

Carolina Conductor



Volume 4 Number 7

Monthly Newsletter of the Carolina Railroad Heritage Association, Inc.

July 2017

Preserving the Past. Active in the Present. Planning for the Future.

Web Site: hubcityrrmuseum.org
Facebook: Carolina Railroad
Heritage Association

Meeting Site:
Woodmen of the World Bldg.
721 East Poinsett Street
Greer, SC 29651-6404
Third Friday of the Month at 7:00 pm

**Hub City Railroad Museum
and SOU Caboose #X3115:**
Spartanburg Amtrak Station
298 Magnolia Street
Spartanburg, SC 29301-2330
Wednesday 10-2 and Saturday 10-2

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Articles and club news due by the
2nd Wednesday of month.

Lima Locomotive Works



Lima Locomotive Works was an American firm that manufactured railroad locomotives from the 1870s through the 1950s. The company took the most distinctive part of its name from its main shops location in Lima, Ohio. The shops were located between the Baltimore & Ohio's Cincinnati-Toledo main line and the Nickel Plate Road main line and shops.

The company is best known for producing the Shay geared steam locomotive, developed by Ephraim Shay, and for William E. Woodard's "Super Power" advanced steam locomotive concept – exemplified by the prototype 2-8-4 Berkshire, Lima demonstrator A-1.

History

In 1878 James Alley contracted the Lima Machine Works to build a steam locomotive that Ephraim Shay had designed. In April 1880, Lima rebuilt Ephraim Shay's original design, using vertically side-mounted pistons mounted on the right, connected to a drive line on the outside of

the trucks. The Shay was geared down to provide more slow-moving, pulling ability for use in the lumber industry. The first Shay locomotive was built in 1880; it was such a success that many people in the lumber industry wanted one. To accommodate the new demand for the locomotive, Shay licensed the right to build his locomotive to the Lima Machine Works, which expanded and began to ship Shay locomotives to lumbermen across the frontier. Two years later, locomotives were the main product being produced by the Lima Machine Works, which would produce over 300 locomotives



during the next ten years.

After a serious fire, a new shop was opened in 1902 and Shay production continued. Then, with initial demand for low-speed geared locomotives well on the way to being sated, and the new facilities in place, Lima moved into the heavy railroad locomotive field.

Super Power

Success returned to Lima in the 1920s with the new concept of "Super Power" developed by Lima's mechanical engineer William E. Woodard. By making several significant changes to maximize a steam locomotive's capacity to generate and utilize steam, Woodard could make such locomotives significantly more powerful and faster. He did this by starting in 1922



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Arrivals

2017 National Train Day at the Museum

Lots of fun activities for those of all ages—music, food, rides, history, operation lifesaver, book authors, memorabilia, Thomas the Tank, HO layout, ATCS, and a NS demonstration on how to change a coupler knuckle on a train parked in front of us all day.



Departures

Continued from Page 1 - Lima

with the H-10 experimental heavy 2-8-2 design for the New York Central (Michigan Central 8000) and applying both relatively new science (the Cole ratios), and every efficiency-enhancing tool available – a larger firebox, increased superheat, a feedwater heater, improved draughting, higher boiler pressure, streamlined steam passages and a trailing-truck booster engine, and by applying limited cutoff (the range of steam valve admission settings) to prevent locomotive engineers from using excessive steam at starting. The 2-8-2 thus produced was demonstrated to be 26% more efficient overall than its immediate predecessor, and the NYC bought 301 copies.

A large increase in firebox area (from 66 square feet on the H-10 to 100 square



The A-1 demonstrator Berkshire.

feet on the A-1), characteristic of his work, necessitated adding another axle to the trailing truck, thus creating the 2-8-4 wheel arrangement. Built in the spring of 1925, the first Berkshire (a demonstrator owned by Lima) was dubbed the A-1. In addition to supporting the very large firebox and grate, the four-wheeled trailing truck carried the ash pan. For this purpose, the truck was redesigned as an articulated extension of the locomotive frame. The result was an ash pan which could hold more ash, allowing the locomotive to travel farther between cleanings.

The locomotive quickly proved to be a whopping 26-30% more efficient than the New York Central H-10. After a highly successful series of tests in the mid-1920s it was sent around the country to make the idea of "Super Power" known. The first forty-five were purchased by New York Central's subsidiary Boston & Albany following initial road testing across the summit of the Berkshire Hills, and so the 2-8-4 wheel arrangement came to be known as

the "Berkshire" on most railroads. The prototype itself was later sold to the Illinois Central as part of an order for 50 similar locomotives. Woodard summed up "Super Power" by defining it as "horsepower at speed". Previous design principles emphasized tractive effort (pulling ability) rather than speed. By 1949 some 613 Berkshires had been constructed for North American service, of which



Pere Marquette #1225,
The Polar Express locomotive.

twenty are preserved - at least two in operating condition (NKP 765 and PM 1225), both Lima products.

There were at least three successive waves of "Super Power". The first began with NYC 8000 and the A-1, and included Missouri Pacific 2-8-4s and Texas & Pacific 2-10-4s. These locomotives had conventional 63" driving wheels. In 1927, the Erie Railroad took delivery of a "second-phase" Berkshire with 70" driving wheels, capable not only of great power but higher speed; in turn, this design evolved into the Chesapeake & Ohio T-1 2-10-4s of 1930, with 69" driving wheels. The "third-phase" of the later 1930s and war years can be identi-



Virginian "Blue Ridge" class 2-6-6-6 #903.

fied with locomotives such as the home-built N&W 2-6-6-4s, C&O/Virginian 2-6-6-6 and virtually all American 4-8-4s. Boiler pressures rose as high as 310 lbs./sq.in.; thermic syphons added to the firebox and combustion chamber added 8% to the

efficiency of the boiler; roller bearings appeared on main axle boxes and sometimes on running gear. And the "Super Power" concept had extended to other builders such as Alco (the Union Pacific Big Boy) and Baldwin (the Santa Fe 5001- and 5011-class 2-10-4s). The four-wheel trailing truck became the standard for large locomotives (i.e. 4-8-4, 2-10-4, 4-6-6-4, 2-8-8-4), though the articulated main frame did not. Many railroads, particularly roads like the Santa Fe (which favored oil burning locomotives and, therefore, did not need the oversized ash pan), adopted many of the Super Power features but utilized a conventional full frame and separate trailing truck.

Decline

In 1947, the firm merged with General Machinery Corporation of Hamilton, Ohio, to form Lima-Hamilton. Lima's last steam locomotive was Nickel Plate Road No. 779, a 2-8-4 "Berkshire", which left the erecting halls in 1949. That same year Lima promoted a new wheel arrangement, the 4-8-6. This would have allowed an even larger firebox than the 4-8-4. No example of the type was built, however.

From 1949 to 1951 Lima-Hamilton produced a total of 174 Diesel Locomotives, in 6 different models. In 1951, Lima-Hamilton merged with Baldwin Locomotive Works to form Baldwin-Lima-Hamilton (BLH). The Lima-Hamilton line of Diesels was discontinued, in favor of Baldwin's existing line. Though Lima and Baldwin had been known for high-quality steam locomotives, their line of diesel-electric locomotives was unable to compete with EMD, Alco, and GE. BLH left the locomotive business in 1956.



BLH PRR diesel class DT6-6-2000.

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Manifest

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For a time, Clark Equipment Company manufactured Lima-brand construction cranes in the old plant. Most of the company's records and builder's drawings have been transferred and are housed in the California State Railroad Museum's library in Sacramento, California.

Preserved Lima Steam Locomotives

Many Lima-built steam locomotives are preserved across the United States. Numerous Lima-built engines are still operational, especially Shay-type locomotives. Shays are operated at the Colorado Railroad Museum, the Cass Scenic Railroad, the Georgetown Loop Railroad, the Mount Rainier Scenic Railroad, and the Roaring Camp and Big Trees Narrow Gauge Railroad. Other widely known preserved Lima-built steam locomotives include Southern Pacific 4449, Nickel Plate 765, Pere Marquette 1225, and Chesapeake & Ohio 614.



Preserved steam still in operation in 2017.



Lima super-power C&O "Allegheny" 2-6-6-6 steam loco builders photo.



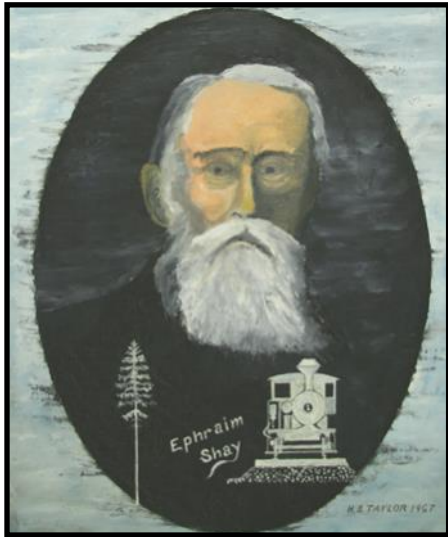
Lima steam powered snow plow.



SP #4449 a streamlined 4-8-4 still in excursion service in 2017.

Rare Mileage

Ephraim Shay



Ephraim Shay was an American merchant, entrepreneur and self-taught railroad engineer who worked in the state of Michigan. He designed the first Shay locomotive and patented the type. He licensed it for manufacture through what became known as Lima Locomotive Works in Ohio. From 1882 to 1892 some 300 locomotives of this type were sold.

Early Life and Military Service

Ephraim Shay was born on July 17, 1839, in Sherman Township, Huron County, Ohio. His parents were James and Phoebe (Probasco) Shay, whose families went back to colonial New Jersey. His parents were of majority-English descent, with some Dutch and Polish ancestry.

In 1861, Shay moved as a young man of 22 with his family to Muir, Michigan. Shortly after he enlisted in Company D, 8th Missouri Volunteer Infantry. In his American Civil War

diary, Shay wrote, "Received marching orders. Quite a coincidence; on the day I am 22 years old I start on my first expedition to defend my country's honor and flag." Shay served in the Western Theatre of the war from St. Louis to Vicksburg, under General William Tecumseh Sherman. He was honorably discharged in 1864, and returned to Ohio to marry.

Marriage and Early Career

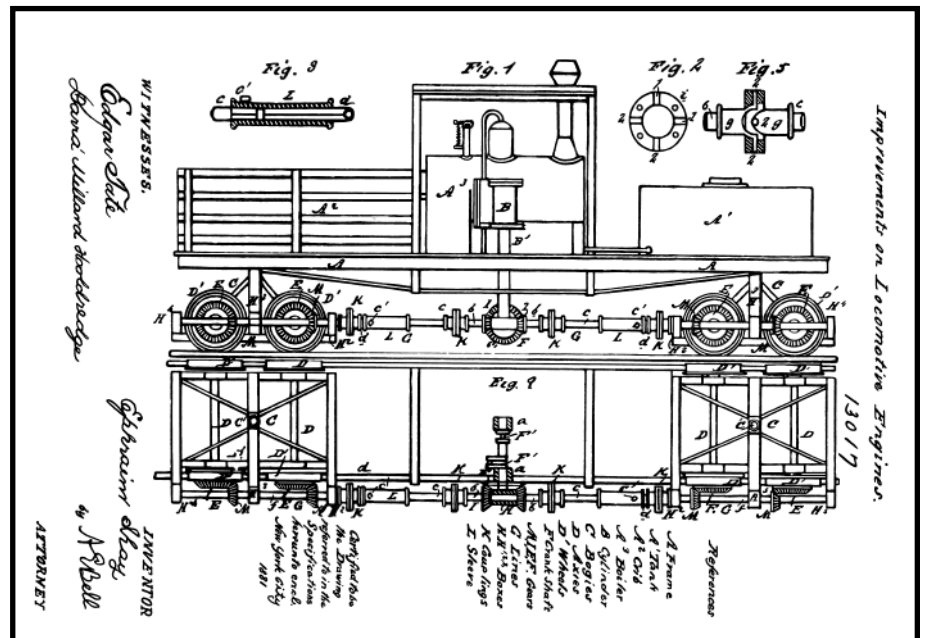
Shay married his sweetheart Jane Henderson on July 26 of 1864. The young couple moved to Ionia County, Michigan, to be near his family members in Portland, Lyons, Muir, and Sebawa. In 1870 they moved to Sunfield, Michigan, where Shay operated a steam sawmill. Their son, Lette, was born there on January 26, 1870.

Lumber and Locomotive

After 1873, the Shay family moved to Haring, Michigan, where Shay established a general store and sawmill, basics in a frontier town. In

1876 or 1877, he had the idea to use a locomotive to haul logs. He experimented with using maple strips on pine rails, to build paths for a locomotive to travel in the forests, and developed the Shay locomotive. Shay started working with Lima Machine Works (later Lima Locomotive Works) in Lima, Ohio, licensing them to manufacture his design locomotive.

In 1880, the first Shay Locomotive was shipped to a customer in Grand Rapids, Michigan, a center of logging on the Michigan peninsula. In 1881, Shay started filing patents for his works. William E. Woodard assisted Lima with improving the design of the engine. Lima built four Shay locomotives in 1881, and 37 Shays in 1883. In 1884, Lima had a 34-page catalog, featuring five models of Shay Locomotives. From 1882 to 1892, Lima sold some 300 of the Shay locomotives. By the late 1890s, Shay Locomotives were shipped around the world.



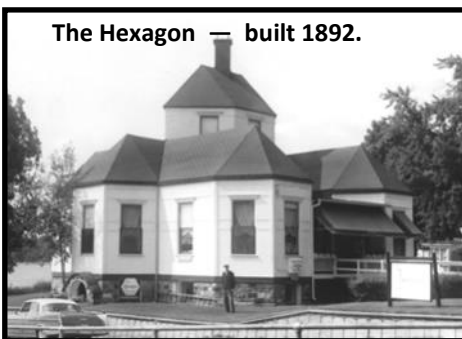
Marker Lights



Experiments with Steel

In 1888, Shay and his family moved to Harbor Springs, Michigan on Little Traverse Bay. There, he designed and built in about 1892 what is known as the *Hexagon* with hexagonal-shaped structure components. It has four wings opening off the central core and a two-story tower on top. The house has been listed on the National Register of Historic Places. The interior and exterior walls were stamped steel, an unusual use of this relatively new product.

In 1891, Shay built an all-steel



The Hexagon — built 1892.

boat that was 40 feet long and a beam of 6 feet, named the *Aba*. Re-



The boat "Aha" built by Shay in 1893.

mains of the *Aba* have been returned to Harbor Springs and are to be preserved. Shay also designed and operated a private water works for the town of Harbor Springs.

Shay established a railroad, the Harbor Springs Railway, nicknamed the *Hemlock Central*, chartered in 1902. It was dissolved in 1912.

Three locomotives of Shay's personal design were the only motive power. The railway primarily hauled timber and lumber, but was also used for sightseeing. Shay also made 400 sleds with maple runners as Christmas

died on April 19, 1916. He is buried in the Lakeview Cemetery in Harbor Springs. The Harbor Springs Area Historical Society annually sponsors "Shay Days" festival at the *Hexagon* house to celebrate Shay's birthday, usually on the third weekend of July.

gifts for the local children.

Shay's wife Jane died on July 24, 1912. He



Hemlock Central #2.

Wanted—Articles for the *Carolina Conductor*

Submit an article of 200 words or more with some photos and captions and see them in print. Every one of us has some unique railroad experience that would make interesting reading for our membership. With Jim Sheppard's passing your editor needs more contributions of local railway history and news.



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