

The Steam Locomotive wheel arrangement or wheel configuration defines the way in which wheels are distributed under a locomotive. Several notations exist. In this video I describe examples of fixed frame locomotives using models representing the most used notations, i.e. UK/US (Whyte), German and French methods.

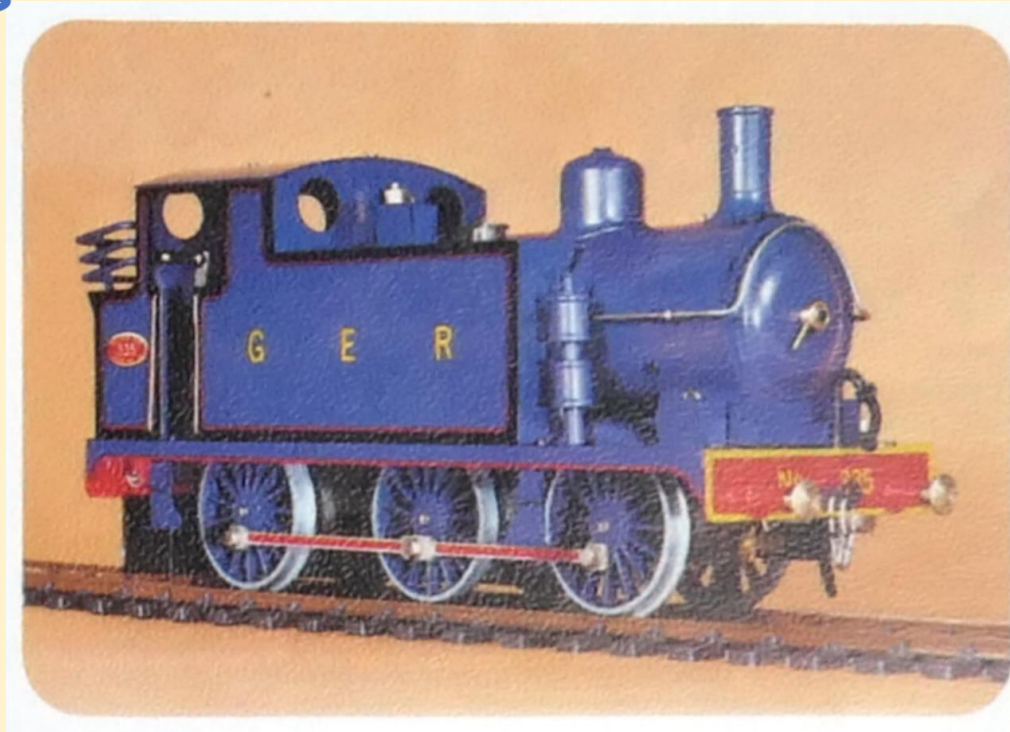
Six Wheel Switcher ?

Boer ?

Six Coupler ?

0-6-0 ? or

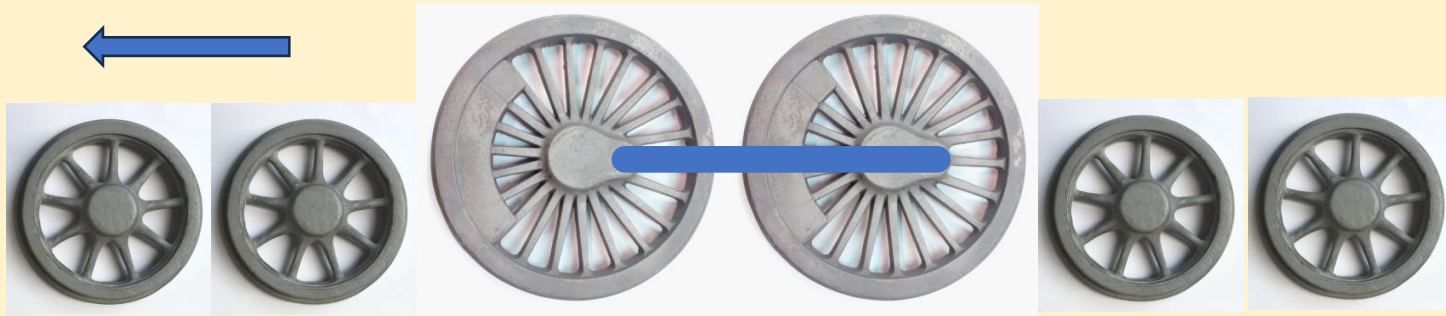
0-6-0T ?



Ct ?

030 ?

All notations count the number of leading wheels/axles, then the number of driving wheels/axles, and finally the number of trailing wheels/axles. The number of wheels is of course always $2 * \text{the number of axles}$. In the German system the number of axles is represented by a letter (1 = A, B = 2....). For a tanklocomotive a T (or t in Germany) is added to the wheel arrangement. The absence of leading or trailing axles is not noted in the German notation; Further the number of tender wheels/axles is not included in any notation.



UK/US : 4-4-4

German: 2B2

French : 222

Many specific wheel arrangements are also known by a name. Sometimes local or national names differ from the general names. A good example of this being Northern, this type is also known as Niagara, Confederation, Dixie, Greenbrier, Pocono, Heavy Mountain, Golden State....

Who am I? I am known
by too many names!





Rocket

0-2-2 A1 011



The 0-2-2 wheel arrangement is one that has two coupled driving wheels followed by two trailing wheels, with no leading wheels. The configuration was briefly built by Robert Stephenson and Company for the Liverpool and Manchester Railway among others for the famous Rocket locomotive.



Patentee

2-2-2 1A1 111



The 2-2-2 wheel arrangement is also known as “Jenny Lind” and was used on the first German steam locomotive Adler. The wheel arrangement both provided more stability and enabled a larger firebox than the earlier 0-2-2 and 2-2-0 types.



Single

4-2-2 2A1 211



This configuration offered designers eight wheels to spread the weight of a larger locomotive, but prior to the invention of bogies created a long rigid wheelbase. The attraction of the 'single' was that, thanks to the large single driving wheels, a locomotive could obtain high speeds while the speed of the engine's pistons and valve gear remained relatively low.



Four Wheel Switcher

0-4-0T Bt 020T



0-4-0 locomotives were built as tank locomotives as well as tender locomotives. The former were more common in Europe and the latter in the United States. The type, also called “Four Wheeler” was found to be so useful in many locations that they continued to be built for more than a century and existed until the end of the steam era.



Olomana

0-4-2 B1 021

The name Olomana is sometimes used for narrow gauge type 0-4-2 tank locomotives.



The first locomotive built in Germany in 1838, the Saxonia, was an 0-4-2. Later the wheel arrangement was adopted by many early British railways for freight haulage since it afforded greater adhesion than the contemporary 2-2-2 passenger configuration.



Forney

0-4-4T B2t 022T



The 0-4-4 was only used for tank locomotives. In the UK 0-4-4T tanks were mainly used for suburban or rural passenger duties. In America, the wheel arrangement became known as the Forney, after a specific design of 0-4-4's, the Forney locomotive, became used on the narrow curves of elevated railways and other rapid transit lines.

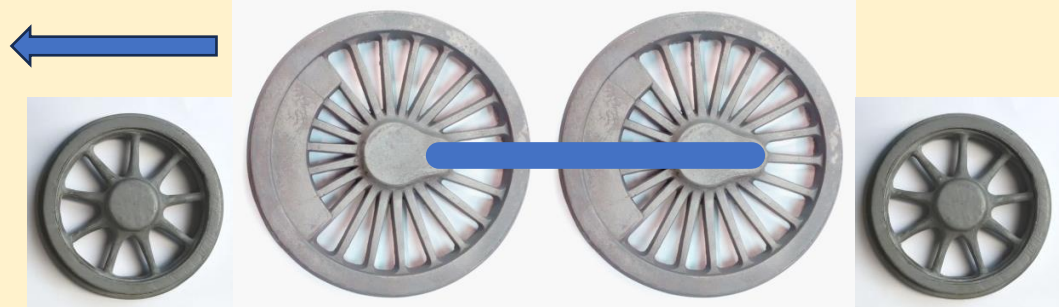


Old English

2-4-0 1B 120



The 2-4-0 configuration was developed in the United Kingdom later as an enlargement of the 2-2-0 and 2-2-2 types, with the additional pair of coupled wheels giving better adhesion. Because of its popularity at that time with English railways it received the nickname of Old English.



Columbia

2-4-2T 1B1t 121T



This wheel arrangement was widely used on passenger tank locomotives from 1870-1910. The vast majority of 2-4-2 locomotives were tank engines, i.e. 2-4-2T. The symmetrical wheel arrangement was well suited for a tank locomotive that is used to work in either direction. The type is named Columbia after a 2-4-2 locomotive showcased at the 1893 World's Columbian Exposition held at Chicago.



2-4-4T 1B2t 122T



This configuration was only used for tank locomotives and did not have a “nick name”. The unusual wheel arrangement does not appear to have been used on many mainline railways. It was however one of the configurations used on the Mason Bogie locomotives in the USA and on Bavarian tank locomotives.



American

4-4-0 2B 220



First built in the 1830s, locomotives with this wheel arrangement were known as "Eight-Wheeler" type. In the second half of the 19th century, almost every major railroad in North America owned and operated locomotives of this type that became known as "American".



Atlantic

4-4-2 2B1 221



The 4-4-2 wheel arrangement is commonly known as the Atlantic type. One advantage of the type over its predecessor 4-4-0 was that the trailing wheels allowed a larger and deeper firebox to be placed behind the driving wheels. They had large-diameter driving wheels, adequate for higher speeds.



Reading

4-4-4 2B2 222



A single, experimental 4-4-4, classified as S 2/6, was built for the Royal Bavarian State Railways in 1906. After the Reading Railroad the Canadian Pacific also built 4-4-4 locomotives, which they called "Jubilee". They were styled after the Milwaukee Road "Hiawatha" 4-4-2, but with a four-wheel trailing truck to support a longer firebox.

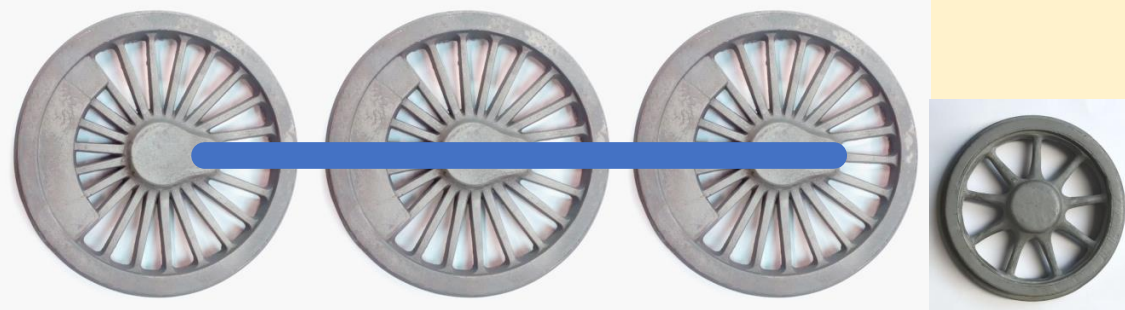


Six Wheel Switcher

0-6-0 C 030

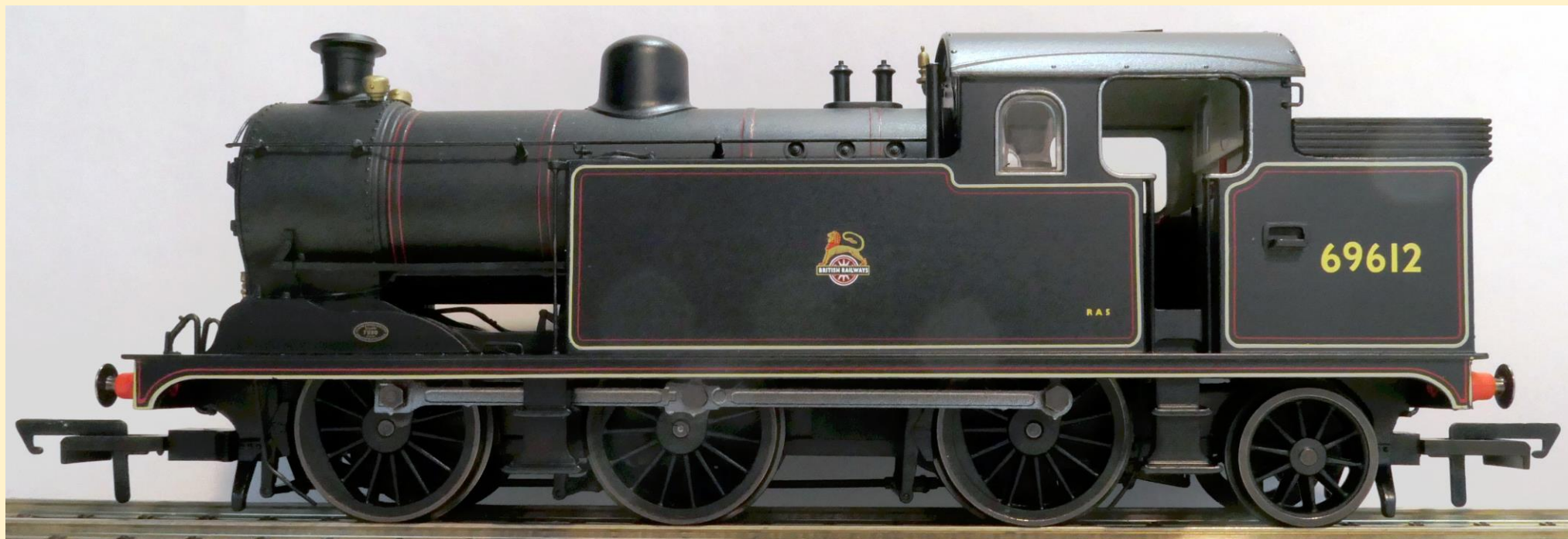


The 0-6-0 configuration was the most widely used wheel arrangement for both tender and tank steam locomotives. Locomotives of this type have all their weight pressing down on their driving wheels and consequently have a high tractive effort and factor of adhesion. They were also known as “Bourbonnais” and “Sixcoupler”.



Branchliner

0-6-2T C1t 031T



While some locomotives with the 0-6-2 wheel arrangement had tenders, the majority were tank locomotives. This type is sometimes known as a Branchliner or Webb type.



0-6-4T C2t 032T

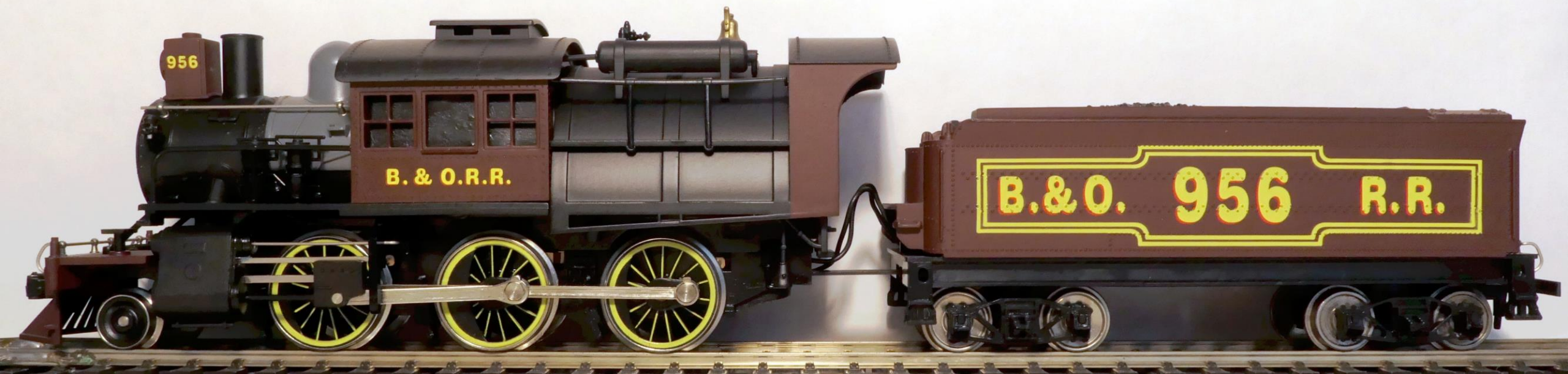


This not much used wheel arrangement has only been used for tank locomotives and Single Fairlies.



Mogul

2-6-0 1C 130



In the United States and Europe, the 2-6-0 wheel arrangement was principally used on tender locomotives. This type of locomotive was widely built in the United States from the early 1860s to the 1920s. In the United Kingdom, where locomotives are generally smaller than in the US, the 2-6-0 was found to be a good wheel arrangement for mixed-traffic locomotives.



Prairie

2-6-2 1C1 131



The majority of American 2-6-2's were tender locomotives, but in Europe tank locomotives, described as 2-6-2T, were more common. The first 2-6-2 tender locomotives were built by Brooks Locomotive Works in 1900 for the Chicago, Burlington and Quincy Railroad, for use on the Midwestern prairies. The type was thus nicknamed the Prairie in North American practice.



Adriatic

2-6-4 1C2 132



With only a few exceptions, the Adriatic wheel arrangement was usually used on tank locomotives. Some Austrian express tender locomotive types designed by Karl Gölsdorf were of this wheel arrangement. The type therefore became known as the Adriatic arrangement, named for the Adriatic Sea which bordered Austria-Hungary.



Ten Wheeler

4-6-0 2C 230



From the second half of the nineteenth century, the 4-6-0 was constructed in large numbers for passenger and mixed traffic service. A natural extension of the 4-4-0 wheel arrangement, the four-wheel leading bogie gave good stability at speed and allowed a longer boiler to be supported, while the lack of trailing wheels gave a high adhesive weight



Pacific

4-6-2 2C1 231



The 4-6-2 locomotive became almost globally known as a Pacific type after a locomotive built by the Baldwin Locomotive Works was shipped across the Pacific Ocean to New Zealand. On many railways worldwide, Pacific steam locomotives provided the motive power for express passenger trains.



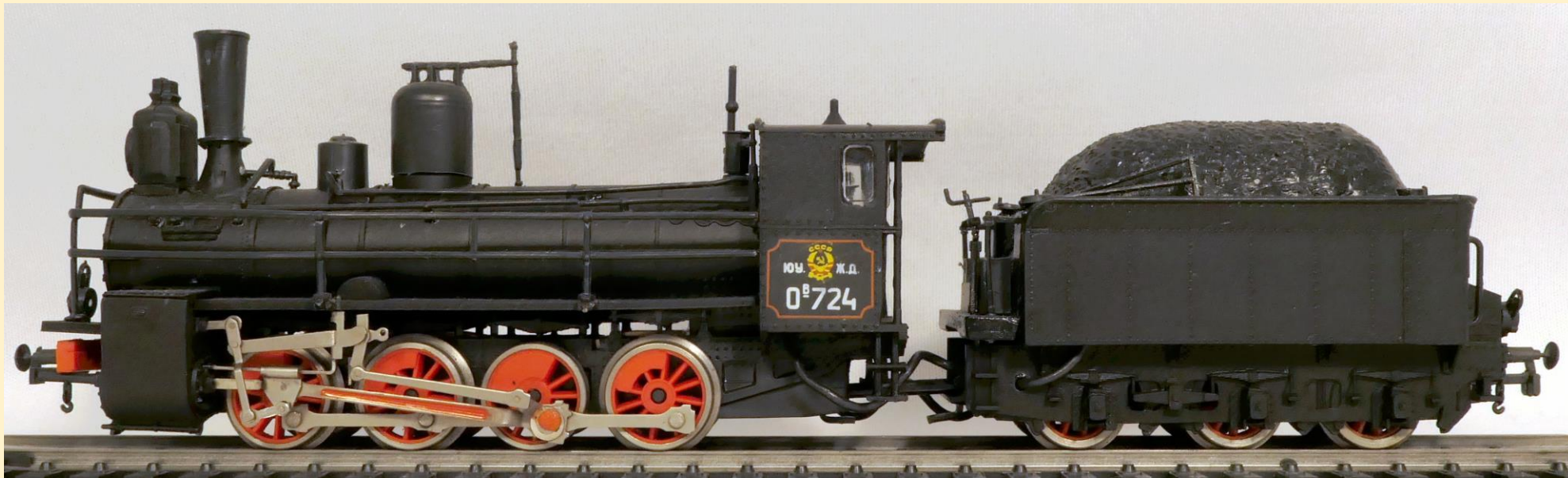
Hudson
4-6-4 2C2 232



In France where the type was first used, it is known as the Baltic while it became known as the Hudson in most of North America. The type combined the basic design principles of the 4-6-2 type with an improved boiler and larger firebox increasing the steam-raising ability and giving more power at speed. The larger firebox necessitated additional support at the rear of the locomotive.



Eight-coupled 0-8-0 D 040



The wheel arrangement provided a powerful layout with all engine weight as adhesive weight, which maximised the tractive effort and factor of adhesion. This wheel arrangement appeared early in locomotive development in the US from the mid-1840s. It saw extensive use as a heavy switcher and freight engine in all countries including Russia.



Consolidation

2-8-0 1D 140



The Consolidation represented a notable advance in locomotive power. After 1875, it became very popular in the US and was built there in greater quantities than any other single wheel arrangement. Many larger narrow gauge engines around the world are Consolidations



Mikado

2-8-2 1D1 141

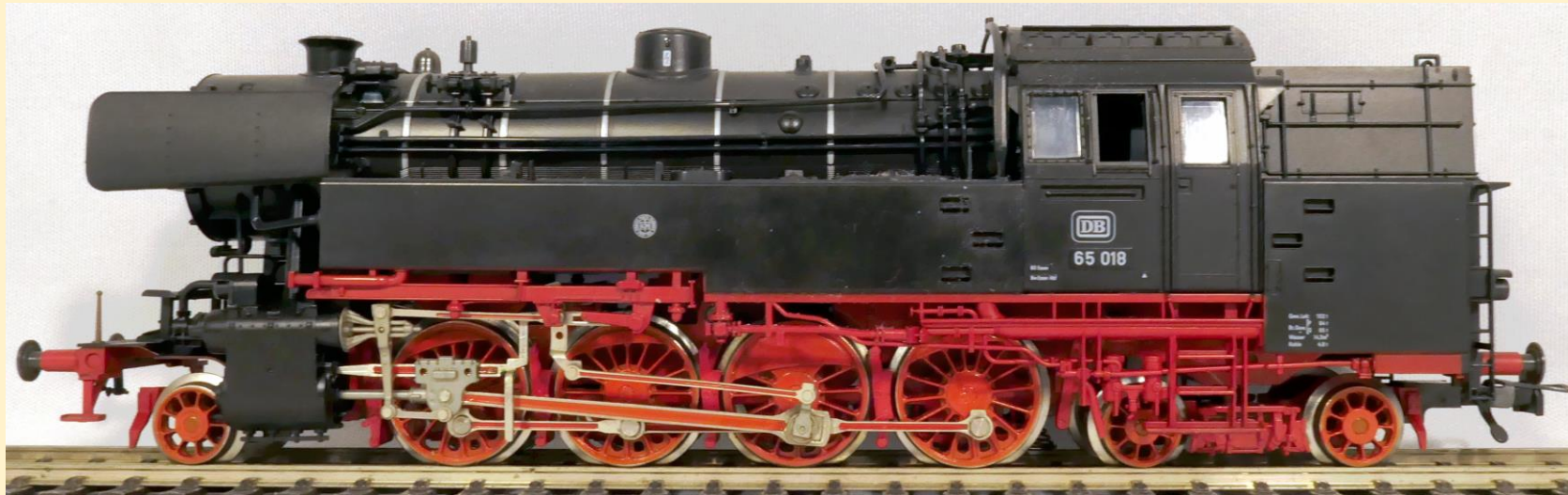


When introduced the 2-8-2 wheel arrangement allowed the locomotive's firebox to be placed behind instead of above the driving wheels, thereby allowing a larger firebox that could be both wide and deep. This supported a greater rate of combustion and thus a greater capacity for steam generation, allowing for more power at higher speeds. It was one of the more common configurations in the first half of the 20th century,



Berkshire

2-8-4 1D2 142



This locomotive type is most often referred to as a Berkshire. It resulted in the US from the requirement for a freight locomotive with even greater steam heating capacity. In Europe, this wheel arrangement was mostly seen in mainline passenger express locomotives and, in certain countries like Germany, in tank locomotives.



Mountain

4-8-2 2D1 241



On the C&O RR it became necessary to doublehead "Pacifics" to get longer trains over the Allegheny Mountains. In 1910, the C&O turned to ALCO, they recommended a locomotive with eight drivers for traction to which they would add a four-wheel lead truck for riding stability. The result was a new wheel arrangement, the 4-8-2. It was named "Mountain" because it was developed to haul passenger trains over the Allegheny Mountains.



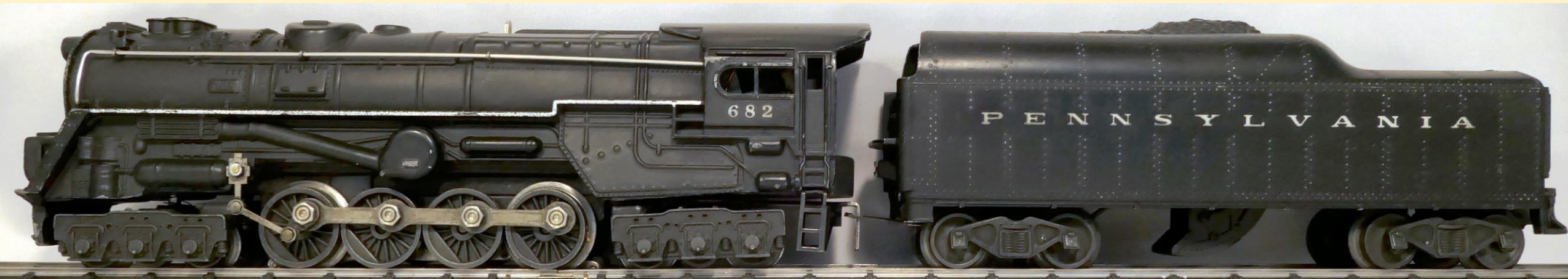
Northern, Niagara, GS,... 4-8-4 2D2 242



The 4-8-4 was a progression from the 4-8-2 and an example of the "Super Power" concept in steam locomotive design that made use of a larger firebox that could be supported by a four-wheel trailing truck, which allowed greater production of steam. The type was first used by the Northern Pacific Railway and called Northern, but some adopted different names.



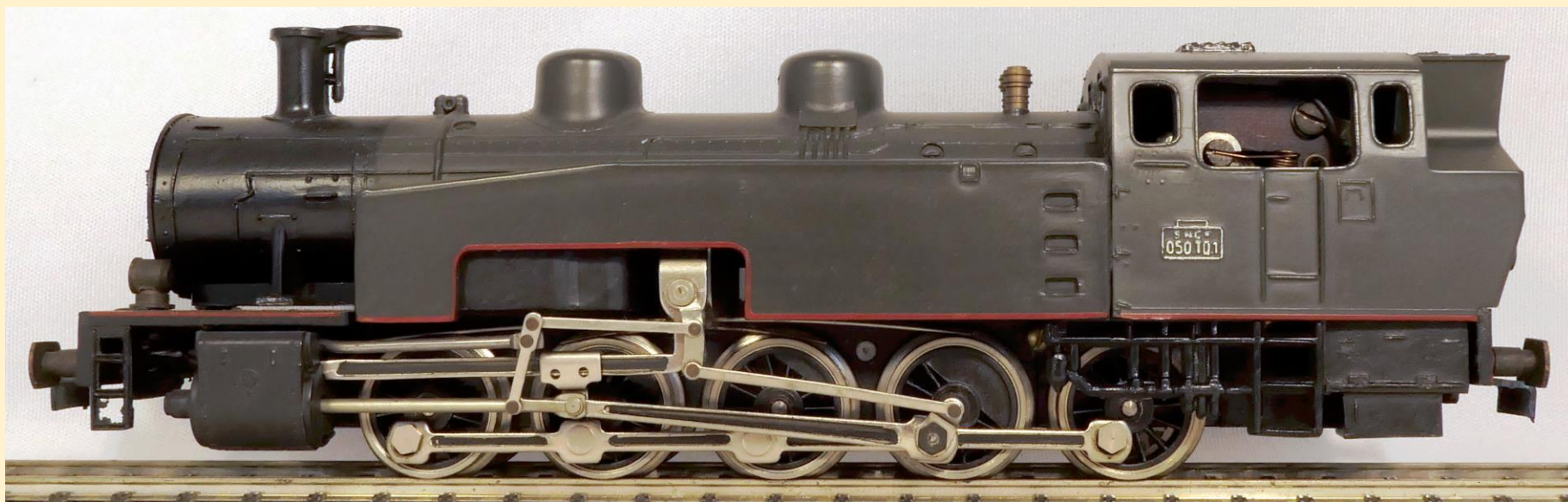
Turbine 6-8-6 3D3 343



6-8-6 represents the arrangement of six unpowered leading wheels, eight powered and coupled driving wheels, and six unpowered trailing wheels. The only known example of the 6-8-6 wheel arrangement is the experimental Pennsylvania Railroad S2 steam turbine locomotive.



Ten-coupled 0-10-0T Et 050T



The lack of leading and trailing wheels makes this wheel arrangement unstable at speed, and it is a type usually confined to fairly low-speed work, such as switching, often as a tank engine version, transfer runs, slow-speed drag freight, or running over mountainous terrain.



These locomotives were popular in Europe, particularly in Germany. In the United States, the 2-10-0 was not widely popular but for a small number of railroads which operated mostly in mountainous terrain. The type operated as freight engine, although locomotives in Germany and the United Kingdom proved capable of hauling passenger trains.

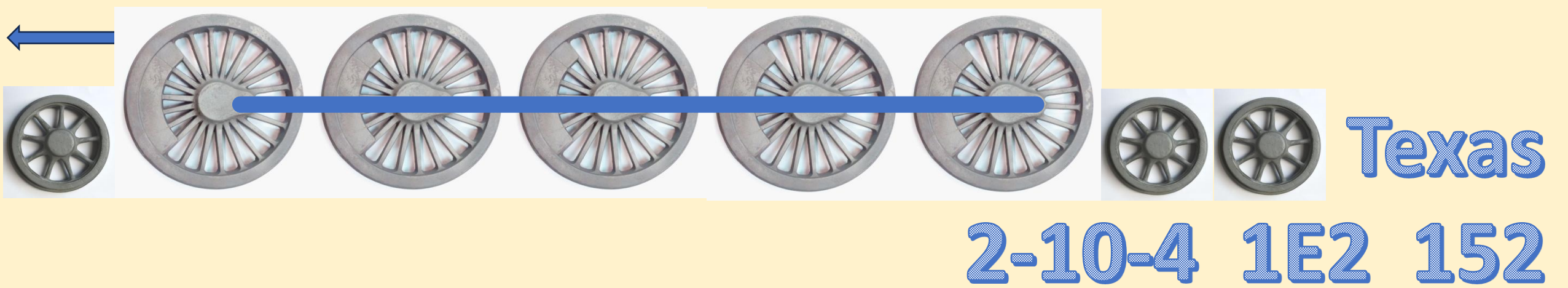


Santa Fe

2-10-2 1E1 151



This type is known as the Santa Fe type, after the AT&SF railway that first used the type in 1903. The 2-10-2's problem was the low speed restriction. A large number of European 2-10-2s were tank locomotives, taking advantage of the symmetrical nature of the wheel arrangement.



The 2-10-4 wheel arrangement originated and was principally used in the United States, but also Canada had this type and called it Selkirk. Some 2-10-4T tank locomotives also existed in eastern Europe.



Centipede 2-12-0 1F 160



This type is quite seldom. 44 units of the so-called Class K for the Royal Württemberg State Railways (later class 59 of the Deutsche Reichsbahn) had this wheel arrangement for heavy duty in mountainous areas.



Union Pacific 4-12-2 2F1 261



The Union Pacific 9000 class was the only class of steam locomotives with a this wheel arrangement ever to be built, also the 9000 class was the largest rigid frame locomotive ever built. These locomotives were used to increase the speed of freight trains in flat country, and were fairly successful.

What about: Articulated locomotives, Duplex locomotives, Geared locomotives?

