



LNER A3 Pacific – 4472

"Flying Scotsman"

A three cylinder locomotive with Gresley conjugated valve.

History of LNER A3 Class Pacific

No. 4472 'Flying Scotsman'

Nigel (later Sir Nigel) Gresley originally developed the Pacific Class A1 as a mainline express locomotive at the very end of the lifetime of the UK's Great Northern Railway (GNR). Gresley had successfully introduced new locomotive designs as Chief Mechanical Engineer of the GNR featuring three-cylinder configuration with 2:1 conjugated valve gear on the inside cylinder. Harold Holcroft chief draftsman of the South Eastern & Chatham Railway had helped Gresley with this project and for that reason the conjugated gear is often called Gresley / Holcroft conjugated valve gear.

The earlier GNR 3 cylinder locomotives were 2-6-0 and 2-8-0 tender designs for freight and mixed traffic work. As experience was gained with these locomotives, Gresley moved towards the possibility of doing something even bigger and better with three cylinders to handle the increasing express passenger loads on the Great Northern route from London to York.

The idea of a new Pacific class is reputed to owe much to Gresley's admiration for the design of the Pennsylvania Railroad Class 'K4s' (another popular Aster model from the 1980's). Although the 'K4s' was a two-cylinder express Pacific design with a Belpaire firebox, Gresley found much of interest in the layout and proportions of this classic American design. The Pacific wheel configuration had been tried already in express design in the UK with the GWR's - 'The Great Bear' but Gresley was looking for something altogether more advanced than this singular concept.

And so the famous Class A1 was born. The first in the new series was No. 1470 'Great Northern' of 1922. This was followed one year later, when the GNR had become part of the London & North Eastern Railway (LNER) by what has surely become one of the World's most famous steam locomotives - No. 4472 'Flying Scotsman'. The popularity of 'Flying Scotsman' was sealed when it was displayed at the British Empire Exhibition in 1924 and 1925. The large locomotive in its attractive LNER apple green livery was an immediate success with the public.

More than 70 examples were added to the A1 class in the 1920's and into the early 30's. Many but not all were named after winners of classic English horse races although not 'Flying Scotsman'.

Gresley's appetite for improving his designs by careful experimentation led to the modification of the Class A1. These improved locomotives, with higher boiler pressure and altered valve arrangements, were classified - LNER Class A3. Over the years all the Class A1 were rebuilt to the improved A3 specification. Further development of Class

A3 led to the famous streamlined A4, the subject of a very successful Aster design dating from 1934.



The name 'Flying Scotsman' can sometimes lead to confusion. Is it a locomotive or is it a train? Well actually it is both! The year 1928 saw the inception of a new non-stop express passenger service between London (Kings Cross) and Edinburgh (Waverley) a distance of nearly 400 miles. This new service was called 'The Flying Scotsman'. It comes as no surprise that locomotive No. 4472 - 'Flying Scotsman' was chosen to launch the service in May of that year.

To permit a locomotive to run this long distance without a stop would require a change of crew whilst on the move. So Nigel Gresley conceived a tender with a corridor running down the right hand side. Crews could now change half way between the two capital Cities, a great innovation. Ten of these corridor tenders were built for the service and fitted to the Class A1 and subsequently to the A3's.

The popularity and fame of 'Flying Scotsman' was further enhanced when in 1934, hauling a dynamometer car; it became the first steam locomotive to record a fully authenticated speed of 100 miles per hour.

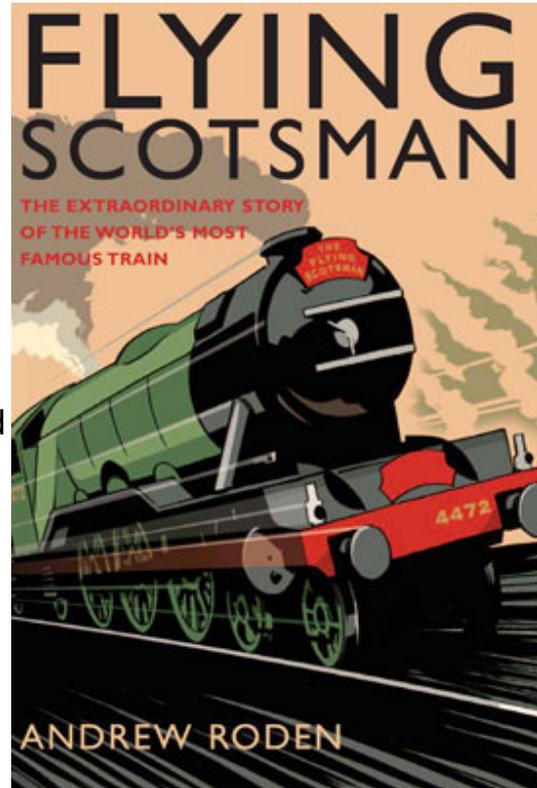
'Flying Scotsman' continued to give excellent service for the LNER in its splendid livery of apple green with black, white and red lining until 1948 when the new nationalized 'British Railways' was formed. Apple green was changed first for dark blue and then dark green and the famous number - 4472 became ultimately 60103.

As steam traction on Britain's railways came to an end in the early 1960's, much enthusiasm was generated among steam devotees to save many of famous locomotives from the scrap yard. Over 70 similar locomotives of

Class A3 were actually scrapped, leaving Flying Scotsman as the sole survivor of its class.

Having covered more than two million miles, 'Flying Scotsman' was sold in 1963 to a private investor - Alan Pegler for £ 3000. The new owner changed the livery back to LNER green and the number 4472 was restored. A second tender was purchased to carry extra water since the track built troughs formerly used for water pickup at speed were falling into disrepair.

Alan Pegler was granted permission to run 'Flying Scotsman' on Britain's railway for special excursion for steam enthusiasts until regular steam operations had finished in Britain in 1968. Many new fans got to know 'Flying Scotsman' during these first important years in preservation.



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Before Pegler's contract with British Railways had ended, he hit upon the idea of taking 'Flying Scotsman' to the USA to pull an exhibition train. So in 1969 'Flying Scotsman' with its two tenders, left the UK to tour the North American continent visiting major cities as well as small towns. The tour started well but by 1972 financial problems led to disaster and bankruptcy. Just in time a new owner - Sir William McAlpine came forward to rescue 'Flying Scotsman'. The locomotive was successfully repatriated in February 1973 to the relief of all Britain's steam fans.

Under new ownership 'Flying Scotsman' future was secured. A program of mainline steam running and visits to preservation railways kept this now legendary locomotive busy. However in 1988 'Flying Scotsman' was away on overseas travels again with an 18-month visit to Australia. During the visit 'Flying Scotsman' visited the length and breadth of Australia and set a new world record for a non-stop run for steam by taking a train for 422 miles from Parkes to Broken Hill.

In 1996 another new owner, Dr Tony Marchington, came forward to purchase and finance a major overhaul of the locomotive. When this was completed in 1999, 'Flying Scotsman' re-emerged from its West London base for a major program of mainline running over Britain's railways. During 2002, the 'Flying Scotsman' has a heavy schedule of mainline trips hauling the prestigious 'Venice Simplon Orient Express' train of Pullman carriages bringing joy to countless thousands and reliving once again the great days of steam.

On April 5, 2004, it was announced that the Flying Scotsman will go on display in York, England. The [National Railway Museum](#) won its battle to save the historic rail icon - "*the Worlds Most Famous Steam Locomotives*" - following an overwhelming show of public support. A successful bid was put forward with the help of a major £1.8m grant from the National Heritage Memorial Fund (NHMF). An initial £365,000 was raised through the NRM's public appeal and, as pledged, Sir Richard Branson matched this £365,000 on behalf of the Virgin Group. A further £60,000 donation by the British public raised the total to £790,000, leaving enough funds to keep the locomotive running on Britain's railway for years to come.

The locomotive on May 29, 2004 to traveled from Doncaster to York to mark the beginning of Railfest, a National Railway Museum celebration of

the bi-centenary of steam locomotives. The Flying Scotsman did public runs between York and Scarborough during the summer of 2004.

Flying Scotsman is currently in the National Railway Museum's workshop, part way through its ten year overhaul. Currently the locomotive is completely dismantled, all welding is finished, and the locomotive is being measured with lasers which allows our engineers to check and remove distortions in the frames. Once any distortions are corrected, the gradual process of re-assembly will begin.

Although much of this work is happening in the workshop at York, various components have been sent to specialist engineers all over the UK. You can monitor progress from the viewing gallery above the workshops, but do not be surprised if at times there are only the frames and disassembled components to see.

The *Flying Scotsman* locomotive will be back in steam in 2011. Delays caused by a world shortage of copper for the firebox and unexpected cracks in the smokebox saddle, only discovered after the loco was totally dismantled, were amongst some of the obstacles eroding the original time scale. The frames were also out of true and this needed rectifying. Most of these elements a result of 80 years hard work in an unforgiving environment. Notwithstanding any unforeseen circumstances, the locomotive will be pulling passenger trains in the 2011 season.

In 2003 the Aster Hobby Co. Inc. was proud to offer their recreation of "the World's Most Famous Locomotive" - No. 4472 'Flying Scotsman'. For additional information and photographs of the prototype and model, visit [The National Railway Museum](#) web feature on the Flying Scotsman. [Geoff Calver's review](#) of the Aster A3 "Flying Scotsman" is posted on the reference pages.

Specifications

Scale: 1/32 (45 mm) No. 1 Gauge

Dimensions:

Length: 687 mm (27 inches) (OB)

Engine 440.5 mm (17.34 inches) + **Tender** 240.5 mm (9.45 inches)

Width: 92 mm (3.6 inches)

Height: 126 mm (5 inches)

Weight: 5.9 kg (13 lbs) (Engine 4.1 kg) (9 lbs) + **Tender** 1.8 kg) (4 lbs)

Wheel Arrangement: 4-6-2 Pacific

Driving Wheels: 62. mm

Pilot Truck Wheels: 28 mm

Trailer Truck Wheels: 34 mm

Tender Wheels: 36 mm

Boiler Type: C Type Working Pressure 3-4 kg / sq.cm

Boiler Fittings: 2 x Safety Valves, Pressure Gauge, Water Gauge, Regulator, Blower Valve, Check Valve, Filler Plug and Superheater.

Engine: 3 Cylinders with Slide Valve Bore 12 mm x Stroke 20 mm

Valve Gear:

Outside: (Right and Left) Walchaeret's

Inside: Gresley/Holcroft Conjugated

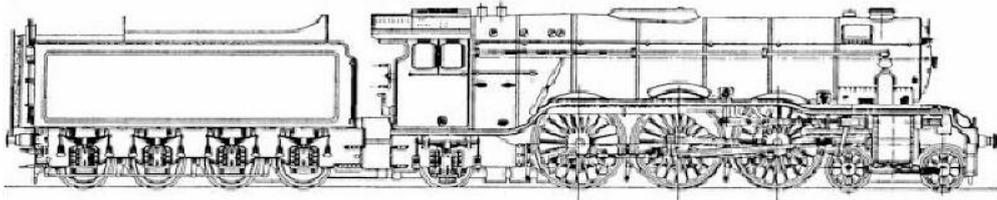
Valve Travel: 6 mm, Cut-off 75%

Axle Driven Pump: Bore 5 mm x Stroke 5 mm Mounted on Main Driver's Axle

Lubricator: Roscoe Displacement Type

Water Capacity: 250 cc at 70% full

Minimum Radius: 2 mm (6.56 feet)



Dave Young's Flying Scotsman (a coal fired conversion by John Shawe) at Steve Speck's Steam Up in Houston, TX. The passenger car built by Peter Comley is based on the prototype pulled by the Flying Scotsman during its US tour. Photo by Arthur Gibson.