# Manufacturers

## Mercier Manufacturing Company

Mercier Manufacturing Company began manufacturing locomotives after Brandt Saunders designed and constructed the first reciprocating steam locomotive in Tarsac, the 2-2-2. Saunders was a recent immigrant to Tarsac who had observed the development of foreign locomotives and reasoned that the construction of railways connecting the coast with the Fall River Valley would help to unite the former colonies with the Alpenreich. Although his first design was not particularly effective, Saunders continued his work. His next design featured coupled axles, the 0-6-0, but its instability at speed meant that this experiment was also not repeated. Saunders’ next locomotive, the 4-6-0, incorporated a four-wheel leading truck that provided the locomotive with three-point suspension and a balance between power and stability. The company began marketing the 4-6-0 as Saunders worked to refine the valve gear and the boiler of the locomotive. Finally, he designed the 2-8-0, which added an extra pair of drivers within roughly the same wheelbase as the 4-6-0. This final design was to become ubiquitous and would establish Mercier Manufacturing Company as the premier supplier of locomotives to Tarsac’s early railway industry.

The company produced successive refinements of the 2-8-0 and its shunting derivative, the 0-8-0, with increasingly higher boiler pressure and greater power, but did not develop designs with new wheel arrangements after Saunders’ retirement from the company. Instead, it focused on producing rolling stock. Hayley Thibault, Saunders’ successor as lead engineer, provided the final refinement to the 2-8-0 and 0-8-0 by fitting both with a superheater. She worked to develop several experimental cross-compound 2-8-0s, but while the experiments proved that compound locomotives were viable, Mercier Manufacturing Company did not see the increased efficiency as a significant advantage over the standard 2-8-0, especially as the Goebels’ locomotives built by Köthen Manufacturing Company were quickly supplanting the 2-8-0 on Tarsac’s railways. The refusal of the company to approve continued experiments to improve the 2-8-0 or to develop new locomotives to compete with the Goebels’ designs prompted Thibault to resign her position and found the locomotive works bearing her name.

## Köthen Manufacturing Company

Köthen Manufacturing Company had been dabbling in the production of motive power and rolling stock after observing the success of Midcroft Manufacturing Company, but did not begin the full-scale production of locomotives until Lorn and Floyd Goebel proposed adding a trailing truck to a 4-6-0 to accommodate a deeper firebox entirely behind higher drivers, creating a 4-6-2. While proportionally less of the locomotive’s weight would be adhesive, the larger firebox gave the engine both a higher horsepower output and a greater tractive effort than a 4-6-0 with a comparable engine weight. This was with the help of a superheater such as Thibault had fitted to the 2-8-0 and 0-8-0. The resulting design was not only more powerful, but also faster than the 4-6-0, and it quickly became the first choice for railways looking for express passenger locomotives.

Building on their success, the Goebel brothers applied the same principle to the 2-8-0, creating the 2-8-2 wheel arrangement. While its tractive effort was greater than that of the 2-8-0, the primary advantage of the 2-8-2 was its higher drivers and thus its greater speed. Tarsac’s railways could now move their time freights significantly more quickly than other classes of freight (and thus charge different rates). Seeking to further capitalize on the desire for high-speed freight locomotives which the 2-8-2 had precipitated, the Goebels produced a third locomotive type, the first 4-8-2, which had the advantage of a four-wheel leading truck over the 2-8-2 and of an extra set of drivers over the 4-6-2. Despite designing the 4-8-2 for fast freight, the Goebels marketed it as a dual service locomotive, with more power than a 4-6-2 for hauling passenger trains through mountainous territory and with greater speed that a 2-8-2 for hauling freight across reasonably level terrain. With these three designs, Köthen Manufacturing Company had taken almost all of Mercier Manufacturing Company’s market share; the 2-8-2, 4-6-2, and 4-8-2 had completely eclipsed the 2-8-0, and many railways simply removed the lead truck from their displaced 2-8-0s to create 0-8-0 switchers rather than purchasing switchers new from Mercier Manufacturing Company.

Köthen Manufacturing Company had learned well from the fall of Mercier Manufacturing Company, and refused to become complacent following its rise to prominence. When the Goebel brothers retired shortly after production had begun on the 4-8-2, the company promoted Grant Kerner to lead engineer. Kerner had been dissatisfied with the Goebels’ 4-8-2, which despite its speed had little more tractive effort than the 2-8-2. Kerner envisioned a revised heavy 4-8-2 with not only even larger drivers, but also a significantly greater tractive effort than any locomotives that had come before. He concurrently developed Tarsac’s first and only five-coupled locomotive, the 2-10-0, which shared a boiler and major components with the heavy 4-8-2 but which, with a shallow firebox above low drivers, was a reversal of the Goebels’ original design paradigms.

Despite having a tractive effort nearly twice that of any other contemporary locomotive, the heavy 4-8-2 and the 2-10-0 were not particularly successful. Their great adhesive weight gave the 2-10-0 an axle load of 66,900 pounds and the heavy 4-8-2 an even greater axle load of 67,750 pounds, 20% greater than that of the other locomotives of their time, which shared a standard axle load of 55,000 pounds. They could only operate on well-maintained tracks laid with heavy rail. Kerner considered modifying the 2-10-0 into a twelve-coupled locomotive, a 2-12-0, and the heavy 4-8-2 into a ten-coupled locomotive, a 4-10-2, to distribute the adhesive weight and lower the axle loading, but the length of the rigid wheelbase, already a problem on the 2-10-0, precluded serious consideration of this idea. Instead, Kerner was convinced that as the advantages of the heavy 4-8-2 and the 2-10-0 over older, lighter locomotives became apparent, Tarsac’s railways would invest in heavier rail and realignment of track to be able to operate the superior new locomotives.

Kerner was correct that Tarsac’s railways would willingly lay heavier rail to operate heavier, more powerful locomotives and longer trains, but his timing was off. The Fall Valley Railway, struggling with the financial burden of its overextended system, was due for new motive power, as years of deferred maintenance had taken their toll on its early Goebel locomotives, but the railway was in no position to renovate its line or to invest in expensive new motive power for the same reason that its current roster was in such poor shape. The Eastern Portage Railway in Oudren and on the Talais and Northern railway and the Western Trunk Line in Bailley had no need for more powerful locomotives than a 2-8-2 or an light 4-8-2 because of their well-graded, nearly level lines and their relatively low traffic density. Further, although they were not in as dire a financial situation as the Fall Valley Railway, none of them had the liquid capital to rebuild their entire line and purchase new motive power, especially if there was no real need.

Other railways were more interested in Kerner’s work. The K&W sought to increase tonnage capacity along its main line between Köthen and the port of Vergons in Bailley, and placed a small order for heavy 4-8-2s to augment its existing roster. Despite investing in the improvement of its line, however, Hayes was unwilling to buy more than a few of the new locomotives when the K&W rostered an almost-new fleet of 2-8-2s and light 4-8-2s. The Oudren State Railway also placed a small order of both heavy 4-8-2s and 2-10-0s to handle passenger and freight traffic on the mountainous Gasney District, but likewise saw no need to replace older locomotives that continued to provide good service on level track between Gueltas and Voreppe and between Tigny and Vignelle. The Gasney Northern bought the most 2-10-0s, for use in ore drags from Murray south to Peyruzel, but had no practical use for the heavy 4-8-2s or for the 2-10-0s outside of this service.

The heavy 4-8-2 and the 2-10-0 might have eventually proven sound designs and been more widely adopted, but they themselves were quickly overshadowed. Hayley Thibault was already experimenting with articulated locomotives that were far more powerful than Kerner’s designs, and despite having observed that the heavy 4-8-2 and the 2-10-0 provided good service on the Oudren State Railway, Caiden Fabel would award Thibault, not Köthen Manufacturing Company, the contract to provide new motive power for TNAT. The success of Thibault’s articulated engines and later the (qualified) success of Washburn’s designs eliminated demand for its locomotives. Eventually, like Mercier Manufacturing Company, Köthen Manufacturing Company shifted its focus to the production of rolling stock, primarily of passenger cars. These heavyweight coaches were stable at speed and became the standard on TNAT and the K&W. Production of replacement parts to keep the locomotives in working order provided another small but steady source of revenue even after the formation of TNAT.

## Thibault Locomotive Works

Thibault Locomotive Works was founded in Rieden to develop and build compound locomotives, but it produced all of Hayley Thibault’s designs and the locomotives it outshopped with simple configuration would outnumber compounds. Building on her experience with the cross-compound 2-8-0 and observing a trend towards a greater number of drivers in the Goebels’ locomotives, Thibault devised a compound locomotive with two engines, a high-pressure engine to the rear and a low-pressure engine in front, mounted under a single boiler on an articulated frame. The 2-8-8-2 would be the equivalent two 2-8-2s, but using less steam (and therefore less fuel) and only one crew.

Thibault’s first experiments were cumbersome and slow, but raising the boiler pressure and increasing the cutoff eventually produced a 2-8-8-2 with the more than twice the tractive effort of a 2-8-2 and capable of 50 miles per hour. Thibault was still not completely satisfied; while the 2-8-8-2 had plenty of power its speed was nothing exceptional compared to Kerner’s high-drivered 4-8-2. The sheer size of the firebox, however, necessitated the use of a four-wheeled trailing truck behind high drivers on Thibault’s locomotive and made the rigid wheelbase of the four-coupled engines impractically long. The resulting design, a 2-6-6-4, proved ineffective as a compound locomotive, so Thibault was forced to concede defeat and rebuild it in simple configuration. The simple 2-6-6-4 compared well with the mighty 2-8-8-2 in terms of horsepower output and tractive effort, but achieved its maximum horsepower output at a higher speed and was capable of over 70 miles per hour. While the production 2-8-8-2 remained a compound locomotive, Thibault redesigned it to allow the engineer to start it in simple configuration, boosting tractive effort by around 26,000 pound-feet at low speed.

Thibault marketed the 2-8-8-2 for heavy freight and the 2-6-6-4 as a dual service locomotive. The demonstrators won Thibault a contract with the newly formed Tarsac National Railway for standard mainline power, easily beating out Kerner’s 4-8-2 and 2-10-0 that only a few years previously had been the pinnacle of railway engineering. Thibault’s locomotives would replace the aging and decrepit fleet of locomotives that TNAT had inherited from the defunct Fall Valley Railway and Western Trunk Railway, sound in design but ruined by years of deferred maintenance. Both the compound articulated 2-8-8-2 and the simple articulated 2-6-6-4 had an even higher axle load than the 4-8-2 and 2-10-0, but TNAT, backed by the federal government of Tarsac, was willing to invest in heavy rail along the entire length of its line to support the 72,000-pound axle loading of the 2-6-6-4 and realignment of its curves and enlarging of its servicing facilities to accommodate its 108’ 4” wheelbase. TNAT foresaw that it would recuperate the cost of this investment by running longer trains behind faster and more powerful locomotives, a change from Caiden Fabel’s attitude in purchasing motive power for the Oudren State Railway. Thibault and her supporters, for their part, recuperated the cost of their own considerable investment in the development of the 2-8-8-2 and the 2-6-6-4 by the sheer size of the contract.

When TNAT approached Thibault to develop a high-speed purpose-built passenger engine to augment its roster of 4-8-2s, the locomotive works produced the 4-8-4, which had comparably-sized drivers and an even larger firebox supported by a four-wheel trailing truck such as that on the 2-6-6-4. Thibault’s on-staff industrial designer Raschelle Washburn created the 4-8-4’s distinctive appearance. The new 4-8-4s freed up the dual-service 2-6-6-4s for additional time freight work and bumped the still-capable 4-8-2s to secondary passenger trains. Despite being designed for passenger service, they proved capable in time freight service as well during occasional motive power shortages.

Washburn was concerned about the feasibility of the 4-8-4 as a high-speed passenger engine, believing that the mass of the main rods would limit the speed of the locomotive, increase wear on the reciprocating parts, and damage the track due to the difficulty of counterbalancing the wheels. These had, after all, been problems identified with the 2-10-0 and to a lesser extent the 4-8-2 at far slower speeds than those TNAT had specified for the 4-8-4. Thibault believed that she had satisfactorily resolved these problems by using lightweight materials and roller bearings on the moving parts, but Washburn believed that they could be avoided altogether by dividing the drivers between two engines on a rigid frame, creating a 4-4-4-4. Smaller rods meant less reciprocating mass and thus higher speed with less wear to both the locomotive and the rails. The tradeoff was the additional mechanical complexity of a second set of cylinders and valve gear and the increased length of the frame and rigid wheelbase of the locomotive; the locomotive could not be articulated without risking instability at high speeds. Thibault rejected Washburn’s proposal for the 4-4-4-4 when the 4-8-4 exceeded TNAT’s design parameters in preliminary tests and the problems with the design that Washburn anticipated never arose.

## Washburn Locomotive Works

Washburn Locomotive Works was founded in Midcroft to develop and construct Raschelle Washburn’s rigid-frame divided-drive locomotives after her designs were rejected by Thibault. Washburn remained convinced that even if the problems she had identified with the 4-8-4 wheel arrangement had been resolved by Thibault, a divided-drive locomotive could still outperform it by combining the power of a simple articulated with the high-speed stability of a rigid frame.

With the financial backing of Björn Hess and the Köthen and Western Railway, Washburn began manufacture of the 4-4-4-4 and a 4-4-6-4 freight engine, the equivalent of a 4-10-4 intended to fill the role of the 2-6-6-4. Initial tests appeared to vindicate Washburn. The 4-4-4-4 produced 6,550 horsepower at the cylinders, over 1,400 more than the 4-8-4, and its 80” drivers, the largest of any locomotive in Tarsac, allowed it to attain mind-boggling speeds upwards of 140 miles per hour. The 4-4-6-4 produced nearly 8,000 horsepower, 2,600 more than its competition.

But tractive effort for both engines was less impressive; the 4-4-6-4 produced just over 100,000 pound-feet of tractive effort, meaning a gain of only 4,000 pound-feet of tractive effort for all of its mechanical complexity compared to the 2-10-0. It produced 14,000 fewer pound-feet of tractive effort than the 2-6-6-4 and only about 80% of the tractive effort of a 2-8-8-2 (in simple configuration, the 2-8-8-2 produced another half again as much traffic effort as the 4-4-6-4). The 4-4-4-4 produced less tractive effort than heavy 4-8-2. Both engines had a relatively low factor of adhesion despite their enormous weight, and their sheer power caused one or the other sets of drivers to slip against the rails during throttle applications, even at speed. The 4-4-6-4’s axle loading of over 78,000 pounds required even heavier rail to be used along the K&W’s line than TNAT had used to accommodate Thibault’s massive articulated locomotives. Finally, the poppet valves, installed to increase speed, ironically limited it as the valves could fail above 100 miles per hour.

In practice, the 4-8-4, which topped out at around 110 miles per hour, could outrun the faster 4-4-4-4 and a 2-6-6-4 could outpull the more powerful 4-4-6-4. The horsepower readings Washburn had used to argue for her designs were misleading, as Thibault had taken readings on the 2-6-6-4 and the 4-8-4 at the drawbar rather than at the cylinders, providing a more accurate indication of their usable power. Even if the 4-4-4-4 and 4-4-6-4 had actually been more powerful, the Thibault designs were more reliable and easier to maintain than the Washburn locomotives that the K&W rostered.

# Modern 0-8-0

|  |  |
| --- | --- |
| Builder | Mercier Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 0-8-0 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel | n/a |
| Driver Diameter | 51” |
| Trailing Wheel | n/a |
| Wheelbase | Coupled: 15’  Locomotive: 15’  Loco & Tender: 52’ 10 ½” |
| Length | 66’ 1 ½” |
| Width | 10’ |
| Height | 15’ |
| Axle Load | 55,000 lbs |
| Adhesive Weight | 220,000 lbs |
| Locomotive Weight | 220,000 lbs |
| Tender Weight | 144,000 lbs |
| Total Weight | 364,000 lbs |
| Fuel | Coal |
| Fuel Capacity | 32,000 lbs |
| Water Capacity | 8,000 gal |
| Grate Area | 46.6 ft2 |
| Boiler Pressure | 175 psi |
| Heating Surface | 2,781 ft2 |
| Tubes | 1,796 ft2 |
| Flues | 773 ft2 |
| Firebox | 190 ft2 |
| Superheater | 637 ft2 |
| Cylinders | 2 |
| Cylinder Size | 25” x 28” |
| Valves | 14” piston valves |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output |  |
| Tractive Effort | 51,042 lbf |
| Factor of Adhesion | 4.31 |

# 4-6-2

|  |  |
| --- | --- |
| Builder | Köthen Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-6-2 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 73” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 13’  Locomotive: 34’ 9”  Loco & Tender: 68’ 7 ½” |
| Length |  |
| Width |  |
| Height |  |
| Axle Load | 55,000 lbs |
| Adhesive Weight | 165,000 lbs |
| Locomotive Weight | 270,000 lbs |
| Tender Weight | 144,000 lbs |
| Total Weight | 414,000 lbs |
| Fuel | Coal |
| Fuel Capacity | 32,000 lbs |
| Water Capacity | 8,000 gal |
| Grate Area | 66.7 ft2 |
| Boiler Pressure | 200 psi |
| Heating Surface | 3,333 ft2 |
| Tubes | 2,091 ft2 |
| Flues | 981 ft2 |
| Firebox | 234 ft2 |
| Superheater | 794 ft2 |
| Cylinders | 2 |
| Cylinder Size | 25” x 28” |
| Valves | 14” piston valves |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output |  |
| Tractive Effort | 40,700 lbf |
| Factor of Adhesion | 4.1 |

# 2-8-2

|  |  |
| --- | --- |
| Builder | Köthen Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 2-8-2 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter | 33” |
| Driver Diameter | 63” |
| Trailing Wheel Diameter | 43” |
| Wheelbase | Coupled:  Locomotive: 36’’  Loco & Tender: 71’ 4¼” |
| Length |  |
| Width |  |
| Height |  |
| Axle Load | 55,000 lbs |
| Adhesive Weight | 220,000 lbs |
| Locomotive Weight | 292,000 lbs |
| Tender Weight | 172,000 lbs |
| Total Weight | 492,000 lbs |
| Fuel | Coal |
| Fuel Capacity |  |
| Water Capacity |  |
| Grate Area |  |
| Boiler Pressure | 200 psi |
| Heating Surface |  |
| Tubes |  |
| Flues |  |
| Firebox |  |
| Superheater |  |
| Cylinders | 2 |
| Cylinder Size | 26” x 30” |
| Valves | Walschaerts |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output |  |
| Tractive Effort | 54,724 lbf |
| Factor of Adhesion | 4.02 |

# Light 4-8-2

|  |  |
| --- | --- |
| Builder | Köthen Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-8-2 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 69” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 18’ 3”  Locomotive: 40’  Loco & Tender: 75’ 8 ½” |
| Length | 62’ 10” |
| Width | 10’ |
| Height | 14’ ½” |
| Axle Load | 55,000 lbs |
| Adhesive Weight | 220,000 lbs |
| Locomotive Weight | 320,000 lbs |
| Tender Weight | 172,000 lbs |
| Total Weight | 492,000 lbs |
| Fuel | Coal |
| Fuel Capacity | 32,000 lbs |
| Water Capacity | 10,000 gal |
| Grate Area | 70.8 ft2 |
| Boiler Pressure | 200 psi |
| Heating Surface | 4,130 ft2 |
| Tubes | 2,598 ft2 |
| Flues | 1,176 ft2 |
| Firebox | 329 ft2 |
| Superheater | 957 ft2 |
| Cylinders | 2 |
| Cylinder Size | 27” x 30” |
| Valves | 14” piston valves |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output |  |
| Tractive Effort | 53,900 lbf |
| Factor of Adhesion | 4.1 |

# Heavy 4-8-2

|  |  |
| --- | --- |
| Builder | Köthen Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-8-2 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 72” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled:  Locomotive:  Loco & Tender: |
| Length |  |
| Width |  |
| Height |  |
| Axle Load | 67,750 lbs |
| Adhesive Weight | 271,000 lbs |
| Locomotive Weight | 390,000 lbs |
| Tender Weight | 172,000 lbs |
| Total Weight | 492,000 lbs |
| Fuel | Coal |
| Fuel Capacity |  |
| Water Capacity |  |
| Grate Area |  |
| Boiler Pressure | 270 psi |
| Heating Surface |  |
| Tubes |  |
| Flues |  |
| Firebox |  |
| Superheater |  |
| Cylinders | 2 |
| Cylinder Size | 27” x 30” |
| Valves |  |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output |  |
| Tractive Effort | 69,700 lbf |
| Factor of Adhesion | 3.89 |

# 2-10-0

|  |  |
| --- | --- |
| Builder | Köthen Manufacturing Co. |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 2-10-0 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 62” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 22’ 8”  Locomotive: 32’ 2”  Loco & Tender: |
| Length | 81’ 9” |
| Width |  |
| Height |  |
| Axle Load | 66.900 lbs |
| Adhesive Weight | 334,500 lbs |
| Locomotive Weight | 366,500 lbs |
| Tender Weight | 182,000 lbs |
| Total Weight | 548,500 lbs |
| Fuel | Coal |
| Fuel Capacity | 35,000 lbs |
| Water Capacity | 9000 gal |
| Grate Area |  |
| Boiler Pressure | 250 psi |
| Heating Surface |  |
| Tubes |  |
| Flues |  |
| Firebox | 312 ft2 |
| Superheater |  |
| Cylinders | 2 |
| Cylinder Size | 30 ½” x 32’ |
| Valves |  |
| **Performance Figures** | |
| Maximum Speed | 50 mph |
| Power Output |  |
| Tractive Effort | 96,000 lbf |
| Factor of Adhesion | 3.35 |

# 2-8-8-2

|  |  |
| --- | --- |
| Builder | Thibault Locomotive Works |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 2-8-8-2 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 58” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 15’ 9”  Locomotive:  Loco & Tender: 103’ 9” |
| Length | 114’ 11” |
| Width |  |
| Height |  |
| Axle Load | 68,562.5 lbs |
| Adhesive Weight | 548,500 lbs |
| Locomotive Weight | 611,500 lbs |
| Tender Weight | 378,600 lbs |
| Total Weight | 990,100 lbs |
| Fuel | Coal |
| Fuel Capacity | 60,000 lbs |
| Water Capacity | 22,000 gal |
| Grate Area | 106 ft2 |
| Boiler Pressure | 300 psi |
| Heating Surface | 4,915 ft2 |
| Tubes |  |
| Flues |  |
| Firebox |  |
| Superheater | 1,478 ft2 |
| Cylinders | 4 |
| Cylinder Size | Front: 29” x 32”  Rear: 25” x 32” |
| Valves | Baker |
| **Performance Figures** | |
| Maximum Speed | 50 mph |
| Power Output | 5,600 hp |
| Tractive Effort | Simple: 152,206 lbf  Compound: 126,838 lbf |
| Factor of Adhesion | 3.6 |

# 2-6-6-4

|  |  |
| --- | --- |
| Builder | Thibault Locomotive Works |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 2-6-6-4 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter | 33” |
| Driver Diameter | 70” |
| Trailing Wheel Diameter | 42” |
| Wheelbase | Coupled: 12’ 4”  Locomotive:  Loco & Tender: 108’ 4” |
| Length | 121’ 9” |
| Width |  |
| Height | 16’ |
| Axle Load | 72,225 lbs |
| Adhesive Weight | 433,350 lbs |
| Locomotive Weight | 573,000 lbs |
| Tender Weight | 378,600 lbs |
| Total Weight | 951,600 lbs |
| Fuel | Coal |
| Fuel Capacity | 60,000 lbs |
| Water Capacity | 22,000 gal |
| Grate Area | 122 ft2 |
| Boiler Pressure | 300 psi |
| Heating Surface | 6,052 ft2 |
| Tubes |  |
| Flues |  |
| Firebox | 587 ft2 |
| Superheater | 2,703 ft2 |
| Cylinders | 4 |
| Cylinder Size | 24” x 30” |
| Valves | Baker |
| **Performance Figures** | |
| Maximum Speed | 70 mph |
| Power Output | 5,400 hp |
| Tractive Effort | 114,000 lbf |
| Factor of Adhesion | 3.44 |

# 4-8-4

|  |  |
| --- | --- |
| Builder | Thibault Locomotive Works |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-8-4 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter |  |
| Driver Diameter | 70” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 18’ 9”  Locomotive:  Loco & Tender: 95’ 5” |
| Length | 109’ 2” |
| Width |  |
| Height | 16’ 2” |
| Axle Load | 72,000 lbs |
| Adhesive Weight | 288,000 lbs |
| Locomotive Weight | 494,000 lbs |
| Tender Weight | 378,600 lbs |
| Total Weight | 872,600 lbs |
| Fuel | Coal |
| Fuel Capacity | 70,000 lbs |
| Water Capacity | 20,000 gal |
| Grate Area | 107.7 ft2 |
| Boiler Pressure | 300 psi |
| Heating Surface | 4,693 ft2 |
| Tubes |  |
| Flues |  |
| Firebox | 578 ft2 |
| Superheater | 2,177 ft2 |
| Cylinders | 2 |
| Cylinder Size | 27” x 32” |
| Valves | Baker |
| **Performance Figures** | |
| Maximum Speed | 110 mph |
| Power Output | 5,100 hp |
| Tractive Effort | 80,000 lbf |
| Factor of Adhesion | 3.6 |

# 4-4-4-4

|  |  |
| --- | --- |
| Builder | Washburn Locomotive Works |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-4-4-4 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter | 36” |
| Driver Diameter | 80” |
| Trailing Wheel Diameter | 42” |
| Wheelbase | Coupled:  Locomotive:  Loco & Tender: |
| Length | 122’ 9¾“ |
| Width | 11’ 1” |
| Height | 16’ 6” |
| Axle Load | 71,680 lbs |
| Adhesive Weight | 279,910 lbs |
| Locomotive Weight | 502,200 lbs |
| Tender Weight | 441,300 lbs |
| Total Weight | 943,500 lbs |
| Fuel | Coal |
| Fuel Capacity | 85,200 lbs |
| Water Capacity | 19,200 gal |
| Grate Area | 92 ft2 |
| Boiler Pressure | 300 psi |
| Heating Surface | 5,639 ft2 |
| Tubes |  |
| Flues |  |
| Firebox | 490 ft2 |
| Superheater | 1430 ft2 |
| Cylinders | 4 |
| Cylinder Size | 19 ¾” x 26” |
| Valves | Poppet Valves |
| **Performance Figures** | |
| Maximum Speed | 143 mph  (100 mph sustained) |
| Power Output | 6,550 hp |
| Tractive Effort | 64,650 lbf |
| Factor of Adhesion | 3.58 |

# 4-4-6-4

|  |  |
| --- | --- |
| Builder | Washburn Locomotive Works |
| Year Designed |  |
| Number Produced |  |
| Wheel Arrangement | 4-4-6-4 |
| **Specifications** | |
| Gauge | 4’ 8 ½” |
| Leading Wheel Diameter | 36” |
| Driver Diameter | 69” |
| Trailing Wheel Diameter |  |
| Wheelbase | Coupled: 20’ 4”, 26’ 4½”  Locomotive: 53’ 5½”  Loco & Tender: 107’ 7½” |
| Length | 124’ 7” |
| Width | 11’ 4” |
| Height | 16’ 5½” |
| Axle Load | 78,600 lbs |
| Adhesive Weight | 393,000 lbs |
| Locomotive Weight | 619,100 lbs |
| Tender Weight | 430,000 lbs |
| Total Weight | 1,049,100 lbs |
| Fuel | Coal |
| Fuel Capacity | 79,720 lbs |
| Water Capacity | 19,020 gal |
| Grate Area |  |
| Boiler Pressure | 300 psi |
| Heating Surface |  |
| Tubes |  |
| Flues |  |
| Firebox |  |
| Superheater |  |
| Cylinders | 4 |
| Cylinder Size | Front: 19¾” x 28”  Rear: 23¾” x 29” |
| Valves |  |
| **Performance Figures** | |
| Maximum Speed |  |
| Power Output | 7,987 hp |
| Tractive Effort | 100,800 lbf |
| Factor of Adhesion | 3.93 |