

**The Knowledge Bank at The Ohio State University**

**Ohio State Engineer**

**Title:** Railroad Rails

**Creators:** Wilkins, Dale

**Issue Date:** 1945-05

**Publisher:** Ohio State University, College of Engineering

**Citation:** Ohio State Engineer, vol. 28, no. 6 (May, 1945), 14, 22.

**URI:** <http://hdl.handle.net/1811/36170>

# RAILROAD RAILS

By DALE WILKINS, C.E. III

Present day rails are made of steel, but apparently the use of steel rails was a last resort because the iron rails of later manufacture were of very poor quality. Due to the tremendous wear by crushing or lamination these iron rails were soon rendered unfit for safe usage when the running surface was destroyed.

But still more interesting is the fact that the first railroad rails in the United States were wood. They were more like roadways than railroads. The wooden stringers were laid for small distances such as very short train roads around coal mines. The speed was slow and the individual carloads were not heavy. Had railways found no other uses there would have been no need to increase the speed or tonnages and, hence, there would be no necessity for improved rails.

Iron was first used as a rail in 1826 near Quincy, Massachusetts, for a four mile railroad built to transport huge granite blocks. These rails consisted of iron plates three inches wide and one-quarter inch thick which were fastened to wooden bases. Thus greater loads could be carried. This was such an improvement, that thicker plates were suggested and gradually came into use.

When the invention of a locomotive with a greater tractive power necessitated a more durable rail, there followed in succession the invention of the cast-iron "fish-belly" rail and diverse forms of strap rails made of wrought iron. A majority of the wrought iron rails laid on American railroads were imported from England.

In 1833, the Allegheny Portage Railroad in Pennsylvania installed what was known as the Clarence rail, which was rolled in England. In cross-section, the iron Clarence rail was similar to the "T-rail" of today which was finally developed from the early forms of wrought iron rails. The large flat base, characteristic of the T-rail, was substituted in the T-rail for the "chair" of cast iron in which rested a knob on the bottom of the Clarence rail. This "knob" rather distinguished the Clarence rails from other developments.

The cast iron rails were cast in lengths of about three feet and were supported in iron

chairs which were often times fastened to stone piers of the road bed. A large amount of the first railroad track of this country was laid with longitudinal stringers of wood placed upon cross-tiers, the inner edge of the stringers being protected by wrought iron straps.

As with all progressive advancements man has made, and as public opinion is slow to place its sanction upon the "unknown," so it was that flat iron rails were slow in being replaced by the wrought iron styles despite the fact that the flat rails often constituted a chronic hazard in operating early railroads. It was not uncommon that the ends of the flat rails would not remain in place, being jarred loose by passing traffic, and curling up, they would penetrate the bottoms of the railroad cars passing above it. Rails that reacted thus were termed "snake heads."

There were no plants in the United States for "heavy" iron rails until 1844, when the first "bridge" rails were rolled at the Mt. Savage Rolling Mill in Allegheny County, Maryland. This inverted U-rail was manufactured according to a design originating in Wales and weighed approximately forty pounds to the yard. The design allowed for longitudinal wooden blocks to which the U-rail was fastened by iron clamps.

The Montour Rolling Mill at Canville, Pennsylvania, along with the Mt. Savage Mill, produced a "pear-shaped" section. Due to the difficulty of forming a good joint, however, the "pear-shaped" section was very defective in proportions and not feasible for constant use.

Then came the "Stevens" section, designed in 1830 by Colonel Robert L. Stevens, president and chief engineer of the Camden and Amboy Railroad.

Even in the best way, an iron rail when manufactured was little more than a bundle of rods. Under the tremendous pounding of the locomotive, the top slab or strap tended to spread laterally and become laminated. The section Colonel Stevens created has remained essentially the same in its basic form down to the present day. However the original "Stevens" section was

(Please turn to page 22)

## RAILROAD RAILS

(Continued from page 14)

faulty with respect to its proportions according to modern knowledge of specification requirements. In 1830, during a commercial voyage to England, Stevens whiled away his leisure time whittling wooden model sections. It was from one of these models that he selected the shape which is standard today.

Shortly thereafter, a man by the name of Charles Vignoles invented a rail similar to Stevens. The "Vignoles" rail is used extensively in Europe and the British Isles today.

Even by 1850, manufacture of rails in America was practically a trickle (in fact only two of 15 rail mills in the United States were operating) due largely to keen foreign competition.

When the problem of how to straighten a rail during its cooling process was ironed out, production of the Stevens T-rail proceeded at a more rapid pace. Today, a short section of the Camden and Ambay Railroad built in 1832 is yet lying alongside the main Pennsylvania Railroad line about twenty miles northeast of Trenton, New Jersey. The track still remains on its original base, which were great stone blocks two feet square, purchased from the prison authorities at Ossining, New York. Amazing as it may seem, the track still stands in a reasonable state of preservation despite the fact that it has been exposed to all types of weathering for well over a full century. The dimensions of the rail are as follows:  $2\frac{1}{8}$  inches width at the top,  $3\frac{1}{4}$  inches width at the bottom,  $3\frac{1}{2}$  inches high, and  $\frac{1}{2}$  inch head thickness. They weigh nearly forty pounds per yard and are fastened to the stone blocks by means of heavy nails. Note how this rail contrasts the heaviest T-rail in usage now, the 152 pound per yard weight, which measured 3 inches across the top,  $6\frac{3}{4}$  inches at the base, and stands 8 inches high.

When Bessemer gave the world a cheap way of making steel, he practically revolutionized rail manufacture. A steel rail rolled from a solid ingot is much more durable than the former iron rails. Iron, in the matter of wear, exhibited very great irregularity, some rails showing signs of distress within a year or two of being laid down, while others afforded very satisfactory results. For this reason steel rails began coming into use in 1865, the North Chicago Rolling Mill of Captain E. B. Ward rolling the first steel rails by the pneumatic or Bessemer process. By 1883, steel rails had almost entirely replaced older iron rails. Since 1911, however, no iron rails have been produced.