

Tough Texans of

Little Bessemer & Lake Erie once operated America's third-largest fleet of 2-10-4 type steam locomotives

By Bert Pennypacker

STANDING AGAINST A BACKDROP of Lake Erie's Conneaut (Ohio) harbor, where giant lakeboats were moored at piers laden with complicated unloading machinery, Bessemer & Lake Erie's sprawling yard teemed with activity. Filling the lakefront yard was a sea of red hopper cars carrying coal northward for loading into boats and iron ore southward for rail movement to the mills of Pittsburgh. Five decades and more ago, a frequent sight here was that of 100-car, 13,000-ton ore drags getting laboriously under way with three ponderous H1 class 2-10-4's. With one pulling and two pushing, the Texas types worked strenuously, climbing out of the Lake Erie basin up to Albion, Pa.

B&LE's fleet of 47 powerful 2-10-4's, the third-largest fleet in America (behind Pennsy's 125 and Texas & Pacific's 70), came to the road in seven groups built by Alco and Baldwin over 15 years from 1929 to 1944. They carried numbers 601-647 and were classified H1a through H1g. Aside from slight differences in weights, all featured standardized mechanical specifications which included 250 PSI steam pressure, 31x32-inch cylinders, 64-inch driving wheels, and a hefty tractive force of 96,700 pounds, with an additional 13,100 pounds produced by trailing-truck booster engines. With all this power came a handsome and rugged appearance, set off by the expansive flanks of huge tenders.

Coal and iron ore comprised three-quarters of the Bessemer's total traffic, and the monstrous 2-10-4's were well suited to the difficult task of moving these heavy commodities over major grades. Out of Conneaut, ore drags followed the valley of Conneaut Creek as they passed under lofty bridges that carried the parallel main lines of the Nickel Plate and New York Central, plus a highway. Beginning at an elevation of 572 feet above sea level at the lake, B&LE's tracks almost immediately hit an ascending grade of 0.9 percent, then an even 1.0 percent. The grade continued for 13 miles, gradually lessening as the line neared Albion, elevation 905 feet.

Albion was the site of the Bessemer's largest engine terminal, which included two roundhouses. One of these cared for engines running north to Conneaut and on the 24-mile branch to Erie, Pa. The other roundhouse handled power running south to the end of the line at North Bessemer, in Pittsburgh's northern suburbs. This unusual arrangement had evolved back in the days of 2-8-0 locomotives. In that era, the Conneaut-Albion hill was treated as a slow drag operation of greatly diminished tonnages. Upon reaching Albion, smaller trains were combined for movement southward. By the 1940's, a sufficient number of Texas types were on hand to permit full 13,000-ton trains to be lifted out of Conneaut, with three of these mighty beasts pulling and pushing.

Proceeding southward from Albion over B&LE's heavily built, double-track line, the 2-10-4's trudged confidently along with their massive loads. The gently undulating profile took advantage of valleys paralleling the mountains in its 126-mile route to North Bessemer, the north end of B&LE's U.S.-steel-owned cousin Union Railroad, which directly served

Bessemer H1d Texas type 627, built in 1937 by Alco, walks a southbound train up the .6 percent grade near Greenville, Pa., sometime in the 1940's. Out of view, another 2-10-4 lends a hand on the rear end of the 11,400-ton train.

B & L E

the Bessemer





B&LE

many of the steel mills in the Pittsburgh area. The relatively short 139-mile route from Conneaut to North Bessemer was indicative of the compact Bessemer, a Class 1 railroad with only 224 route-miles and 597 track-miles. But the road's tonnage figures were impressive—in 1940, it hauled 11 million tons of iron ore, all south, and 7.5 million tons of coal, mostly north. Moreover, B&LE's traffic mix showed a whopping 47 percent ore and 29 per-

No. 601, first of Bessemer's 2-10-4's, is seen in an official portrait. Note twin sand domes, and sand pipe for the trailing-truck booster. B&LE photo.

cent coal, vs. only 24 percent general freight. (One of a handful of "classic era" roads which has kept its name and route system, B&LE is still hauling mostly iron ore and coal between Lake Erie and the Pittsburgh area.)

B&LE's role as a major hauler of mineral freight was strongly emphasized by its fleet of 9353 hopper cars which represented 90 percent of its total car ownership. The average Bessemer hopper car boasted a capacity of 90 tons, employed clasp brakes on all wheels, and had a self-adjusting brake system that allowed for weight differences between empty and loaded cars.

An unidentified 2-10-4 rolls a limestone train over the pride of the B&LE's physical plant, the 2351-foot-long, 165-foot-high Allegheny River bridge.

Coal and ore traffic rode upon heavy-duty rail of 152 to 155 pounds per yard, with which the entire 139.5-mile Conneaut-North Bessemer main line was laid.

From 2-8-0's to 2-10-2's

In the first decade of the 20th century, the Bessemer's heaviest engines were 2-8-0 Consolidation types having 200 PSI steam pressure, 24x32-inch cylinders, 54-inch driving wheels, and





WAYNE BRUMBAUGH



Engine 647 (below) begins the hard climb up Conneaut Hill with an iron-ore train; smoke from two sisters pushing on the rear is visible beyond the Nickel Plate Road bridge. Nos. 602 and 628 (left) help a different train up the hill in 1950.



B&LE

63,829 pounds tractive force. Such small power could not begin to handle the steadily increasing coal and ore traffic, so in 1916 the railroad acquired from Baldwin 20 husky 2-10-2 Santa Fe types. Classified D1a and numbered 501-520, the 2-10-2's quickly became the backbone of the heavy tonnage work. They had rather small driving wheels of 60 inches diameter and a commendable tractive force of 85,680 pounds.

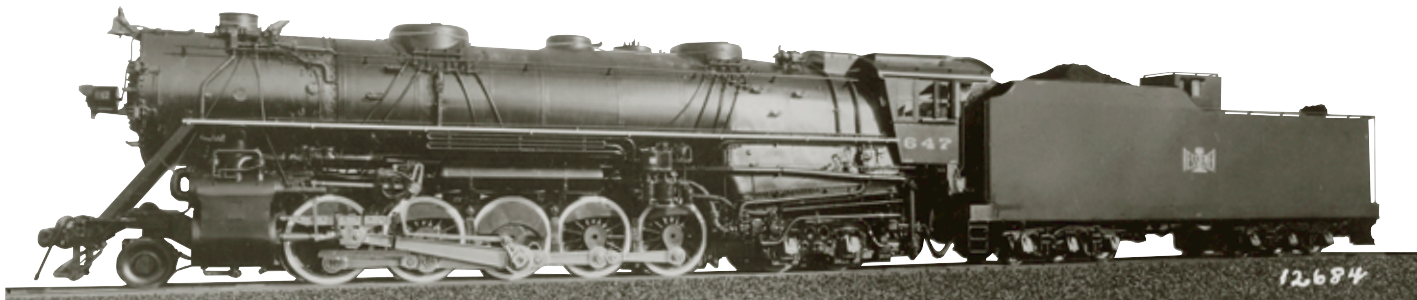
In 1919, B&LE acquired from Baldwin five more 2-10-2's. Built to USRA heavy 2-10-2 plans, class D2a (Nos. 521-525) had somewhat larger

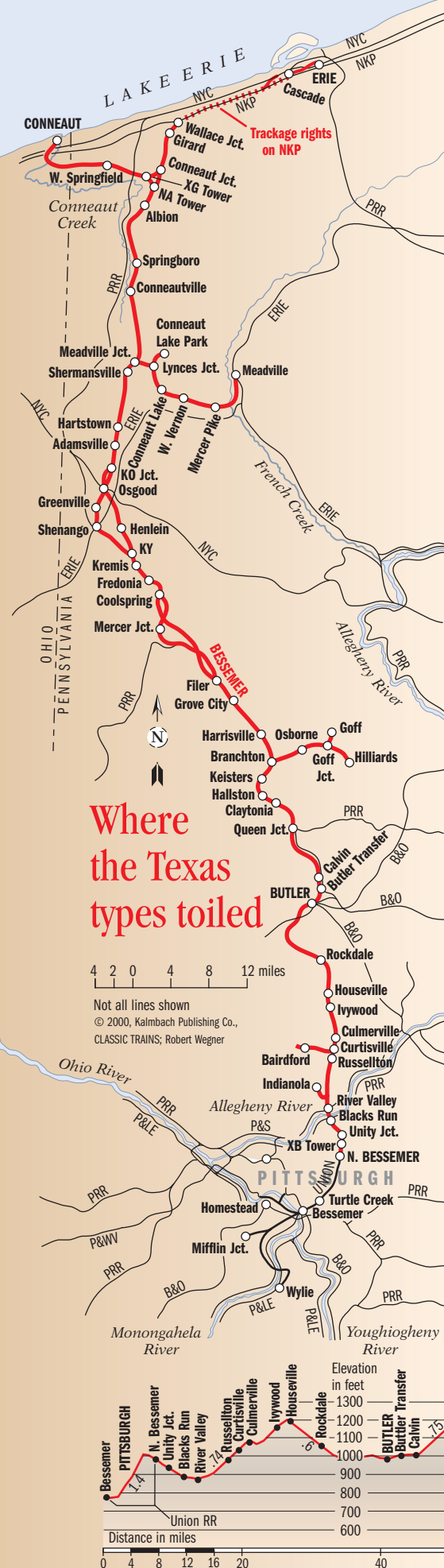
driving wheels of 63 inches, but only 190 PSI steam pressure, which provided a relatively modest 73,829 pounds of tractive force. This gave B&LE a total fleet of 25 Santa Fe types, its only big drag freight power through the 1920's.

During the 2-8-0 and 2-10-2 era, the Bessemer made substantial improvements to the Conneaut Harbor ore-handling facilities. The first boatload of iron ore had arrived there as early as 1892 and, by 1896, the Pittsburgh, Bessemer & Lake Erie Railroad had completed its through route and become a part of Andrew Carnegie's

growing steel empire. A better way of transferring ore from a ship's hold to hopper cars came along in 1899 when George H. Hulett designed the amazing ore-handling machine that would bear his name. These steam-operated devices could move along the dock as their scooping arms dipped into a boat and came up with 15-ton bites. The Hulett's greatly increased the speed with which ore could be transferred from boat to shore.

No. 647, last-built of the B&LE Texas fleet, shows that few changes were made over the locomotives' 15-year production period. Baldwin photo.





The year 1901 saw two notable changes in company names as the PB&LE became the Bessemer & Lake Erie and Carnegie Steel assumed the new U.S. Steel Corp. identity.

On the lakes, the early years of the 20th century brought forth the really giant ore carrying lakeboats, with lengths of 500 to 640 feet and capacities ranging from 15,000 to 20,000 tons. To keep pace, unloading spaces at Conneaut Harbor were increased with four docks, and unloading times were cut to 10 hours for even the largest boats. This was achieved by replacing the four original steam-powered Hulett machines with five new electrically operated ones whose fast-moving scoops could come up with a 17-ton bite of ore every two minutes.

Since the Great Lakes shipping season lasted but eight months a year, approximately April 15 to December 15, a fair percentage of ore received at Conneaut was sent to ground storage scattered over vast nearby acreage to be shipped south later for winter use. In order to carry off a 20,000-ton boatload of ore, some 225 of B&LE's 90-ton hopper cars were required. Under 2-10-2 operation, this meant a bit more

than three trains of 70 cars each, with about 6300 net tons of the heavy red mineral aboard each consist.

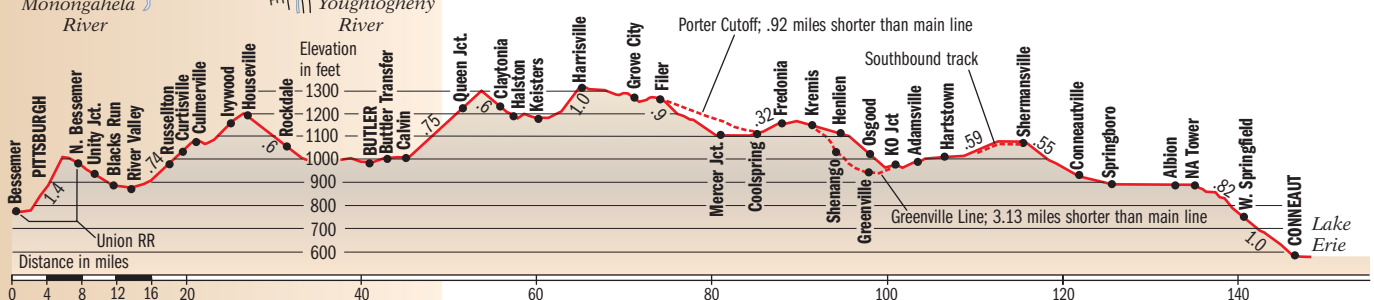
Throughout the 1920's, Bessemer's plodding 2-10-2's were adequate to handle the road's short-haul, high-volume mineral traffic. But elsewhere in the railroad industry, this decade was a time of great increases in locomotive sizes and capacities. So it was that two locomotive developments by Baldwin were destined to directly influence the designing of a giant 2-10-4 that became the successor to the Bessemer's Santa Fe types.

B&O and Burlington cousins

In 1923, Baldwin and Baltimore & Ohio mechanical engineers planned a truly heavy and powerful new 2-10-2 type having a weight of 426,510 pounds and a tractive force of 84,300 pounds. By 1926, Baldwin and Lima had built a combined fleet of 125 engines carrying B&O numbers 6100-6224 in classes S1 and S1a. They had 220 PSI steam pressure and 30x32-inch cylinders, with 64-inch driving wheels, somewhat unusual but previously used on B&O's fleet of 135 heavy Mikados in several Q4 classes.

Texas types compared

Railroad	AT&SF	B&LE	CPR	PRR
Class	5001	H1g	T1b	J1
Wheel arrangement	2-10-4	2-10-4	2-10-4	2-10-4
Road Nos.	5001-5005	638-647	5920-5929	6150-6174 6435-6474
Builder	Baldwin	Baldwin	Montreal	PRR
Years built	1938	1943-44	1938	1942-44
Cylinders (in.)	30x34	31x32	25x32	29x34
Driver dia. (in.)	74	64	63	70
Steam pressure (PSI)	310	250	285	270
Grate area (sq. ft.)	121.5	106.5	93.5	121.7
Heating surface (sq. ft.)	6075	5912	5054	6558
Superheaters	E-2675	E-2366	E-2032	E-2930
Total heating surface	8750	8278	7086	9498
Weight on drivers (lbs.)	371,680	372,277	309,900	377,800
Total weight (lbs.)	545,260	524,440	447,000	572,640
Tractive force (lbs.)	93,000	96,700	76,905	93,750
Tractive force, booster	None	13,100	12,000	15,000
Tender fuel capacity	23 tons	25 tons	5400 gal. (oil)	30 tons



Following construction of the outstandingly successful B&O S1 fleet, Baldwin and the Burlington Route collaborated in 1927 on a new locomotive to replace CB&Q's aging 2-10-2's in coal service on the carrier's Beardstown Division linking Galesburg, Ill., with southern Illinois mines and Paducah, Ky. This, in effect, practically duplicated the coming needs for new heavy-duty power on the Bessemer.

In order to fill the Burlington's need for a heavy duty, two-cylindere design that would be superior to its 2-10-2's, Baldwin looked to the 2-10-4. This wheel arrangement had been introduced two years earlier by Lima and first built for the Texas & Pacific, which christened it the Texas type. Beginning with the basics of the B&O S1 design, Baldwin increased the boiler size and total engine weight by 86,000 pounds to reach a total figure of 512,110 pounds. Steam pressure rose by 30 PSI to the 250 mark, and cylinder diameter was increased by one inch to become 31 inches with the 32-inch stroke remaining unchanged. But the really interesting feature (and a clue to the whole design formula) came in the retention of those 64-inch drivers taken from previous B&O designs. The new Burlington class M4 of 1927 carried road numbers 6310-6321 and boasted a husky tractive force of 90,000 pounds. These engines did so well that Burlington in 1929 went back to Baldwin for five more M4's.

Also in 1929, Bessemer, looking for something better than its World War I-era 2-10-2's, ordered a single duplicate of the Burlington M4 class to evaluate the design. It became B&LE 601, class H1a, and had two changes, which brought a noticeable increase in hauling power. Steam cutoff in the cylinders was increased to provide a tractive force of 96,700 pounds, and a trailing-truck booster added an additional 13,100 pounds tractive force.

Since this particular 2-10-4 design had been selected because of its proven performance on the Burlington, the success of B&LE 601 was practically assured. Thus her trial runs were made in large part to determine tonnage ratings and average operating speeds. Indeed, No. 601 posted extremely favorable increases over what the lethargic D1a 2-10-2's could manage. Once the 601 had settled these operating

From top: B&LE replaced its turn-of-the-century 2-8-0's with 2-10-2's like D1a 508 and USRA-design D2a 521. B&O's S1 2-10-2's led to Burlington's 2-10-4's, the basis of B&LE's Texas types.





Among the 18 2-10-4's that went to the Missabe Road after B&LE dieselized were No. 621 (right), seen helping a freight up Minnesota's Proctor Hill as DM&IR 700 in May 1957, and 631 (DM&IR 710), being cleaned at the Proctor roundhouse.



BRUCE MEYER



W. G. FANCHER

details, Bessemer went to Baldwin for nine near-duplicates, delivered in 1930 as class H1b. The 2-10-4's gradually became Bessemer's standard coal and ore haulers, and the road acquired six more groups between 1936 and 1944.

Anatomy of the Texans

In presenting its mechanical description of B&LE class H1c locomotives, *Baldwin Magazine* first told about the water-heating properties of the large boilers and the overall power which was produced. The huge boiler could evaporate as much as 84,300 pounds (about 10,500 gallons) of water per hour and, with a steam pressure of 250 PSI and 250 degrees of superheat, the potential boiler horsepower was 4690. The boiler was of the straight-top, wagon-bottom type, its first course having an outside diameter of 92 inches and the last course next to the firebox had an outside diameter of 104 inches.

The room-size firebox of radially stayed construction had generous di-

mensions of 150 $\frac{1}{16}$ inches in length and 102 $\frac{1}{4}$ inches in width, with a grate area of 106.5 square feet. Its depth at the front was 95 $\frac{1}{2}$ inches and at the back, 76 $\frac{3}{4}$ inches. The combustion chamber extended 49 $\frac{1}{2}$ inches into the barrel of the boiler, and there were three thermic syphons, two in the firebox and one in the combustion chamber. An American firebrick arch was supported on two siphons and three 3 $\frac{1}{2}$ -inch tubes.

Cylinders were made of close-grained cast iron, each cast with a half saddle. Valve motion was actuated by Walschaerts gear designed for a maximum cutoff of 68.75 percent. Baldwin type T power reverse gear was applied to two H1c engines, 614 and 620, while the remaining eight were equipped with Franklin type E gear.

The locomotive underframe was of cast steel-bar construction bolted to back frame cradles, which were supplied by General Steel Castings Corp. Pedestal wedges were of steel, but the pedestal shoes were bronze. The

Alemite system of lubrication was applied to connecting rods, valve motion, driving spring rigging, crosshead wrist pins, travel lever work, expansion pad at front end of firebox, radial buffer mechanical lubricator mechanism, stoker gear case, and drawbar pins between engine and tender.

The 64-inch driving wheels were considered quite adequate to meet heavy-load and moderate-speed requirements encountered in B&LE service. Main drivers had Baldwin disc type centers made by Standard Steel Works Co. from special Anchor high-tensile steel. The frame of the pony truck was cast steel made by General Steel Castings Corp., while the wheels themselves were of wrought steel with a diameter of 33 inches. The four-wheel trailing truck of the Delta type also came from GSC, with cast steel wheels of the spoked center type having diameters of 36 inches. The truck was fitted with a Franklin limited cut-off booster used only at low speeds.

Brake equipment was Westinghouse American outside equalized and combined automatic straight air applied to all driving and tender wheels. This included Westinghouse Schedule 8ET with two 8 $\frac{1}{2}$ -inch cross-compound compressors (one on each side, under the running board) and American Foundation Schedule WU6BC. This somewhat complex braking system was employed to handle the extremely heavy train tonnages common on the Bessemer.

B&LE's biggest engines had big tenders with a capacity of 23,000 gallons and 25 tons of coal for a weight of 304,000 pounds when two-thirds loaded. Cor-Ten alloy steel plates and rolled shapes were used throughout the tender construction to fashion the welded water bottom underframe and entire body structure. The stoker engine was housed in a blocked-off compartment of the left water leg of the tank. Frames and bolsters of the six-

Sole survivor of Bessemer's 2-10-4 clan is No. 643, "the King." Stored indoors for most of its retirement, 643 is reported to be in excellent condition.

wheel trucks were of cast steel, while the wheels had a diameter of 33 inches. Mounted upon the water tank was a cabin for the head-end brakeman.

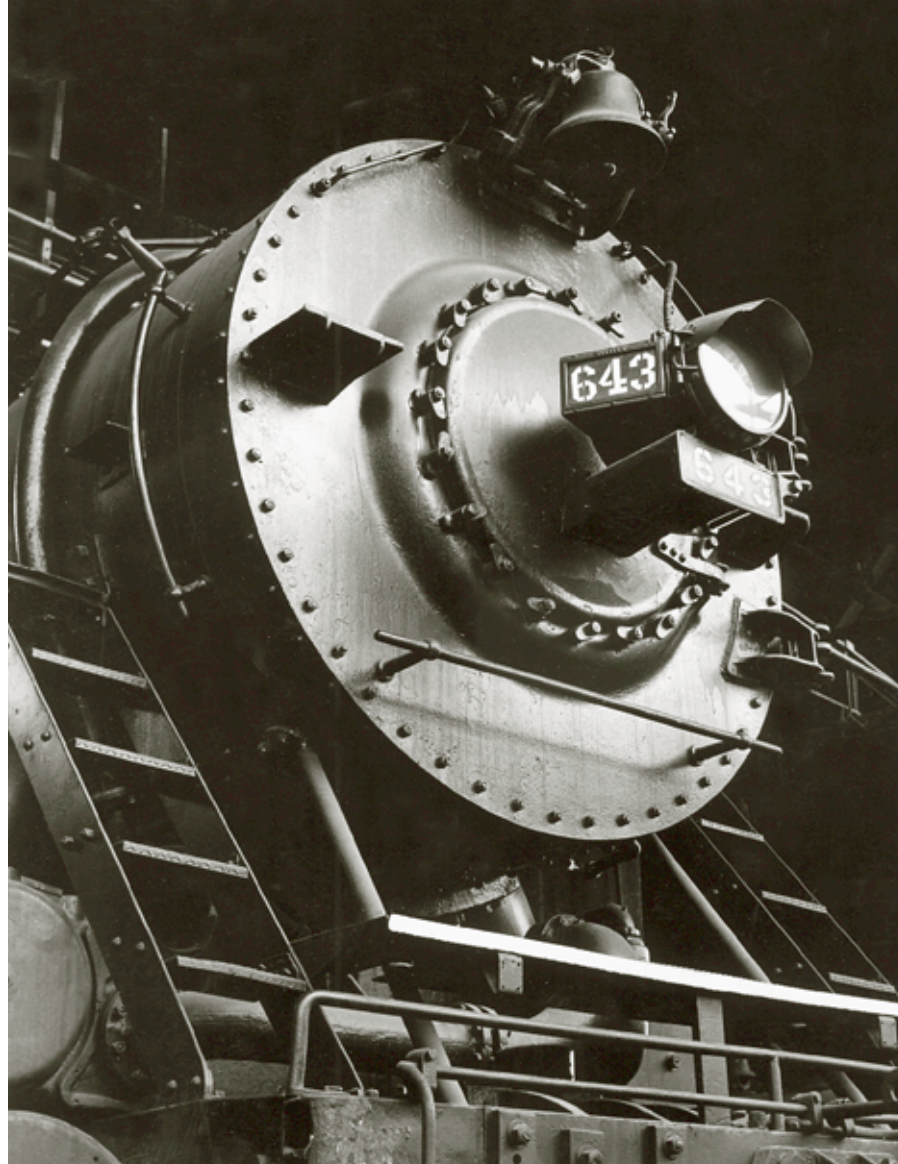
All of Bessemer's Baldwin 2-10-4's were delivered under their own steam as they ran from the Eddystone (Pa.) plant near Philadelphia via the PRR to reach the Bessemer at Butler, Pa. Their paint scheme was all black with aluminum leaf numbers on the cabs and the Bessemer name with rail-head emblem on the tenders. There were special times when certain engines appeared with white edging of their running boards and driving-wheel tires. Their overall appearance simply was big and husky, with boilers cluttered by piping and topped with two sand domes. But on the side of good esthetics, the left-hand running board was straight while the right one had two levels. The engines' classic front end featured a bell overhanging a centered headlight.

Short careers, and a sole survivor

The booming exhausts and massive stature of these powerful machines made an awesome spectacle as they trudged confidently through the hills and small towns of rural western Pennsylvania. As examples of their great size, just consider that the overall total heating surface of their monstrous boilers, including firebox, tubes, flues, and superheater, came to a whopping 8390 square feet, while the weight per driving axle amounted to 74,000 pounds. Moreover, the combined total weights of engine and tender came to 901,340 pounds, more than that of many articulateds. The B&LE Texans had a rigid driving-wheel base of 22 feet, 4 inches and, to get them around 13-degree curves, particularly on loop tracks at Conneaut, the rails there were spaced 4 feet, 9½ inches apart.

Tucked away in western Pennsylvania where they ran over a short route on a steel-company railroad that had strict rules against photography, the B&LE 2-10-4's labored in obscurity. Most had relatively short lives, thanks to Bessemer's early dieselization with Baldwin road-switchers and EMD F7's. The last 2-10-4 known to depart Conneaut was the 642, which, on November 26, 1952, pushed an ore drag headed by a four-unit diesel to Albion.

Not all the Bessemer Texans met an early end, though. In 1951, the road sold 18 of them to sister U.S. Steel car-



JOHN B. CORNS

Bessemer's family of Texans

Class	Road nos.	Builder, year	Weight (lbs.)	Tractive force
H1a	601	Baldwin, 1929	502,630	96,700
H1b	602-610	Baldwin, 1930	503,300	96,700
H1c	611-620	Baldwin, 1936	523,540	96,700
H1d	621-630	American, 1937	520,000	96,700
H1e	631-635	Baldwin, 1941	519,740	96,700
H1f	636-637	Baldwin, 1942	524,440	96,700
H1g	638-642	Baldwin, 1943	523,600	96,700
H1g	643-647	Baldwin, 1944	523,600	96,700

rier Duluth, Missabe & Iron Range in northern Minnesota. As DM&IR 700-717, they worked several more years. Moreover, the 643 was among three steamers saved by the B&LE and stored in the Greenville roundhouse (along with 2-8-0 154 and Union 0-10-2 604). The railroad exhibited the 643 occasionally throughout the 1960's, then sold it in 1983 to the Steel City Railway Historical Society, which now keeps it in a warehouse in McKees Rocks, Pa.

While plans to operate "the King," as some call it, have never come together, the engine is in excellent condition, thanks to regular maintenance and almost continuous indoor storage. ■

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For more on Texas types, please visit our website: www.classictrainsmag.com