

Pure Pennsy

The Allure of the Pennsylvania Railroad K4s Pacific

To the non-Pennsy fan, the K4s is an enigma. Why, in the late 1930s and '40s — when 4-8-4 Northern locomotives like the Southern Pacific Daylight and the Norfolk & Western J represented the high water mark of steam technology — was the self-proclaimed Standard Railroad of the World still powering its fastest expresses with double-headed Pacifics built to a 1914 design?

To the Pennsy fan, however, the K4s is the ultimate symbol of the greatest American railroad. Borrowing a phrase from author Richard Adams, it was “pure PRR — a big boiler and big cylinders, and nothing else.” The K4s was what engineers admirably called “free steaming”: no matter what the conditions, the big boiler ensured that the cylinders never ran low on steam. In full flight, a K4s could hustle an express along at 90 mph. During the winter of 1934, when the design was already two decades old, it still managed to hold down the fastest scheduled steam passenger run in the world: 75.6 mph average speed on the K4s-hauled *Union* between Valparaiso and Plymouth, Indiana. While lesser engines needed smaller drivers for more power in mountain divisions, the K4s' tall 80" drivers could conquer the Allegheny Mountains *and* run like the wind in flatter territory.

In an era when the Pennsylvania Railroad employed some of the nation's most talented locomotive designers, the K4s

epitomized the Pennsy philosophy: develop a conservative standard design in-house, test it extensively, build it in huge quantities at the railroad's own Juniata shops, and run it for decades. Intended to eliminate the double-heading of earlier, lighter Pacifics, the K4s design drew heavily from the Pennsy's own E6 Atlantic and an experimental Alco K29 Pacific purchased in 1911. The Alco's huge boiler, for a 4-6-2 of that era, was the inspiration for a standardized boiler shared by 425 K4s passenger locomotives and 574 L1s Mikado freighters — giving Pennsy shop crews nearly 1,000 engines with a common boiler, trailing truck and many other parts. The K4s was in fact the largest single class of passenger steamers on any American railroad.

Prototype K4s No. 1737 left Juniata's erecting floor in 1914. Like most Pennsy designs, she was tested extensively on the road and on Altoona's stationary test plant — where peak horsepower was measured at 3,184 — before mass production was authorized. The pressure of World War I freight traffic, however, moved L1s Mikado production to the head of the line, and the next K4s passenger engines weren't outshopped until 1917. Mass

production continued in groups until 1928, with Baldwin Locomotive Works building 75 engines and Juniata constructing the rest.

The “s” in K4s stood for “superheater,” a relatively modern innovation that markedly increased horsepower, by delivering hotter, drier steam to the cylinders. In most other respects, however, the K4s design was conservative. The 70 square foot grate (firebox floor) was dramatically larger than that on earlier Pennsy Pacifics, but was hand-fired. Not until automatic coal stokers



Get the details on this model in our HO brochure, by scanning this QR code or visiting www.mthtrains.com/brochure006



were perfected and then mandated around 1930 by the Interstate Commerce Commission did many, but not all, K4s engines get Standard stokers that boosted performance. In addition, all but the later orders of K4s' were delivered with a hand-operated screw reversing mechanism, actuated by turning a



hand wheel in the cab. Here as well, ICC regulations forced an upgrade to safer power reverse units in the 1930s — recognizable in photos by a modified running board on the engineer's side that stepped up and over the air-operated reverse mechanism.

No less than eight different types of tenders trailed K4s locomotives over the years, from the small original model to giant "coast-to-coast" tenders that were longer and heavier than the engine itself. All had water scoops to permit refueling from troughs between the rails at 45-50 mph.

Other than experimental models, the most dramatic visual change to the big Pacifics during their 44-year career was the post-World War II adoption of cast metal drop-coupler pilots, replacing the graceful bar-type "cowcatcher" on many engines. While the added weight helped front-end tracking, the look was less than pleasing to many railfans. With various upgrades and changes applied as engines came in for maintenance, from the 1920s onward no two K4s engines looked exactly alike.

In its early years, the K4s eliminated double-heading on most passenger runs, as it was designed to do. But as schedules accelerated and heavier, air-conditioned cars became the norm, double-heading became commonplace again, with Pacifics often triple-headed on runs over Horseshoe Curve, the Pennsy's conquest of the Allegheny Mountains.

Why, then, did the K4s remain the road's front-line passenger power until the end of steam? For a time in the late 1920s, more-powerful, then-new 4-8-2 Mountains indeed replaced Pacifics on heavier passenger trains. But in the mid-1930s, as the Pennsy electrified its four-track speedway between New

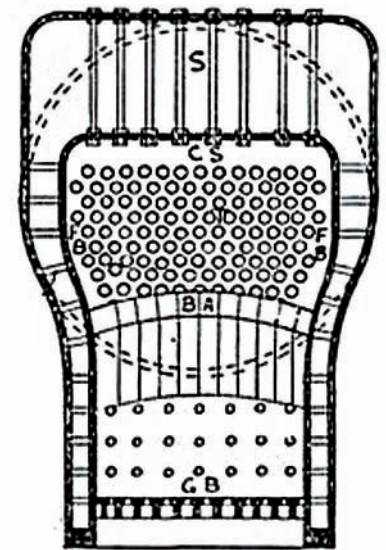
The Belpaire Firebox Defined the Pennsy "Look"

In any lineup of steam locomotives, Pennsy engines were immediately recognizable by one signature feature: their Belpaire firebox, a flat-topped bulge in the boiler, just ahead of the cab. Whereas a typical engine had a rounded exterior above the firebox that conformed with the rest of the boiler, the Belpaire design gave the boiler course above the firebox a flat surface that paralleled the flat top of the firebox itself.

This offered two distinct advantages. It increased the water volume in the hottest part of the boiler, immediately above the firebox — in perfect sync with the Pennsy philosophy of big, free-steaming boilers. In addition, it meant the stay bolts, the interior rods that brace the boiler to the firebox, would run at right angles between parallel surfaces — making them easier to build and maintain than the angled stay bolts that connect a curved boiler to a flat firebox in a conventional locomotive.

York and Washington, hundreds of K4s' were freed up for service west of Philadelphia, and the 4-8-2 Mountains were shifted largely to fast freight assignments.

By 1938, catenary wires had reached Harrisburg, and the full fleet of K4s' was available to cover less than half the trackage they had been built for. In an economy just beginning to recover from the Great Depression, perhaps management saw no reason to retire four hundred perfectly good engines. Or maybe the will to design a new steamer was just not there, as the team of superb steam men who had once guided development had retired or moved up the corporate ladder.



Dashed circles indicate boiler outline ahead of firebox; S = stay bolts (in water jacket); CS = crown sheet (top of firebox); FB = firebox; BA = brick arch; GB = grate bars

Invented by Alfred Belpaire of Belgium in 1864, the Belpaire design was introduced on a Pennsy subsidiary in the 1880s and became standard practice in the ensuing years. The Great Northern was the only other American road to use Belpaire boilers in significant numbers.

In any event, it was 1940 before a K4s replacement, the 4-4-4-4 T1 Duplex, was even on the drawing boards — just as the steam era was drawing to a close. As a testament to their bullet-proof construction, 424 of the original 425 K4s Pacifics were still in service as late as 1946. Finally displaced by diesels on limiteds, the fleet soldiered on in branch line and secondary service until the last K4s fire was dropped in 1958.

Two members of the class survive today, No. 3750 on display at the Railroad Museum of Pennsylvania and No. 1361, which steamed for a time in preservation and today awaits completion of further restoration at the Railroaders Memorial Museum in Altoona, PA.



See our HO models at your M.T.H. Authorized Retailer today, in four new road numbers

Kadee® coupler on pilot permits prototypical double- or triple-heading