incline railroad was “a feat of engineering

well worthy of notice,” assistant engineer James E. Little dryly noted. Indeed, the directors of Pennsylvania Steel were so pleased that they voted to name the settlement on the top of the plateau “Woodfred” in honor of the president of the Maryland Steel Co.²⁵

A three-mile-long mine railroad was established at Woodfred, connecting the settlement with the open-pit sites. Excavators and a Bucyrus steam shovel loaded the red-orange ore into side-dump hopper cars, which were then moved to the head of the incline by one of the four Baldwin-built 0-6-0 switchers (Nos. 52-55) that worked the open pits.

The upper incline was 6,503 feet long and pitched on a maximum grade of 25 percent, and the lower incline was 1,950 feet on a uniform 25 percent grade. Separating the two inclines was nearly a mile of level track that, on each end, sloped in a vertical curve to connect to the 25-percent incline grades.

Operations were carried out by the use of barney mine cars. They ran on a three-foot, six-inch-gauge track laid inside the main track. The barneys were attached to a three-inch-diameter steel cable, consisting of 12 strands of 19 wires each, that was laid on rollers inside the main track. Stationary engines were installed to control the descent of the barney.

Cars were lowered down the incline either singly or in pairs. The descent took 12 minutes. At the foot of the incline, the barney dropped into a pit and the ore cars drifted by gravity into a yard called Piedra Gorda (Fat Stone). Empties were picked up by the barney on its return trip up the incline.

The Mayarí Railroad was built 13 miles through the jungle from Piedra Gorda to Felton, which fronted the Atlantic Ocean on Nipe Bay. The single-track road was constructed to the finest U.S. standards. At no point was the ruling grade more



Railroad workers pose with No. 55, a Baldwin 0-6-0, at the summit of the incline at Woodfred. Dropping 1,500 vertical feet on the incline, the ore cars were controlled by a barney car that was attached to a steel cable. The descent took 12 minutes.





Ore trains that were assembled at the bottom of the incline at Piedra Gorda were hauled by No. 60 to the drying kilns and steamship docks at Felton on the Atlantic Ocean.

than 0.5 percent. The bridges, designed by PRR's engineering department, were constructed of steel. As a general rule, 30 loaded ore cars were hauled to Felton by No. 60, a 2-8-2 Mikado, although trains of 45 cars were sometimes operated.²⁶

Shipments of Mayari ore were expected to reach 500,000 tons in 1911, and to exceed one million tons by 1913. These ambitious goals were never realized, as the rail business began showing unmistakable signs of tapering off. The great railroad building projects that were undertaken at the turn of the century, personified by PRR's Manhattan Extension, were coming to a close.

It had given Wood enormous pride that Sparrows Point had rolled a large portion of the rail for PRR's Hudson River Tunnel and Pennsylvania Station improvements, completed in 1910, and had gone on to supply the Western Maryland Railway's new line from Cumberland, Md., and Connellsville, Pa., which was opened on August 1, 1912, and the Baltimore & Ohio's 1913-14 Magnolia Cut-Off in West Virginia.

In 1911, Pennsylvania Steel introduced the trademarked Mayari rail, which contained a natural percentage of nickel and chromium from the new deposit. Based on independent tests, the rail was superior in wear resistance to standard carbon rail. But carrying a \$5-a-ton premium over the

price of standard rail, it did not sell in the quantity that was needed to turn around the rail market.²⁷

Without the projected volume of ore movement, Cuba was no longer the profit center that paid fat dividends to Pennsylvania Steel. The Mayari mine, in fact, lost \$570,422 in 1913, nearly wiping out the net income of \$677,447 from the Lola Hill-Berraco mines. Things got worse in 1914, when the Cuban mines as a whole lost \$217,320.²⁸

By sticking to a specialty of steel rails, Frederick Wood and his associates had steered Sparrows Point through the business storms of the 1890s. The tapping of the Mayari deposit gave the company a supply of raw material that company engineers estimated would last 150 years. But the world was a fickle place that could confound the logic of an engineer. The months leading up to the European war had the effect of freezing public and private investment in colonial railways, ending a longtime outlet for Sparrows Point production.

"Small orders that have come in during the past 24 hours will keep the works in operation a few days longer," Wood wrote to his wife after the outbreak of war in August 1914. "Beyond is blank, and we have to muster up faith that a greater demand will spring up before long."

But sufficient demand did not return.

In February 1916, PRR and Reading sold their majority interests in Pennsylvania Steel Co. to Charles M. Schwab, the owner of Bethlehem Steel.²⁹ Schwab shifted production at Sparrows Point to other steel markets. Eventually, the mill on the

Chesapeake Bay would make 3,500 different types and grades of steel, ranging from the sheet for Chevy tail fins to the tin plate for Campbell's Soup cans. Rail rolling became an insignificant part of the plant's output.

Epilogue

The mines at Daiquiri, Juragua, and Mayarí continued to be used by Bethlehem Steel after 1916. More ore property was acquired in Camagüey, and Cuba remained the largest exporter of iron ore to the United States through 1926.

But new mines opened at El Tofo, Chile, and El Pao, Venezuela, by Bethlehem Steel replaced the played-out fields. Mining at Daiquiri and Juragua slowed considerably in the 1930s, and both of the operations were closed in 1947. Mayarí continued on a very limited basis. By 1955, a skeletal force of 200 Cubans was

employed at Felton, assigned to maintain the railway and port in case large-scale mining ever resumed.³⁰

In December 1956, the mountains around the abandoned ore banks of Juragua became the hideout for Fidel Castro, Ernesto Che Guevara, and a small band of Communists who had entered Cuba from Mexico to initiate a revolutionary war. Eluding capture by government forces, the revolutionaries issued the "Manifesto of the Sierra Maestra" in July 1957, calling for land reform, universal education, and the ouster of dictator Fulgenico Batista.



Mark Reutter

Branded "1908 MARYLAND |||||," this rail forms part of the yard trackage of the former PRR's main line at Lewistown Junction, Pa. The year on the rail indicates that it is composed of hematite ore mined from either Lola Hill or Berraco and was rolled at Sparrows Point during the month of July. This photo was taken on July 5, 2004.

In August 1958, Guevara led Column No. 8 westward from the Sierra Maestra. An armored train sent by Batista to meet the rebels never reached its destination, and Guevara captured Santa Clara, Cuba's third largest city.³¹ The dictator fled the country in the early morning hours of January 1, 1959.

Castro's takeover led to the confiscation of all private property. The regime also

withdrew all of the mining concessions that had been granted to the American steel companies since the 1883 decree by the Spanish Crown.

On April 1, 1960, Bethlehem Steel shut Mayarí. Employees were given two months' pay and the right to occupy the company houses at Felton.³² Apparently no iron ore has been mined in Cuba since that date. ♦

Notes

1. Irene A. Wright, *The Early History of Cuba, 1492-1586, Written from Original Sources* (New York, 1916), pp. 5-9.

2. Mark Reutter, *Making Steel: Sparrows Point and the Rise and Ruin of American Industrial Might* (New York, 1988; updated, Champaign, Ill., 2005), p. 22. Additional information from Papers of Frederick W. Wood, Accession 884, Hagley Museum and Library. Henceforth FWW Papers.

3. George H. Burgess and Miles C. Kennedy, *Centennial History of the Pennsylvania Railroad Co. 1846-1946* (Philadelphia, 1949), p. 293.

4. Carnegie's contact with PRR began in 1854 when he became an assistant to Tom Scott, then superintendent of the western division of the railroad.

5. Reutter, *Making Steel*, pp. 25-26.

6. Richard Harding Davis, *The Cuban and Porto Rican Campaigns* (New York, 1898), p. 108.

7. FWW Papers; *Iron Age* (March 8, 1883): 17, (April 5, 1883): 15. Hard hematite is Fe_2O_3 , about 62 percent pure iron, and ranges in color from dirty orange to dark brown depending on its exposure to the elements and other factors.

8. The company initially claimed 750 hectares (1,852 acres), but eventually the claim expanded to 10,000 acres and 11 mines.



With no more than bridle paths for local roads, this open-air car was used to transport officials to the mines.

9. Reutter, *Making Steel*, pp. 27-28; Pennsylvania Steel Co., *General Catalogue* (Steelton, Pa., 1900).

10. One example of the close alliance forged between PRR and PS Co. involved the joint-traffic freight rates arranged between the two companies. As Bent noted in an undated (c. 1889) letter to Wood: "Wilson [of PRR] will make the proportion of the S. Pt. RR Co. large enough to make it satisfactory to us—this arrangement he will make to include traffic [sic] between Steelton and S. Pt." The steel company built the Sparrows Point Railroad between the mill and Colgate Creek (four miles), where it met PRR's Union Railroad and, hence, connected to PRR's Philadelphia-Washington, D.C., main line. In addition to freight traffic, SP RR handled 10-12 daily passenger trains between Sparrows Point and Union Station, Baltimore. The railroad was later renamed Baltimore & Sparrow's [sic] Point Railroad. It was eventually sold to PRR and now serves the Port of Baltimore's Dundalk Marine Terminal.

11. FWW Papers, Rail Makers Association correspondence.

12. Nearly all of the rail rollers were financially allied with railroads. The Delaware, Lackawanna & Western Railroad, for example, held a large stake in Lackawanna Iron, and the Lehigh Valley Railroad had close boardroom ties with Bethlehem Iron.

13. In his personal papers, Wood estimated that Mesabi ore had reduced the price of pig at Pittsburgh by \$2 a ton.

14. FWW Papers; Reutter, *Making Steel*, p. 90

15. Reutter, *Making Steel*, p. 89.

16. Burgess and Kennedy, *Centennial History of PRR*, pp. 458-60.

17. FWW Papers.

18. In 1901, PRR also purchased a majority stake in the Cambria Steel Co.

19. Wood denied to newsmen that Maryland Steel was part of the reconstituted Rail Makers Association. (*Baltimore Sun*, June 13, 1901).

20. Reports from Charles Rand to FWW.

21. Reutter, *Making Steel*, pp. 80-81.

22. "The Mayari Iron Ore District of Cuba. A Remarkable Bessemer Deposit Acquired by the Pennsylvania Steel Co.," *Iron Age* (August 15, 1907): 421-25.

23. On February 8, 1900, Gen. Wood issued Civil Order 53 that granted indefinite continuance of the ore-mining claims at Juragua and Daiquiri, which were set to expire in 1903 under the Spanish Crown's decree.

24. FWW Papers, correspondence with PRR and other engineering departments.

25. "The Sintering of Mayari Iron Ore in Cuba," *Iron Age* (September 14, 1911): 586-89.

26. Annual Reports of Spanish-American Iron Co. to PS Co., 1907-1910.

27. Mayari-trademarked pig iron and steel forgings became much valued in the manufacture of ordnance and armor plate during World War I.

28. Mayari ore had a high moisture content, which required costly drying kilns to be installed at Felton and additional equipment to agglomerate the ore before it was shipped.

29. Reutter, *Making Steel*, pp. 103-7.

30. "Iron Ore Properties," in 1946 and 1947 *Annual Reports of Bethlehem Steel Corporation*; R. R. Darsley, "The Spanish-American Iron Railway," *Industrial Railway Record*, No. 88 (March 1981): 257.

31. Rolando E. Bonachea and Nelson P. Valdes, Introduction in *Che: Selected Works of Ernesto Guevara* (Cambridge, Mass., 1969), pp. 9-13.

32. No reliable information is known about the disposition of the Mayari Railroad. Anyone with information should contact *Railroad History*.