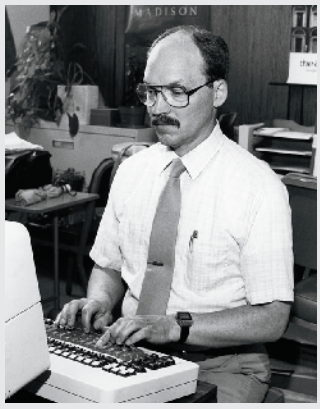
In Tribute



George H. Drury wrote and compiled the first edition of this book in 1993. A native of Reading, Mass., George began working for Kalmbach Publishing Co. in 1972, becoming the company's librarian in 1975. As librarian, he organized what had been a loose collection of books, photos, and other reference materials into one of the top railroad libraries in the country. During his time at Kalmbach, George also wrote and compiled *The Historical Guide to North American Railroads, The Train-Watcher's Guide to North American Railroads,* and the *Guide to Tourist Railroads and Museums.* He also authored three volumes in the Golden Years of Railroading book series: *New York Central in the Hudson Valley, Santa Fe in the Mountains,* and *Southern Pacific in the Bay Area*. Readers of *Trains* magazine knew him as the author of dozens of entertaining articles on rail travel in Europe and North America.

Following his retirement in 1997, George continued to do freelance writing, including a column for *Railfan & Railroad* magazine and several railfan and rail-travel guides to European countries.

George was a lifelong rail enthusiast. Among his principal railroad interests were the Boston & Maine, which he knew as a youth; the Southern Pacific, for which he worked for a time; and steam locomotives and passenger trains.

George died in 2013 at age 73.

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Introduction

Rock Island 4-8-4 no. 5024, a 1930 Schenectady product, lays down a big plume of steam as it rolls a long eastbound freight near Lawrence, Kan., on a frigid January day in 1952. The last days of steam on the Rock were just 18 months away. ***Robert Olmsted***

The steam locomotive is the most fascinating machine yet devised. It was the first piece of industrial technology that was on public display: Steam locomotives came right into every town, and all their working parts were open to view. The men who ran them were visible and accessible, whether inspecting and oiling the machinery during a stop or seated in the cab. The romance of the locomotive was almost unbearable. The engineer's seat was at a throne-like height above ordinary people, and the train was a link to exotic places (or at the very least, the next town).

The romance has been explored and explained by others. What lies behind the romance is the development of a technology. Steam locomotives were the machinery of transportation factories, and each factory—each railroad—had its own ideas about the machinery it needed; rarely did two of them agree about the proper design. This book explores those designs and explains how they developed.

Locomotive development until 1900

The first locomotives, like Stephenson's *Rocket* of 1829, were contraptions. They had boilers, cylinders, and wheels, but each pioneering builder had his own ideas about placement of the components. By 1840 the conventions had been established: horizontal firetube boiler with firebox at the rear and smokebox and stack at the front, horizontal cylinders ahead of the driving wheels and usually outside the frames, a cab to shelter the engineer and the fireman at the rear, and, behind the cab, a car carrying fuel and water—the tender.

The typical locomotive of the 1860s and 1870s was a 4-4-0 weighing about 30 tons. It had a deep, narrow firebox (about 33 inches wide) set between the driving axles, and a low-mounted, tapered boiler. Slide valves actuated by Stephenson valve gear routed saturated steam to the cylinders. It was a simple machine, sufficient for most duties. Other types in common use, usually for freight service, were the Ten-Wheeler (4-6-0), essentially a 4-4-0

with a third pair of drivers, and the Mogul (2-6-0). Locomotives were little changed from the designs of 1850, because there had been little need for change. Train length and weight were limited by the strength of couplers, draft gears, and underframes. Primitive braking systems and the lack of signals kept train speeds low. During that period there was considerable experimentation with various aspects of locomotive design. The net effect of most of it was to prove what wouldn't work.

Until about 1880 railroads generally bought locomotives designed by the builders. Then different lines began to need specialized locomotives, first choosing from designs offered by the builders, then developing their own. The result was that Alco and Baldwin could build identical 2-8-0s for Boston & Maine, but those 2-8-0s would differ greatly from 2-8-0s built for the Pennsylvania Railroad and the Denver & Rio Grande.

In the 15 years before 1900, railroad technology made several major advances. The Master Car Builders Association adopted the Janney automatic knuckle coupler in 1887 and the Westinghouse automatic air brake in 1889. Automatic block signals were coming into use. Steel was replacing wood for car underframes and, within a few years, for entire cars.

Faster, stronger, more powerful locomotives were needed. Increased tractive effort could be achieved by increasing the weight on the drive wheels, but few railroads had track that could support high axle loads. For most railroads a heavier locomotive required more wheels to spread the weight. In turn, a larger locomotive needed greater steaming capacity, which meant a larger firebox.

Wide fireboxes and trailing trucks

By 1890 locomotive fireboxes were located above the frames instead of between them, making possible an increase in width of approximately 8 inches. A firebox above the frames could also be longer, but the length was limited by how far a fireman could fling coal with a shovel.

One development of a regional nature that was a step toward increased steaming capacity was the Wootten firebox, shallow and wide for the best combustion of slow-burning anthracite. It was introduced on the Philadelphia & Reading Railroad in 1877. Its width, 7 to 8 feet, required that it be located entirely above the drivers. The width also required that the engineer's cab be placed ahead of the firebox astride the boiler, resulting in the Camelback or Mother Hubbard configuration.

A firebox entirely above the drivers was practical on low-drivered locomotives but not on high-drivered passenger locomotives—it would raise the center of gravity too high. The solution was to place the firebox entirely behind the drive wheels.

Baldwin introduced the 2-4-2 at the Columbian Exposition in Chicago in 1893. A medium-size trailing wheel instead of a third driving axle allowed a deeper firebox. In 1895 Baldwin built an experimental 2-4-2 for the Chicago, Burlington & Quincy. Number 590 had 84¼" drivers and a wide firebox over the trailing wheels. Most 2-4-2s and 4-4-2s built during the 1890s were characterized by a non-swiveling trailing axle and a narrow firebox. The trailing truck evolved gradually, beginning with provision for lateral movement. The 2-4-2, intended for fast, light passenger trains, was unstable at high speeds and was quickly superseded by the 4-4-2, but the 2-4-2 wheel arrangement found a niche in logging and industrial service as a tank engine, essentially an 0-4-0 with guiding wheels fore and aft (and also in thousands of Lionel "Scout" electric train sets, which are beyond the scope of this book).

Development from 1900 to 1918

By 1900 the elements of larger steam locomotives were ready for combination: the wide firebox and the swiveling trailing truck. That year the Chicago, Burlington & Quincy built the first four 2-6-2s at its Burlington, Iowa, shops. The 2-6-2 appeared in passenger and freight versions, differing in driver size, but the type tended to be rear-heavy. The four-wheel lead truck of the 4-6-2 provided more stability at passenger-train speeds; the 2-8-2, which combined the deep firebox of the 2-6-2 and the four coupled axles of the 2-8-0, had better weight distribution. The 4-6-2 and the 2-8-2 soon became the most common passenger and freight locomotive types on North America's railroads. On some railroads they were the limit of motive power development.

Adding a driving axle to the 4-6-2 and the 2-8-2 produced the 4-8-2 and the 2-10-2 for passenger and freight service, respectively. The 4-8-2 proved to be as good for freight service as it was for passenger trains. The 2-10-2 was usually a ponderous machine, pressing the limits of piston thrust and rod weight. It could pull almost anything, but not very fast.

Development after 1920

Locomotive development in the mid-1920s took two directions. The American Locomotive Company advocated three-cylinder locomotives. Splitting the power output of the boiler three ways instead of two meant pistons and rods could be lighter. The extra weight of the third cylinder almost always required a four-wheel lead truck; 4-6-2, 4-8-2, 4-10-2, and 4-12-2 were the common wheel arrangements. The third cylinder and main rod were located between the frames, making maintenance difficult, but where three-cylinder power was the rule, not the exception, it performed well—witness Union Pacific's 90 4-12-2s.

The other and ultimately more significant trend in locomotive development was Lima's Super-Power concept. The basic premise was that a large firebox supported by a four-wheel trailing truck was necessary to provide sufficient steam at speed. The first Super-Power wheel arrangement was the 2-8-4, quickly followed by the 2-10-4. The 4-6-4 was a natural development for passenger service. The 4-8-4 was initially a passenger engine, but like the 4-8-2 it was just as useful for freight, and can be considered the ultimate modern locomotive type.

Articulated locomotives

The compound articulated locomotive, designed by Anatole Mallet (pronounced "malley") appeared in 1903. The rear engine received steam from the boiler and exhausted it to the cylinders of the front engine. The first type built, the 0-6-6-0, was unstable for road service but sufficient for pusher and hump-yard work. The 2-6-6-2 was more successful, producing about the same output as a 2-10-2 but better able to negotiate curves and to remain stable at freight-train speeds. The last of that type were built in 1949. The 0-8-8-0, first built in 1907, had the same characteristics as the 0-6-6-0. The 2-8-8-2 appeared in 1909, and it was built until 1950.

The 4-6-2 Pacific was the dominant type of passenger locomotive in North America for most of the early 1900s. Here St. Louis-San Francisco no. 1034, built by Baldwin in 1910, is on the ready track at Springfield, Mo., in December 1948. *Arthur B. Johnson*

In the mid-1920s the simple articulated appeared, with all four cylinders receiving steam directly from the boiler. The four-wheel trailing truck was first applied to an articulated in 1928, creating the 2-8-8-4. The 2-6-6-4 appeared in 1935 and the 4-6-6-4 in 1936, both designed for fast freight service. The latter received wide acceptance and was the best articulated locomotive design.

Other types

Locomotive development includes a number of types that were built for only one or two railroads. Some were experimental, and some were built in large quantities (a few types were experimental and built in quantity). Among the wheel arrangements are 4-10-2, 4-12-2, 2-10-10-2, 2-6-6-6, 4-8-8-2 (2-8-8-4 if you start counting wheels at the smokebox; 4-8-8-2 if you start at the headlight), and 4-8-8-4.

In the 1930s and 1940s the Pennsylvania Railroad invested heavily in nonarticulated duplex-drive locomotives of several types: 6-4-4-6, 4-4-4-4, 4-4-6-4, and 4-6-4-4, plus a 6-8-6 steam turbine locomotive. Baltimore & Ohio had a single duplex-drive 4-4-4-4. None of the duplex drives could be judged a success. Four railroads experimented with steam turbines, in most cases as the prime mover of a steam turbine-electric locomotive.

About the information in this book—and beyond

Entire books have been written about single classes of locomotives; any book that attempts to explain the locomotives of an entire continent in 336 pages will emphasize breadth over depth. Constraints of time and space meant some topics, even a few railroads, had to remain unexplored. Some railroads and locomotives got less ink than others because information just wasn't available. Over the years much has been made of some landmark locomotives; I have tried to bring some balance to the topic.

For those who want further information on specific railroads I have cited what I think is the best book. Many of those books are out of print. Dealers specializing in out-of-print railroad books advertise in *Trains* magazine. Old railroad books can be found for sale on several Websites, including abebooks.com and Amazon.com as well as ebay.com. Check your local public library: It may be able to obtain many books through interlibrary networks.

The two best sources of steam locomotive rosters are issues of *Railroad* magazine from the mid-1930s to the mid-1950s and the twice-yearly *Bulletin* of the Railway & Locomotive Historical Society (the title of the magazine changed to *Railroad History* with issue No. 127).

For further reading on steam locomotive development as a whole, I suggest these books:

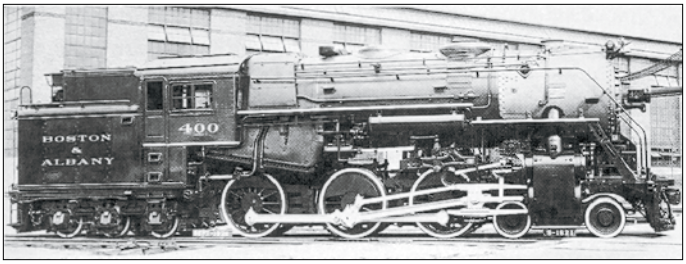
The Steam Locomotive in America, by Alfred W. Bruce (W. W. Norton & Company, 1952)—a technical history of the steam locomotive.

The Evolution of the Steam Locomotive, by Frank M. Swengel (Midwest Rail Publications, 1967, LCC 67-29846)—organized chronologically and without an index, but containing a remarkable amount of information and insight.

Model Railroader Cyclopedia, Volume I—Steam Locomotives, by Linn Westcott (Kalmbach Publishing, 1960, ISBN 089024-001-9)—HO scale drawings of more than 125 stearn locomotives, copiously illustrated with black-and-white photos, plus good explanations of many facets of the steam locomotive.

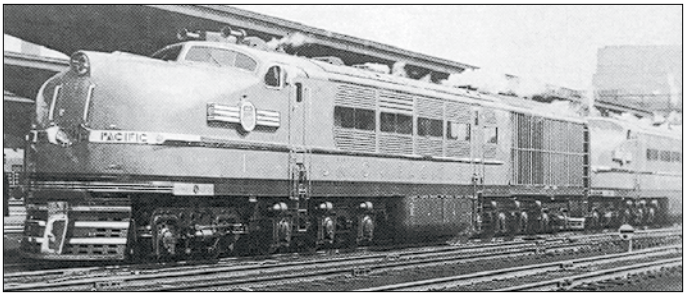
Steam's Finest Hour (second edition), by David P. Morgan (Kalmbach Publishing, 1990, ISBN 0-89024-002-7)—an exploration of the best locomotives built after the mid-1920s, with photos and specifications for each.

Articulated Steam Locomotives of North America, by Robert A. LeMassena (Sundance Publications, 1979, ISBN 0-913582-26-3)—a history of all the articulateds.



Tank engine — The ultimate development of the suburban tank engine in North America was Boston & Albany's 4-6-6T, which looked like a condensed or concentrated New York Central Hudson. Alco built five of them in 1928. Note that the water tank extends under the rear of the cab. ***Alco Historic Photos***

Tank engine — Quincy no. 2, an Alco product of 1924, carried enough water in its side tanks and fuel oil in the rear tank for the 6-mile run between Quincy, Calif., and the connection with the Western Pacific at Quincy Junction. ***Guy L. Dunscomb***



Steam turbine — Union Pacific 1 and 2 await departure from Omaha on their first run in March 1938. ***John P. McGlynn***

Steam turbine — Chesapeake & Ohio orange-and-silver steam turbine-electric no. 500 was enormous, 20 feet longer than today's auto-rack cars and piggyback flats, and its tender was about the size of a modern covered hopper car. ***Baldwin***

Locomotive classes

Railroads needed a convenient way to refer to groups of similar locomotives. Most roads eventually assigned a letter more or less arbitrarily to each wheel arrangement, usually with a number to note successive groups or different sizes of a type, and sometimes with a letter after the number to indicate variations. For example, Louisville & Nashville's classification was:

0-4-0	A	2-6-0	F	4-6-2	K
0-6-0	B	4-6-0	G	4-8-2	L
0-8-0	C	2-8-0	H	2-8-4	M
4-4-0	D	2-8-2	J		

Other roads chose a letter or two to abbreviate the common name of the type. A hazard of this method is that several names start with the same letter, requiring some creative adaptations. Here are a few examples from Southern Pacific:

2-6-0	M	Mogul
2-8-2	Mk	Mikado
4-8-2	Mt	Mountain
2-6-6-2	MM	Mallet Mogul
2-6-2	Pr	Prairie
4-6-2	P	Pacific

Occasionally railroads assigned the same letter to two types. On the Milwaukee Road, for instance, classes F1 through F5 were 4-6-2s and F6 and F7 were 4-6-4s. The Pennsylvania's 2-10-4s came on the scene long after the experimental 2-6-2s had been scrapped, and were thus assigned the same letter, J.

The converse was sometimes the case. Canadian National assigned letters F, G, H, and I to 4-6-0s of different driver sizes. Other roads—Santa Fe, for example—skipped letters entirely and simply referred to locomotives by number groups: the 1950 class, the 3700 class.

Some railroads used an "s" in their locomotive classifications to indicate superheating. Well-known examples are Southern Railway Ps-4 and Pennsylvania Railroad K4s Pacifics.

There were many ways to designate subclasses and sub-subclasses: numbers, letters (both lower-case and small capitals), and even fractions. In the text and the rosters, I stay as close as possible to what was painted on the locomotives.

Atlantic Coast Line steam locomotives built since 1900

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
0-6-0	E	117	1	Baldwin	1900	1929	
0-6-0	E-3	118-120	3	Baldwin	1901	1934	
0-6-0	E-3	124-125	2	Baldwin	1903	1936	
0-6-0	E-4	126-190	65	Baldwin	1904-1910	1935-1952	
0-6-0	E-5	121-123	3	Richmond	1901	1929	Ex-SF&W
0-6-0	E-7	1151-1158	8	Baldwin	1917-1924	1950-1952	
0-6-0	E-9-S	1136-1145	10	Cooke	1918-1919	1951-1952	
0-6-0	E-10	1100-1125	26	Baldwin	1912-1913	1948-1952	
0-6-0	E-11	1126, 1127	2	Baldwin	1916	1951, 1952	
0-6-0	E-12	1128-1135	8	Baldwin	1917	1952	
0-6-0	E-13	1146-1150	5	Baldwin	1920	1950-1952	
0-6-0	AS-1	7023-7028	3	Baldwin	1907	1946-1952	Ex-AB&C
0-8-0	E-14	1200-1234	35	Baldwin	1923-1926	1952	
0-8-0	AS-2	7033-7035	3	AB&C	1939-1942	1952	Ex-AB&C, rebuilt from 4-6-0
2-8-0	L	700-713	14	Baldwin	1901, 1903	1939-1942	
2-8-0	L-1	714-716	3	Baldwin	1905	1951-1955	
2-8-2	L-2	717-720	4	Baldwin	1911	1951-1955	
2-8-2	M	800-819	20	Baldwin	1911	1950-1952	
2-8-2	M-2	820-836	17	Baldwin	1918-1923	1952	
2-8-2	AK-1	7205-7213	4	Baldwin	1912-1915	1946-1951	Ex-AB&C
2-8-2	AK-2	7225-7235	11	Alco	1912-1915	1947-1952	Ex-AB&C, NYC
2-10-0	AK-3	7301,7302	2	Baldwin	1910	1946, 1947	Ex-AB&C
2-10-2	O	8000-8009	10	BLW, Rich	1917-1918	1949-1952	
2-10-2	Q-1	2000-2019	20	Baldwin	1925	1951-1952	
4-4-2	AF-1	7401-7403	3	Baldwin	1917	1951-1952	Ex-AB&C
4-6-0	I-3	98,99	2	Baldwin	1900	1934	
4-6-0	K	322-327	6	Richmond	1900	1934	
4-6-0	K	328-351	24	Baldwin	1901-1903	1934-1935	
4-6-0	K-4	212-222	11	Baldwin	1903	1934	
4-6-0	K-5	233-211	12	Baldwin	1907	1936-1939	
4-6-0	K-5	910-1005	96	Baldwin	1906-1907	1935-1964	
4-6-0	K-6	223-232	10	Baldwin	1905	1934-1942	
4-6-0	K-6	351-399	49	Baldwin	1904-1906	1935-1950	
4-6-0	K-6	900-909	10	Baldwin	1906	1935-1947	
4-6-0	K-9	206-210	5	Rhode Island	1900	1934-1942	Ex-SF&W
4-6-0	K-9	211	1	Baldwin	1902	1934	
4-6-0	K-14	245-254	10	Baldwin	1910	1947-1950	
4-6-0	K-14	1006-1011	6	Baldwin	1910	1947-1951	
4-6-0	K-15	1012-1044	34	Baldwin	1912-1933	1947-1955	
4-6-0	K-16	1045	1	Baldwin	1922	1952	
4-6-0	AW-1	7060	1	Baldwin	1907	1949	Ex-AB&C
4-6-0	AW-2	7064	1	Baldwin	1907	1949	Ex-AB&C
4-6-0	AW-3	7101-7113	6	Baldwin	1906-1907	1950-1952	Ex-AB&C
4-6-0	AW-4	7115-7124	9	Baldwin	1906-1907	1946-1952	Ex-AB&C
4-6-2	P	260-274	15	Baldwin	1911	1939-1944	
4-6-2	P-1	275-286	12	Baldwin	1912	1939-1944	
4-6-2	P-2	400-410	11	Baldwin	1913	1950-1952	
4-6-2	P-3	411-455	45	Baldwin	1914-1916	1947-1952	
4-6-2	P-4	456-482	27	Baldwin	1917-1918	1949-1952	

ACL steam locomotives built since 1900 *(continued)*

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
4-6-2	P-5-A	1500-4569	70	Brooks, Rich	1919-1920	1939-1944	
4-6-2	P-5-B	1600-1764	165	Baldwin	1922-1926	1950-1953	
4-6-2	AJ-1	7071-7086	11	Schenectady	1911-1913	1946-1955	Ex-AB&C, FEC
4-6-2	AJ-2	7153, 7175	2	Lima	1914	1949, 1950	Ex-AB&C, GN
4-8-0	AS-3	7034	1	Baldwin	1906	1949	Ex-AB&C, N&W
4-8-2	J-1	1401-1405	5	Brooks	1924	1951-1952	Ex-DL&W
4-8-2	AM-1	7351, 7372	2	Schenectady	1924	1951	Ex-AB&C, FEC
4-8-4	R-1	1800-1811	12	Baldwin	1938	1951-1952	

AB&C (Atlanta, Birmingham & Coast), DL&W (Delaware, Lackawanna & Western), FEC (Florida East Coast), GN (Great Northern), N&W (Norfolk & Western), NYC (New York Central), SF&W (Savannah, Florida & Western)

The ultimate development of dual-service power on the Atlantic Coast Line was the R-1-class 4-8-4, built by Baldwin in 1938. In appearance the R-1s were very much the modern Baldwin locomotive. ***Trains collection***

185 pounds pressure, equally spaced drive wheels, 140,000 to 160,000 pounds—until 1910. The last batches were built with piston valves and Walschaerts valve gear, and many early Copper Heads were eventually superheated and fitted with Modern steam chests, which were bolt-on replacement piston valves. Copper Head classes included K, K-4, K-5, K-6, K-14, and K-15.

In 1922 ACL and Baldwin designed a new Ten-Wheeler, class K-16, 34,000 pounds heavier than the newest Copper Heads. It was intended for routes which couldn't handle the Pacifics, but ACL had begun to improve its track and roadbed, and there was little need for it.

ACL acquired three 4-6-2s with the Plant System. They were built by Rhode Island in 1893 as cross-compounds for Milwaukee Road, which soon turned them back. Rhode Island rebuilt them as simple locomotives for Plant System. ACL rebuilt them as 4-6-0rs in 1912.

The first of ACL's own Pacifics arrived from Baldwin in 1911: 15 class P engines with 73" drivers and slide valves. Eventually they were superheated and equipped with Modern steam chests, and reclassified P-S. The P-1 class was delivered in 1912, essentially the same size as the P class but superheated and equipped with piston valves. The P-2 class was delivered in 1913 for freight

Boston & Maine steam locomotives built since 1900

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
0-6-0	G-9-b	160-185	18	Manchester	1899-1901	1926-1927	
0-6-0	G-10	200-309	110	Manchester	1903-1910	1927-1949	
0-6-0	G-9-c	190-199	10	Baldwin	1902-1903	1926-1928	
0-6-0	G-11	400-429	30	Manchester	1911, 1913	1947-1953	
0-6-0	G-11-b	430-452	23	Brooks	1916	1953-1955	
0-6-0	G-11-c	830-832,	4	Schenectady	1917-1920	1952-1953	Ex-Portland Terminal, 1951
0-8-0	H-1-a	600, 601	2	Schenectady	1916		To Portland Terminal, 1935
0-8-0	H-2-a	610-631	22	Schenectady	1922	1946-1955	4 to BAR, 1 to MEC, 1946
0-8-0	H-3	640-654	15	Baldwin	1927, 1929	1951-1953	
0-8-8-0	M-2-a	800, 801	2	Schenectady	1922		To Bingham & Garfield, 1929
2-6-0	B-15	1360	137	Manch, Schen	1903-1910	1927-1955	
2-8-0	K-5	2310-2343	34	Schenectady	1901-1902	1926-1936	
2-8-0	K-6	2350-2359	10	Schenectady	1901-1902	1928-1936	Simpled 1910-1919
2-8-0	K-7	2360-2429	66	Schenectady	1905-1911	1928-1955	
2-8-0	K-8	2600-2734	135	BLW, Sch, Brks	1911-1916	1937-1954	2 to BAR 1946
2-8-4	T-1	4000-4024	25	Lima	1928-1929	1948-1955	10 to SP, 7 to AT&SF, 1945
2-10-2	S-1-a	3000-3019	20	Schenectady	1920	1946-1949	11 rebuilt to S-1-c, 1940; 8 to MEC, 1936-1947
2-10-2	S-1-b	3020-3029	10	Schenectady	1923	1940-1948	
2-6-6-2	M-1	3000-3003	4	Schenectady	1910		To MEC 1911-1912
4-4-0	A-40-b	944-949	6	Manchester	1900	1926-1927	Ex-Fitchburg
4-4-0	A-41	950-1029	77	Manch, BLW	1900-1911	1926-1947	
4-4-0	A-45	1133-1136	4	Schenectady	1900	1926-1935	Ex-Fitchburg
4-4-0	A-46	1170-1173	4	Baldwin	1900	1926-1929	
4-4-2	J-1	3204-3244	41	Schen, Manch	1902-1909	1927-1952	
4-6-0	C-15-c	2020-2025	6	Rhode Island	1900	1927-1928	
4-6-0	C-17	2060-2064	5	Rhode Island	1900	1927-1928	
4-6-0	C-20		4	Baldwin	1900	1928	Ex-Fitchburg
4-6-0	C-21	2100-2129	26	Schenectady	1904-1906	1935-1937	
4-6-2	P-1	3600-3611	12	Schenectady	1910	1938-1952	
4-6-2	P-2	3620-3689	70	Schenectady	1911-1916	-1956	
4-6-2	P-3-a	3700-3709	10	Schenectady	1923	1952-1955	
4-6-2	P-4	3710-3719	10	Lima	1934, 1937	1953-1954	
4-6-2	P-5-a	3696-3699	4	Brooks	1924	1951-1952	Ex-Delaware, Lackawanna & Western
4-8-0	L-1-a	2900-2909	10	Schenectady	1899	1926	Ex-Fitchburg, simpled 1904
4-8-0	L-1-b	2910-2917	8	Rhode Island	1900	1926	Ex-Fitchburg, simpled 1904
4-8-2	R-1	4100-4117	18	Baldwin	1935-1941	1955-1956	4100-4112 to Baltimore & Ohio, 1947

AT&SF (Atchison, Topeka & Santa Fe), BAR (Bangor & Aroostook), MEC (Maine Central), SP (Southern Pacific)

Oddities

B&M had its share of oddities. Four oil-burning 2-6-6-2s were purchased in 1910 to work through the 4¾-mile Hoosac Tunnel. The tunnel electrification opened within 6 months, and B&M sold the Mallets to the Maine Central. In 1922 two 0-8-8-0s arrived from Alco at Schenectady to work the hump yard at Mechanicville. They were sold to the Bingham & Garfield in Utah in 1929.

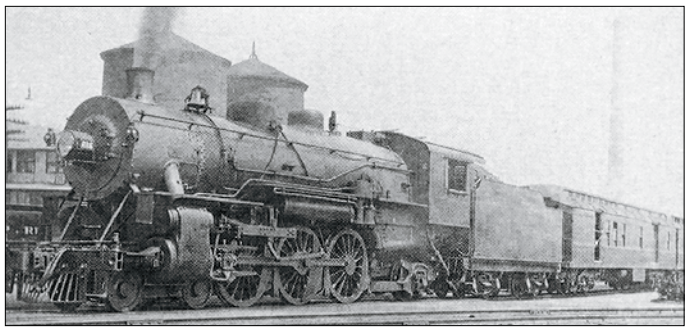
When B&M leased the Fitchburg Railroad in 1900 it acquired 18 brand-new 4-8-0s, which remained on the roster until 1926. The road got a similar quarter-century of use out of a handful of 0-4-4Ts and 2-6-4Ts built in the 1890s for suburban service. K-8-b no. 2648, a 2-8-0, was built in 1913 with a McClellon watertube boiler, which it carried until 1920.

Historical and technical society: Boston & Maine Railroad Historical Society, www.bmrrhs.org

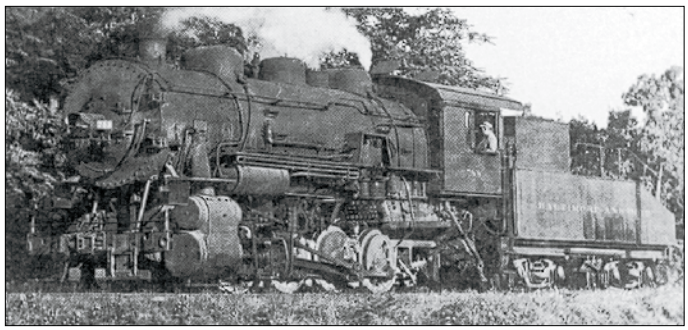
Recommended reading: *Minuteman Steam*, by Harry A. Frye (Boston & Maine Railroad Historical Society, 1982, ISBN: 0-916578-05-4; LCC: 82-071735).

Published rosters: Railway & Locomotive Historical Society *Bulletin:* No. 26, No. 28, No. 29, No. 31 (Boston & Lowell), No. 32 (Connecticut & Passumpsic), Nos. 34 and 35 (Concord & Montreal), No. 37 (Fitchburg), No. 38 (Vermont & Massachusetts); *Railroad* magazine: April 1933, page 88; January 1946, page 100; October 1956, page 54

Buffalo, Rochester & Pittsburgh



BR&P 616, shown at East Salamanca, N. Y., was the highest-numbered of the WW class of Pacifics. The piston-rod extensions and the undersized trailing truck frame are interesting features. ***Trains collection***



BR&P had 18 eight-wheel switchers. They were similar to the USRA switcher in dimensions and tractive effort, but not in the shape of the tender. ***Carl E. Stolberg***

Between 1869 and 1899, the Buffalo, Rochester & Pittsburgh developed into a coal carrier that extended from the coalfields of western Pennsylvania north to Buffalo, northeast to Rochester, N. Y., and west to a connection with the Baltimore & Ohio at Butler, Pa., about 50 miles north of Pittsburgh.

The BR&P was a prosperous railroad, and the prosperity was reflected in its locomotives. The road appeared to wait until new technology had settled down, then it bought large batches of a single type of locomotive: 2-8-0s right after the turn of the century, 2-8-2s in the Teens, 2-6-6-2s in the late Teens and 1920s. Successive batches of each locomotive type were little different from the original group. Previous top-rank locomotives were bumped from mainline duties to local service; locomotives at the bottom of the heap were usually not scrapped but sold to short lines through dealers such as Southern Iron & Equipment of Atlanta.

Baltimore & Ohio acquired the BR&P at the beginning of 1932 and took over its operation. It is interesting to speculate how BR&P's motive power would have developed otherwise—in the late 1920s BR&P was investigating 4-8-4s and 2-10-4s.

Freight locomotives

The BR&P entered the 20th century using Consolidations as road freight engines. During the first decade of the century BR&P bought 133 2-8-0s, most of them 57"-drivered machines with only minor differences between successive batches. In 1912 BR&P got its first 2-8-2, and within five years had 48 of them. They represented a leap forward in locomotive design for the road: They were half again as heavy and powerful as the Consolidations, and their 63" drivers made them faster. The Mikados were hardly established when the road started buying 2-6-6-2s to eliminate doubleheading of the Mikados.

BR&P had a number of grades that required helper locomotives. At the turn of the century it used 4-8-0s for pusher service. They were replaced in part by eight Decapods built by Brooks in 1907 and 1909; the 2-10-0s were in turn replaced by 2-8-8-2s in 1918.

Passenger locomotives

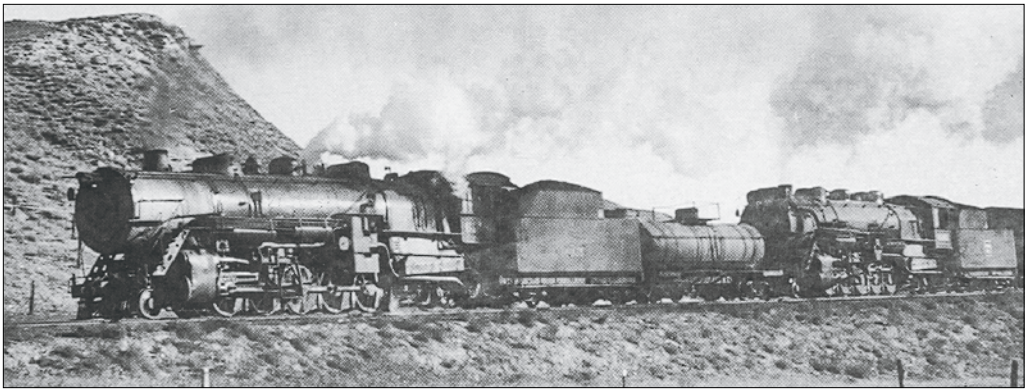
The BR&P was not a major passenger carrier, but it was quick to adopt new technology. In 1901 the road ordered four Atlantics, two from Baldwin and two from Brooks. They had 72" drivers, inboard piston valves, and inside-bearing trailing trucks. Later Atlantics had 73" drivers and slide valves, and the last had Walschaerts valve gear. One curious characteristic of BR&P's Atlantics was the driver spacing, making the engines look as though the builder had intended to use 80" drivers, then changed his mind after the locomotive was under construction.

The 15 Atlantics the BR&P had acquired by 1909 were sufficient for the short trains the road operated, but they weren't powerful enough when steel cars replaced wood. Between 1912 and 1918 BR&P received 17 Pacifics from Brooks, medium-size machines with 73" drivers. Five more Pacifics came in 1923, smaller and lighter, surprisingly, than the first group—241,200 pounds compared to 258,000 for the WW class.

In 1923, BR&P had 37 passenger locomotives, which seems like a lot, compared to the number of Amtrak diesels that today ply the rails on the Pittsburgh-Punxsutawney-Bradford-Buffalo run. Consider BR&P's passenger service in January 1930. Mainline passenger trains in each direction included day and night Buffalo-Pittsburgh expresses; two Buffalo-Springville, N. Y., locals; a Buffalo-Bradford, Pa., local; a Buffalo-Punxsutawney, Pa., local; a Bradford-Punxsutawney local; a Du Bois-Butler, Pa., local; a Du Bois-Pittsburgh local; two Rochester-East Salamanca, N. Y., trains; a Rochester-Perry, N. Y., local; and a Rochester-Le Roy, N. Y., local. Assuming engine runs of no more than 100 miles and allowing at least 2 hours to turn and service an engine, these mainline runs accounted for at least 17 locomotives, and the branches for at least another six. There were jobs for nearly all the Pacifics and Atlantics that were conveyed to B&O.

Baltimore & Ohio ownership

Buffalo, Rochester & Pittsburgh's locomotives were renumbered and reclassified into the B&O roster in 1932. BR&P had more locomotives than it needed, particularly during the Depression, so



Fat-boilered 2-10-2s 6148 and 6161 lead a freight near Clearmont, Wyo., in 1942. Both are lignite-burners and have extended smokeboxes. Number 6148 has a Worthington BL feedwater heater; 6161 has an Elesco unit. The tank car behind 6148's tender is an auxiliary water car; the hoses and pipes are clearly visible along the side sill of the tender. ***W. R. McGee***

arrived from Baldwin in 1929. Between 1934 and 1940 Burlington rebuilt the 2-10-4s with an eye to increasing their speed. They were given disk main drivers, better counterbalancing, and roller bearings on all axles, and their cylinder diameter was reduced to 28", reducing the tractive effort from 90,000 to 83,300 pounds.

For fast freight and occasional heavy passenger service, the road took delivery of eight 4-8-4s from Baldwin in 1930. They were numbered 5600-5607 and classed O-5, using the same letter as the 2-8-2s. In 1937 the West Burlington shops built 13 more O-5s, 5608-5620, using boilers furnished by Baldwin. The Baldwin 4-8-4s had 74" spoked drivers and Elesco feedwater heaters; the homebuilt O-5s had the same drivers but Worthington SA feedwater heaters. Burlington's third batch of 4-8-4s, class O-5A, which came from West Burlington shops in 1938 (5621-5625) and 1940 (5626-5635), were characterized by solid pilots, Boxpok drivers, lightweight rods, roller bearings, and vestibule cabs. Later some of the earlier O-5s were given the same improvements and reclassed O-5A. In 1942 the road applied poppet valves to no. 5625. The valves weren't equal to the power they transmitted, and by the time the Burlington decided the experiment was unsuccessful, it was purchasing diesels in quantity. The poppet-valve 4-8-4 was retired early and scrapped in 1954.

Two locomotives made a late transition from freight to passenger service. Between 1958 and 1966 the Burlington operated excursion trains over much of its system with 2-8-2 no. 4960 and 4-8-4 no. 5632.

Articulateds

CB&Q wasn't a major user of articulateds. The only mountainous territory on its map was in the Black Hills of Nebraska and South Dakota; the only other place where Mallets proved useful was the hump yard at Galesburg, Ill.

Three compound 2-6-6-2s, 4000-4002, class T-1, came to the Burlington in 1908. They had been built for the Great Northern, and it is uncertain whether they were delivered directly to the Burlington or worked briefly on the GN. Five similar 2-6-6-2s, class T-1A, arrived from Baldwin in 1909. Like the T-1s they had Belpaire fireboxes over the rear two sets of drivers. The T-2 Mallets of 1910 had a rigid two-section boiler like those on Santa Fe's 2-6-6-2s, with a feedwater heater occupying the front half. They had 64" drivers—the T-1s had 55" and the T-1As, 56"—and their fireboxes were aft of the drivers over an outside-journal trailing truck. They were originally set up to burn lignite but were later converted to oil. They proved difficult to maintain and spent most of their lives in the Black Hills, about as remote as possible from Burlington headquarters. Most of the eight T-1s and T-1As found their way to the hump yard at Galesburg, and all but 4001 were rebuilt into 0-8-0s of the F-2 class in 1926 and 1927.

In 1911 Burlington's sole 2-8-8-2, class T-3, arrived from Baldwin. It worked the hump yard at Galesburg before being converted to oil fuel and sent to Alliance, Neb.

Passenger locomotives

In 1900 the CB&Q was using 4-4-0s, 4-6-0s, and 2-6-0s in passenger service. The 4-4-0s that were bumped from mainline duties soon after the turn of the century got a reprieve of a decade or more—the road rebuilt 105 between 1915 and 1917 for branchline service with new boilers, new cabs, and in some cases new cylinders. A few were rebuilt with a second cab over the pilot and smokebox for use as inspection engines.

The use of 2-6-0s with 69" and 72" drivers in fast mainline passenger service was unusual, but the Burlington's main lines had few curves, and the two-wheel lead truck proved satisfactory at speed. In 1895 Baldwin built a single high-speed 2-4-2 for the CB&Q. It was a development of the Q's passenger 2-6-0s, but the drivers were higher, 84¼", and in place of the third set of drivers was a trailing axle over which was a wide firebox. There was further innovation behind: a six-wheel, rigid-frame tender characteristic of British practice. The wide firebox proved to be the significant feature of the engine. The wheel arrangement wasn't repeated on the Burlington (Atlantic Coast Line tried two of the type), and No. 590 was rebuilt to a 4-4-2 in 1905.

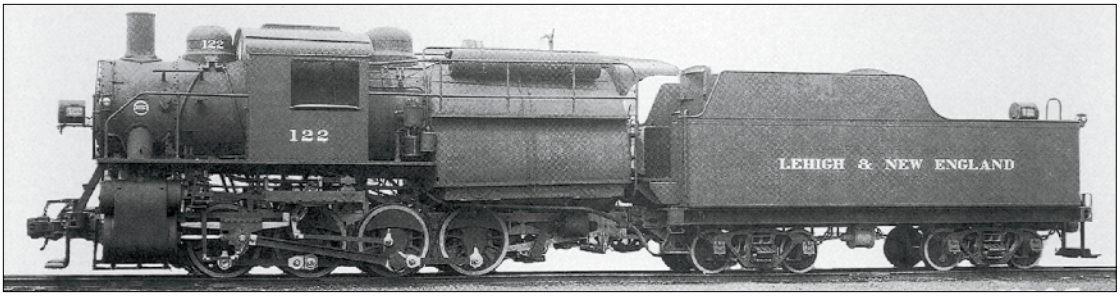
The Burlington received its first 4-4-2s, the P-1C class, in 1899 and 1900. They were Vauclain compounds that shared driver size and tender configuration with the 2-4-2, but they had narrow fireboxes. Larger conventional tanks soon replaced the six-wheel tenders. The P-1Cs were followed in 1902 by six P-2Cs, also Vauclain compounds with 84¼" drivers, but a wide firebox behind the drivers supported by an outside-frame trailing truck. In 1903 Rogers delivered 25 simple Atlantics, class P-2, essentially the same as the P-2Cs but lighter and more powerful. The Q's last Atlantics were 20 Vauclain balanced compounds delivered in 1904 and 1905. They had low-pressure cylinders in the usual location driving the second set of drivers and a pair of high-pressure cylinders between the frames driving the first set. To provide enough space for the high-pressure main rods, the P-3s had longer boilers and frames, with a noticeable space between the lead truck and drivers.

The P-1Cs were rebuilt to simple engines with 78" drivers between 1913 and 1915. They were reclassed P-1 but kept their

Chicago, Burlington & Quincy steam locomotives built since 1900

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
0-6-0	G-3	1400-1579	180	CB&Q, Baldwin	1900-1913	1928-1947	
0-6-0	G-4A	1600-1654	55	CB&Q	1900-1903	1909-1928	Rebuilt from 2-8-0
0-6-0	G-4B, C	1601-1603, 1647, 1651, 1655-1677	28	CB&Q	1904-1921	1926-1939	Rebuilt from 2-8-0
0-6-0	G-5	500-509	10	Cooke	1919	1954	USRA
0-6-0	G-5A	510-524	15	Baldwin	1921	1953-1955	USRA copy
0-6-0	G-6	1678-1699	22	CB&Q	1905-1910	1931-1955	
0-6-0	G-7	1702, 170	32	CB&Q		1931, 1933	Rebuilt from 2-6-2
0-6-0	G-8	1710-1769	70	CB&Q	1917-1929	1938-1951	Rebuilt from 2-6-2
0-6-0	G-9	1805-1848	22	CB&Q	1925-1928	1942-1951	Rebuilt from 2-6-2
0-6-0	G-10	560-594	35	CB&Q	1928-1930	1951-1955	Rebuilt from 2-6-2
0-8-0	F-1	540-549	10	Brooks	1919	1953-1956	USRA
0-8-0	F-2	550-556	7	CB&Q	1926-1927	1946-	Rebuilt from 2-6-6-2
0-8-0	F-3	5020	1	CB&Q		1939	
2-6-0	H-4	1220-1262	43	BLW, Rogers, CB&Q	1899-1900		19 rebuilt to K-10
2-6-2	R-1	1700-1703	4	CB&Q	1900	1929-1930	2 rebuilt to 0-6-0
2-6-2	R-2	1710-1769	60	BLW, CB&Q	1901		All rebuilt to 0-6-0
2-6-2	R-3	1800-1849	50	Baldwin	1902	1928-1930	Many rebuilt to 0-6-0
2-6-2	R-4	1900-1939	40	Baldwin	1904	1928-1953	Few rebuilt to 0-6-0
2-6-2	R-4	1940-1989	50	Brooks	1905	1928-1954	Few rebuilt to 0-6-0
2-6-2	R-4	2000-2049	50	Baldwin	1906	1928-1951	Few rebuilt to 0-6-0
2-6-2	R-5	2050-2224	175	Baldwin, Brooks	1906-1907	1928-1953	
2-8-0	D-4A	3100-3174	75	Schenectady	1903	1928-1946	
2-8-0	D-4B	3175-3199	25	Baldwin	1903	1928-1932	
2-8-0	D-7	3030, 3031	2	Baldwin	1903	1928	Ex-Iowa & St. Louis
2-8-2	O-1	5000-5059	60	Baldwin	1910-1911	1927-1951	
2-8-2	O-1A	4940-4999	60	Baldwin	1923	1951-1957	
2-8-2	O-1A	5060-5147	88	Baldwin	1917-1922	1953-1957	
2-8-2	O-2	5200-5299	100	Baldwin	1912-1913	1931-1954	
2-8-2	O-3	5300-5359	60	Baldwin	1915-1919	1951-1956	
2-8-2	O-4	5500-5514	15	Baldwin	1919	1954-1957	
2-10-2	M-1	6000-6004	5	Baldwin	1912	1933, 1950	
2-10-2	M-2	6100-6107	8	Baldwin	1914	1951-1953	
2-10-2	M-2A	6108, 6109	2	Baldwin	1914	1952	
2-10-2	M-2	6110-6125	16	Baldwin	1914	1951-1954	
2-10-2	M-2A	6126-6170	45	Baldwin	1915-1921	1951-1954	
2-10-2	M-3	6300-6309	10	Brooks	1919	1953-1954	USRA, leased to C&S
2-10-4	M-4	6310-6327	18	Baldwin	1927, 1929		
2-6-6-2	T-1	4000-4002	3	Baldwin	1908		Rebuilt to F-2, 1926-1927
2-6-6-2	T-1A	4003-4007	5	Baldwin	1909		Rebuilt to F-2, 1926-1927
2-6-6-2	T-2	4100-4109	10	Baldwin	1910	1929-	
2-8-8-2	T-3	4200	1	Baldwin	1911	1934	
4-4-0	A-2	374-478	105	CB&Q	1915-1918	1927-1935	Rebuilt
4-4-0	A-6	479	1	Baldwin	1901	1923	Ex-DRI&NW
4-4-2	P-1C	2500-2504	5	Baldwin	1899-1900	1932-1933	Ex-1591-1595
4-4-2	P-2C	2510-2515	6	Baldwin	1902		Ex-1584-1589
4-4-2	P-2	2520-2527	8	Rogers	1903	1930-	Ex-1576-1583
4-4-2	P-2	2528-2544	17	Rogers	1902-1903	1930	
4-4-2	P-3C	2700-2719	20	Baldwin	1904-1905		Rebuilt to P-5 and P-6
4-4-2	P-4	2599	1	CB&Q	1905	1929	Rebuilt from 2-4-2
4-4-2	P-5	2550-2555	6	CB&Q	1915-1917	1942-1947	Ex-P-2

Lehigh & New England



Switchers 120-122, turned out by Baldwin in 1927, were the last Camelback engines built for service in North America. ***Baldwin; collection of H. L. Broadbelt***

The Lehigh & New England extended from the anthracite-, slate-, and cement-producing region of eastern Pennsylvania to a connection with the New Haven at Campbell Hall, N. Y. Like the parallel Lehigh & Hudson River, its original purpose was to move anthracite from eastern Pennsylvania to New England (it was owned by the Lehigh Coal & Navigation Co.). The road later carried considerable cement traffic, but never became a bridge route as L&HR did. It wasn't a passenger carrier of any consequence. As early as 1930 its passenger service consisted of local trains on 10 miles of track at the Pennsylvania end of the line and a single train at the New York end. Its *Official Guide* listing said of most of the line, "Passenger service not established." All passenger service was discontinued in 1938. Dieselization occurred quickly and was complete by the end of 1949.

Low-drivered Camelback 2-8-0s were the mainstay of L&NE freight service until Alco's Schenectady Works delivered seven medium-size conventional 2-8-0s in 1922. They had 61" drivers and 27" × 32" cylinders. They weighed 233,000 pounds; their fireboxes were as wide as the Wootten fireboxes used on previous L&NE engines.

The Decapods were purchased specifically for a stretch of 2.74 percent grade between Bath and Summit, Pa. They were the largest, most-powerful 2-10-0s built. They weighed 400,000 pounds and with tender booster working could exert a tractive force of 106,200 pounds, more than a USRA 2-8-8-2 working compound. They had 61" drivers and 30" × 32" cylinders. During World War II LNE purchased four Pennsylvania Railroad L1 2-8-2s.

Lehigh & New England's latter-day roster included two 0-6-0s and 19 0-8-0s, 13 of which were Camelbacks—and three of those were the last Camelbacks built in the United States (nos. 120-122, Baldwin, 1927). The conventional-cab 0-8-0s, nos. 131-136, built by Baldwin between 1927 and 1931, had Wootten fireboxes and enormous rear overhangs that looked long enough to justify trailing trucks.

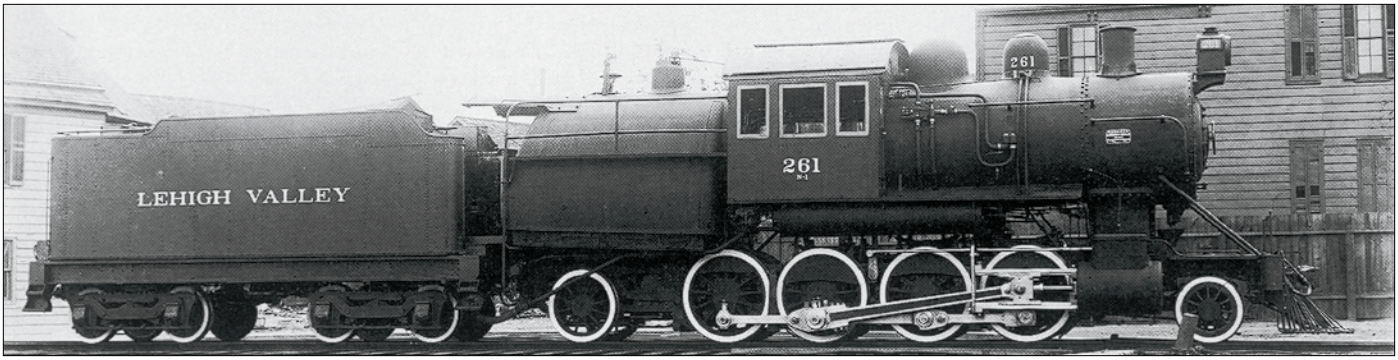
The two 0-6-0s were latecomers. Though built in 1931, no. 206 had slide valves. Number 207 was enough of a curiosity that it got its picture in the 1938 *Locomotive Cyclopedia*.

Historical and technical society: Anthracite Railroads Historical Society, www.anthraciterailroads.org
Published rosters: *Railroad* magazine, March 1933, page 94; November 1946, page 114

Lehigh & New England steam locomotives built since 1900

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
0-6-0	B-4	206	1	Baldwin	1931		
0-6-0	B-5	207	1	Baldwin	1936		
0-8-0	I-1	101	1	Baldwin	1913		Camelback
0-8-0	I-2	111-115	5	Baldwin	1913		Camelback
0-8-0	I-3	116-119	4	Baldwin	1915		Camelback
0-8-0	I-4	120-122	3	Baldwin	1927		Camelback
0-8-0	I-5	131-136	6	Baldwin	1927-1931		
2-8-0	E-8	25, 27	2	Baldwin	1906		
2-8-0	E-9	29	1	Baldwin	1909		Camelback
2-8-0	E-12	151, 152	2	Baldwin	1911		Camelback
2-8-0	E-13	153, 154	2	Baldwin	1915		Camelback
2-8-0	E-14	301-307	7	Schenectady	1922		
2-8-2	G-1	501-504	4	Juniata	1915		
2-10-0	F-1	401-404	4	Baldwin	1927-1931		

Lehigh Valley



Lehigh Valley had the only Camelback 2-8-2s; no. 261 was built at Schenectady in May 1907. The handrail below the sand dome that ends abruptly at a cluster of hot injector pipes must have been cursed by engineers. ***Alco; collection of C. W. Witbeck***

The Lehigh Valley of 1900 extended west from Jersey City and Perth Amboy, N. J., to Easton, Bethlehem, and Allentown, Pa., then northwest through Wilkes-Barre and Sayre, Pa., and Ithaca, N. Y., to Geneva, then west to Buffalo. Branches reached Niagara Falls and Rochester; several branches and alternate routes served the Finger Lakes area south of Geneva and Auburn, N. Y.; and a network of branches covered the anthracite-producing area around Hazelton and Pottsville, Pa. Some of LV's expansion was relatively late. The line from Geneva to Buffalo was opened in 1892, and the line from Easton to Jersey City in 1899; both extensions avoided cities and even medium-size towns. LV was leased briefly by the Reading in 1892 and 1893, and around the turn of the century several railroads purchased and briefly held interests in the road: New York Central, Reading, Erie, Lackawanna, and Central of New Jersey.

In the mid-1920s Leonor F. Loree, president of the Delaware & Hudson, tried to assemble a New York-Chicago railroad based on D&H, LV, Wabash, and Buffalo, Rochester & Pittsburgh. He got the backing of the Pennsylvania Railroad. In 1928 he lost a battle for control of the BR&P, and suddenly the PRR held 44 percent of LV's stock. Pennsy kept LV out of the hands of other railroads but exercised no influence on the road's policies and operations.

LV was the weakest of the railroads from New York to Buffalo. It had to rely on connecting roads at Buffalo, and most of those were aligned to some extent with one of LV's competitors. Its freight business was also affected negatively by government regulation that forced it to sell its Great Lakes boats and its coal mining subsidiary. Although LV's passenger trains used Pennsylvania Station in New York (LV had no passenger terminal of its own on the New Jersey waterfront), its trains were older and slower than those of the New York Central and the Lackawanna. It was the dominant passenger carrier to Allentown, Bethlehem, and Wilkes-Barre.

Much of LV's main line ran alongside rivers and lakes or through the flat country of New Jersey and western New York, but between Mauch Chunk (now Jim Thorpe) and Wilkes-Barre, Pa., the road had a major struggle to cross the divide between the Lehigh and Susquehanna rivers. There was a long stretch of ascending grade somewhat less than 1 percent along the Lehigh River westbound, followed by 10 miles of 1.2 percent to the summit. Eastbound passenger trains faced about 10 miles of 1.81 percent grade out of Wilkes-Barre; a longer bypass for freight had a grade of 1.16 percent. Many of LV's heavy locomotives were designed for the line over Penobscot and Wilkes-Barre mountains.

In the 19th century LV had a reputation for motive power innovation. It originated the 2-8-0, 4-8-0, and 2-10-0 wheel arrangements (one of the two Decapods was rebuilt as a 2-8-2, then a 2-8-0; the other, a 4-8-0), but shortly after the turn of the century moved away from slow, drag-freight engines in favor of faster machines, generally types with fireboxes supported by trailing trucks. It made that move before it switched from Camelbacks to locomotives of conventional configuration, with the result that LV was the only road to operate Camelback Pacifics, Mikados, and (except for one engine) Prairies. About 1910 the road standardized on four wheel arrangements: Mikados for heavy freight, Pacifics for passenger and light freight, Ten-Wheelers for local and branchline service, and 0-8-0s for switching and short-distance coal trains.

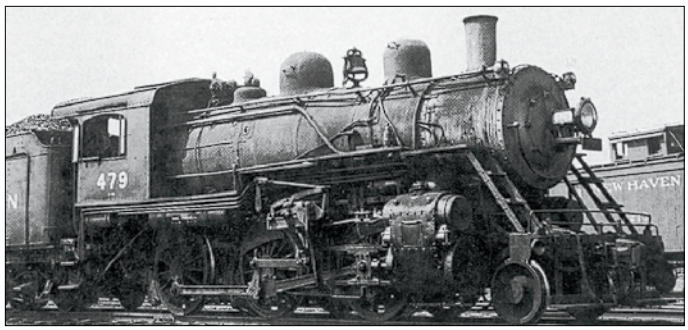
LV's locomotives underwent a general renumbering in 1905; the 1905 numbers are used in the text and roster.

In the late 1920s LV acquired several diesel locomotives to work the waterfront in New York and New Jersey, and in 1937 began buying diesel switchers in earnest. In 1945 it bought four two-unit FTs for helper service. LV dieselized quickly between 1948 and 1951. Mikado 432 had the honor of the last steam run on September 14, 1951.

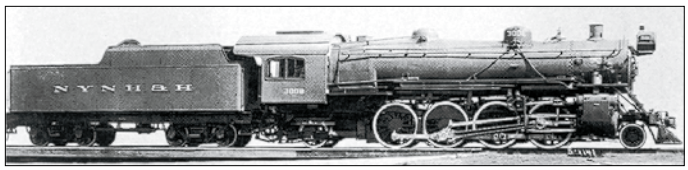
Freight locomotives

Between 1880 and 1900 LV acquired large numbers of Camelback 2-8-0s of the 20" cylinder, 50" driver size. Between 1899 and 1902 Baldwin delivered 102 M-35-class Consolidations, Vauclain compounds with 62½" drivers and 21" × 30" cylinders, and at the same time 15 M-37-class 2-8-0s, Vauclain compounds with 55½" drivers. The M-36 class 2-8-0s, built by Alco's Schenectady Works

New York, New Haven & Hartford



New Haven chose the Mogul as its standard freight locomotive at the turn of the century and had 226 of the type built after 1900. Number 479 was the highest-numbered but not the last built. Southern valve gear and piston valves were added after no. 479 had been in service several years. ***Kent W. Cochrane***



The J-1 Mikados had an extremely low profile, with cabs set much lower than customary. ***Alco***

The New Haven system reached all but full growth shortly before 1900, and in 1904 it acquired the Central New England. Full growth meant almost all the railroading—indeed, almost all the transportation in southern New England south of the Boston & Albany main line, and several lines reached north of the B&A almost to the Massachusetts-New Hampshire state line. The main line, the "Shore Line," reached from Woodlawn, N. Y., on New York Central's Harlem Division about 14 miles out of Grand Central, to Boston. A secondary main line reached north from New Haven through Hartford to Springfield, Mass. Other secondary lines ran from Norwalk, Conn., to Pittsfield, Mass.; from Devon, Conn., through Waterbury to Hartford, then northeast to Boston; from Groton, Conn., north to Worcester, Mass.; from Providence, R. I., to Worcester, Mass.; and from Mansfield, Mass., to Fitchburg and Lowell. Branches covered the area.

The Shore Line was almost gradeless except for five miles of 0.7 percent against southbound trains through Sharon, Mass. Numerous curves with speed restrictions along the shore in Connecticut hampered fast running and required engines that could accelerate quickly. Secondary lines that branched off the Shore Line generally followed rivers. Helper grades were found on the routes that ran crosswise to the watercourses, notably the line from New Haven to Maybrook and the CNE—away from Long Island Sound, Connecticut is hilly country.

The Central New England ran from Hartford to the northwest corner of Connecticut, then southwest to Poughkeepsie, N. Y., where it crossed the Hudson on a high bridge, and on to Maybrook and Campbell Hall, where it connected with Erie; Lehigh & Hudson River; Lehigh & New England; and New York, Ontario & Western. NH's chief reason for acquiring CNE was the Poughkeepsie bridge and the western connections. Although under NH control, CNE remained a separate operation until 1927.

New Haven electrified the main line from Woodlawn to Stamford in 1907 and on to New Haven in 1914. Its experience with electric power made it an early experimenter with diesels; by 1940 it had 31 diesel switchers on its roster. By then NH was experiencing the beginnings of a wartime traffic surge. Its newest steam locomotives were 12 years old, and its choices were to extend electrification (expensive, and the road was in bankruptcy), order new steam locomotives (they would take time), or adapt stock diesel locomotives for freight service. The only diesels available were 2,000-hp passenger engines from Alco and Electro-Motive. Alco had long been NH's prime locomotive builder, and in December 1941 NH took delivery of the first of ten DL-109s geared for freight and equipped with heavy-duty draft gear and couplers. They also had steam generators, because the freights ran at night and the road planned to use them on passenger trains during the day. By 1945 NH had amassed a fleet of 60 such units and effectively dieselized mainline freight and passenger service east of New Haven.

Dieselization gathered speed after the war. The official last run of steam was an excursion behind Pacifics 1372 and 1388 in April 1952, but J-1 Mikado no. 3016 operated on a fan trip on July 19, 1953. Mikados 3006, 3016, and 3020 were used as snow melters until 1956. The three Mikes remained on the property awaiting scrapping. In spring 1958 no. 3016 made another appearance in steam on New Haven rails: It became Eastern & Portland 97 for the filming of *It Happened to Jane,* in which lobster-seller Doris Day kidnaps no. 97, ties up the freight and passenger service of the E&P, gets her lobsters to market alive and well (behind steam, giving them a preview of their eventual fate), and makes a monkey out of the president of the E&P, played by Ernie Kovacs.

The New Haven adopted a new numbering scheme in 1904, right after devising a new classification system in which the newest and largest locomotives got the lowest numbers (B-1, for example) and the oldest of the type got the highest (B-5, for instance). The road soon had to grapple with the problem of another group of B-class engines (B-0? and beyond that, what?). It decided to follow the more usual practice of assigning higher class numbers to successive groups of locomotives.

Freight locomotives

New Haven's post-1900 freight locomotives were atypical. After 226 Moguls built between 1900 and 1910 came 18 Consolidations acquired with the Central New England, then 33 Mikados. For a railroad with NH's traffic density and a wheel arrangement that was the standard freight locomotive for decades, 33 engines hardly justified the time it took the motive power superintendent to find the classification book and decide what the next available

The last steam freight engines NH purchased were the R-3-a class, three-cylinder 4-8-2s. Number 3558, built by Alco in 1928, was still in service in 1950, awaiting helper duties at Hopewell Junction, N. Y. ***John V. Weber***

class letter was. Fifty 2-10-2s seemed a lot for a New England railroad, but the region is hilly, even mountainous. Seventy 4-8-2s complete the list, and they were appropriate for a fast, water-level railroad. (Actually, the 4-8-2s didn't complete the list. NH's roster of freight engines included 48 other 2-8-2s, most with 63" drivers, and ten 4-6-6-4s with 57" drivers, but they were restricted to electrified territory west of New Haven, and their wheel arrangements were usually given as 1-B+B-1 and 2-C+C-2.)

New Haven inherited a large number of 2-6-0s from predecessors such as the Old Colony and the New York & New England. In 1896 and 1898 Schenectady delivered two groups of ten heavy 2-6-0s (145,000 pounds) with 63" drivers and 20" × 28" cylinders for freight service. They were classed K-1-a and (after 1905) numbered 480-499. Between 1900 and 1907 Baldwin, Cooke, Rhode Island, and Schenectady delivered 195 more with the same size cylinders and drivers but another 6,000 to 9,000 pounds weight. They were classed K-1-b, and like the K-1-a class had fireboxes atop the frames between the drivers, but the frames were notched aft of the main drivers to allow the grate to slope downward toward the front. The 25 members of the K-1-c class, delivered in 1902 by Rhode Island, had wider fireboxes above the rear drivers. Number 325 in the Schenectady 1900 group was a tandem compound classed K-1-d; it was rebuilt to a simple K-1-b in 1905.

The 2-6-0s initially were mainline freight locomotives, and while they could not pull as much as the 51"-drivered 2-8-0s, they were faster, important on a line with heavy passenger traffic. In 1913 NH began to superheat the K-1-bs, fit them with outside valve gear and larger cylinders, and (later) reclass them K-1-d. Some received new boilers and power reverses. With the arrival of larger locomotives, the 2-6-0s were demoted to local freight, work train, and commuter service.

The Central New England K-6 Moguls differed from the K-1-b class only in having Walschaerts valve gear, and although they were the newest 2-6-0s on the system, they were never superheated. The wide-firebox K-1-c Moguls turned out to be coal gluttons, and six were converted to oil burners in 1931 for work in the electrified zone.

New Haven ordered 25 2-8-0s from Rhode Island in 1895. They were impressive looking, but much of their apparent bulk was an illusion caused by their 51" drivers. They weighed 156,000 pounds, only a ton more than the K-1-b Moguls of a decade later, and were too slow for mainline service. They were relegated to switching and pusher work and were retired in the mid-1920s.

By the time NH absorbed the Central New England in 1927, only three older 50"-drivered 2-8-0s were left on its roster, but there were 15 medium-weight, superheated 2-8-0s built by Schenectady in 1912 for Maybrook-New Haven freight service. New Haven thought well enough of them to fit them with firebox syphons and power reverses; they ran through World War II.

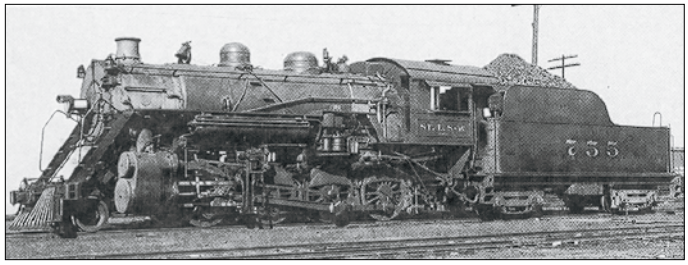
New Haven took delivery of two groups of 2-8-2s in 1916. The first, the J-1 class, nos. 3000-3024, had 63" drivers and 25" × 30" cylinders and weighed 251,750 pounds, a little smaller than a USRA light Mikado. They were notable for an overall height of 13' 9", more than a foot lower than contemporary New Haven Pacifics, which enabled them to fit under bridges on the Dorchester Branch, the freight route from Readville, Mass., to Boston. Their cabs were noticeably lower but the tenders were of conventional configuration. (A freshly coaled J-1 was likely to have a coal pile towering over the cab, at least as far as the first bridge on the Dorchester Branch.) The last two of the group were built with McClellon boilers and watertube fireboxes; both received new McClellon boilers in 1928 and conventional boilers in 1942.

Eight heavy 2-8-2s also came from Schenectady in 1916, NH 3100-3104 and CNE 3105-3107, class J-2. They had the same 63" drivers but 26" × 32" cylinders and weighed 309,600 pounds; tractive effort was 58,372 pounds. They were slightly less locomotive than a USRA heavy Mike, but they lacked the mechanical stoker of the USRA engine. It was impossible for a fireman to fling enough coal into the firebox for mainline speeds, and they were relegated to yard and pusher service.

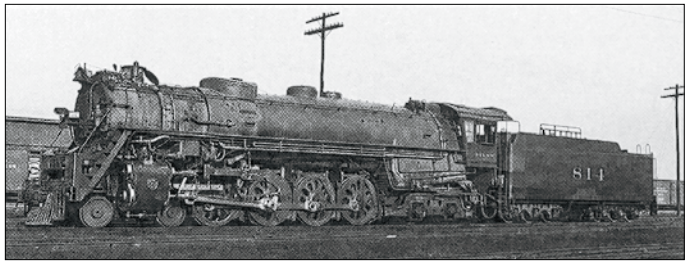
As World War I began, New Haven's only mainline freight power was the group of 25 J-1 Mikados. E. J. Pearson, who had come to the presidency of the road after stints on Milwaukee Road, Northern Pacific, and Missouri Pacific, got NH what it needed in the form of 50 2-10-2s, which Alco's Schenectady Works delivered in 1918. They had 63" drivers and 30" × 32" cylinders and were about halfway between the USRA light and heavy Santa Fes in weight and tractive force. They had shallow fireboxes over the rear two pairs of drivers and roller-skate-wheel inboard-journal trailing trucks. Counterbalancing problems restricted their speed to 25 mph, incompatible with the fast, frequent passenger trains on the New Haven-Boston main line. The USRA 4-8-2s that arrived the next year solved that problem, and most of the 2-10-2s were moved to the New Haven-Maybrook line. However, NH had more 2-10-2s than it needed, so any that needed repairs were simply set aside. During the late 1920s nearly all received Elesco feedwater heaters and thermic syphons, and in the late 1930s a few were fitted with Boxpok drivers. By the beginning of World War II five of the class were being cannibalized. When war traffic surged New Haven needed all 50, and the five hulks were restored to service.

The USRA assigned its first 10 light 4-8-2s to the road for New Haven-Boston freight service. NH classed them R-1 and numbered them 3300-3309, and liked them well enough to order 39 copies, 3310-3348, for delivery in 1920 and 1924. They were assigned to fast freight service on all the main lines except the Maybrook route. They were equipped with steam and signal lines for passenger service, but their long rigid wheelbase was incompatible with the slip switches in Boston's South Station, so what little passenger work they did was on the lines to Springfield and

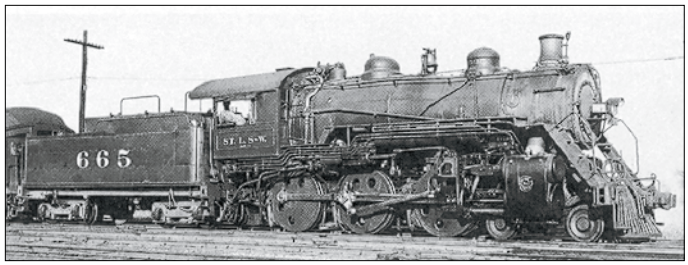
St. Louis Southwestern (Cotton Belt)



The K1-class Consolidations were Cotton Belt's big freight locomotives until the 4-8-4s arrived in 1930. ***R. J. Foster***



Cotton Belt's finest freight engines were its home-built 4-8-4s. Number 814 was the last of the 1937 group. ***R. J. Foster***



Eighteen Ten-Wheelers were the mainstay of passenger and fast freight service until the arrival of 4-8-4s and ex-Florida East Coast 4-8-2s. The Scullin disk drivers under no. 665 would have been more at home on a New York Central Hudson. ***R. J. Foster***

The St. Louis Southwestern, early nicknamed the Cotton Belt, began life as a narrow gauge feeder line to start Texas cotton on its way to St. Louis. Jay Gould tried to hem it in, but it built northeast, then fell into Gould's hands. Shortly after 1900 it reached St. Louis by trading trackage rights with Missouri Pacific in southeast Missouri and southwest Illinois and teaming up with MoPac to build a bridge across the Mississippi at Thebes, Ill. By then Cotton Belt was at its full extent: St. Louis to Fort Worth, with branches to Sherman, Hillsboro, Waco, and Lufkin, Texas, Shreveport, La., Memphis, Tenn. (by trackage rights on Rock Island), and Cairo, Ill.

Rock Island purchased control of Cotton Belt in 1925 and sold it almost immediately to Kansas City Southern. In 1932 Southern Pacific acquired control of Cotton Belt to establish a St. Louis connection for its Texas lines. The road continued to be more or less independent until about 1950, when it began to look more and more like a piece of SP.

Cotton Belt began dieselizing in earnest with FTs in 1944 and 1945. Between 1951 and 1953 it cut its passenger-train miles by more than half, and by the end of 1952 the road's passenger trains were dieselized. By mid-1953 diesels had replaced the last steam engines in freight service. The official last run was a work train on October 28, 1953, behind 2-8-0 no. 502 (Baldwin, 1906).

Freight locomotives

At the beginning of the 20th century Cotton Belt freight rolled behind 2-6-0s and 4-6-0s. The road bought Moguls through the first decade of the century, and the last four, G1s 425-428, had many features in common with the G1 Consolidations (including cylinder size and thus the same classification). They were intended for heavy switching and transfer service around St. Louis.

Cotton Belt bought its first 2-8-0s in 1906, ten small 55"-drivered engines with slide valves, Stephenson valve gear, and narrow fireboxes—class G1, 500-509. In the 1920s five were superheated and given new cylinders and valve gear, and three were converted to 0-8-0s. Next in 1909 and 1901 were the G2s, (510-529), which differed principally in having a 30" piston stroke and Walschaerts valve gear. Later all were superheated and fitted with piston valves, and two of the class were converted to 0-8-0s.

Between 1912 and 1923 Baldwin delivered 76 K1-class engines, nos. 550-589 with 57" drivers and 750-785 with 61". Both groups had 25" × 30" cylinders; weight ranged from 228,000 pounds for the first ones as built to 243,775 pounds for the last. All were eventually converted to oil fuel, and 15 received tender boosters in 1927. Many K1s displaced by diesels were not scrapped but sold to the Southern Pacific of Mexico and its successor, the Ferrocarril del Pacifico.

During World War II SSW bought several groups of 2-8-0s from Erie, Chicago & North Western, and Detroit, Toledo & Ironton, and seven 4-8-2s from Rock Island.

Until the late 1920s Cotton Belt was an also-ran, secondary railroad. In 1929 the investors that had acquired the road began to upgrade it, and new locomotives were at the top of the list. In the late 1920s all sorts of high-capacity freight locomotive designs were available, but Cotton Belt needed an engine that was compatible with 85-pound rail, 90-foot turntables, and wood bridges. Baldwin proposed a high-drivered 2-8-4, then a 4-8-4, then built ten 4-8-4s—and Cotton Belt's leap from 2-8-0 to 4-8-4 is one of the longest in North American railroading. The new engines, nos. 800-809, had 70" drivers and 26" × 30" cylinders, and weighed 422,500 pounds, about the same weight as Rio Grande's 1700s, Great Noethern's S-2s, and Timken demonstrator no. 1111.

The L1s went into service moving 30 percent more tonnage than the K1s and doing it faster. The road's new fast freight, the *Blue Streak,* was good publicity; better for the finances was an ever-increasing amount of freight moving to and from Southern Pacific at Corsicana, Texas. In 1937 Cotton Belt built five more 4-8-4s in its own shops at Pine Bluff, Ark. Engines 810-814 incorporated two refinements, Boxpok drivers and roller bearings

St. Louis Southwestern steam locomotives built since 1900

Type	Class	Numbers	Qty	Builder	Built	Retired	Notes
0-6-0	C3	95-97	3	SSW	1895-1900	1916, 1917	Built at Pine Bluff
0-6-0	C4	86-94	9	Rogers, Bald.	1901, 1903	1925-1933	87 Ex-Dallas Terminal
0-8-0	G2	500, 504, 509, 524, 528	5	SSW	1927-1929	1945-1953	
2-6-0	D2	300-330	31	Rogers	1901-1904	1929-1944	
2-6-0	D3	331-340	10	Baldwin	1906, 1909	1945-1955	
2-6-0	E3	400-404	5	Rogers	1905	1934-1956	
2-6-0	E4	450-459	10	Baldwin	1909	1947-1950	
2-6-0	G1	425-428	4	Baldwin	1912	1946	
2-8-0	G1	500-509	10	Baldwin	1906	1935-1953	500, 504, 509 to 0-8-0
2-8-0	G1	530-532	3	Alco	1904-1905	1945	Ex-Erie
2-8-0	G2	510-529	20	Baldwin	1909-1910	1945-1953	524, 528 to 0-8-0; 6 to SPdeM, 1947
2-8-0	G2	545-548	4	Schen, Rich	1909,1911	1946-1949	Ex-Detroit, Toledo & Ironton
2-8-0	J1	533-536	4	Schenectady	1903, 1904	1945-1949	Ex-Erie
2-8-0	K1	540, 541	2	Schenectady	1909, 1910	1945	Ex-Chicago & North Western
2-8-0	K1	550-589	40	Baldwin	1912-1917	1934-1952	15 to Ferrocarril del Pacifico, 1950
2-8-0	K1	750-785	36	Baldwin	1920-1923	1934-1956	25 to Ferrocarril del Pacifico, 1950
4-4-0	C2	40-57	18	Rogers, Pitt	1900-1903	1927-1944	
4-4-0	D1	58-62	5	Baldwin	1906	1933	
4-4-2	E1	600-605	6	Baldwin	1909	1933-1952	601 sold to Cotton Plant-Fargo
4-6-0	E2	209-224	16	Rogers, Pitt	1900, 1901	1925-1944	
4-6-0	F1	250-255	6	Baldwin	1910	1945-1953	
4-6-0	G0	650-667	18	Baldwin	1913, 1916	1945-1952	
4-8-2	L0	675-679	5	Schenectady	1924	1952, 1953	Ex-Florida East Coast
4-8-2	M1	680-686	7	Brooks	1920, 1923	1953	Ex-Rock Island
4-8-4	L1	800-819	20	BLW, SSW	1930-1943	1953-1959	

on all axles; the Baldwin 4-8-4s received them in the early 1940s. Wartime traffic required more power, so Pine Bluff built another five, 815-819, in 1942.

In 1952, 11 4-8-4s moved west to parent SP for freight service out of El Paso, Texas. When those routes were dieselized, they found a new career in commute service, first San Francisco-San Jose, then on SP's main lines out of Oakland.

Passenger locomotives

Cotton Belt's passenger business was primarily local (Missouri Pacific served all of Cotton Belt's important cities and towns faster and more frequently). The road bought 4-4-0s with 69" drivers until 1906. Most were scrapped in the early 1930s, but three lasted into the 1940s. In 1909 Baldwin delivered six small Atlantics (600-605). They had 70" drivers, a narrow firebox between the trailing wheels, slide valves, and Stephenson valve gear—they were not so much Atlantics as they were Americans with trailing axles. In the mid-1920s they were modernized with piston valves, Walschaerts valve gear, and superheaters, and were converted to oil burners. Until 1930 they were Cotton Belt's only locomotives with trailing trucks. Two 4-4-2s were scrapped in the early 1930s; the other four lasted through most of the 1940s—and one was sold in 1952 to the Cotton Plant-Fargo Railway, probably for use as a stationary boiler.

Six E2 Ten-Wheelers were adapted for passenger service by adding thicker driver tires, increasing their 61" drivers to 70".

In 1913 Baldwin delivered ten G0-class 4-6-0s with 69" drivers. Other than being Ten-Wheelers long after Pacifics had become the standard passenger engine, they were as modern as the Atlantics were archaic, with wide fireboxes, superheaters, piston valves, and Walschaerts valve gear, and at 209,200 pounds they were 13 tons heavier than the Atlantics. Eight more with Baker valve gear came from Baldwin in 1916. In the 1920s they were converted to oil burners, and later several were fitted with disk drivers.

In the early 1920s the road considered ordering copies of the light USRA Pacific, but nothing came of it nor of a proposal for a heavy 73"-drivered 4-8-2. By the mid-1930s the road needed something larger than the G0 Ten-Wheelers. In 1936 Florida East Coast defaulted on an equipment trust, and SSW entered a bid for five 12-year-old light 4-8-2s. They were a bargain at $12,500 each—the Baldwin 4-8-4s of 1930 had cost $110,849 each. Cotton Belt classed them L0 and numbered them 675-679.

Historical and technical society: Cotton Belt Chapter, National Railway Historical Society, www.nrhs.com/chapters/cotton-belt

Recommended reading: *Cotton Belt Locomotives,* by Joseph A. Strapac (Shade Tree Books, 1977, LCC 77-78935)

Published rosters: *Railroad* magazine, September 1932, page 196; February 1947, page 110; July 1953, page 96