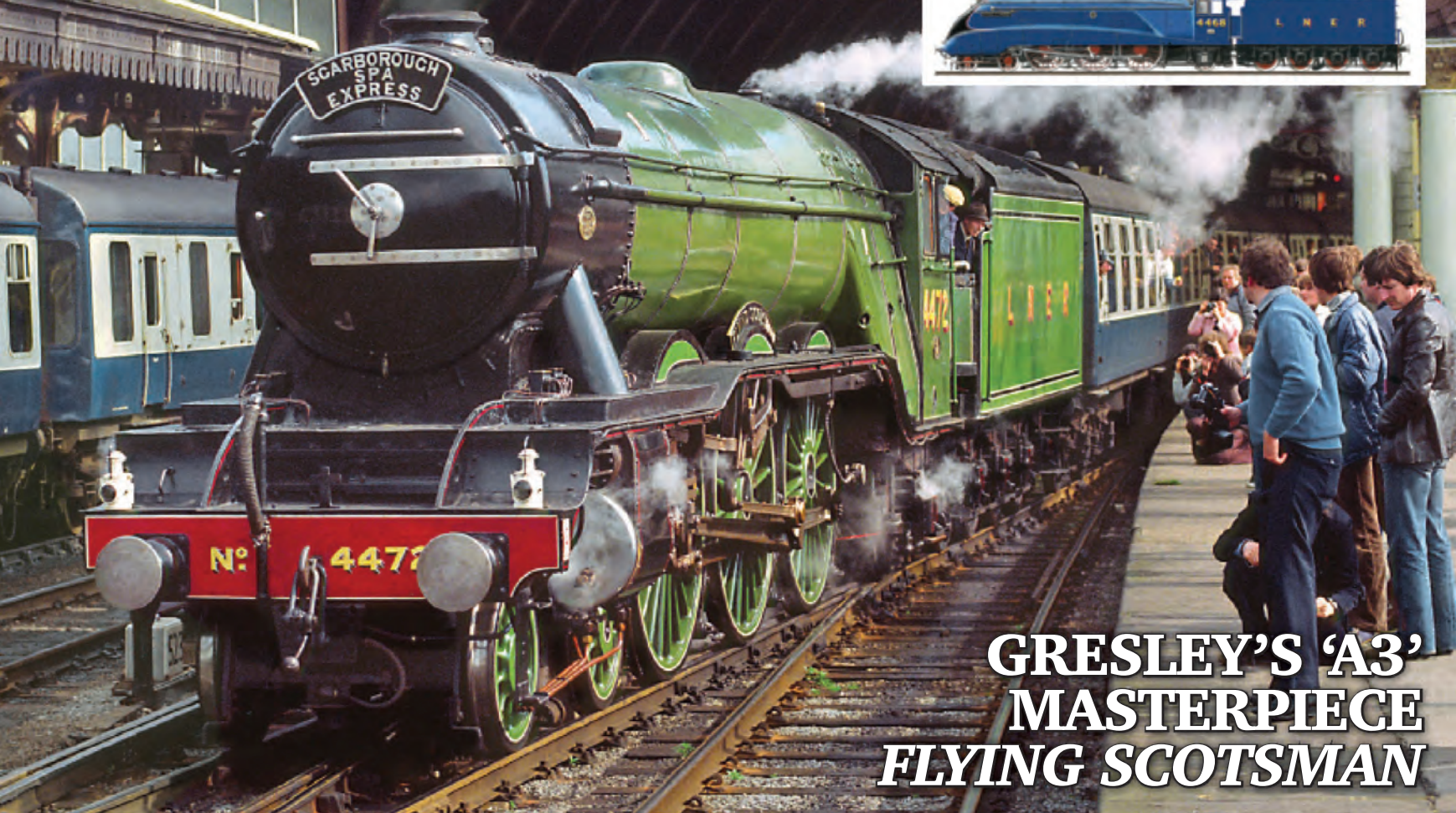


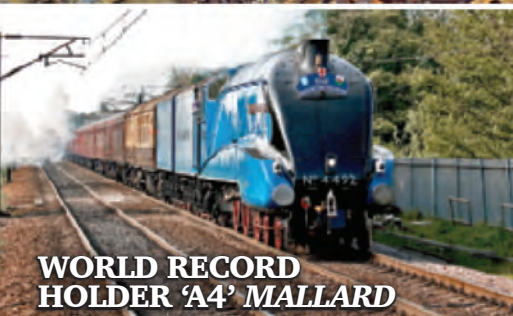
# LOCOMOTIVE LEGENDS

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FLYING SCOTSMAN**



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HOLDER 'A4' MALLARD**



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# LOCOMOTIVE LEGENDS

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**THIS PAGE:** 'A3' 4-6-2 No. 60052 *Prince Palatine* departs from Marylebone with the 'Master Cutler' for Sheffield Victoria in 1949. **F.R. HEBRON/RAIL ARCHIVE STEPHENSON**

**FRONT COVER:** Happier times for No.4472 *Flying Scotsman* seen here leaving York with a special train on May 25, 1981. It is hoped the world famous 'A3' will return to the main line once more in 2015. **JOHN COOPER-SMITH**

**BACK COVER:** The almost symmetrical mirror image of two of the six 'A4s' during an evening photographic shoot at Shildon on February 20, 2014. **DAVID WILCOCK**

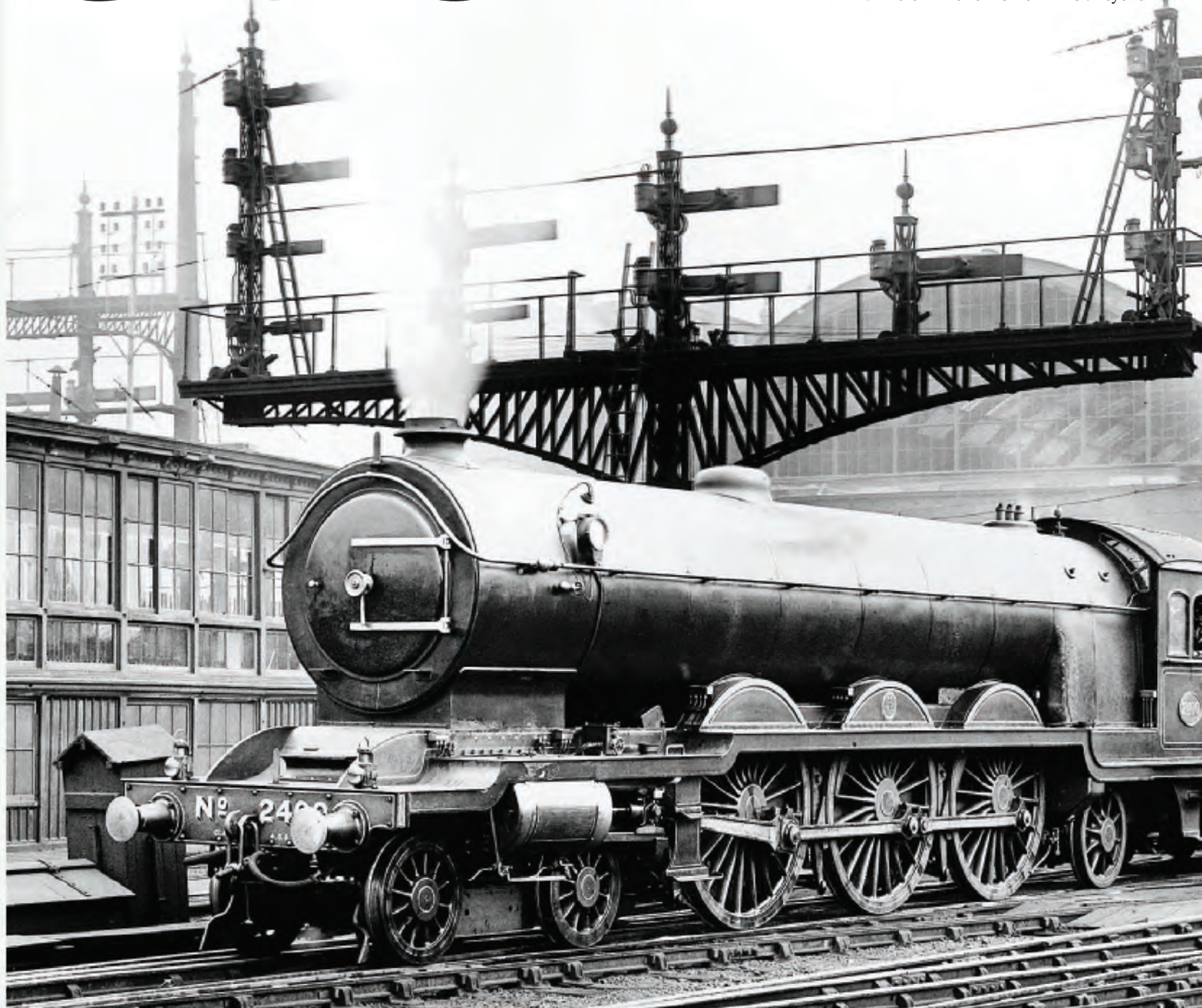


# RAVEN VERSUS GRESLEY

**T**he London & North Eastern Railway (LNER) is well known for its magnificent 'Pacific' type locomotives. Some of the most famous locomotives have graced the metals of the LNER and British Railways; *Mallard*, *Flying Scotsman*, *Blue Peter* and (more recently) *Tornado*.

The route of the East Coast Main Line north out of London King's Cross, through the suburbs and across the Bedfordshire and Cambridgeshire Flats (or fens) meant they were a veritable racing ground with little to challenge locomotives in the way of undulation.

Onward through Peterborough, and aside from Stoke Bank just south of Grantham, there was little to slow trains down all the way to Doncaster, across the flatness of the Vale of York and onward to the North East. Beyond





Newcastle the story pretty much remained the same, the line hugging the Northumberland coast, crossing the border into Scotland and onward to Edinburgh.

By comparison to other primary routes, the LNER's line was as flat as they come and this enabled the rapid development of express locomotive to handle the ever increasing train weights. It was only north of Edinburgh on the road to Aberdeen where things became more challenging, otherwise the Great Northern Railway and the North Eastern Railway, which were to join forces as part of the newly formed LNER empire in 1923, had it fairly easy and their large wheeled 'Single' and 'Atlantic' types were staple motive power until the demands of the rapidly expanding railways of Britain led to the need for much

The first Raven-designed NER 'Pacific' for the North Eastern Railway, No. 2400, is seen at London King's Cross on June 23, 1923. **W.J. REYNOLDS/RAIL ARCHIVE STEPHENSON**



**'PACIFICS' COMPARED:** Raven NER class 'A2' No. 2403 *City of Durham* stands beside Gresley-designed 'A1' No. 2571 *Sunstar*, fitted with Westinghouse brake pump, at Haymarket shed in 1927. **F.R. HEBRON/RAIL ARCHIVE STEPHENSON**



more powerful machines – enter the 'Pacificals' with their six-coupled driving wheels in a 4-6-2 wheel arrangement.

It is widely thought that Nigel Gresley was the first to build 4-6-2 locomotives for the LNER, and whilst to a degree this is true – he was the LNER's CME at the formation of the new company in 1923 – the first two of his famous 'A1' class were actually built under his auspices for the GNR. However, the NER was also designing its own 'super power' in the form of what was to become the 'A2' under the aegis of Vincent Lichfield Raven. He had become Chief Mechanical Engineer to the NER in 1910 and developed the very successful 'C7' class 'Atlantics' that had a wheel arrangement of 4-4-2. Given the need for a new locomotive capable of hauling heavier trains and having greater acceleration, he decided to stretch the 'C7' into a 'Pacific' type.

Authorisation to build two of these at Darlington was issued in July 1922 with drawings released seemingly to counter the publicity being given to the launch of Gresley's new 'Pacific' design for the GNR. Although both engineers were developing their own designs for a 4-6-2 locomotive type, it was Gresley who won the 'race' with No. 1470 *Great Northern* appearing in April 1922, whereas Raven's Nos. 2400 and 2401 weren't finished until the end of the same year.

In many respects the two locomotives were very similar. Raven's three cylinder arrangement had three sets of independent Stephenson valve gear in such a confined space that the size of the bearings were limited, which although fine for an 'Atlantic' would be a limiting factor on a locomotive expected to take a much greater load. In contrast Gresley's three-cylinder design incorporated his own 'conjugated' valve gear which in simple terms meant a connecting

Raven NER class 'A2/2' 'Pacific' No. 2404 *City of Ripon*, fitted with a Gresley 'A1' boiler and cab, passes Geneva Road as it leaves Darlington with an up express at 5.04pm on October 3, 1931.

**WM. ROGERSON/RAIL ARCHIVE STEPHENSON**



'bar' was used to operate the valves for all three cylinders instead. The 'A2' was the biggest locomotive built by the NER but it seems that its production was rushed in order to complete the project ahead of the forthcoming Grouping and as a result it had its problems.

That said, results were satisfactory enough for another three to be ordered in February 1923, on the eve of Gresley's impending appointment as CME to the LNER. Gresley was in office before these were completed and in fact modified the rear wheels with his own 'A1' bogie design. Naturally, with two new types of 'Pacific' locomotive to work with, the opportunity was taken to test them to ascertain which was the best. Although it appears that the 'A2' was better at maintaining boiler pressure, the 'A1' gave better economy, so the decision was taken to go with Gresley's design and 40 'A1s' were ordered.

The 'A2s' mainly worked on the East Coast Main Line between Grantham and Edinburgh, with the occasional sortie to King's Cross and Leeds. No. 2404 was modified in 1929 with a Gresley 'A1' boiler. Rather than build new boilers for them, a spare was

used, but major modifications had to be made to both boiler and the longer 'A2' frames. In 1933 it was considered replacing the remaining 'A2' boilers with the new 'A3' type, but this never materialised. They were also matched with standard eight-wheel Gresley tenders in 1933, their original Raven six-wheel tenders being passed on for use with J39 0-6-0s.

With the appearance of the new 'V2s' and the fact that the 'A2s' had limited route availability, they were withdrawn and scrapped in 1936/7. No. 2402 had the distinction of being the first LNER-built locomotive to be scrapped. Vincent Raven had overseen the electrification of the NER's Shildon to Newport freight line and had grandiose plans to electrify the whole of the East Coast Main Line using a new 4-6-4 electric locomotive capable up hauling 450-ton passenger trains. However, with the imminent formation of the LNER, Raven resigned his post in 1922 but was asked to join the LNER as a technical advisor in 1923. Raven was certainly an innovator, but his ideas never came to fruition and electrification of the ECML didn't happen until the 1980s. It makes you wonder what might have been! ■



# CHAPTER ONE

# GRESLEY 'A1/A3' PACIFICS

BY TONY STREETER



It's 10am on May 1, 1928 and No. 4472 *Flying Scotsman* lifts the first non-stop London to Edinburgh express of the same name out of King's Cross at the start of its 393 mile journey, amid great attention from the media, railwaymen and enthusiasts. CORBIS





**THE GLORIOUS LNER IMAGE:** *Flying Scotsman* passes Belle Isle (London) with a down semi-fast train from King's Cross in July 1938. The 'Pacific' is now coupled with a streamlined non-corridor tender. **G R GRIGS/RAIL ARCHIVE STEPHENSON**

# NON-STOP.. FOR 393 MILES

**A**t 10am on May 1 1928 *Flying Scotsman* steamed out of King's Cross with a train for Edinburgh. Coming the other way – though receiving less publicity – was another of the London and North Eastern Railway's top 'Pacifics', No. 2580 *Shotover*.

Due to a remarkable invention by the locomotives' designer Nigel Gresley, neither train would need to stop before reaching their destinations 393 miles away. It was the start of a new era.

Gresley's secret weapon was a tender with a corridor that connected the footplate to the first coach of the train. The fireman and driver could walk through the tender and so – uniquely – the LNER didn't have to stop to allow crews to be changed.

The factors limiting long distance runs would now just be coal and water – but the nine tons of coal

carried was enough for the distance and the tenders had scoops to pick up water while moving.



*Flying Scotsman* in the engine yard at King's Cross, finished in the 1924 Wembley Exhibition livery. **F R HEBRON/RAIL ARCHIVE STEPHENSON**

The new services were a marketing triumph in the battle between the LNER and the rival London Midland and Scottish Railway for lucrative Anglo-Scottish express traffic. Ironically though, the trains would at first still need 8 ¼ hours to cover the distance.

Ever since the 19th Century's 'races to the north' had raised public concerns, the rival East Coast and West Coast routes had agreed not to accelerate their services. That changed in the 1930s, bringing about some of the most glamorous trains the world had ever seen.

In 1928 though, the shimmering streamliners of the 'Coronation' and their LMS equivalents were still in the future. For now, the LNER turned to what it had.

There's no doubt the company deliberately chose *Flying Scotsman* for the first northbound run; already famous, No. 4472 had actually been named after the crack train service it was hauling.

Yet despite its fame then and now, the Apple Green-painted *Flying Scotsman* was far from being the only Gresley 'Pacific' available – it wasn't even the first built. ■



# GREAT NORTHERN PROGRESS





The LNER hadn't yet been created when a new class of engine rolled out of the Great Northern Railway's Doncaster Works in 1922. Appropriately, Nigel Gresley's big 'Pacific' No. 1470 would be named *Great Northern*. The second became No. 1471 *Sir Frederick Banbury*.

By the time the third engine was finished in early 1923, the GNR had just given way to the LNER. That was a result of a government policy to 'group' many of the country's

independent railways into the 'Big Four'.

So the new No. 1472 became an instant symbol of the LNER; Gresley had been chosen as the railway's first chief mechanical engineer.

The new engines were big – so big that they had to be redesigned with smaller chimneys to allow them over less generously proportioned parts of the LNER system than the former GNR. Their large boilers looked purposeful, and there was a wide 41.25sq ft firebox

#### FACT FILE: 'A1'/'A3' IN DETAIL

<b>BUILT:</b>	Doncaster Works (LNER) and North British
<b>IN SERVICE:</b>	1922-1966
<b>WHEEL ARRANGEMENT:</b>	4-6-2 (2'C1h)
<b>DRIVING WHEEL DIAMETER:</b>	6ft 8in (2.03m)
<b>BOILER PRESSURE:</b>	220lb/sq in (15 bar) ('A3')
<b>FIREBOX GRATE AREA:</b>	41.25sq ft (3.83sq m)
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts, with Gresley 'conjugated' drive
<b>TRACTION EFFORT:</b>	32,910lb (146kN)
<b>WEIGHT:</b>	104 tons 2cwt (105.8 tonnes)
<b>MAXIMUM RECORDED SPEED:</b>	108mph (174kph)
<b>NUMBER BUILT (ALL FORMS):</b>	79

The second GNR Gresley class 'A1' 'Pacific' No. 1471 *Sir Frederick Banbury* is being serviced at Hornsey shed before returning to Doncaster with the 4pm express from King's Cross in 1922. **W.J. REYNOLDS/RAIL ARCHIVE STEPHENSON**





## NON-STOP... WITH A CORRIDOR TENDER

The nearly 400 miles between London and Edinburgh was too far to expect one crew to drive and fire all the way, but how could you change crews without stopping?

The answer was the corridor tender – which incorporated an 18in (46cm) wide, 5ft (1.52m) high internal corridor along the right-hand side. A connection to the first coach meant one crew could travel in comfort

'on the cushions' in the train while the other manned the locomotive. When changeover time came, the relief crew simply walked through the tender.

The tender also incorporated space for nine tons (9.1 tonnes) of coal, which was enough to cover the entire distance, and 5,000 gallons (22,730 litres) of water, which wasn't. So a water scoop was fitted to allow

the tender to be refilled on the move.

The fireman lowered the scoop when running over water troughs, which were positioned between the rails at strategic points; the scoop's forward motion forced water into the tank – but the fireman needed to make sure he'd raised the scoop again before the train reached the end of the troughs!

'A1' No. 4472 *Flying Scotsman*, newly fitted with a corridor tender for working the non-stop 'Flying Scotsman' train to Edinburgh in May 1928. **W.J. REYNOLDS/RAIL ARCHIVE STEPHENSON**



**LNER ENGINE ON GREAT WESTERN METALS:** No. 4474 *Victor Wild* hauls the 10.30am Paddington to Plymouth 'Cornish Riviera Express' near Hayes & Harlington during the exchange with *Pendennis Castle* in 1925. **F R HEBRON/RAIL ARCHIVE STEPHENSON**







carried above a set of trailing wheels. Compared to many other engines Gresley's new 'Pacifics' were modern and imposing.

A year after No. 1472 was built, the glamorous British Empire Exhibition was held at Wembley; the LNER chose its representative in time to give the 'A1' – now number 4472 – a special finish and a name, *Flying Scotsman*.

Also at the show was an engine from the Great Western Railway. Although also built in 1923, *Caerphilly Castle* was smaller than *Flying Scotsman*. It had no wide firebox, no rear carrying wheels, and a low, old-fashioned looking tender. So when the GWR claimed it was displaying Britain's



Gresley LNER class 'A1' Pacific No. 2553 *Prince of Wales* takes water from Langley troughs, Stevenage with the 4pm King's Cross to Leeds and Bradford in 1930. **F.R. HEBRON/RAIL ARCHIVE STEPHENSON**



**BIRTH OF A LEGEND:** Gresley LNER class 'A1' No. 1472 at Doncaster shed when new in 1923. It was soon to become No. 4472 *Flying Scotsman* and star on the crack express of the same name. **W.H. WHITWORTH/RAIL ARCHIVE STEPHENSON**





When first built, the original 'A1s' had quite a different look to later on – as they were constructed to the generous Great Northern loading gauge and so could have, for example, larger chimneys. This is No 1478 *Hermit* (later No. 4478) after arrival at King's Cross with an express from Leeds in 1924. **F R HEBRON/RAIL ARCHIVE STEPHENSON**

#### DID YOU KNOW?

- During the Second World War a Spitfire fighter aeroplane was named *Flying Scotsman*. A second was named after another LNER celebrity locomotive, 'P2' *Cock o' the North*.
- Many of the 'A1' and 'A3' names – though not any of the first three *Great Northern*, *Sir Frederick Banbury* and *Flying Scotsman* – were those of famous race horses. Other non-racehorse names included *Prince of Wales* and *Centenary*, which was built at Doncaster in 1925, 100 years after the opening of the Stockton and Darlington Railway.
- *Flying Scotsman* was not included in the steam ban introduced by BR in 1968, but only took limited advantage of this because it went to North America in 1969. By the time it returned in 1973 the steam ban had already been lifted.
- Cracking of the locomotives' frames was such a problem that Doncaster Works kept spare sets to allow swaps. Some of the engines received completely new frames, others largely new frames incorporating some old sections. Frame swaps started in 1931, with the last not taking place until 1962.

most powerful type of express locomotive, it led to a challenge...

What resulted was a series of trials in which the 'Castle' and 'A1' were tested on each other's railways.

The results were embarrassing – for the LNER. Not only did the 'Castle' turn out sparkling performances, it used less coal and water than the 'A1'. In the words of the Railway Correspondence and Travel Society's definitive *Locomotives of the LNER*, the 'Castles' showed their superiority "in no uncertain manner."

Learning from the trials, Gresley set about addressing detail problems with the 'A1s' – and the resultant improved water economy boosted the idea of running long distances non-stop. More

enhancements followed, with the real transformation coming with conversion of the 'A1s' to the new 'A3' standard. In 1927 a 220lb/sq in boiler was fitted to No. 4480 *Enterprise*; from the following year new 'Pacifics' were built to the 'A3' configuration; the last 'A3' was produced in 1935, the same year Gresley launched his streamlined 'A4' – which had a 250lb/sq in boiler.

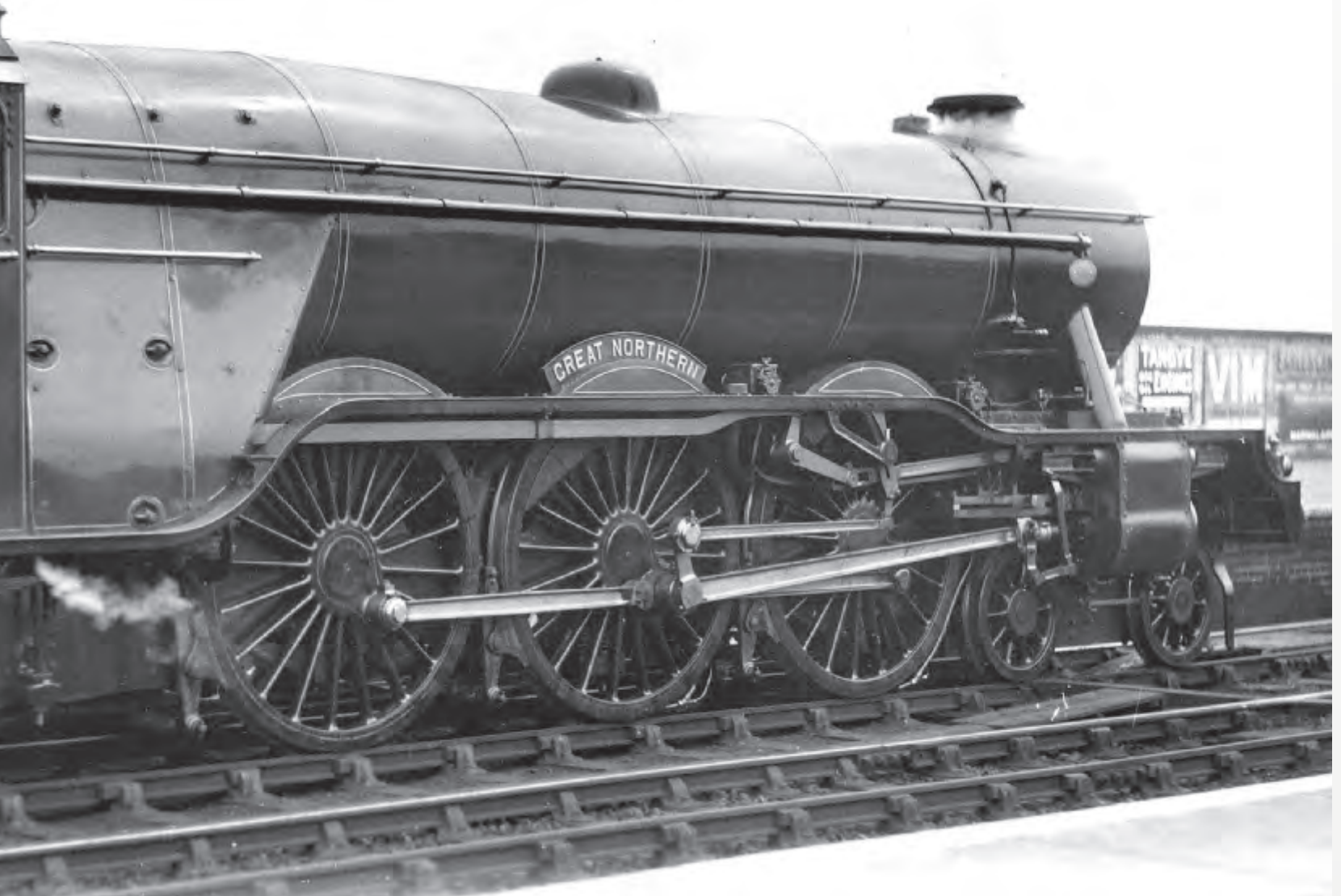
The earlier 'A1s' were gradually converted to 'A3s' too – the last one in 1948 (*Flying Scotsman* received the more powerful boiler in 1947). Despite the launch of the 'A4s', the final 'A3s' would last another 30 years – and later modifications probably made them better than ever. ■

**RIGHT: THE OLD AND THE NEW:** Stirling's legendary 'single' 4-2-2 No. 1, for so long a mainstay of express passenger trains on the Great Northern, alongside the new order, LNER 'A1' No. 2579 *Dick Turpin* on March 1, 1927. **CORBIS**

**BELOW: THE FIRST:** No. 1470 *Great Northern* stands at Retford with the 10am Leeds-Kings Cross express in 1922, the year before the LNER was formed. **W H WHITWORTH/RAIL ARCHIVE STEPHENSON**



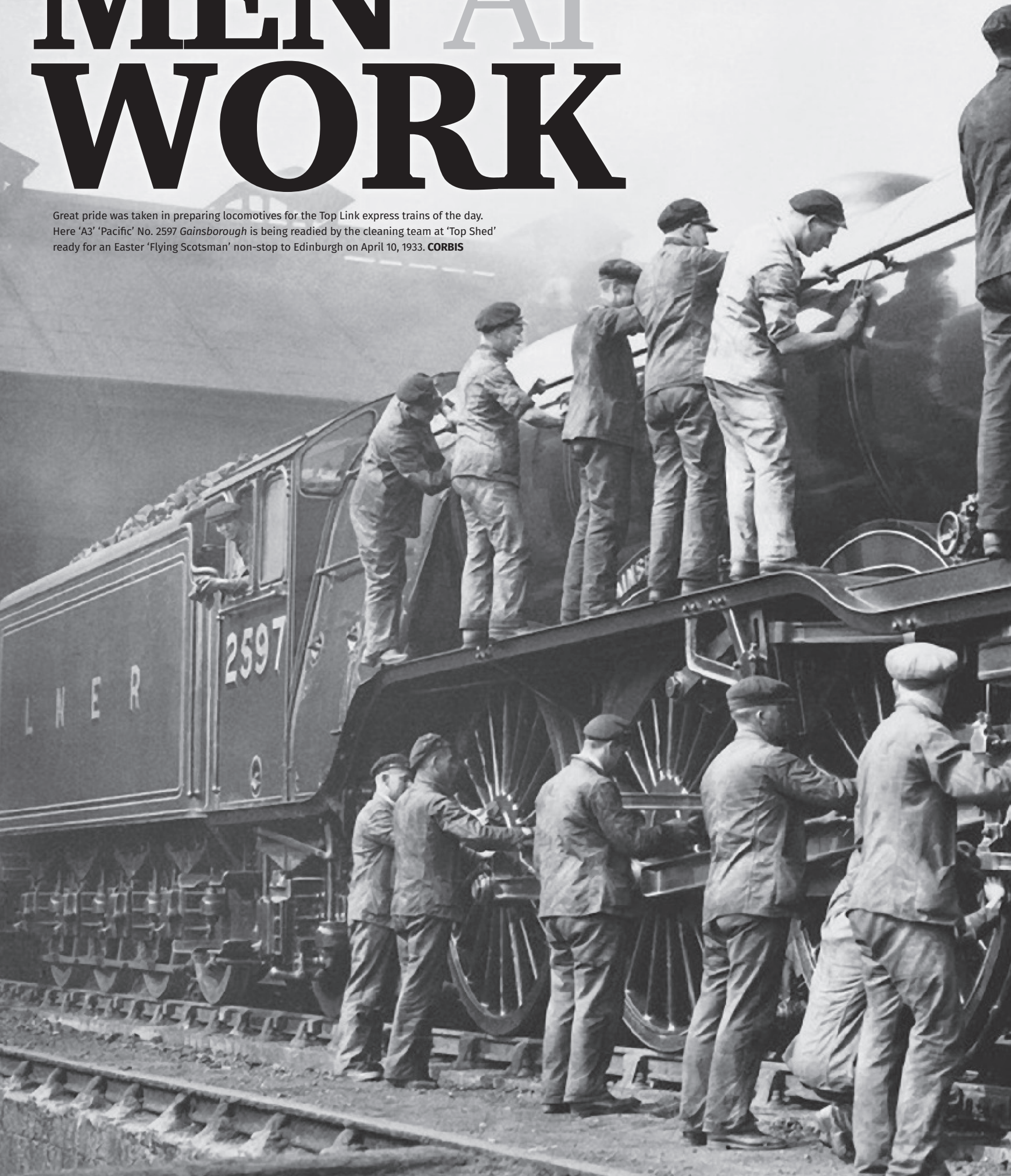






# MEN AT WORK

Great pride was taken in preparing locomotives for the Top Link express trains of the day. Here 'A3' 'Pacific' No. 2597 *Gainsborough* is being readied by the cleaning team at 'Top Shed' ready for an Easter 'Flying Scotsman' non-stop to Edinburgh on April 10, 1933. **CORBIS**







FLYING  
SCOTSMAN

379

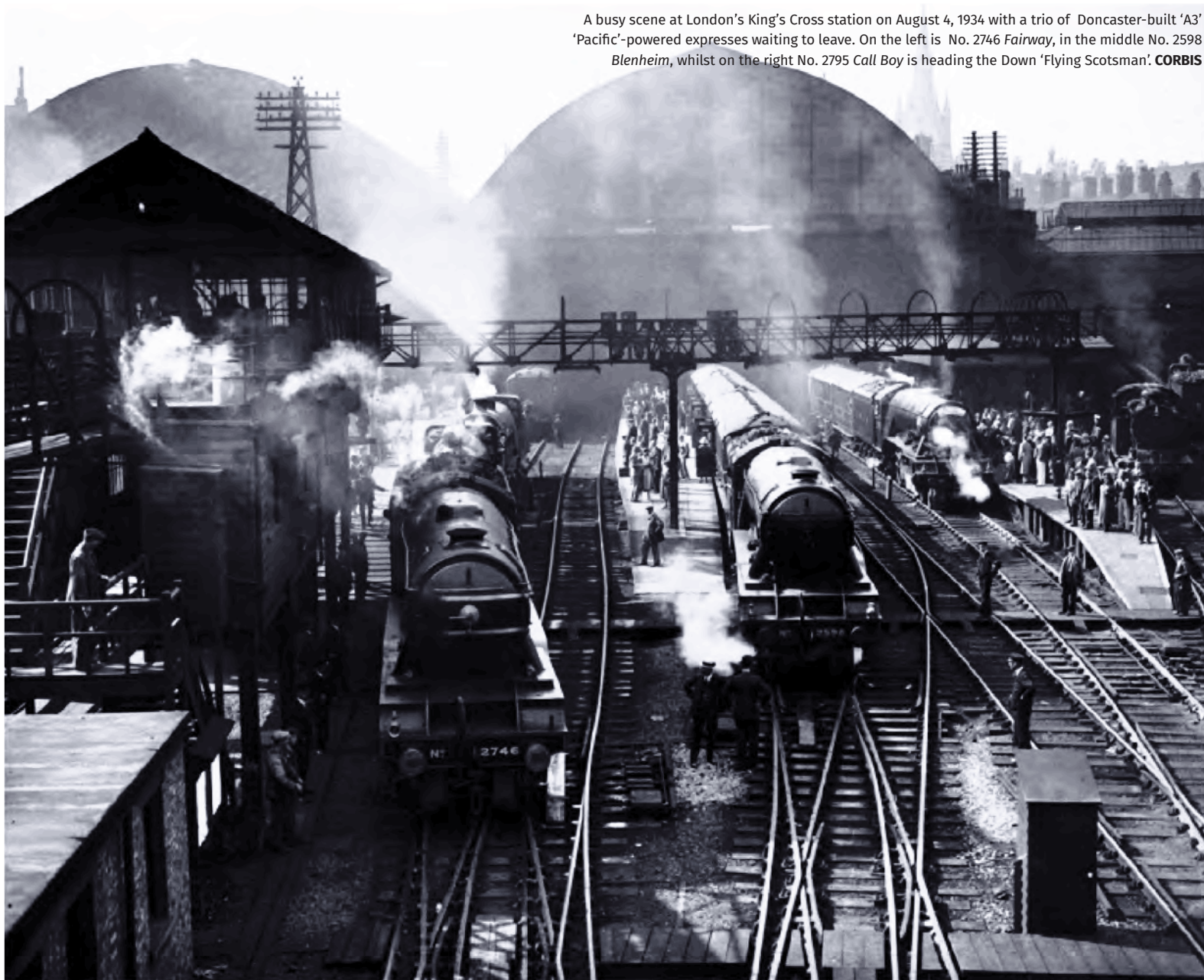


Amid great steam and smoke effects, 'A3' No. 2750 *Papyrus* sets off on its 393 mile journey at the head 'of the 'Flying Scotsman' on May 2, 1932. **CORBIS**





A busy scene at London's King's Cross station on August 4, 1934 with a trio of Doncaster-built 'A3' 'Pacific'-powered expresses waiting to leave. On the left is No. 2746 *Fairway*, in the middle No. 2598 *Blenheim*, whilst on the right No. 2795 *Call Boy* is heading the Down 'Flying Scotsman'. CORBIS



# BREAKING 100MPH...

In 1934, while 'A3s' were still being built, an earlier 'A1' was chosen to attempt to reach the symbolic 100mph; with its eye again on publicity, the LNER picked *Flying Scotsman*. The train, on November 30 1934, was a prelude to the planned launch of high-speed streamlined services with the new 'A4s' in 1935.

Until then, nobody had recorded a completely doubt-free steam 'ton'. So *Flying Scotsman* would take the official 'dynamometer car' test coach, and timing expert C J Allen was invited as back up.

After running north from London to Leeds, *Flying Scotsman* headed south with six vehicles; the return journey would include hurtling down Stoke Bank near Grantham,

where 'A4' *Mallard* would win the world speed record four years later.

The run achieved a high average speed – and as No. 4472 rushed down Stoke, exactly 100mph was briefly clocked as No. 4472 reached the bottom of the 1-in-200. It was beyond doubt... or maybe it wasn't.

Performance expert O S Nock later noted "disagreement between the two principal sources of recording" in his book *Speed Records on Britain's Railways*. C J Allen, said Nock, "clocked two alternate quarter miles at speeds of 97.3mph, whereas the dynamometer car chart showed a marked but rather unnatural peak of exactly 100."

Either way, *Flying Scotsman* was credited with the world's first



**AFTER DARK:** No. 4474 *Victor Wild* seen on March 23, 1931. Like the majority of its classmates it was named after a well-known racehorse of its day. CORBIS



'authenticated' 100mph. After the Wembley exhibition, and the 'non-stop', it ensured *Flying Scotsman* global fame. Yet 'Scotsman's' glory was short lived: less than four months later, on March 5 1935, another Gresley engine bettered No. 4472's performance, again on Stoke Bank. *Papyrus* – built from the start as an 'A3' in 1929 – blasted past *Flying Scotsman's* speed to reach 108mph. It was the fastest ever speed recorded by an 'A1' or 'A3'. ■

#### DESIGNER PROFILE: SIR NIGEL GRESLEY

Born in Edinburgh in 1876, Herbert Nigel Gresley started his railway career at the London and North Western Railway's Crewe Works, later moving to the Horwich Works of the rival Lancashire and Yorkshire. He joined the Great Northern Railway in 1905 as carriage and wagon superintendent, and became chief mechanical engineer in 1911. When the GNR was merged into the newly formed LNER in 1923, Gresley became CME of the new company.

Gresley never saw retirement: he died while still the LNER's CME, in 1941.



LNER 'A3' No. 2751 *Humorist*, fitted with an experimental smoke deflecting arrangement, approaches Grantham with a King's Cross to Leeds express in 1933. GORDON HEPBURN/RAIL ARCHIVE STEPHENSON

**THE GLORIOUS LNER IN ITS HEYDAY:** 'A3' No. 2795 *Trigo* recovers from a signal check as it passes Retford with the 'Up' non-stop 'Flying Scotsman' in 1930. F R HEBRON/RAIL ARCHIVE STEPHENSON





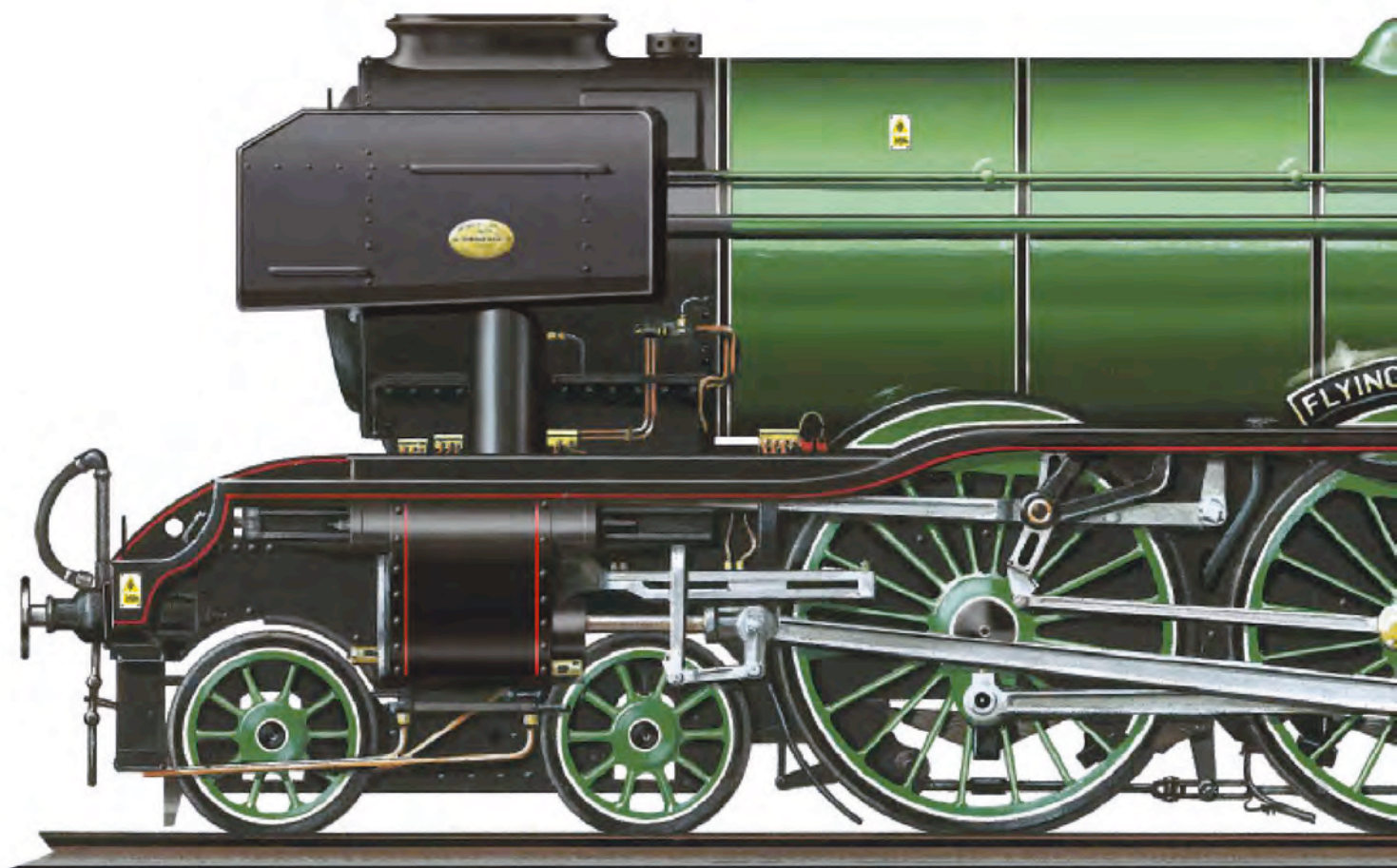
Summer 1934 and holiday-time expresses create a busy scene on August 4, 1934 as LNER 'A3' No. 2795 *Call Boy* gets away from King's Cross with the 'Flying Scotsman' bound for Edinburgh. **CORBIS**















# No. 4472 *Flying Scotsman*

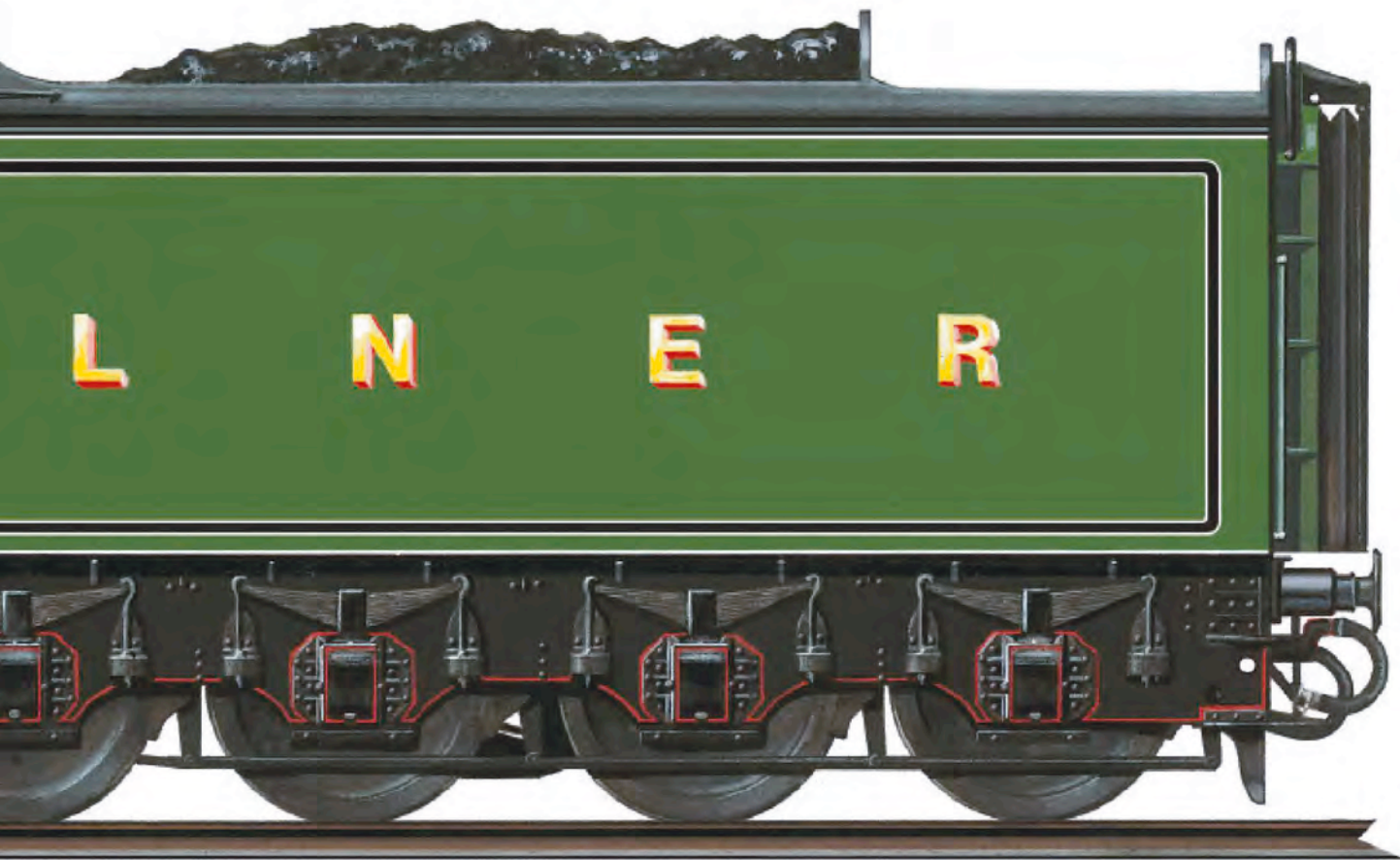
BY STUART BLACK

'A3' 4-6-2 'Pacific' No. 4472 *Flying Scotsman*. Built Doncaster, 1932 as an 'A1' 'Pacific', designed by Sir Nigel Gresley (CME GNR/LNER) for the London & North Eastern Railway. Rebuilt as an 'A3' in January 1947.

The first locomotive to officially achieve 100mph on November 30, 1934.

Set a new world record for non-stop steam haulage on August 8, 1989 when running 422 miles (679km) from Parkes to Broken Hill in Australia.









LNER 'A3' 4-6-2 No. 2573 *Harvester* heads north from Darlington with the down 'Flying Scotsman' on May 14, 1932.  
WM. ROGERSON/RAIL ARCHIVE STEPHENSON

*Papyrus* – the engine that reached 108mph in 1935 – takes water from Langley troughs just south of Stevenage with a Harrogate to King's Cross express in 1929, the year it was built. F R HEBRON/RAIL ARCHIVE STEPHENSON





The driver of 'A3' 'Pacific' No. 2744 *Grand Parade* awaits the 'right-away!' at Grantham with a King's Cross to York express in the mid 1930s. **GORDON HEPBURN/RAIL ARCHIVE STEPHENSON**









**FAR LEFT:** A classic shot of a Gresley 'Pacific' in the LNER's heyday: 'A1' No. 2558 *Tracery* leaves Grantham with a King's Cross to Leeds Central express circa 1935.

**T G HEPBURN/RAIL ARCHIVE STEPHENSON**

**LEFT:** LNER 'A3' No. 2501 *Colombo*, completed at Doncaster's 'Plant' in July 1934 is turned using vacuum created by itself on November 7, 1934. **CORBIS**

**RIGHT:** 'A3' 4-6-2 'Pacific' No. 2751 *Humorist* fitted with a cut out smoke deflecting arrangement to the smokebox, the air trappee exiting through the rear half of what appears to be a double chimney, stands at Doncaster shed on May 7, 1932.

**T G HEPBURN/RAIL ARCHIVE STEPHENSON**



### 'FLYING SCOTSMAN' - THE TRAIN

Say 'Flying Scotsman' today and most people will think of the locomotive. However, No. 4472 was named after a train service, which itself inherited its identity from the express stagecoaches running before the railway.

The train that became the 'Flying Scotsman' has run almost continuously since 1862, with the northbound service traditionally leaving King's Cross for Edinburgh Waverley at 10am. The 'Flying Scotsman' was a key part of the 19th Century contests between the East Coast and West Coast Main Lines to bring passengers the fastest Anglo-Scottish trains. Subsequently, however, the rival companies agreed that rather than aiming for the fastest possible times, they would limit themselves to 8 ¼ hours between London and Glasgow or Edinburgh. Even when the non-stop 'Flying Scotsman' was introduced in 1928, it at first kept to the old times! Then, in 1932, the schedules finally began to be speeded up.

In later steam years the non-stop mantle was passed to other high-profile trains such as the 'Elizabethan' (which was hauled by 'A4s') – and after Gresley's 'Pacifics' were replaced by diesels, non-stop services were abandoned completely. Even so, the 'Deltics' were able to run continuously at 100mph, meaning the distance could now be covered in six hours. Electrification of the route followed later, being finished in 1990.

After a period when the name was out of use, modern operator East Coast reintroduced the 'Flying Scotsman' title in May 2011. Today's train runs southbound only, leaves Edinburgh before 6am, and takes four hours.



July 17, 1933 and 'A1' No. 4472 *Flying Scotsman* stands at London King's Cross at the head of the 'Flying Scotsman' non-stop train to Edinburgh. **CORBIS**



The record-breaking engine from 1935, *Papyrus*, on shed at Dundee in later years. The 108mph reached by *Papyrus* is still the highest speed recorded by an 'A3'. In the background is a far less glamorous locomotive, 'War Department' 2-8-0 No. 90444. **COLOUR-RAIL**



# LATER DEVELOPMENT

Gresley's development of his first 'Pacifics' didn't stop with the upgrade of the engines from 'A1' to 'A3' status. After trying various modifications to the exhaust system, in 1937 Gresley had a double-Kylchap blastpipe fitted to No. 2751 *Humorist*.

The new layout, which had previously been tried on Gresley's 'P2' 2-8-2, was designed to improve efficiency by allowing locomotives to 'breathe out' more freely. *Humorist's* exhaust was now softer, which led to smoke and steam drifting down in front of the cab. Various designs were tried to

cure the problem, culminating in large smoke deflectors being fitted in 1947.

Although the new exhaust was otherwise successful, it wasn't until the 1950s that double chimneys spread across the class; BR started fitting Kylchap exhausts throughout the 'A3' fleet in 1958.

By then, even these prestigious locomotives had to deal with poor coal and the efficiency improvement was welcome.

BR, however, chose a different smoke-clearing layout, using German-style 'trough' deflectors. Visually, the deflectors and double chimneys made the 'A3s' more





modern and purposeful looking – though critics argued that the previous elegance was sacrificed.

Other modifications included converting the class from right-hand to left-hand drive and, from 1954 onwards, fitting the more modern 'A4' pattern boiler. However, even these boilers were only rated at 220lb/sq in on the 'A3'.

By this time, the 'A3s' had long since lost their corridor tenders. With the introduction of the 'A4s',

the last of the older 'Pacifics' had given its up in 1937.

### 'A3' Territory: East Coast Main Line

Running for 393 miles between London's King's Cross and Edinburgh's Waverley stations, the East Coast Main Line was (and still is) one of two principal Anglo-Scottish routes.

From King's Cross the line climbs through tunnels before heading out through the northern

### THE RIVALS COMPARED

#### Great Western Railway 'Castle'

The 'Castle' was a smaller design – a 4-6-0 without carrying wheels at the rear. It was introduced by the Great Western in 1923, with chief mechanical engineer Charles Collett building on the traditions set up by his predecessor George Jackson Churchward. The design was extremely efficient – and 'Castles' continued to be built until 1950, two years after the GWR had become part of BR.

#### London Midland and Scottish Railway 'Princess Royal'

It was 1933 before the LMS began building big 'Pacifics', starting with the 'Princess Royal' 4-6-2s. In contrast to the three-cylinder 'A1' and 'A3' designs (but like the 'Castle' with which it shared its heritage), the 'Princess Royal' had four cylinders. The 'Princess Royal' also became the basis for the later 'Princess Coronation'.

No. 60108 *Gay Crusader* arrives at the stop-blocks at London's King's Cross station in this undated view, but likely to be late 1950s/early 1960s. Built in 1923, this locomotive was rebuilt from an original 'A1' to 'A3' in January 1943 and was withdrawn in November 1963. **CORBIS**



The first double-chimney 'A3' No. 60097 *Humorist*, with Thompson style smoke deflectors, approaches Coal Town of Balgonie with the 4.15pm Edinburgh Waverley to Aberdeen express in c1955. **W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON**



Destined to be the last LNER 'A3' in service, No 60052 *Prince Palatine* departs from Edinburgh Waverley with a last 'A3' special to Newcastle on June 5, 1965. **W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON**





London suburbs and via Hatfield and Stevenage to Peterborough. Between there and Grantham comes the climb to Stoke summit (in the other direction, this is where *Flying Scotsman* was measured at 100mph in 1934 and *Papyrus* at 108mph in 1935).

York and Newcastle follow, before the ECML stretches out along the Northumberland coast to Berwick-upon-Tweed, site of the spectacular Royal Border Bridge, and then into Scotland for the final part of the run to Edinburgh. Today, the ECML is electrified throughout; trains travel at up to 125mph. ■



LNER 'A3' 'Pacific' No. 2572 *St Gatien*, still in the wartime black livery with 'NE' on its tender, waits to take over a down express at Grantham on June 11, 1946. T.G. HEPBURN/RAIL ARCHIVE STEPHENSON





## SPOTTER'S POINTS

In single-chimney form, Gresley's 'A3' was an elegant, smoothly proportioned machine. Its large boiler, short chimney and (where fitted) Banjo dome were characteristic features, set off for most of the LNER period by Apple Green livery.

An obvious 'family likeness' existed between the 'A3' and other Gresley designs such as the mixed-traffic 'V2' 2-6-2. Later 'Pacifics' such as the Peppercorn 'A1' and 'A2' classes also showed a clear relationship to their predecessors.

A more powerful look came later, when the double Kylchap exhaust system pioneered on *Humorist* was fitted to the whole class. BR's subsequent adoption of German-style smoke deflectors, to stop the softer exhaust from the Kylchap system drifting in front of the cab, completed what had become a very different image; arguably, this final condition was more distinctive than anything that had come before.

## Liveries

**APPLE GREEN:** The LNER's traditional express livery was a

variation on the colours previously used by the Great Northern. Apple Green was set off by black and white lining, with larger black areas utilising red lining. Although replaced in wartime by all-over black, Apple Green was revived after the Second World War.

**WARTIME BLACK:** As with so many other locomotives, the 'Pacifics' were painted plain black during wartime – a livery briefly revived by the National Railway Museum on *Flying Scotsman* in 2011.

**BR BLUE:** The 'A3s' were painted BR blue during the newly nationalised

railways' early period (some even received the experimental, almost purple, version). The colour proved short lived.

**BR BRUNSWICK GREEN:** Brunswick Green with black and orange lining appeared from 1951, and became the standard livery until withdrawal. The earlier 'cycling lion' was replaced by the later style emblem from 1957 onwards. During this latter period the engines had double chimneys and smoke deflectors added.

■ *Note: The above summary is indicative only – many variations appeared.*

An immaculate railway in a perfect landscape... *Flying Scotsman* passes Hadley Wood with the afternoon 'Talisman' express from King's Cross to Edinburgh Waverley on September 8 1959.

O J MORRIS/RAIL ARCHIVE STEPHENSON



By now fitted with a double chimney (which it received in 1958), No. 60090 *Grand Parade* has just taken the Stirling line at Hilton Junction, south of Perth, with an Aberdeen-Glasgow Buchanan Street train in June 1962. *Grand Parade* was fitted with German-style deflectors in 1963, the year it was withdrawn.

W J VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON



Now classified 'A10' and still with the wartime abbreviated 'NE' on its tender, No. 103 *Flying Scotsman*, passes a temporary speed restriction sign just after passing Barkston Junction with an up express on July 6, 1946.

T.G. HEPBURN/RAIL ARCHIVE STEPHENSON





# SAVING AN 'A3'

**T**he 'A3' era should have ended in January 1966, when No. 60052 *Prince Palatine* was taken out of traffic. By that time 'Deltic' diesels had taken over the East Coast Main Line's top jobs, and later that year even the 'A4s' would disappear from service.

However, the businessman Alan Pegler made sure Gresley's classic 'A3' design would not completely disappear; Pegler stepped in to save

*Flying Scotsman*, acquiring it from BR in 1963. Not only did Pegler rescue the most famous 'A3', he paid to have a single chimney put back on, in place of the 'trough' deflectors and double chimney. *Flying Scotsman* was then repainted Apple Green, and renumbered from '60103' to '4472'.

Prudently, Pegler also acquired a spare boiler, plus spare cylinders from classmate No. 60041 *Salmon Trout*. A second tender was added





as well to give the engine extra range on a railway fast ditching its steam age water facilities. A deal was also agreed with BR whereby the engine could keep running – despite a subsequent steam ban. *Flying Scotsman* would haul enthusiasts' trips – and in 1968 it even undertook a final 'non-stop' before the East Coast Main Line's last water troughs were taken up.

Then in 1969 Pegler tried something even more ambitious –

a British trade train across North America. It worked, to start with, but then the cash began to dry up. Eventually the saviour of 'Scotsman' ran out of money and the 'A3' went into store. From then on, it once again hauled special trains, until in 1988 it made another trip overseas.

This time, *Flying Scotsman* went to Australia to mark that country's bicentenary. While 'down under', and hauling extra water in a special bowser, *Flying Scotsman* set up a

new non-stop steam distance record – 422 miles. The engine returned to the UK 15 months after leaving.

The 1990s brought a tie-up between McAlpine and pop music businessman Pete Waterman – and a period when 'Scotsman' ran with double chimney, smoke deflectors and BR Brunswick Green paintwork. After that, however, the engine was sold again. The new owner was Tony Marchington, who had the locomotive overhauled and returned

to Apple Green – albeit with double chimney and, later, smoke deflectors too. Subsequently, Marchington transferred the engine to a new firm, Flying Scotsman plc. It was when that company ran into financial difficulty that the 'A3' was once again sold. This time, the National Railway Museum stepped in.

### Return to Steam in 2015

*Flying Scotsman* is expected to steam some time in 2015. If it does, that will be around a decade after the last surviving Gresley 'A3' last moved under its own power – and following a massive rebuild.

The LNER 'Pacific' has been owned by the National Railway Museum since 2004. That's when it was bought for the nation for £2.3m, following a £1.8m grant from the National Heritage Memorial Fund and a public appeal that raised £365,000 and was matched by Sir Richard Branson. Previously, the 'A3' had been owned and run by private owners ever since 1963, when businessman Alan Pegler saved the then No. 60103 for preservation.

York ran *Flying Scotsman* on the main line in 2004 and 2005, although the museum also carried out a fair amount of intermediate work in that time, before deciding that a full overhaul was to start following the end of the 2005 season. The hope had been that the refit would be finished in 2007, with an expected cost of around £3¼m.

In fact, it was the start of a long-running saga that has led to what is now a £3.8m strip-down and rebuild, with large sections of the boiler being completely replaced, and parts of the frames too. The result will be one of the – if not the – most far reaching overhauls ever undertaken in preservation.

At times, the museum has believed the work to be close to completion – not least when the engine was unveiled at York in May 2011 and expected to be steaming that year – but the on-going discovery of further work caused the programme to be repeatedly extended.

That, and the resulting increase in cost, has at times raised questions among some observers as to whether the locomotive would – or even should – be finished or whether it might instead simply be put on static display. However, following a pair of reports concentrating firstly on the overhaul itself and secondly recommendations for what should happen next, the museum confirmed that it would finish the job. The first of those reports was completed in October

In recent years the only surviving 'A3' has run with a double chimney and smoke deflectors but also been painted Apple Green, a condition that it has only been in during preservation. In October 2000 *Flying Scotsman* hauls the 'Royal Scotsman' luxury train near Culloden. **JOHN COOPER-SMITH**





Is this the world's most famous locomotive?  
*Flying Scotsman* leaves York with a special  
 train on May 25 1981. **JOHN COOPER-SMITH**



2012; the second was published by the museum in March 2013 and recommended seeking an external contractor to take on the remaining sections of work.

That October the NRM announced it had done a deal with specialist steam engineers Riley and Son (E) of Bury to bring the overhaul to completion - subject at that point to examination of sections of the frames which were hidden behind the cylinders. A final go-ahead was announced in January 2014.

Additional money was found from within the Science Museum Group - of which the NRM is part - to add to the previous funds that also included donations from the public, sales of *Flying Scotsman* products, and £275,000 from the Heritage Lottery Fund. The deal includes a commercial partnership under which Riley will manage operation of the completed locomotive for two years.

### The rebuild

A major part of the overhaul has centred around the boiler, of which large sections are new: other than the throatplate *Flying Scotsman* now has a new firebox; there are new tubeplates at both ends of the boiler; and tubes, stays, and the smokebox have been replaced. The boiler work was undertaken by Riley's and by R K Pridham's, which has now become part of the South Devon Railway.

When it steams, *Flying Scotsman* will once again run with an 'A3' boiler; the locomotive came into the national collection with two boilers and the decision was taken to return to the one that had been 'spare', rather than the 'A4'-pattern version that had most recently been used (something that did happen with some 'A3s' in latter service days). The 'A4' boiler has now been sold for re-use, becoming the spare for 'A4' No. 4464 *Bittern* which is now part of the collection brought together by businessman Jeremy Hosking.

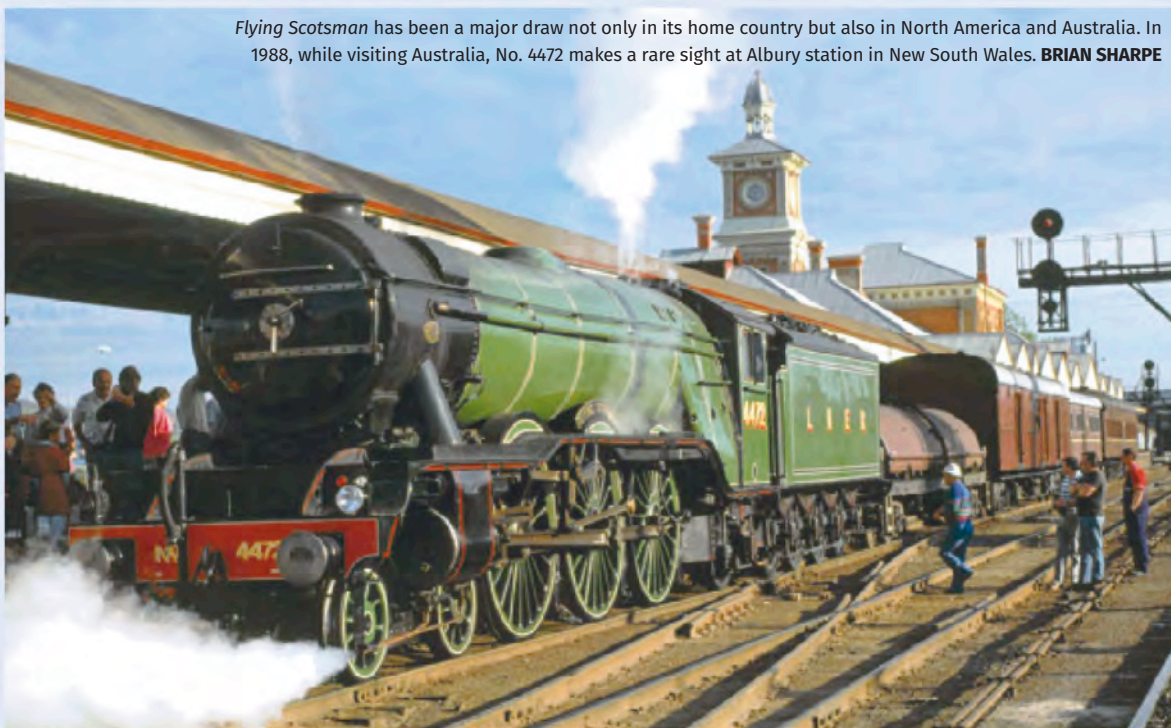
Completion of the boiler rebuild was undertaken in time for it to undergo a steam test in 2011.

### The 'bottom end'

It was the discovery of cracks in the hornblocks (part of the assembly holding the axles) in summer 2011 when the reassembled Gresley 4-6-2 had already been shown off as a static engine that prompted its renewed dismantling for further work. This has now included replacing areas of the frames.

When *Flying Scotsman* steams, the front 12ft of its frame plates - the vertical sheets of metal that form part of the locomotive's basic

*Flying Scotsman* has been a major draw not only in its home country but also in North America and Australia. In 1988, while visiting Australia, No. 4472 makes a rare sight at Albury station in New South Wales. **BRIAN SHARPE**





structure - will be completely new. That follows a decision to replace them in the summer of 2014; this was because it was found that the bolt-holes where the cylinders are attached had become elongated. Frame stretchers have also been replaced, as has the smokebox saddle - the piece of the locomotive's structure on which the smokebox itself rests.

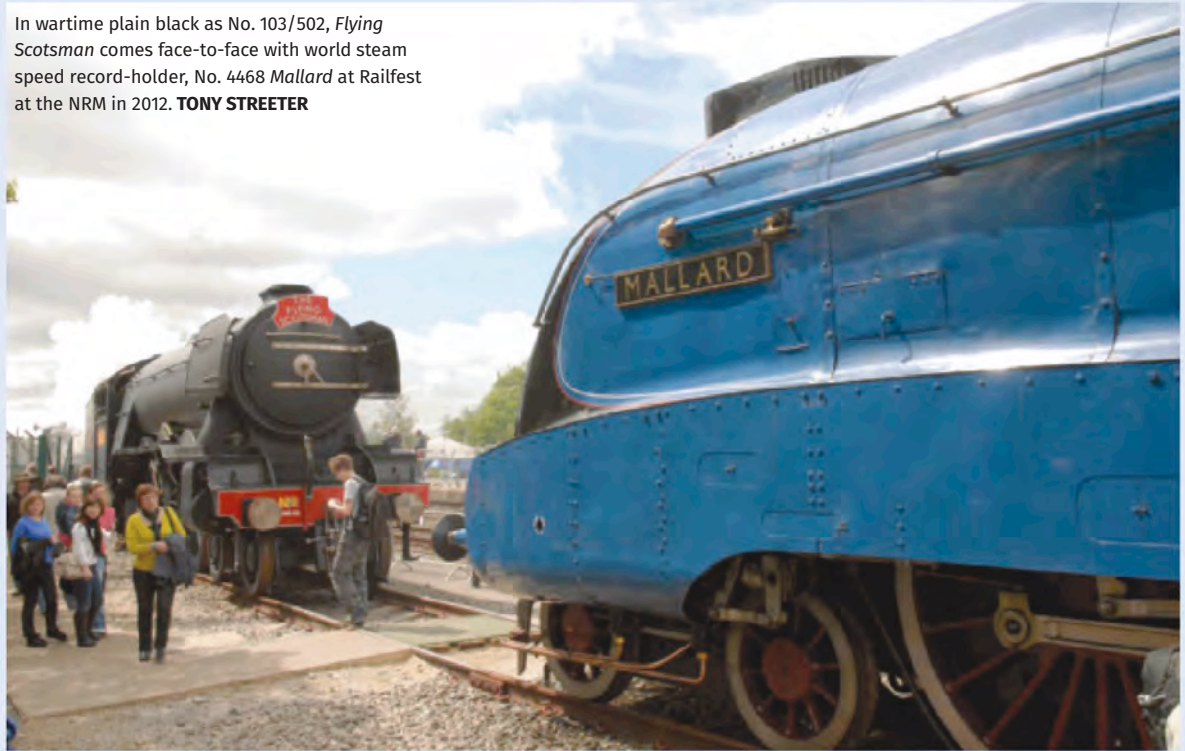
An extra boiler wasn't the only spare part acquired from British Railways by Alan Pegler, and in future the NRM's 'A3' will use the right-hand cylinder that was formerly on classmate No. 60041 *Salmon Trout*. *Flying Scotsman*'s own casting was cracked. Work has also been carried out on the middle cylinder, and the cylinders have also had liners fitted.

Repairs to wheel cracks have taken place, and the Doncaster locomotive has had vacuum-brake gear returned to it, to complement the air-braking previously fitted but which had hitherto completely taken the place of the traditional system. Although air-braking has been standard on the modern railway for many years, the absence of vacuum braking had restricted the engine's ability to haul trains on preserved lines, most of which rely on vacuum-braked coaching stock.

During its period in operation with the NRM *Flying Scotsman* ran with the later BR exhaust arrangement with double Kylchap blastpipes and chimney, and the German-style smoke deflectors introduced in the early 1960s. However it also retained its LNER apple green livery and number 4472 - thus continuing an historically incorrect combination only so far seen on the locomotive in the 2000s. Presenting the engine in a fully authentic guise would however be difficult, as it is also coupled to a corridor tender, which it did not have in BR days. Indeed, *Flying Scotsman* has only run as an 'A3' (as opposed to the earlier 'A1'/'A10' variant of 'Pacific') since 1947, by which time it had already lost the number 4472 - it never ran in service as an 'A3' as No. 4472, even with a single chimney.

Previously, the NRM had intended to undertake running-in and trials in a version of wartime black (albeit with double chimney) complete with two numbers the engine carried in the 1940s - Nos. 502 and 103. It was in this colour that *Flying Scotsman* was unveiled in 2011, and appeared as a static exhibit at York's 'Railfest' the following year. However, more recently the museum has said that decisions on liveries would now be

In wartime plain black as No. 103/502, *Flying Scotsman* comes face-to-face with world steam speed record-holder, No. 4468 *Mallard* at Railfest at the NRM in 2012. **TONY STREETER**



*Flying Scotsman* undergoing heavy bottom end repairs inside the workshops of Riley & Sons at Bury. **TONY STREETER**



made nearer to the completion of the restoration.

#### Where now?

Although much of the earlier work was done in the museum's own workshop, the deal with Riley and Son means the rest of the rebuild is being undertaken in Riley's premises in Bury, Lancashire. The intention is that *Flying Scotsman* will run at some point in 2015. When it does steam, and the locomotive finally reaches the end of this massive rebuild, it should be ready for many years of use. ■

#### WANT TO KNOW MORE?

- *British Pacific Locomotives*, Cecil J Allen, Ian Allan, second edition, 1971.
- *Speed Records on Britain's Railways: a chronicle of the steam era*, O S Nock, Pan Books, 1972.
- *Locomotives of the LNER, part 2A tender engines - classes A1 to A10*, Railway Correspondence and Travel Society, 1973.
- *East Coast Pacifics at Work*, Peter Townend, Ian Allan, 1982.
- *The Gresley Pacifics (new omnibus edition combining parts 1 and 2)*, O S Nock, Book Club Associates, 1982.
- *Flying Scotsman: the extraordinary story of the world's most famous train*, Andrew Roden, Aurum, 2007.
- *The Flying Scotsman: the train, the locomotive, the legend*, Bob Gwynne, Shire Publications, 2010.



# CHAPTER TWO

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# GRESLEY 'A4s'

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BY TONY STREETER





**O**n July 3, 1938 *Mallard* crawled through Grantham at about 25mph. Just over ten minutes later, it had become the fastest steam locomotive on the planet.

For ahead of the London and North Eastern Railway's new No. 4468 at Grantham on that summer's day was the climb to Stoke tunnel around five miles away - then the racing section towards Tallington some 15 miles further on, almost all of it downhill.

Stoke Bank was where, four years before, *Flying Scotsman* had been measured at 100mph - and it was where, now, the LNER planned to take the British steam speed record from its rival the London, Midland and Scottish Railway. To do it, the blue streamliner would have to top 114mph - the speed reached by the LMS the year before. Gresley's new 'Pacific' might even snatch away the Germans' 124.5mph world record, set in 1936.

*Mallard* did both, just. At the time the LNER claimed 125mph, though this was later upped to 126mph. That has never been bettered by steam to this day.

Officially, the run had been to test brakes. Unofficially, hush-hush preparations had laid the plans for a record attempt. That was why the train ran as far as Barkston - north of Grantham - so

# WORLD RECORD HOLDER



Here it is... *Mallard*, complete with dynamometer car and test train, speeds past Potter's Bar in July 1938. **K H LEECH/COLOUR-RAIL**

it could have a crack at Stoke on the way home. Barkston had a triangle, so the train could be turned round for the return run.

Even the engineers from brake company Westinghouse, working on the trials, were kept out of the secret. It was only after the

northbound run from London's Wood Green that they were told - and given the choice of taking a taxi. They stuck with the train.

*Mallard* had been chosen and a Doncaster crew: Joe Duddington would drive the fastest steam locomotive ever, and Tommy Bray would fire it. Just three months old, No. 4468 was the first of four new engines equipped with the new double-Kylchap exhaust, an arrangement so successful it was later fitted to the whole class.

The LNER's 'dynamometer car' test coach was tagged along so that performance could be accurately logged. Train timing expert Cecil J. Allen had been invited too, but he was a dedicated Methodist - and July 3 a Sunday. He declined. So, in the last full year before the Second World War, *Mallard* raced down Stoke Bank to snatch the world record from Germany. No serious challenge was ever mounted.

In its 25-year career *Mallard* would never have such an exciting day again, but it had assured a place in history not only for itself, but also for Gresley and the LNER.

Now preserved as part of the UK's national collection, No. 4468 is normally displayed at the National Railway Museum in York. On its gorgeous streamlined sides, plaques proclaim: "On 3rd July 1938 this locomotive attained a world speed record for steam traction of 126 miles per hour." ■

In 1938, the year it broke the world record, *Mallard* has just passed New Southgate in London with the northbound 'Yorkshire Pullman'.  
**COLLING TURNER/RAIL ARCHIVE STEPHENSON**





The most famous train of all? The 'Coronation' leaves London's Gasworks tunnel behind No. 4467 *Wild Swan* in July 1938. **GEORGE R GRIGS/RAIL ARCHIVE STEPHENSON**





# 'SILVER JUBILEE' STUNNER!

**M**allard's record was just the latest feat for a design introduced only three years before.

In September 1935 the LNER had unveiled its new 'Silver Jubilee' express – 'Britain's first streamline train'.

On the trial trip on September 27, No. 2509 *Silver Link* had pushed to a maximum of 112.5mph – twice. The pioneer 'A4' also ran for 25 miles continuously at 100mph-plus, and more than 41 miles at an average of just over 100mph. Both were world records

– and this was under a year since *Flying Scotsman* had achieved the world's first 'authenticated' 100mph.

As an impressed O.S. Nock later said in his book *Speed Records on Britain's Railways*: "The changes in design between the A3 and A4 classes had advanced the normal maximum from 90mph range to 110mph plus!"

Just three days after the record-breaking trial, the 'Silver Jubilee' entered normal service. Trains ran non-stop between London and Darlington, and again between





## WELL I NEVER!

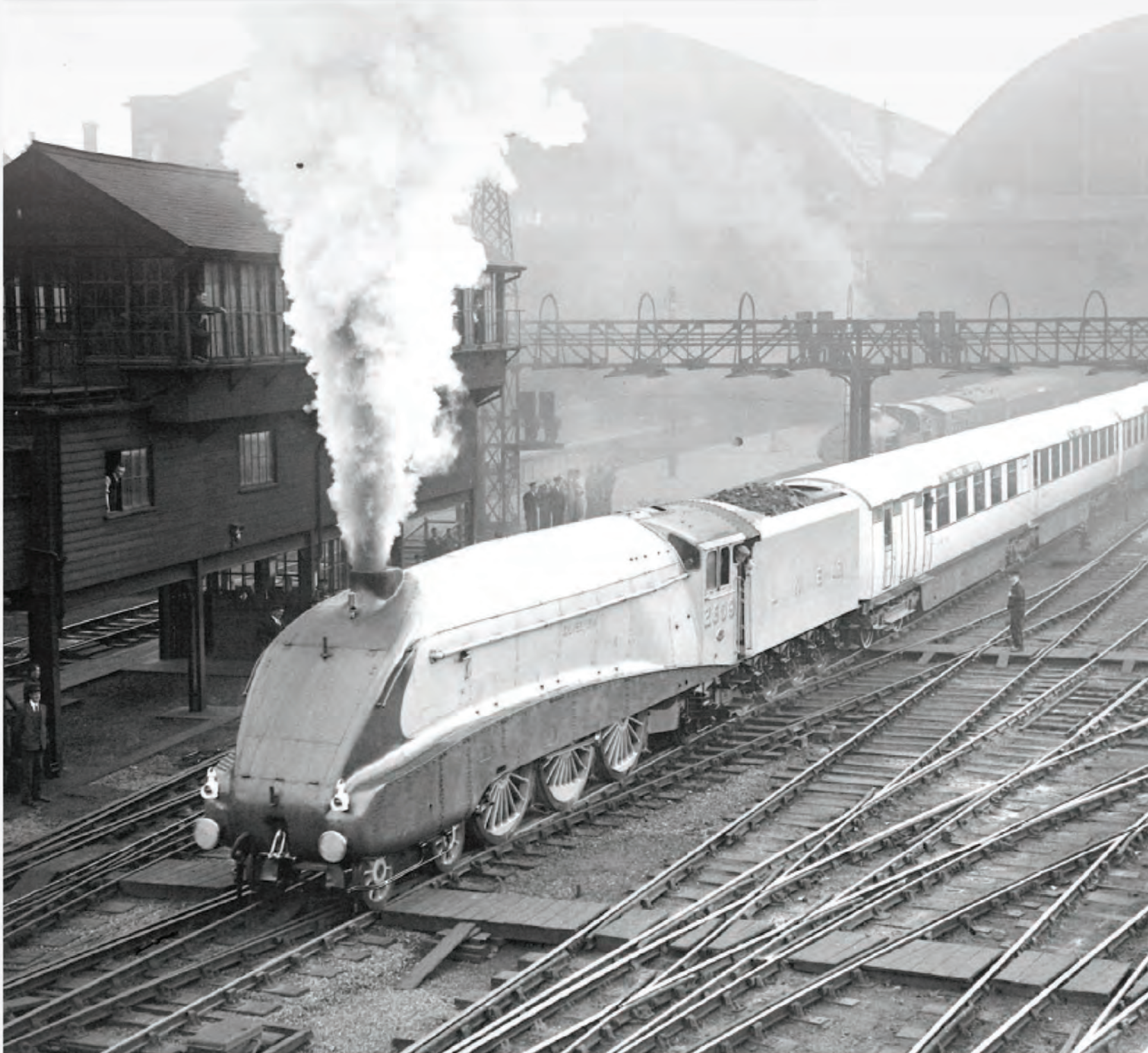
## (SOME INTERESTING FACTS YOU MAY NOT KNOW)

- Although they carry the LNER logo, the world-record plaques were actually mounted on the sides of *Mallard* in 1948. They are therefore not actually authentic to the engine's LNER condition with side valances.
- In 1944 No. 4486 *Merlin* briefly appeared for photographs numbered and named as Nos. 1928 *Brigid*, 1931 *Davina* and 1934 *Bryan*. These were the years of birth and names of an LNER director's children.
- The only 'A4' scrapped in LNER days was No. 4469 *Sir Ralph Wedgwood*, damaged beyond economic repair in an air raid on York shed in 1942. The spot, now inside the National Railway Museum, is marked by a plaque. The *Sir Ralph Wedgwood* name was afterwards put on No. 4466.
- A sign alongside the East Coast Main Line now marks the spot near Essendine where *Mallard* reached 126mph.
- The 'A4's could have looked very different – the original proposals looked a lot more like Gresley's earlier 'P2' 2-8-2.
- Problems clearing smoke and steam from the driver's vision on the proposed design was solved by chance – when someone put a thumbprint behind the chimney of the putty model being used in the wind tunnel! The indentation made the exhaust lift clear.
- There could have been more LNER streamlined 'Pacifics' after the Second World War – the 'A1s' were planned to have streamlining, but they appeared after nationalisation in 1948, and the new British Railways built the engines without it.

there and Newcastle. The new engines were expected to regularly run at 90mph.

It was three weeks until the second engine, No. 2510 *Quicksilver*, was ready. In that time *Silver Link* racked up a huge 8,000 miles – without failure. Two other 'silver'-themed 'A4s' followed, Nos. 2511 *Silver King* and 2512 *Silver Fox*.

Two years later the LNER's latest streamlined train, the 'Coronation', was chopping travel times over the full 393 miles between London and Edinburgh. The new train included swivelling seats in First Class, two kitchen cars, air-conditioning (a first for Britain) and a streamlined





observation car. The 'Coronation' also marked the introduction of the famous Garter Blue livery that later became standard for the 'A4s', though not all of them received the full chrome 'Coronation' trim, numbering and lettering.

The 'Coronation' brought the London to Edinburgh schedule down to just six hours. No wonder the new class picked up the nickname 'Streak'. ■

**BELOW:** LNER 'A4' No. 2509 *Silver Link* leaves London's King's Cross on September 27, 1935 resplendent in the silver/grey 'Silver Jubilee' livery and matching train of coaches. **CORBIS**



'A4' 'Pacific' No. 4496 *Golden Shuttle* (later to be re-named *Dwight D. Eisenhower*) passes Ganwick between Hadley Wood and Potter's Bar with a down express in 1938. **JAMES R. CLARK/RAIL ARCHIVE STEPHENSON**

LNER Class 'A4' 4-6-2 No. 4489 *Dominion of Canada* passes Haringay with the 4pm 'Coronation' express from King's Cross to Edinburgh Waverley in 1937. **W.S. GARTH/RAIL ARCHIVE STEPHENSON**



## MEASURING THE SPEED

How do you measure 126mph? In 1938 the answer was a dynamometer car – a coach full of equipment to accurately record what's going on with a locomotive being tested. The basic concept is said to date back to Brunel.

The dynamometer car used for *Mallard's* record run was the same one used to measure the 100mph by *Flying Scotsman* in 1934. In fact, the car is much older even than

that, having been built for the North Eastern Railway around 30 years before.

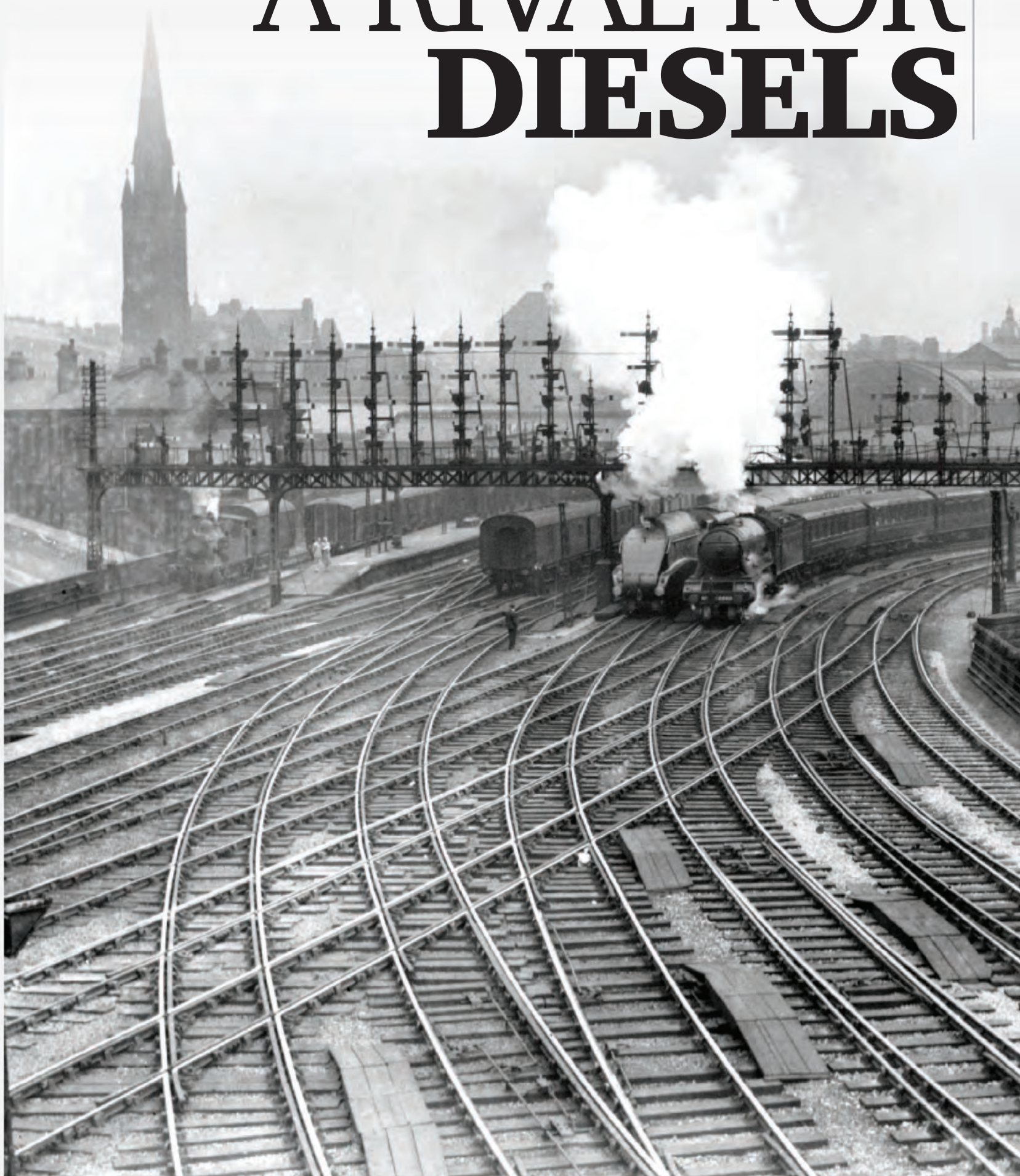
Key to the dynamometer car is a ninth wheel, not for carrying the coach, but to drop onto the track to measure the distance travelled. A massive spring attached to the drawhook of the coach allows the effort of the engine to be recorded, there's a microphone to allow the

car's operators to speak to the locomotive crew, and a loudspeaker to hear what's happening on the footplate.

Through linkages, pens mark a roll of paper – which allows the working out (among other things) of how fast the train is travelling. The car, saved after being taken out of service in the 1950s, is in the National Railway Museum at York.



# A RIVAL FOR DIESELS





If the LNER's original ideas had been followed, there might never have been any 'A4s'. In the 1930s, after introducing non-stop trains between London and Edinburgh, the LNER was looking to increase speeds. Germany's new 'Flying Hamburger' diesel units seemed a possible solution.

These trains were making a big difference in their home

country, where faster trains were being introduced to compete with private cars and the new Autobahn high-speed roads. Yet the prospects proved disappointing. The East Coast Main Line is fairly flat, but not as flat as the route between Hamburg and Berlin, and the Germans reckoned 'Flying Hamburger' units would achieve an average speed of just over 60mph.



The famous crossovers just outside Newcastle station often witnessed parallel departures. In this view taken on May 23, 1936, the identity of the 'A4' on the left isn't known, but the locomotive on the right appears to be LNER 'A3' No. 2582 *Sir Hugo*. CORBIS



Fitting the whistle to No. 2509 *Silver Link* at Doncaster in 1935. CORBIS

#### FACT FILE: 'A4' IN DETAIL

CONSTRUCTED AT:	Doncaster Works, UK
BUILT:	1935-1938
IN SERVICE:	1935-1966
WHEEL ARRANGEMENT:	4-6-2 (2'C1h)
DRIVING WHEEL DIAMETER:	6ft 8in (2.03m)
BOILER PRESSURE:	250lb/sq in (17 Bar)
FIREBOX GRATE AREA:	41.25sq ft (3.83sq m)
CYLINDERS:	Three, 18½ in x 26in (470mm x 660mm)
VALVE GEAR:	Walschaerts, with Gresley 'conjugated' drive
TRACTION EFFORT:	35,450lb (158kN)
LENGTH (WITH CORRIDOR TENDER):	71ft 3/8in (21.65m)
WEIGHT:	102 tons 19cwt (104.6 tonnes)
MAXIMUM RECORDED SPEED:	126mph
NUMBER BUILT:	35

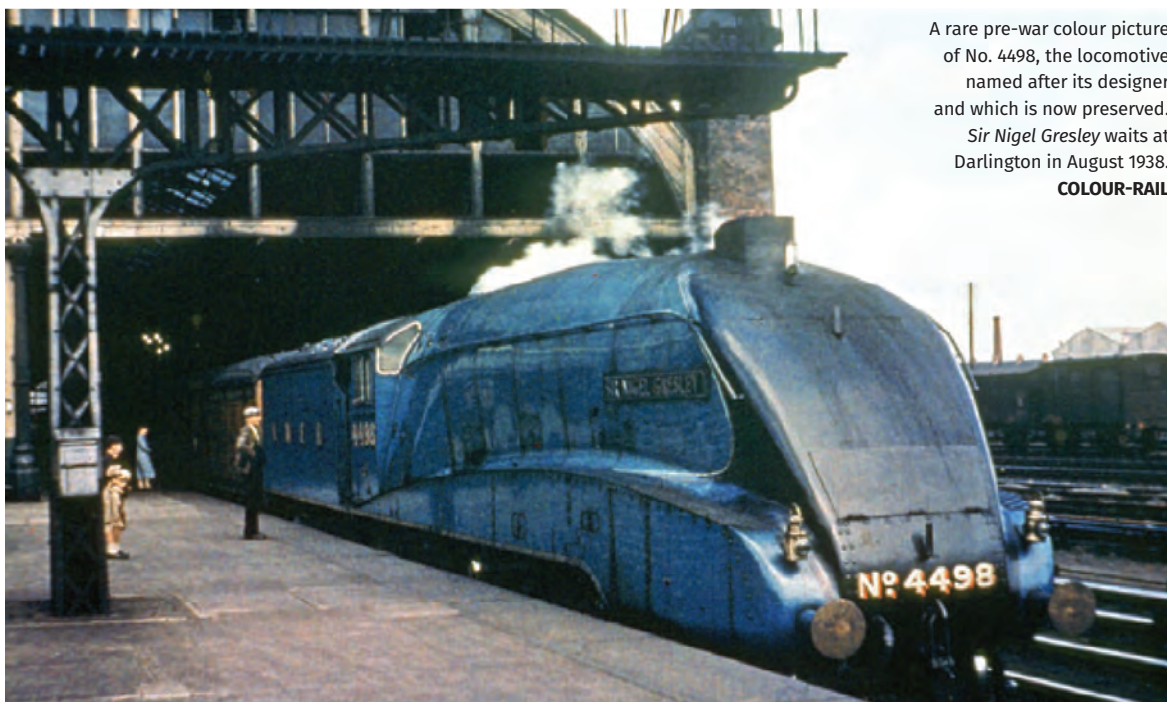


'A4' No. 2510 *Quicksilver* in original condition, passes Ganwick with the down 'Silver Jubilee' from King's Cross to Newcastle in 1936. F.R. HEBRON/RAIL ARCHIVE STEPHENSON





**THE OLD AND THE NEW 2:** Stirling 'Single' 4-2-2 No. 1, the Great Northern Railway's flagship locomotive, meets one of the LNER's new order at Stevenage on June 30, 1938, in the shape of No. 4498 Sir Nigel Gresley. **CORBIS**



A rare pre-war colour picture of No. 4498, the locomotive named after its designer and which is now preserved. Sir Nigel Gresley waits at Darlington in August 1938.

**COLOUR-RAIL**

Gresley reckoned the LNER didn't need to go abroad – or move from steam – to improve on that. What's more, the extra power a steam-hauled train offered over the lightweight 'Flying Hamburger' meant more comfort could be offered – and in particular a proper dining service. That was important on a run of nearly 400 miles, especially for a luxury service.

So, after trial runs with 'A1' *Flying Scotsman* and 'A3' *Papyrus*, Gresley started work on a new 'Super Pacific' – a design that ended up as the 'A4'.

The streamlined casing, and the new silver grey livery (a version of which ran all along the train), made the new 'A4' a visual sensation. The name 'Silver Jubilee' was chosen to mark the 25th anniversary of King George V becoming Britain's monarch.

Under its streamlined skin, *Silver Link* owed much to Gresley's previous designs – especially the



Information on this picture is scant, but is thought to be No. 2509 *Silver Link* on September 1, 1935, shortly after completion at Doncaster. CORBIS





'A3'. Even so, a higher pressure boiler (250lb/sq in instead of 220lb/sq in), and numerous tweaks meant the 'A4' was perfect for sustained high-speed running. When it was later twinned with the double-Kylchap exhaust the design became a world-beater.

However, it wasn't infallible: in beating the speed record in July 1938, driver Joe Duddington had pushed his proud 'Pacific' to the point of breaking. Just as *Mallard* reached its maximum speed near Essendine, Duddington had to ease back, after the engine started to run hot.

The problem was the 'big end' on the rod connected to the middle one of the locomotive's three cylinders. Despite the extra oil splashed over it at Barkston this known weak point overheated; the built in 'stink bomb' told Duddington of the problem.

So *Mallard's* driver eased his train onwards to nearby Peterborough, where the 'A4' was replaced by a spare engine. When the press turned up at King's Cross to see the record breaker arrive, all they found was an old Great Northern Railway 'Atlantic'. ■



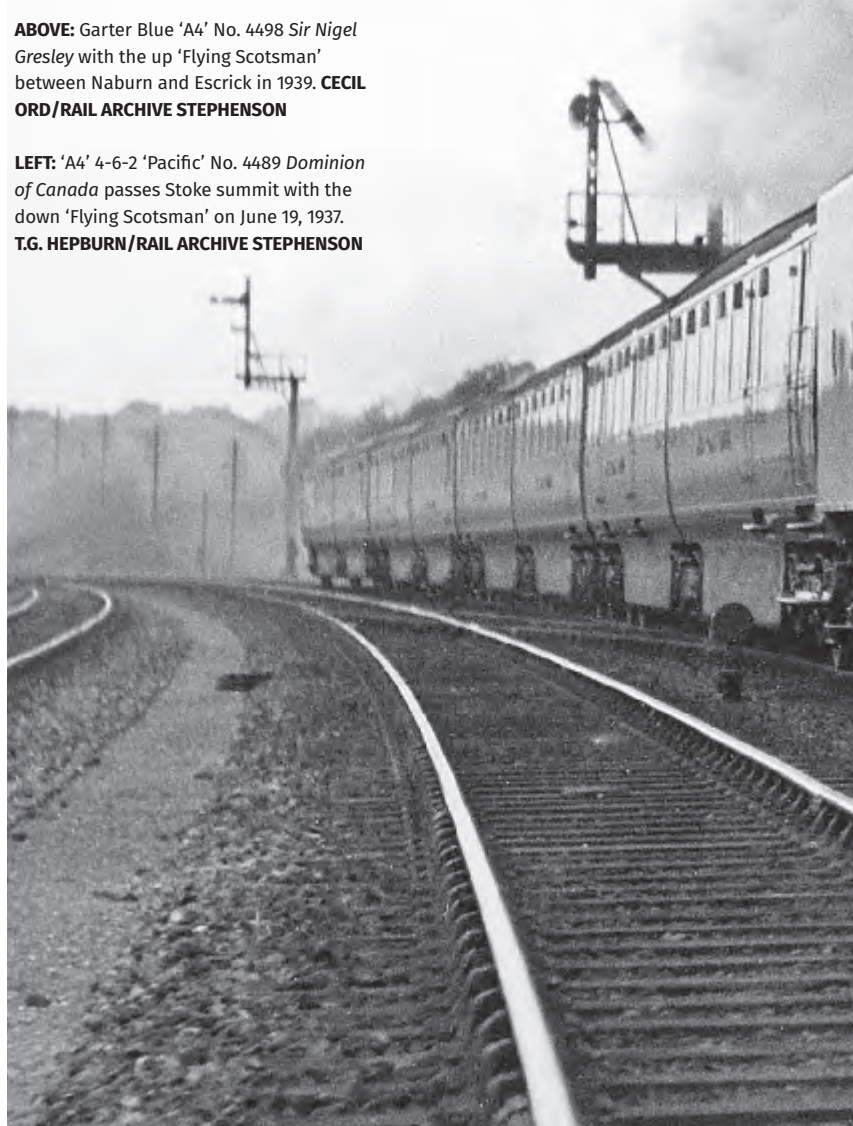
**ABOVE:** Garter Blue 'A4' No. 4498 *Sir Nigel Gresley* with the up 'Flying Scotsman' between Naburn and Escrick in 1939. **CECIL ORD/RAIL ARCHIVE STEPHENSON**



**LEFT:** 'A4' 4-6-2 'Pacific' No. 4489 *Dominion of Canada* passes Stoke summit with the down 'Flying Scotsman' on June 19, 1937. **T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**

## 'A4' MILESTONES

- 1935** *Silver Link* is unveiled and immediately sets records, as well as being used to launch Britain's streamlined era with the 'Silver Jubilee'.
- 1937** The non-stop London-Edinburgh 'Coronation' is launched, together with a new Garter Blue livery.
- 1938** Introduction of double Kylchap exhausts on the 'A4s'. The last four of the class are built with it and one of these locomotives, *Mallard*, breaks the world steam speed record.
- 1941** Removal of side-skirting starts.
- 1955** BR publishes its Modernisation Plan, which foresees the replacement of steam by diesel and electric traction.
- 1957** Fitting of double chimneys begins (to those of the class not already so fitted).
- 1961** The non-stop 'Elizabethan' runs with steam for the last time. From 1962 'Deltic' diesels take over.
- 1962** The first of the 'A4's' – other than No. 4469 *Sir Ralph Wedgwood* destroyed in the war – are taken out of service; they include *Silver Link*. However, a successful trial run over the old Caledonian line between Glasgow and Aberdeen leads to a new area of work for some.
- 1964** *Union of South Africa* is the last 'A4' to leave King's Cross, with a special train in October.
- 1966** In September the 'A4' era comes to an end, when the final engines are withdrawn.





*Golden Fleece* passes Stoke signalbox and begins the dash down Stoke Bank to Peterborough with the up 'West Riding Limited' from Leeds Central to Kings Cross on June 7, 1938. A few weeks later *Mallard* would take the world record on this stretch. **T G HEPBURN/RAIL ARCHIVE STEPHENSON**











# No. 4468 *Mallard*

BY STUART BLACK

'A4' 4-6-2 'Pacific' No. 4468 Mallard. Built Doncaster, 1938, designed by Sir Nigel Gresley (CME LNER) for the London & North Eastern Railway.

World speed record holder for steam. Officially timed at 125.88mph (202.58km/h) on July 3, 1938 whilst descending Stoke Bank, south of Grantham, Lincolnshire.











Classic LNER publicity shot of five 'streamliners' drawing forward simultaneously 'on shed' on November 30, 1937. From left to right are 'A4' Nos. 4492 *Dominion of New Zealand*, 4496 *Golden Shuttle*, 4490 *Empire of India* and 4482 *Golden Eagle*. Whilst on the far right is No. 10000, Gresley's one-off streamlined 'W1' 4-6-4, known as 'Hush'Hush'. **CORBIS**







*Union of South Africa demonstrates the later condition of the class, at King's Cross after having arrived with the 'Elizabethan'. Large double-Kylchap exhaust, lack of valances and BR green complete with the later crest on the tender all date this as a late-steam view. COLOUR-RAIL*

# LATER YEARS

**J**ust over a year after *Mallard's* epic run, the Second World War killed the railways' golden age. The glamorous streamlined trains stopped running at the end of August 1939, and before long dirty wartime replaced Garter Blue on the 'A4s'.

From 1941, the reality of trying to look after run-down engines with insufficient manpower even saw the locomotives stripped of their side skirting over the wheels; the valances never went back on again, even in the more prosperous and peaceful 1950s and 1960s.

One of the 'A4s' was even destroyed – No. 4469 *Sir Ralph Wedgwood* was written-off in an air raid on York in 1942. Yet the 'A4s' did amazing wartime work, hauling heavy trains contrasting with the lightweight expresses they were designed for; *Silver Link* is on record as having pulled a 25-coach train out of King's Cross.



*Kingfisher* is a rare visitor to the Southern Region's Nine Elms shed in London. The corridor tender – complete with central gangway to allow changeover of crews mid-trip and which was essential to long-distance non-stop running – can clearly be seen. COLOUR-RAIL

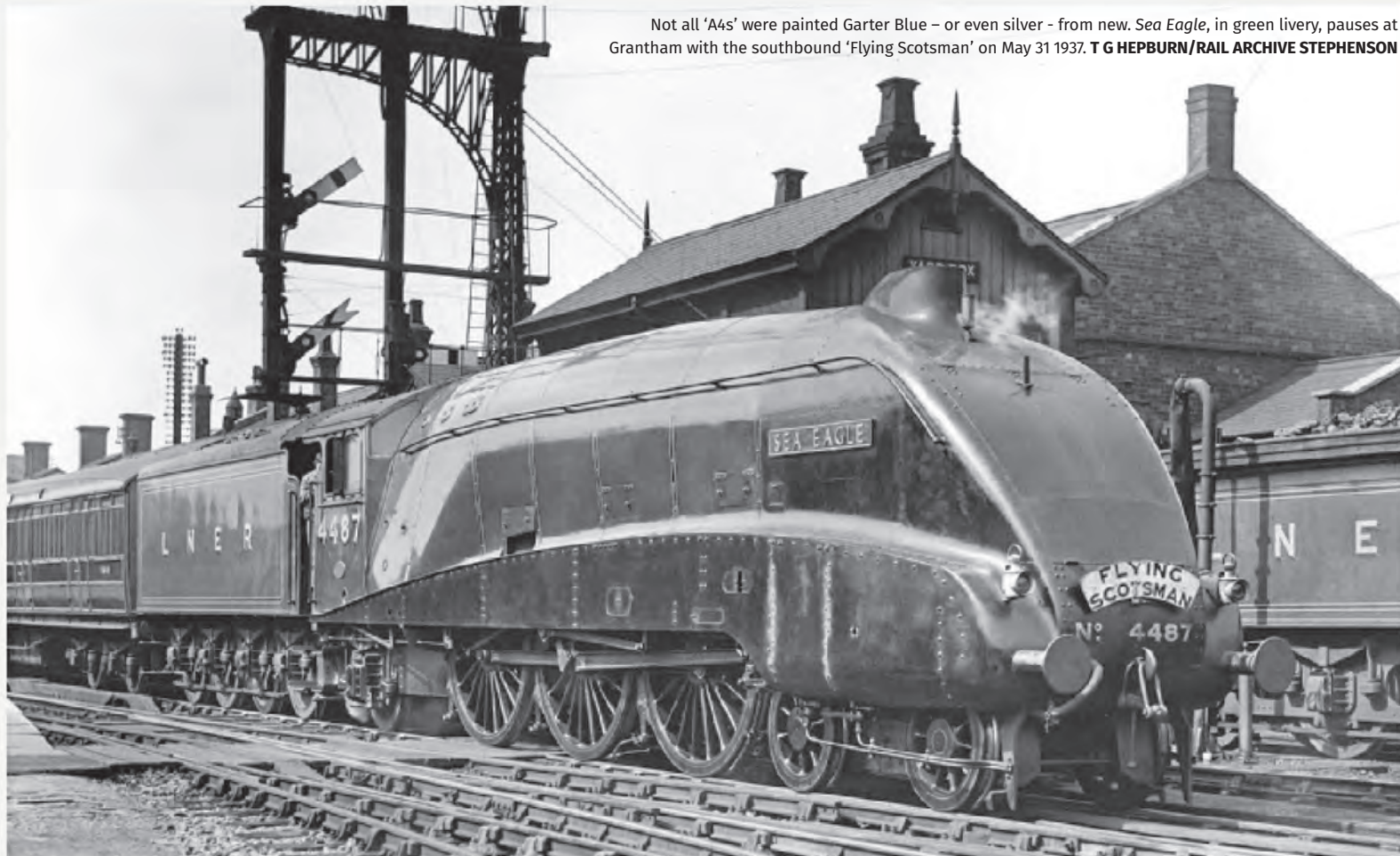


Taken shortly after nationalization in 1948, ex-LNER 'A4' No. 60024 *Kingfisher* is about to set off from King's Cross on the long journey home to Edinburgh at the head of the 'Flying Scotsman'. CORBIS





Not all 'A4s' were painted Garter Blue – or even silver – from new. *Sea Eagle*, in green livery, pauses at Grantham with the southbound 'Flying Scotsman' on May 31 1937. T G HEPBURN/RAIL ARCHIVE STEPHENSON



'A4' No. 4902 *Seagull* seen in the drab wartime plain black livery at Grantham on June 1, 1946. T.G. HEPBURN/RAIL ARCHIVE STEPHENSON



Carrying its early BR number with the 'E' prefix, ex-LNER 'A4' 'Pacific' No E22 *Mallard* approaches Grantham with the down 'Queen of Scots' Pullman train on May 7, 1949. JOHN P. WILSON/RAIL ARCHIVE STEPHENSON



A sign that things were getting better came in 1949 with the start of a new non-stop service between London and Edinburgh: the 'Capitals United'. By that time, the LNER had been absorbed into British Railways, and Garter Blue was being replaced by new colours.

In 1953, the 'Capitals United' became the 'Elizabethan' – this time in homage to the new Queen Elizabeth – and the final years of 'A4' glory began. They finally came to an end with the introduction of the new 'Deltic' diesels; the 'Elizabethan' ran with steam for the last time in 1961.

The era of the 'A4s' on their home stretch was over, and the

## LIVERIES

**SILVER:** The first four locomotives, built for the 'Silver Jubilee', were painted in a striking livery with silver grey on the sides, wheels and tender, and two shades of darker grey on the nose and side skirts.

**APPLE GREEN:** The LNER's traditional express livery of Apple Green was applied at first to 'standard' locomotives, sometimes with the black of the nose following the more normal sweep associated with the class, sometimes with the entire smokebox area of the casing painted black.

**GARTER BLUE:** The colour now most associated with the 'A4s' was

introduced for the 'Coronation'. The blue was matched with red wheels. 'Coronation' engines had chrome trim and lettering/numbering; other engines carried standard lettering/numbering. Garter Blue gave way to black in wartime, but was reinstated soon afterwards.

**WARTIME BLACK:** Plain black appeared from late 1941, initially with 'LNER' on the tender, later just with 'NE' except for engines carrying the metal lettering/numbering.

**BR BLUE:** Some 'A4s' received BR's early dark blue livery with 'BRITISH RAILWAYS' on the tender, but from

1949 the standard livery applied was express passenger blue, lined in black and white and with the 'cycling lion' emblem on the tender. BR's number scheme placed the 'A4s' in the range 60001-60034.

**BR BRUNSWICK GREEN:** Great Western-style Brunswick Green with black and orange lining appeared from 1951, becoming the standard livery of the class until withdrawal. The 'cycling lion' was replaced by the later style emblem from 1957 onwards.

■ *Note: The above summary is indicative only – many variations appeared.*





Looking less distinguished without the silver/grey livery and full valances it once sported, but nevertheless still a magnificent sight, 'A4' No. 60014 *Silver Link* leaves Hadley Wood North tunnel with the 3.55pm Kings Cross to Leeds & Bradford express on August 4, 1962. **K.L. COOK/RAIL ARCHIVE STEPHENSON**

### A STRANGE ACCIDENT

In the last wartime winter, on February 4 1945, a strange accident happened at King's Cross that killed three people.

*Silver Fox* had 17 coaches behind it for the 6pm train to Leeds – but it didn't have the normal banking engine to help push it up the gradient out of the station.

Unnoticed by the crew, who by now were already inside Gas Works tunnel just outside King's Cross, the train started slipping back towards the station, where it collided with another train waiting to leave. The passengers killed were in the last coach of the train, which reared up and collided with a signal gantry.



Ex-LNER 'A4' No. 60022 *Sir Murrough Wilson* climbs away from Grantham with the up 'Flying Scotsman' on April 4, 1951.

**T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**

In later years the 'A4s' were popular for enthusiasts' trips. On June 2 1962 *Mallard* had been highly polished ready for its part in the epic two-day 'Aberdeen Flyer'. The 'A4' would take the train on the first section of the trip, to Edinburgh. **COLOUR-RAIL**



BR liveried 'A4' No. 60011 *Empire of India* heads the 4.05pm Edinburgh Waverley to Perth train between Mawcarse Junction and Glenfarg in 1957. The M90 motorway passes over the trackbed here now. **W.J.V. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON**





first were taken out of service in 1962. They included the famous pioneer, *Silver Link*.

However, BR's Scottish Region had one more use for Gresley's masterpieces: three-hour express trains over the old Caledonian Railway route between Glasgow and Aberdeen. Until 1966 these trains gave the streamliners some last high profile work before the final ones were withdrawn that summer.

The very last to go was No. 60019 *Bittern*, officially taken out of service on September 5 1966 – though it did reportedly haul a goods train slightly after that! ■

## THE RIVALS COMPARED

### London Midland and Scottish Railway 'Duchess'

The LNER's main competitor was the London Midland and Scottish Railway, which operated the rival Anglo-Scottish route, from Euston to Glasgow. LMS chief mechanical engineer William Stanier's answer to the 'A4' was the 'Duchess' – a powerful streamlined 'Pacific' capable of running fast, but also producing awesome power.

### Deutsche Reichsbahn '05'

*Mallard's* 126mph snatched the world record away from a German engine, streamlined 4-6-4



If the LNER had adopted these, the 'A4s' would never have been built. This 1935-built 'Hamburg' diesel unit (SVT137225) is now displayed in Leipzig, Germany.

No. 05.002, which had reached 124.5mph in 1936. The '05s' were designed for lightweight high-

speed trains. They had three cylinders, massive 7ft 6in driving wheels and an almost 300lb/sq in boiler.

### Deutsche Reichsbahn 'Flying Hamburger'

The 'A4s' would never have existed if the LNER had opted to adopt trains based on the German diesel unit known as the 'Flying Hamburger', that entered service in 1933 and became the prototype for production vehicles built from 1935. Other versions were also built. Speeds of 160kph (99mph) were regularly achieved.





## SPOTTER'S POINTS

- Many people recognise a Gresley 'A4'. The sloping nose and well-proportioned casing gave this design a distinctive grace.
- As first built, the casing extended to valances on each side that largely covered the wheels. The valances were removed during wartime, after which the driving wheels and rods were fully exposed to view.
- Unusually, the whistle was mounted forward of the chimney; the haunting note of the chime whistle meant an 'A4' could be identified without it being seen!
- Although having a similar profile to the double chimney, the original single chimney was smaller.
- The crew could access the side of the locomotive by walking along a curved running plate that swept back from above and behind the buffers towards the cab. Seen from the front, this is a particularly obvious design feature.



'A4'4-6-2 No. 60034 *Lord Faringdon* enters Perth station with the 1.30pm Aberdeen to Glasgow Buchanan Street express in July 1964. W.J.V. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON







# SAVING THE 'STREAKS'

It's a sign of the 'A4s' popularity that six were preserved. Maybe it's no surprise that *Mallard* was on the 'official list' and sent to Doncaster for restoration to LNER condition, after withdrawal in 1963.

From 1986 to 1988 it was a runner, restored to operational condition in time to celebrate the 50th anniversary of its record; other than that, it has been on public display.

Fife farmer John Cameron bought the last steam locomotive

overhauled at Doncaster, No. 60009 *Union of South Africa*, which was withdrawn in 1966. After a brief spell on the main line the 'A4' moved initially to the specially set up Lochty Private Railway, but later returned to BR

for special trains. It is still owned by John Cameron.

*Bittern* was similarly saved by private initiative, being bought by businessman Geoff Drury. No. 60019 went initially to York, later spending many years out of action, before being restored in 2007. This 'A4' was later bought by Jeremy Hosking. It is currently operational running in Garter Blue, including for a short spell, as scrapped classmate *Dominion of New Zealand*.

A fourth example of Gresley's 'Streaks' was saved privately, this time by the specially formed A4 Locomotive Society. Appropriately, No. 60007 *Sir Nigel Gresley* was chosen. The locomotive has appeared regularly on main line charter specials for much of the last 40 years, at first in Garter Blue as







Who would have thought in 1966 that three working 'A4s' would be seen together again? From the left, *Union of South Africa*, *Sir Nigel Gresley* and *Bittern* line up at the North Yorkshire Moors Railway in 2008. **BRIAN SHARPE**

#### FACT FILE: WHERE CAN I SEE ONE?

**NO. 4464 (60019) BITTERN:** Normally based at the private Southall depot in London, *Bittern* is used to haul steam special trains over Britain's main lines. It is currently running in Garter Blue livery.

**NO. 4468 (60022) MALLARD:** The world record breaker is part of Britain's national collection. Normal home is the National Railway Museum in York, although visits away are sometimes agreed. It is kept in Garter Blue.

**NO. 4488 (60009) UNION OF SOUTH AFRICA:** Privately owned by John Cameron, the normal home base for this 'A4' is a private site in Fife. It is however used on special trains across the country. It has been maintained in BR green ever since being preserved.

**NO. 4489 (60010) DOMINION OF CANADA:** One of two 'A4s' to leave the UK for preservation, *Dominion of Canada* is displayed in LNER Garter Blue at the Canadian Railway Museum near Montreal, Canada.

**NO. 4496 (60008) DWIGHT D EISENHOWER:** On static display at the National Railroad Museum, Green Bay, USA. Like *Union of South Africa*, this 'A4' has kept its BR green look.

**NO. 4498 (60007) SIR NIGEL GRESLEY:** Normal home for the engine named after its designer is the North Yorkshire Moors Railway, but the 'Pacific' hauls main line charter trains too. Although painted Garter Blue in its early preservation years, *Sir Nigel Gresley* now carries its BR identity and blue livery.

Lined up in numerical order, three BR green-liveried 'A4s' are seen at Shildon before the North American visitors received their cosmetic restorations.

No. 60010 *Dwight D. Eisenhower* was soon to receive a full LNER makeover of Garter blue livery, complete with side valances as No. 4496. **DAVID WILCOCK**





When not running on the main line, *Sir Nigel Gresley* is normally found at the North Yorkshire Moors Railway. Now painted in BR blue, the 'Streak' eases away from the NYMR's Goathland station. **BRIAN SHARPE**



LNER No. 4498, and now in BR's short-lived express passenger blue.

Most intriguingly of all, two 'A4s' were restored and presented to countries with connections to the engines due to their names. They are: *Dwight D Eisenhower* – the engine named after the 34th president of the United States of America. It was restored at Doncaster after being withdrawn in 1963 and presented to the National Railroad Museum. No. 60008 sailed across the Atlantic in 1964.

*Dominion of Canada* – restoration of this engine took place at Crewe, before No. 60010 left the UK in 1967 to be placed into the care of the Canadian Railroad Historical Association.

The North American locomotives have been on static display in their host countries since - that was until an audacious plan to bring them back to the UK was hatched...

#### THE GREAT GATHERING

Steve Davies, then head of the National Railway Museum, came up with the outlandish plan to







With full side valances and in sparkling Garter Blue LNER livery, No. 4464 *Bittern* is seen at Bewdley, during the Severn Valley Railway's spring steam gala on March 22, 2012. **PAUL CHANCELLOR**

bring the two exiled 'A4s' back across the Atlantic in order to mark the 75th anniversary of *Mallard's* world speed record. This included many logistical issues, not least of which was how to release one of them from its enclosed display area that had been built around it.

Remarkably though, the plan came to fruition and on July 3 2013, *Mallard* was pushed into the National Railway Museum's 'Great Hall' to complete a line-up many thought they would never see: all six surviving 'A4s' together in one place.

As part of the celebrations *Dwight D Eisenhower* received

All six 'A4s' line up for the 'Great Goodbye' at Shildon on February 20, 2014. **DAVID WILCOCK**



Elevated view of No. 60009 *Union of South Africa*, during servicing at Scarborough in July 2008. **TONY STREETER**

a new coat of BR green, while *Dominion of Canada* had its bell returned, a single chimney and valances fitted, and was painted 'Coronation'-style blue, as it was when new.

Record crowds gathered to see the 'Streaks' at events held at York in 2013, while a farewell show was to follow at Shildon in February 2014 before the North

American 'A4s' headed home, in all probability never to return.

As if that wasn't enough, there was to be yet more excitement for 'Mallard 75' year: *Bittern* was given special permission to run at 90mph (15mph more than the normal modern limit for steam) for three commemorative trips, a fitting way to round off the 75th anniversary of *Mallard's* world speed record. ■



Record crowds flocked to the first day of the 'Great Gathering' in July 2013 with all six surviving 'A4s' on display at the National Railway Museum. **PAUL APPLETON**

#### WANT TO KNOW MORE?

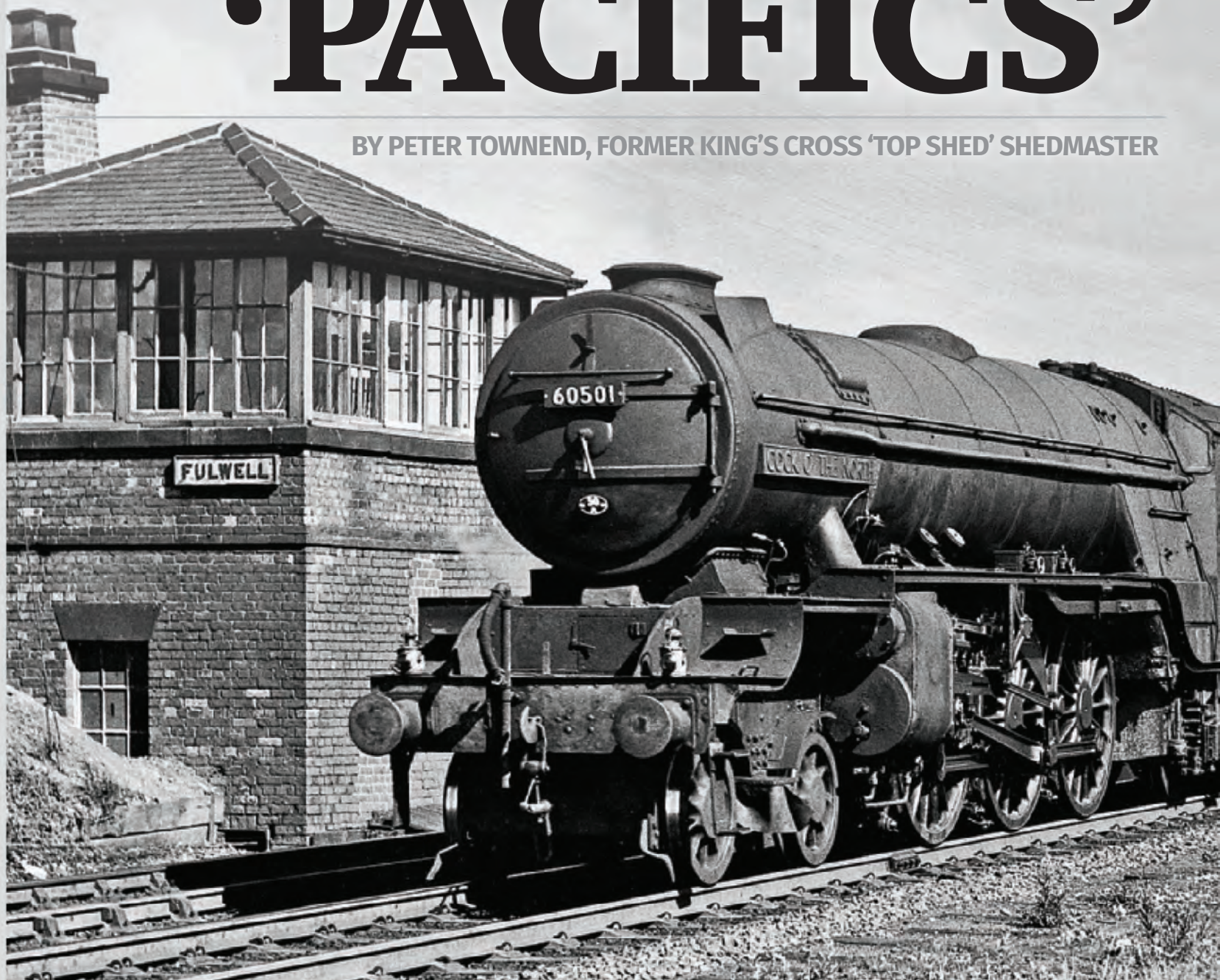
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## CHAPTER THREE

# THOMPSON 'A1/A2' 'PACIFICS'

BY PETER TOWNEND, FORMER KING'S CROSS 'TOP SHED' SHEDMASTER





# FROM 'P2' TO 'A2/2'

'A2/2' 4-6-2 'Pacific' No. 60502 *Earl Marischal*, still with LNER on its tender, heads south out of York with an up fitted freight in late summer 1948. **CECIL ORD/RAIL ARCHIVE STEPHENSON**



**S**ir Nigel Gresley died in 1941 shortly before his 65<sup>th</sup> birthday after holding the position of Chief Mechanical Engineer of the LNER and previously that of Locomotive Superintendent of the Great Northern Railway for 30 years. He had left the LNER with the finest fleet of large locomotives in the country, unsurpassed in everyday performance and endurance. The work of his locomotives had virtually eliminated expensive double heading on the railway. Gresley had personally been held in the highest esteem by the LNER Board, his own staff, drivers who were not under his control, the travelling public and not least by his professional colleagues.

He was succeeded by Edward Thompson, the senior of the Regional Works Mechanical Engineers, in April 1941, who was within a few weeks of his 60<sup>th</sup> birthday and could be expected to hold office for five years before retirement. Thompson had been advised that new designs of locomotives were not immediately required but nevertheless he had radically different views on locomotive matters and was determined to change what he could. Thompson had experience at three main works which were still largely maintaining pre-1923 grouping types of locomotives and saw the way ahead to build large numbers of standard simple locomotives, eliminating many of these older types. As it was wartime this was not immediately possible as materials were in short supply and he continued the construction of the Gresley 'O2' class and 'V2' 'Green Arrows'. He decided however to rebuild a number of different designs as prototypes under his standardisation scheme. All except the biggest were to have only two cylinders and the Gresley three cylinder conjugated valve gear was out.

Nevertheless his first 'Pacific' proposal was very much Gresley in appearance with three cylinders, 6ft 2in driving wheels, an 'A4' boiler and a small tender. This was not proceeded with and Thompson decided to construct a prototype 'Pacific' by rebuilding one of Gresley's 'P2' 'Cock of the North' class 2-8-2s. No. 2005 *Thane of Fife*, the only one with a single chimney. This engine had run the lowest annual mileage of the class. The six 'P2s' had been built for hauling heavy sleeping car trains between Edinburgh and Aberdeen, successfully handling 600 ton trains over a difficult road, surely an asset in wartime to be retained.

No. 2005 was rebuilt at Doncaster in the Crimpsall Repair shops in a back corner by simply cutting off the frames between the first and second driving wheels. The monobloc cylinder casting, front frame sections



First of the rebuilt 'P2s', Thompson 'A2/2' No. 60501 *Cock o' the North* passes Fulwell 'box', north of Sunderland, with an express for Newcastle on August 1, 1958. **D.M.C. HEPBURN-SCOTT/RAIL ARCHIVE STEPHENSON**





Formerly a 'P2' 2-8-2, Thompson rebuild 'A2/2' No. 506 Wolf of Badenoch is seen to good effect in this undated view. **COLOUR-RAIL**



'A2/2' rebuild No. 60506 Wolf of Badenoch at New England shed on May 2, 1955. **J.F. DAVIES/RAIL ARCHIVE STEPHENSON**



Thompson 'A2/2' No. 60502 Earl Marischal on shed at King's Cross 'Top Shed' on February 19, 1961. **COLOUR-RAIL**

## FACT FILE: THOMPSON 'A2/2' IN DETAIL

<b>BUILT:</b>	Re-built from 'P2' 2-8-2 class
<b>IN SERVICE:</b>	1943-1961
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 2in (1.88m)
<b>BOILER PRESSURE:</b>	225lbs/sq in
<b>CYLINDERS:</b>	Three, 20in x 26in (508mm x 660mm)
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.65m <sup>2</sup> )
<b>TRACTIVE EFFORT:</b>	40,320lbs (179.35kN)
<b>BR POWER CLASS:</b>	8P7F
<b>WEIGHT:</b>	101 tons 8cwt (103.1 tonnes)
<b>NUMBER BUILT:</b>	6

and the lower part of the smokebox sides with nameplates still attached, all in one big lump, were placed on the scrap heap and left there for 18 months until a request was made for the nameplates to be attached to the rebuilt locomotive. New front frames were attached to the remaining rear section with an overlap of almost 4ft 6in around what was now the leading horns. The wayward position of the outside cylinders between the bogie and leading driving wheels was necessitated by the retention of the rather short 'P2' connecting rods, a feature of the 'P2' class, giving rise to the comment by one of the draughtsmen involved that the rebuild was almost designed around the connecting rods. The drive was now divided with the inside cylinder connected to the leading axle and the outside to the centre axle. Three sets of Walchaerts valve gear were fitted in place of the previous Gresley conjugated arrangement. The cylinders were reduced in size to 20in and large 10in valves fitted. The nominal tractive effort was reduced from 43,462 lbs to 40,318lbs and the adhesive factor from 4.06 to a rather low 3.67.

The existing boiler was retained but the barrel reduced in length by two feet to 17ft between tubeplates in order that the steam pipes to the outside cylinders were as direct as possible and not curved backwards as on GWR locomotives with divided drive. This resulted in the longest smokebox on any LNER locomotive, a source of some wonder to the staff who generally had to work in more cramped conditions and it was found that a sizeable card school could play within, unseen by authority. A double Kylchap exhaust system was fitted in place of the single chimney but the rim of the double chimney was unadorned and looked rather Spartan, but this was done to assist in smoke deflection. Small type smoke deflectors somewhat longer than those tried some years earlier by Gresley on 'A3' class *Humorist* were welded to the top of the smokebox.

The bogie was ahead of the outside cylinders and the weight was carried on hemispherical side bearers instead of the centre, an arrangement not used previously on the Gresley 'Pacifics'. To avoid the need for new steel castings fabricated components were used where required. The rear of the engine and tender were unchanged apart from the fitting of steam brakes instead of vacuum. The total wheelbase of the engine was only one foot shorter than that of the 'P2' and over a foot longer than a Gresley 'Pacific' with larger driving wheels.

The rebuilt engine, eventually classified 'A2/2', entered traffic in January 1943 and returned to the Aberdeen line. The engine was considered successful. The conversion of the remaining five locomotives of the class was authorised in September 1943 and the work completed at Doncaster in December 1944. The press release in May 1944 claimed the superiority of the independent valve gears

Class 'A2/2' 60502 Earl Marischal gets its train underway from York on March 17, 1957. **COLOUR-RAIL**





over the conjugated system and the *Railway Gazette* in March 1944 stated that Mr. Thompson had felt the locomotives would be generally more useful converted due to their limited range of activity. The Scottish Motive Power authority had not requested any change to the 'P2s' in the first place and had opposed the rebuilding. The 'P2s' whilst generally working on the Aberdeen line were not specifically restricted to it.

Problems were soon found with the rebuilt locomotives. The cab floor had been made level but this was not satisfactory for the fireman and was quickly changed back to the well arrangement that they were used to. More fundamentally there was considerable difficulty in keeping the cylinders tight and the rear of the smokebox and the cradle bolts, necessitating frequent visits to Cowlaers works for repair. During 1945 No. 2005 made no less than eight visits to the works

for repairs. The long external exhaust ducts fractured and the joints leaked causing poor visibility at the front end. The front end had to be strengthened and the exhaust ducts redesigned with expansion joints. The riding was not as good as the earlier 'Pacifics' and the bogie springing arrangements had to be modified. Generally the ride was the least comfortable of all the 'Pacifics'.

Although the rebuilt engines worked initially on the Edinburgh to Aberdeen line, by 1946 the engines were mainly used on express goods work and in 1949 all six were transferred away, being divided between New England (Peterborough) and York. Although often to be seen on fast goods trains, New England did work the 'Aberdonian' into King's Cross, returning on the 'Flying Scotsman' to Grantham for a period often using an 'A2/2'. A run with No. 60502 on a light train was also published by Cecil J. Allen where

### THOMPSON 'A2/2' NUMBERING AND NAMES

ORIGINAL	LNER	BR	NAME
2001	501	60501	Cock o' the North
2002	502	60502	Earl Marischal
2003	503	60503	Lord President
2004	504	60504	Mons Meg
2005	505 (994)	60505	Thane of Fife
2006	506	60506	Wolf of Badenoch

the locomotive attained 95mph and averaged 92.5 for almost 21 miles, the fastest he had known with 6ft 2in driving wheels on level track. There was never any question of the engines not being able to do the work required of them as the 'A2/2s' were never used to their full capacity on express work, but the task was frequently carried out on a cold morning in a cloud of steam with the exhaust additionally not clearing the cab on a generally uncomfortable riding engine and

certainly not as economically as most of the other 'Pacifics'. One engine did run over a million miles in both wheel arrangements, but another only ran three-quarters of that figure. Despite all their periodical inactivity in works, the annual mileage was if anything slightly higher after rebuilding than before, no doubt due to their wider use. The class achieved the distinction of being some of the first LNER 'Pacifics' to be withdrawn from 1959-61. ■





# 'GREEN ARROW'

## THE CLASS 'A2/1s'

About the time the order was issued for the remainder of the 'P2' class to be rebuilt in 1943, it was decided to terminate the order for new 'V2' class locomotives under construction at Darlington and build the last four locomotives on the lines of the 'P2' rebuild. The 'V2' mixed traffic 2-6-2s had been introduced in 1936 principally for working fast heavy freight trains over the LNER main lines. The first engine built was No. 4771 and named *Green Arrow* after the guaranteed overnight freight delivery service provided by the company and widely advertised under that name before the war. The first five were built at Doncaster and unusually for freight engines were turned out in full lined out green livery. The first 'Green Arrow' with burnished buffers, cylinder covers and smokebox fittings was allocated to

King's Cross, frequently working the 15.40 down Scotch goods from the freight terminal to York. It remained at King's Cross until the depot closed and is now preserved. A total of 184 were built by 1944 and the class quickly established a reputation for fast economical running not only on fitted freight work but also working rostered turns on express passenger trains. The overall length of the locomotive was shortened by the use of the group standard 4,200 gallon tender which enabled the engines to be turned on 60ft diameter turntables rather than 65ft minimum required for 'Pacifics'. It was therefore possible for wider use to be made of the engines. During the war the 'Green Arrows' often worked the heavy main line passenger trains unassisted and were noted on previously unheard of trains up to 25 and 26 coaches in length.

The four locomotives were turned out of Darlington works as 'Pacifics' in 1944-1945 and had the same front end arrangements, smokebox, bogie and valve gear as used on the 'A2/2'. The same cylinders were used but lined to the smaller diameter of 19in and 10in valves were fitted. The frames were however made in

one piece, but the unequal coupled wheel spacing of the 'V2' was shortened and equalised at 6ft 6in centres. The boiler was that of the 'V2' but the boiler pressure slightly altered to 225lbs/sq. in. Many of the details such as crankpin sizes, springs and the rear part of the locomotive were the same as the 'V2' including the small six-wheel tender. Steam braking was fitted as on the 'P2' rebuild and the level cab floor. New features introduced on a 'Pacific' were steam reversing gear, electric

### FACT FILE: THOMPSON 'A2/1' IN DETAIL

<b>BUILT:</b>	Revised design from 'V2'
<b>IN SERVICE:</b>	1944-1961
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 2in (1.88m)
<b>BOILER PRESSURE:</b>	225lbs/sq in
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.65m <sup>2</sup> )
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts
<b>TRACTION EFFORT:</b>	37,397lbs (166.35kN)
<b>BR POWER CLASS:</b>	7P6F
<b>WEIGHT:</b>	98 tons (100 tonnes)
<b>NUMBER BUILT:</b>	4

Second of the 'A2/1s', No. 508 *Duke of Rothesay* leaves Welwyn South with an evening King's Cross to Peterborough semi-fast in 1947. **F.R. HEBRON/RAIL ARCHIVE STEPHENSON**





# TO 'PACIFIC'

Ex-LNER 'A2/1' No. 60507 *Highland Chieftain* heads a northbound fitted freight near Granthouse on September 11, 1954. **W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON**



lighting, a Great Central regulator handle, rocking grate and a hopper ashpan. With three sets of valve gear it was not easy to reverse a 'Pacific' if it should not start a heavy train first time. Although steam reversers had been used on many North Eastern locomotives, its use on a 'Pacific' elsewhere was anything but welcome as it was almost impossible to make fine adjustments by using the single operating lever provided and in any case the cut off did not remain in the set position. At the first general repair the steam reverser was removed, as were some of the other alien features including the Great Central type regulator handle and the level cab floor. Electric lighting was applied to only three of the four locomotives using a Metro-Vickers generator driven off a stub axle screwed into the rear bogie axle. A battery was fitted for stationary use and up to 10mph. White discs were fitted for operation in daylight, which folded back when

not required. The signalman turned the first engine so fitted back into the works as no headlamp was visible but there was nowhere to put one. The works had to fit lamp brackets and discs were made detachable, but their use was eventually dropped. The fitting of stub axle generators was not satisfactory and in 1950-52 the electric lighting was removed. The use of rocking grates and hopper ashpans was successful and these were fitted thereafter to all new 50sq. ft. grate locomotives, but not to any further engines with 41.25sq. ft. grates.

The tractive effort was higher than a 'V2' and the engine weight was five tons heavier. The class of 'A2/1' was applied from June 1944. Small smoke deflectors were fitted on top of the smokebox with the Kylchap double chimney, but were not effective and were replaced by large smoke deflectors in 1946-47. All received Scottish names by April 1948 fitted to the smoke deflectors

although only two were allocated to Haymarket, but another was transferred there later but the odd one remained in the Eastern Region. All four locomotives were withdrawn by February 1961.

Comparative coal trials were carried out with the 'A2/1', the 'P2' rebuild and the 'A4' but without the use of the dynamometer car. Generally the 'A4' was more economical on express work but the 'A2/1' was lower on coal consumption on freight work, but the small tender left too small a

margin for normal requirements. Timekeeping was very good with up to ten minutes recovered and generally the 'A2/1' did very well. The larger grate of the 'A2/2' was hardly justified with a wide variation in coal burnt but nevertheless the 50sq. ft. grate was used on all the new 'Pacifics' built thereafter. Eight-wheel tenders were eventually fitted. One was immediately on hand as the tender from 'A4' No. 4469 which had to be scrapped after an air raid on York survived and had been stored in the Paintshop at Doncaster. Strangely the 'V2' class from which the 'A2/1' was derived was not mentioned or used in the trials.

Engine No. 60508 working from King's Cross at the time featured in a serious derailment at New Southgate in July 1948 when the rear bogie wheel became derailed at speed but this was stated to be due to the track and the locomotive was not criticised. Although difficulties were experienced in maintaining the tightness of the cylinders which had not been a problem on the 'V2s' and the awkward front end arrangement, the troubles were not quite on the same scale as with the 'P2' rebuilds. By using a standard 'V2' boiler there was no difficulty waiting in works for boiler repairs. The 'A2/1s' in consequence attained a higher mileage during their short lives by over 20% more than the 'P2' rebuilds ran as 'Pacifics', achieving an average total of just under 800,000 miles for each locomotive. The four engines were withdrawn between August 1960 and February 1961. ■

## THOMPSON 'A2/1' NUMBERING AND NAMES

ORIGINAL	LNER	BR	NAME
3696	507	60507	Highland Chieftain
3697	508	60508	Duke of Rothesay
3698	509	60509	Waverley
3699	510	60510	Robert the Bruce



Thompson 'A2/1' No. 60510 *Robert the Bruce*, the last of the four planned 'V2' 2-6-2s that were built as 'Pacifics' instead, seen at Carlisle on September 22, 1959. **DAVID FORSYTH/COLOUR-RAIL**



Thompson 'A2/1', developed from Gresley's 'V2', No 507, yet to be named, waits to leave King's Cross with an express for the north in 1946. **RAIL ARCHIVE STEPHENSON**



# A BRAND NEW DESIGN

## THE CLASS A2/3

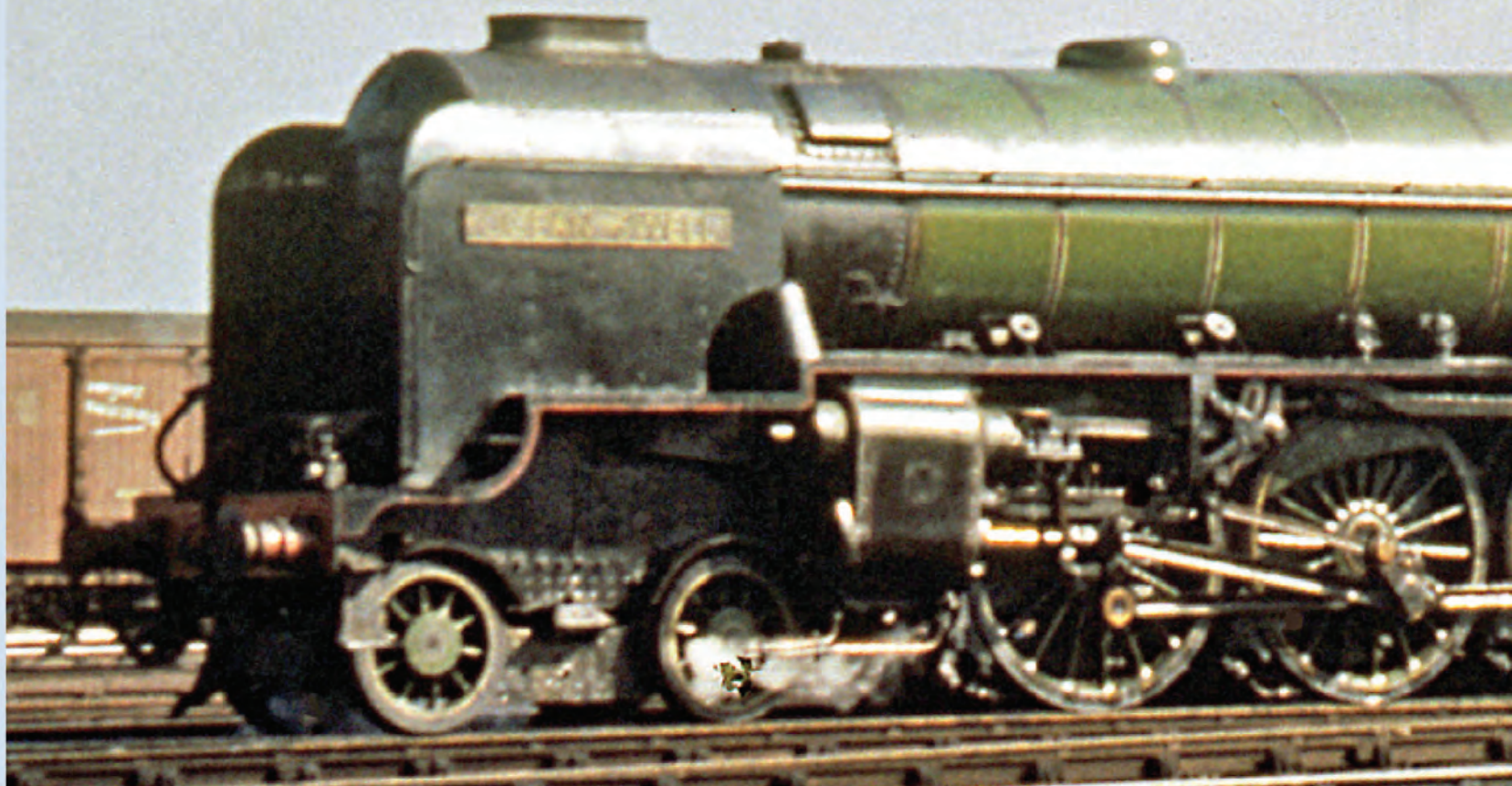


Thompson 'A2/3' 4-6-2 No. 60513 Dante provides superpower for its two-coach payload at Walton on July 2, 1956. **D OVENDEN/COLOUR-RAIL**

In April 1944 30 new 'Pacific' locomotives were ordered from Doncaster Works and a further 13 in the 1946 building programme from Darlington Works. In the event only 15 were completed at Doncaster to the design of Edward Thompson. The first, No. 500 appeared shortly before Thompson retired and was named at Marylebone in May 1946 at a small ceremony, one of the few social occasions at which Thompson participated. The remainder of the class were named after racehorses. The new class followed the 'P2' rebuilds

in having a 50sq.ft. grate but the boiler pressure was increased to 250lbs/sq. in. This enabled the cylinders to be reduced to 19in. diameter but retaining the 10in diameter piston valves. The boilers were to a new diagram and made at Darlington with a round dome on the front parallel ring of the boiler instead of the steam collector type on the highest part of the tapered section. The distance between the tubeplates was retained at 17ft as on the earlier Thompson boilers but the combustion chamber was lengthened by 7in. The same front end arrangement of the bogie ahead of the outside cylinders was used as well as divided drive and equal length connecting rods. The larger coupling rod and crankpin bearing sizes including the middle big end as used on the 'P2s' were fitted. The tractive effort was 40,430 lbs. and the total weight 101tons 10cwt. as shown for the 'A2/2' but it actually came out at 102tons 7cwt. A plain double Kylchap chimney was fitted but with a small beading around the top and a self-cleaning smokebox.

Large smoke deflectors were fitted to which nameplates were attached. Although a hopper ashpan was used, a drop grate was fitted, this was later changed





to a rocking grate. The 'A2/1' and 'A2/2' had both retained the V-fronted cab but a straight cab front was used on the new locomotives. The interior of the cab reverted to standard Gresley practice after Thompson had found out the hard way that enginemen did not take kindly to changes being made. The first engine, No. 500, was fitted with a Metro-Vickers lighting set as used on the 'A2/1' but this was later removed. The tender of No. 500 was also fitted with side buffers between engine and tender but these had to be removed after the first trial trip as one of the Cartazzi axleboxes ran hot.

After the first engine was released to traffic in May 1946 and worked to Grantham the next day, the bogie became derailed on a turning triangle on plain track. The engine was used on local trains under observation for some time before working to King's Cross in August when it had to come off its train as did the second engine about the same time. One of the problems experienced was due to the carry over of water caused by the positioning of the round dome so far forward on the boiler barrel. As the engine braked to a stand the water would surge in the boiler and enter the steam supply pipe

On a parcels train near York, 'A2/3' class 'Pacific' No. 60518 Tehran is looking a tad grimy in this 1959 view. **COLOUR-RAIL**



to the manifold in the cab which in turn supplied the injectors, vacuum ejector and the steam brake cylinders on the engine and tender. These appliances did not work very well on water and some dangerous incidents occurred such as the steam brake not applying as well as ejecting quantities of dirty water from the chimney when the vacuum brake was created onto any passenger's clothing within range. The steam supply pipe was lifted as high as possible within

#### FACT FILE: THOMPSON 'A2/3' IN DETAIL

<b>BUILT:</b>	Doncaster/Darlington (boilers)
<b>IN SERVICE:</b>	1946-1965
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 2in (1.88m)
<b>BOILER PRESSURE:</b>	250lbs/sq in
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.65m <sup>2</sup> )
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts
<b>TRACTION EFFORT:</b>	40,430lbs (179.84kN)
<b>BR POWER CLASS:</b>	8P7F
<b>WEIGHT:</b>	101 tons 8cwt (103.1 tonnes)
<b>NUMBER BUILT:</b>	15

One of Thompson's 15 new class 'A2/3s', No. 60517 *Ocean Swell*, stands between duties at York in 1949. **ERNEST SANDERSON/COLOUR-RAIL**





## THOMPSON 'A2/3' NUMBERING AND NAMES

LNER	BR	NAME
500	60500	Edward Thompson
511	60511	Airborne
512	60512	Steady Aim
513	60513	Dante
514	60514	Chamossaire
515	60515	Sun Stream
516	60516	Hycilla
517	60517	Ocean Swell
518	60518	Tehran
519	60519	Honeyway
520	60520	Owen Tudor
521	60521	Watling Street
522	60522	Straight Deal
523	60523	Sun Castle
524	60524	Herringbone

■ *Note: all apart from No. 500 were named after famous racehorses of the day*

the dome and after this order all subsequent boilers were fitted with steam collectors as used on the Gresley 'Pacifics'. Until 1947 when the class 'A2/3' was applied, the engines were simply 'A2', the Thompson designation for 6ft 2in diameter driving wheel 'Pacifics'.

The Thompson 'Pacifics' were not the best of riding locomotives and perhaps the name applied to No. 512 *Steady Aim* was somewhat inappropriate. It was also unfortunate that the winner of the St. Leger in 1943 was Herringbone, which was applied to the last of the class, No. 524. The 15 locomotives were divided amongst the three areas of the LNER, but only one was allocated to Scotland, No. 519 *Honeyway*. After the initial teething problems had been overcome the engines did some excellent work when performance generally was poor and the running of the Gresley classes was rather erratic. Their performance was enhanced due to the fitting of the double Kylchap arrangement to all the class. The Haymarket engine was recorded as working nine coaches, 325 tons gross, to Newcastle in 120 minutes, arriving six and a half minutes early, exactly equalling the pre-war 'Coronation' working. Cecil J. Allen also recorded his most astonishing run northbound from York to Darlington with 60524 *Herringbone* with eleven coaches, 380 tons gross, 90mph was reached on level track and 41 miles covered at an average of 82.5 mph, or 24 miles at 86.4 mph. Trials with the dynamometer car were arranged between the new No. 500 and 'V2' No. 959 on light and heavy trains.

The outcome was somewhat affected by poor and inconsistent quality coal with the 'V2', which indicated the difficulties of the times, but the 'A2/3' fitted with the double blast-pipe was clearly superior and could have taken a greater load up Cockburnspath, whereas the 'V2' was about at its limit with 14 coaches. The back pressure of the 'V2' was 75-95% greater than on the 'A2/3' for the same power output and at 60mph this alone gave the 'Pacific' an advantage of between 15 and 90hp. The 'A2/3' had an advantage of about 20% in power output over the 'V2', but at speeds over 50mph the cut off would have to be increased. This was due to the greater resistance of the heavier engine and tender.

Altogether Thompson had produced a locomotive of considerable potential if it could be used, somewhat more powerful than the 'V2' and with a dimensionally much improved front end. Trouble still stemmed from the cylinder arrangement, the smokebox fastenings and blows from the exhaust joints, which at least had not caused any difficulty on the monobloc cylinder castings fitted to the 'V2'. There were fewer visits to main works for out of course repairs than the 'P2' rebuilds, but the engines were not regarded with much affection generally by drivers due to their riding. The mileage run was greater than the other Thompson 'A2s' and one engine, No. 60519 of Haymarket, achieved a total of about 920,000 miles, an annual average of 58,000. The class was withdrawn in 1962-65. ■



LNER 'A2/3' No. 516 *Hycilla* waits to take over a down express at Grantham on March 27, 1948. **T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**

The fireman of 'A2/3' last-of-class No. 60524 *Herringbone* puts the express headlamps on the loco before departing from York with an up express in c1958. **KENNETH FIELD/RAIL ARCHIVE STEPHENSON**







Thompson 'A2/3' Pacific No. 512 Steady Aim at Grantham shed on August 30, 1947. T.G. HEPBURN/RAIL ARCHIVE STEPHENSON



'A2/3' No. 60518 Tehran, recently out-shopped with new BR number and tender markings, runs through Princes Street Gardens to Edinburgh Waverley station before taking a southbound express in 1948. W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON





# THOMPSON'S 'A1'

## WAS GRESLEY'S FIRST 'PACIFIC'



'A1/1' No. 60113 restarts the down 'Queen of Scots' Pullman from a stop to change engine crew outside Grantham station on October 30, 1948. T.G. HEPBURN/RAIL ARCHIVE STEPHENSON

## THE CLASS A1/1

The locomotive standardisation policy of Edward Thompson had included a 6ft 8in driving wheel 'Pacific' in addition to one with 6ft 2in wheels. Initially this was covered by the 'A4' but by 1944 he had decided to proceed with a new design of express passenger 6ft 8in wheel 'Pacific' with three sets of Walchaert's valve gear and an 'A4' boiler working at 250lbs/sq. in. Of the 79 'A1' and 'A3' type engines built by Gresley, 66 had already been fitted with new three-quarter front frame sections and the remaining engines would need to be dealt with in the near future. The original boilers fitted to the Gresley 'A1s' worked at 180lbs/sq. in. and when these required replacement 220lbs boilers had been

fitted and the cylinders reduced to 19in diameter. 18 engines still required to be altered and one of these, the first of the class, No. 4470 *Great Northern*, was with some controversy selected to be rebuilt in 1945 as the prototype for the new class, but with the later 'A4' 250lbs boiler and the 19in cylinders. In effect the rebuild was virtually a new locomotive and it was constructed in the New Erecting shop.

The frames from No. 4470 had previously been updated and went into the Doncaster Works pool and continued life under another locomotive which had not been so fitted. Divided drive was used with the outside cylinders between the rear bogie wheels and the leading coupled wheels. The Gresley

conjugated valve gear was replaced by an inside valve gear and the arrangement generally complied with the 'P2' rebuilds. No further rebuilds were carried out and *Great Northern* remained a one off. The 'A4' boiler however became standard on the 'A3s' a few years later for

renewals but working at 220lbs/sq. in.

The new frames for No. 4470 were made in one piece and incorporated the design of hornstay fastening to both the frames and hornblocks which had been so successfully used avoiding frame fractures in this area on the 'A4' and 'V2s'. The wheelbase was the longest used on any of the LNER 'Pacifics' and 2ft 8in longer than that of the 'A4'. The connecting rods were different in length at 8ft

### FACT FILE: THOMPSON 'A1/1' IN DETAIL

BUILT:	Rebuilt from Gresley A1 (A10)
IN SERVICE:	1945-1962
WHEEL ARRANGEMENT:	4-6-2
DRIVING WHEEL DIAMETER:	6ft 8in (2.032m)
BOILER PRESSURE:	250lbs/sq in
CYLINDERS:	Three, 19in x 26in (483mm x 660mm)
VALVE GEAR:	Walschaerts
TRACTION EFFORT:	37,400lbs (166.36kN)
BR POWER CLASS:	8P6F
WEIGHT:	101 tons 8cwt (103.1 tonnes)
NUMBER BUILT:	1



for the outside but 7ft 2in for the inside as on the 'A2/2'. The crankpin and coupling pin sizes of the original Gresley 'A1' were retained. A Great Central type regulator handle was fitted. The Lockyer double beat regulator valve fitted to the Gresley 'Pacifics' had proved to be difficult to maintain during the war years and the new design of slide valve regulator was fitted to *Great Northern*. This caused an unusual incident early in 1946 when the engine was still new. Running into Peterborough station the signal along the platform was 'on' but as the driver approached it changed to green. The driver opened the regulator but the engine slipped violently and the driver could not immediately close the regulator valve, possibly the train brakes were not fully off and perhaps there was a surge of water under the valve. The rails were burnt through! *Great Northern* also had a higher tractive effort and lower adhesive factor than the Gresley 'Pacifics'. The engine was kept under observation on local work until called into works in June 1946 with a fractured superheater header and the design of regulator valve changed.

The original cab sides of No. 4470 were fitted but shortened in height. The cab was now more difficult to access and also a level cab floor was used. A double Kylchap blast-pipe was fitted but no smoke deflectors. New nameplates were made and attached to the smokebox sides. The locomotive was painted in a unique new livery of deep royal blue with red lining and a Metro-Vickers electric lighting set was fitted, driven off the rear bogie axle with combined headlamps and white discs. The lighting was changed to a Stone's generator in 1947 and later removed altogether. The livery was also changed to LNER green at that visit to works, but the engine later had another spell painted in British Railways blue.

Two of the sandboxes were centrally fitted between the frames and filled from the right hand side running plate and were only used on this locomotive. This feature had been designed to accommodate a steam



No. 60113 *Great Northern* again, seen in the striking early BR express passenger blue livery, on the occasion of the Great Northern Railway's 100th anniversary celebrations in June 1950 at York. **H.M. LANE/COLOUR-RAIL**

reverser, which was never fitted. The leading sandboxes were fitted one each side in the normal manner with separate fillers. Steam operated sanders applied sand in front of the leading driving wheels and both front and rear of the intermediate driving wheels, an arrangement which became standard for the Thompson and post-war 'Pacifics'. Complaints were quickly forthcoming concerning the cab arrangement and the exhaust obscuring the driver's forward vision. Two months after entering service the engine was brought back to be modified, large smoke deflectors were fitted and the cab reverted to one more accessible, but it was 1947 at its first general repair that the Gresley pull out regulator handles were fitted.

Coal consumption trials were carried out in November 1945 between King's Cross and Grantham in which the single chimney 'A4' No. 4466 and No.4470 produced almost identical results on working trains just under 500 tons in weight. Similar trials were carried out in Scotland between Edinburgh and Dundee compared to an 'A4', No. 31, with reduced size middle cylinder, which showed No. 113 (4470 now renumbered) to be considerably more economical in coal and water. When repeated between Edinburgh and

Gresley's first 'Pacific', rebuilt by Thompson and classified as an 'A1/1', the now No. 113 *Great Northern* stands at Doncaster shed on May 17, 1947, looking immaculate. **T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**



### THOMPSON 'A1/1' NUMBER AND NAME

ORIGINAL	LNER	BR	NAME
4470	113	60113	Great Northern

Newcastle the results were however very slightly in favour of No. 31.

The engine was allocated to the Eastern Region, initially to King's Cross, but later worked from Grantham and latterly Doncaster. *Great Northern* was a good engine, generally more powerful and easier to work than in its original form as a low pressure 'Pacific', and slightly if anything more economical than the majority of the single chimney 'A4s' at the time. It had been spoiled by the positioning of the outside cylinders and the problems arising from this. During its 17 year life until withdrawn in November 1962, the engine made no less than 29 visits to Doncaster Works, which was excessive for even a prototype

locomotive but nevertheless *Great Northern* had run well over two million miles altogether and about 950,000 miles after rebuilding, the highest of any Thompson 'Pacific'. This represented an average annual mileage of nearly 56,000 after rebuilding compared to 53,000 in its original form. A Great Western 'Star'/'Castle' withdrawn about the same time with the highest total mileage of any GW engine had averaged 45,300 miles each year since construction.

Thompson had built or rebuilt a total of 26 'Pacifcs' of four different designs with four different boilers and it remained for his successor to build the standard locomotives he had wished to achieve. ■



Unique 'A1/1' No. 60113 *Great Northern* seen at Doncaster in September 1960, its unusual smoke deflectors making it instantly recognizable. **GWYN PARRY COLLECTION/COLOUR-RAIL**

### HISTORICALLY IMPORTANT

As Gresley's first 'Pacific' it was of significant historical importance, yet was selected by Thompson to be rebuilt beyond recognition despite this. It has been suggested this was pure bad luck, but others put it down to Thompson's

own feelings towards Gresley and his locomotives with their complex conjugated valve gear. Nevertheless there was an attempt to save *Great Northern* from the cutter's torch so that it could be preserved, but to no avail.









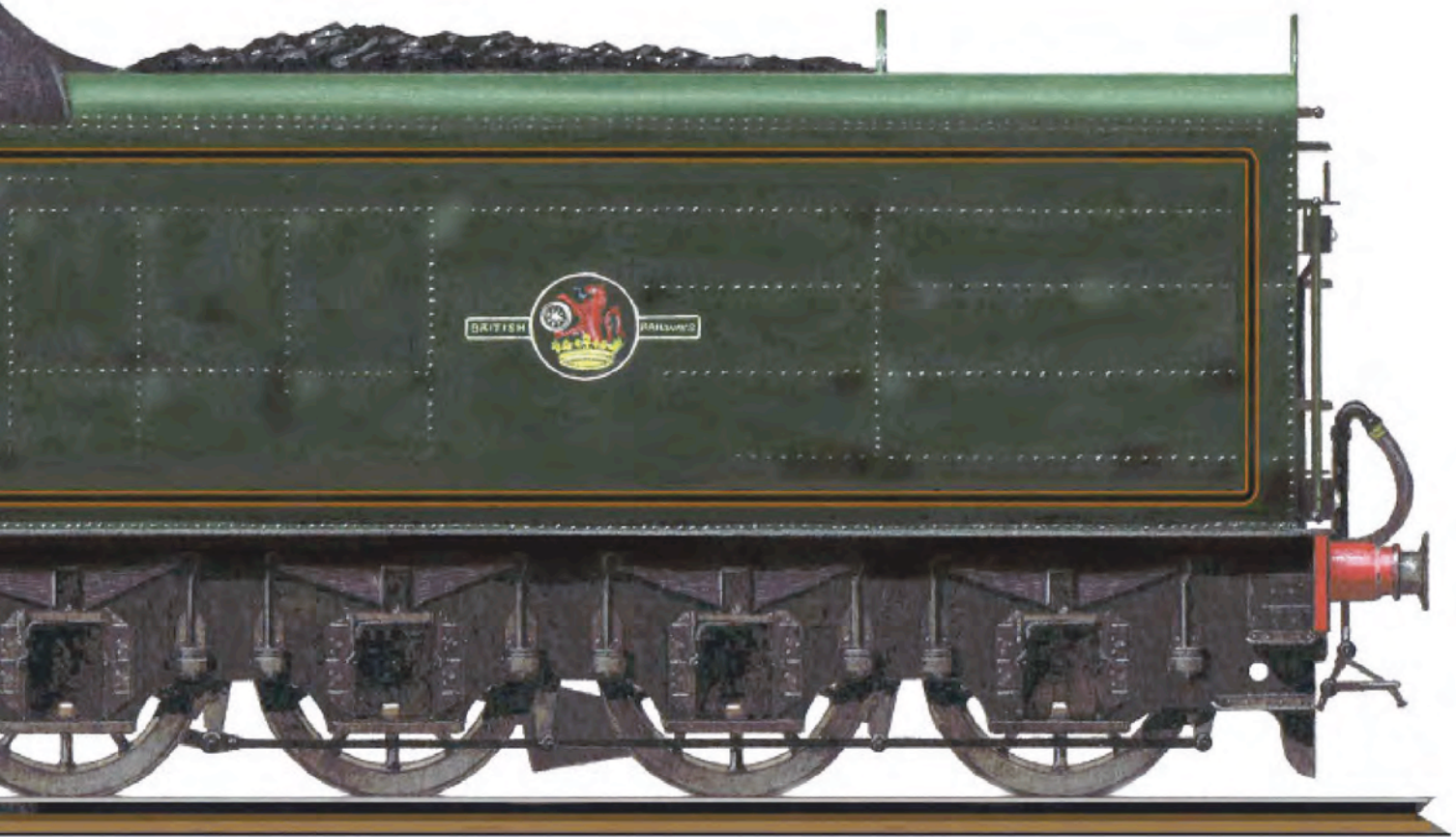
# No. 60532 *Blue Peter*

BY STUART BLACK

'A2' 4-6-2 'Pacific' No. 60532 *Blue Peter*. Built Doncaster, 1948, designed by Arthur Peppercorn for the LNER, entering service on March 25 after the formation of British Railways on January 1, 1948.

During tests in Scotland achieved 100mph on the 'Aberdonian' in 1949.







# THE P 'A1/A2





# CHAPTER FOUR

# PEPPERCORN

# 2' 'PACIFICS'

BY PETER TOWNEND, FORMER KING'S CROSS 'TOP SHED' SHEDMASTER



Peppercorn class 'A2' 4-6-2 No. 60526 *Sugar Palm* waits in the centre road at York before taking over a northbound express in the mid 1950s. KENNETH FIELD/RAIL ARCHIVE STEPHENSON



Peppercorn 'A2' No. 60532 *Blue Peter* in later Brunswick Green livery, seen at Dundee on August 28, 1965. GWYN PARRY COLLECTION/COLOUR-RAIL



# THE CLASS 'A2'

**W**hen Thompson retired in June 1946 a very large number of 'Pacifics' were on order. Doncaster was engaged in building 30 class 'A2/3s' with 6ft 2in driving wheels of which only the first, No. 500 *Edward Thompson*, had actually entered service. It was decided by the new Chief Mechanical Engineer, Arthur H. Peppercorn that this order could conveniently be curtailed after the 15th locomotive and the remainder built to a new design with the outside cylinders more conventionally placed between the bogie wheels which would shorten the locomotive and at last overcome the problems associated with the outside exhaust ducts. 13 more 6ft 2in wheel engines were on order from Darlington at an estimated cost of £14,700 each and this order was later transferred to Doncaster and increased to 20 of the revised design, but in 1948 the Railway Executive cancelled the order, although it was thought at one time if any regional designs were to be perpetuated in a standard BR range the new design classed 'A2' might have been one.

The 15 new 'A2' class 'Pacifics' entered service between December 1947 and August 1948. Only one was actually turned out by the LNER before nationalisation and the Chairman of the Board decided

that as it was the last locomotive to be built by the LNER it should be named after the CME, Arthur H. Peppercorn. Unfortunately his name was too long to fit on the now shorter smoke deflectors and therefore only his initials could be used: *A. H. Peppercorn*.

With the repositioning of the outside cylinders the wheelbase was now reduced by 2ft 7in and by retaining divided drive, the inside cylinder was moved forward increasing the front overhang. The outside connecting rods were increased to 10ft long and the inside rod was the same as Thompson had used at 7ft 2in centres. The same inside Walchaerts

valve gear was also fitted. The boiler was made of 2% nickel steel thereby reducing the plate thickness by 1/8in and the weight

by 7cwts. There was a return to the steam collector dome at the highest point on the boiler and the self-cleaning smokebox was reduced in length by nearly 1ft 6in. The cab was built to a new standard loading gauge introduced in 1947 where the sides tapered in slightly towards the corner of the roof. The front of

## FACT FILE: PEPPERCORN 'A2' IN DETAIL

<b>BUILT:</b>	Doncaster Works
<b>IN SERVICE:</b>	1947-1966
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 2in (1.88m)
<b>BOILER PRESSURE:</b>	250lb/sq in
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.6m <sup>2</sup> )
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts
<b>TRACTIVE EFFORT:</b>	40,430lbs (179.84kN)
<b>BR POWER CLASS:</b>	8P7F
<b>WEIGHT:</b>	101 tons (102.6 tonnes)
<b>NUMBER BUILT:</b>	15



'A2' 'Pacific' No. 60528 *Tudor Minstrel* with a fitted van train at Dundee on August 29, 1965. COLOUR-RAIL



BR-built Peppercorn 'A2' No. 60539 *Bronzino* at Grantham shed on October 9, 1948 in newly applied Apple Green livery. T.G. HEPBURN/RAIL ARCHIVE STEPHENSON



the cab was set at an angle of 45 degrees, a feature found previously to be advantageous in reducing glare and improving visibility, but

the front was straight in the middle so that the safety valves were now outside the cab instead of inside as on the 'A4' and 'V2'. A rocking

grate and hopper ashpan, a BTH speedometer, a steam driven Stones generator and electric lighting were also fitted.

Curiously the one retrograde feature was the reversion to single blast-pipes but the last of the class was fitted with the Kylchap double blast-pipe which left insufficient room in the smokebox for the self cleaning screens which had

been fitted to the rest of the class. The use of these screens in smokeboxes had generally a detrimental effect on steaming, although not a problem where fitted on other double blast-pipe locomotives. The single chimney was subject to complaint by the Scottish motive power authorities over some years. Most of the class had eventually been allocated to

#### 'A2' NUMBERING AND NAMES

LNER	BR	NAME
525	60525	A. H. Peppercorn
526	60526	Sugar Palm
527	60527	Sun Chariot
528	60528	Tudor Minstrel
529	60529	Pearl Diver
530	60530	Sayajirao
531	60531	Bahram
-	60532	Blue Peter
-	60533	Happy Knight
-	60534	Irish Elegance
-	60535	Hornets Beauty
-	60536	Trimbush
-	60537	Bachelors Button
-	60538	Velocity
-	60539	Bronzino

■ Note: only the first, No. 525 was built by the LNER, but the first seven received their LNER numbers, No. 60532 onward receiving their BR numbers from new.



Class 'A2' 'Pacific' No. 60527 *Sun Chariot* heads away from Hilton Junction, Perth with the up 'West Coast Postal' c1962. W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON



The now-preserved 'A2' No. 60532 *Blue Peter* departs from Perth with the Sunday 10.30am Aberdeen to Glasgow Buchanan Street in February 1962.  
W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON





Scotland and various adjustments to the smokebox proportions based on work carried out at Swindon were tried, ignoring the superiority of the obvious to fit the Kylchap arrangement of double blast-pipes. Five more of the class were however so fitted in conjunction with the change to Multiple Valve Regulators made in 1949, which were tried on these 'A2s' prior to adoption on the BR 'Britannia' 'Pacific' locomotives, but the other nine of the class remained with single blast-pipes, the only LNER 'Pacifics' never fitted with the double Kylchap arrangement. The Multiple Valve Regulators were in the superheater header instead of the dome and were operated by a control rod on the right hand side of the boiler. The snifting valve was eliminated as the regulator

operated on the superheated side of the header and the elements were therefore full of steam. A tangential steam drier was used in the dome and was intended to separate any water in the steam and prevent any scale forming in the elements.

Excluding the first of the class, the names of racehorses were fitted to the other engines which included several Doncaster Cup winners. There was at least one oddity, *Batchelors Button*, but fortunately also one name which helped the survival of the locomotive into preservation, *Blue Peter*. This was the name of a well known BBC television programme and the engine, the last of the class, was withdrawn in December 1966. It was the only 'Pacific' to survive from the Thompson and Peppercorn period. ■

LNER-designed 'A2' 60529 *Pearl Diver* actually carried its LNER number, 529, when it first entered service, even though officially it was completed by BR after nationalisation. Seen here on the turntable at Haymarket shed, Edinburgh. **COLOUR-RAIL**



Named after the LNER's last CME, 'A2' 'Pacific' No. 60525 A.H. *Peppercorn* is seen near Portlethen (just north of Stonehaven), with the up 'Aberdonian' from Aberdeen to King's Cross on July 25, 1955. D.M.C. HEPBURN-SCOTT/RAIL ARCHIVE STEPHENSON





## PRESERVING BLUE PETER BY PAUL APPLETON

No. 60532 *Blue Peter* is the sole survivor of Peppercorn's 'A2' class of 15 locomotives. It was outshopped in the old LNER apple green livery but with 'British Railways' spelled out on its tender sides in 1949.

During tests in Scotland, No. 60532 reached 100mph on the 'Aberdonian'. A regular railtour engine, its last was over the Waverley route in October 1966, with official withdrawal in December whereupon the locomotive was put into store. Purchased for preservation in 1968, it was adopted by the children's TV series *Blue Peter* generating a great deal of publicity, and soon returned to working order. It was painted into non-authentic LNER apple green livery and turned out as No. 532 *Blue Peter* at Doncaster Works Open Day in 1971.

The locomotive didn't do a great deal of work at the time, so owner Geoff Drury reached an agreement for the North East Locomotive Preservation Group (NELPG) in 1980 to return the locomotive to main line condition. This was carried out and in December 1991 *Blue Peter* went to the North Yorkshire Moors Railway for running in prior to its return to the main line, where it saw regular use from 1992. However, whilst working a train from Edinburgh to York on October 1, 1994 the locomotive suffered a prolonged and uncontrolled wheel slip whilst departing from Durham station, which resulted in the destruction of both sets of outside valve gear, movement of the front driving

wheels on its axle and bending of the leading coupling rods.

Repairs took 18 months with No. 60532 returning to the main line in 1998. With its main line certificate expiring in September 2001, the locomotive saw out its boiler certificate at the NYMR through to the end of the 2002 season. With uncertainty over its future and the funding of an estimated £500,000 overhaul it was put on static display at Barrow Hill Roundhouse, near Chesterfield.

In October 2014 it was announced that the locomotive has been acquired by the Royal Scot Locomotive & General Trust and is to be returned to steam once more, although at present no timescale has been set for this.





# THE FINAL DEVELOPMENT CLASS 'A1'





**1** 6 'Pacifics' with 6ft 8in driving wheels were authorised for construction at Doncaster and 13 more approved by the Board in May 1946, a month before the retirement of Edward Thompson. A further ten of these engines, all of which became known as class 'A1' were later additionally built at Doncaster and were the last 'Pacifics' to an LNER design built for the East Coast main line. When authorised at £15,500 each it was envisaged that the locomotives would be streamlined and £500 was allowed for this, but in those austerity times of shortages and rationing the idea was not proceeded with. Nevertheless a

variety of front end shapes had been considered in model form in order to incorporate the part which would assist in exhaust deflection.

The 49 'A1s' built were turned out from Doncaster and Darlington at the same time during a period from August 1948 to December 1949, the quickest delivery of 'Pacifics' achieved. The design is attributed to Arthur Peppercorn but was mainly the work of the drawing office team under Edward (Ted) Windle. In most respects the engines were similar to the 'A2s' except where the larger driving wheels required changes. The boiler and cab were identical but the smokebox was extended by 1ft 9in and at the last minute it

#### FACT FILE: PEPPERCORN 'A1' IN DETAIL

<b>BUILT:</b>	Doncaster and Darlington
<b>IN SERVICE:</b>	1948-1966
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 8in (2.03m)
<b>BOILER PRESSURE:</b>	250lbs/sq in
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.65m <sup>2</sup> )
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts
<b>TRACTIVE EFFORT:</b>	37,397lbs (166.35kN)
<b>MAXIMUM SPEED:</b>	100mph (160km/h)
<b>WEIGHT:</b>	105 tons 2cwt (106.9 tonnes)
<b>NUMBER BUILT:</b>	49 (plus one new-build, 2008)

was decided to fit the Kylchap double blast-pipe. As a result the whole class were free of steaming problems. Single seat Zara type regulator valves were fitted to most

of the class and largely overcame the blowing through problem. No new corridor tenders were made and the fitting of steam brakes precluded an interchange of those



Peppercorn 'A1' 'Pacific' No. 60115 Meg Merrilies seen on July 7, 1962. DONALD WILSON/COLOUR-RAIL



'A1' No. 60119 *Patrick Stirling* waits to leave King's Cross with an express on March 20, 1952. R.O. TUCK/RAIL ARCHIVE STEPHENSON



fitted to the 'A4s' which were vacuum braked. The 'A1' could not therefore participate in the non-stop workings to Edinburgh.

The only fundamental change made to the class was the fitting of roller bearing axleboxes to five of the class; Nos. 60153 to 60157, which increased the estimated cost of each locomotive to £18,500. A small number were also fitted with split axleboxes that were not successful and eventually removed. The additional cost of fitting roller bearings was amply justified by their trouble free running and higher mileages achieved between overhaul, the weight of the engine was however increased to 105tons 4cwt. The bearing sizes of the

crankpins and coupling rod pins were of the larger sizes used on the 'P2s'. The frames were spliced at the front which was odd considering *Great Northern* and the 'A2/1' had integral frames of one piece, but this was possibly due to the difficulty in obtaining the length of steel required.

An unusual fitting to some of the 'A1s' in later years was a silencer fitted to the vacuum ejector exhaust pipe inside the smokebox due to complaints of engines standing at the buffers at King's Cross station, making a noise when creating the brake and causing difficulties in hearing announcements. The locomotives were not immediately named but the first of the class,

No. 60114 was named *W.P. Allen* two months after construction, a trade union leader on the Railway Executive. He had started his railway career as a cleaner at Hornsey. It was another 18 months before a start was made in naming the rest of the class. The names selected were unusually mixed but included 13 more racehorses, some former 'A4' bird names, a number of Scottish interest and four representing the largest of the constituent companies of the LNER, which incorporated hand painted crests on the nameplates. A further six were named after former Locomotive Superintendents of the Great Northern and North Eastern railways.

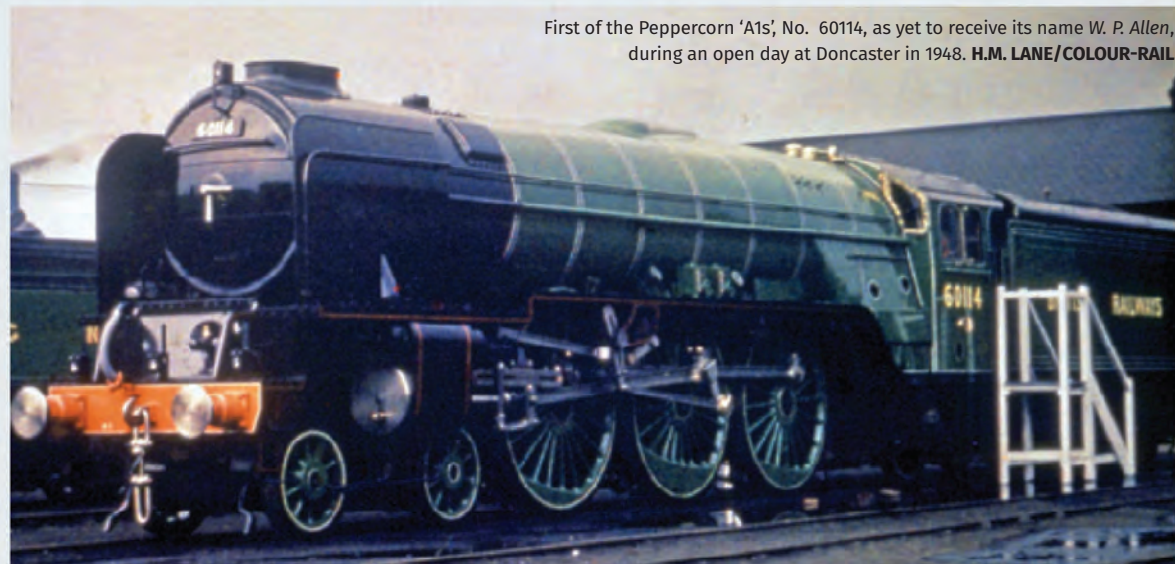
During April and May of 1949, the last of the 'A2s', No. 60539, and the first of the 'A1s', No. 60114, were tested with the dynamometer car on express trains of around 500 tons from King's Cross to Leeds and back using the same colliery coal as the interchange trials. Also tests were carried out on the 10.00am from King's Cross to Grantham and back with 600 tons. The first very clear and satisfactory result arising from the tests was the ease with which both locomotives worked the trains up to 616 tons in weight, proving their capacity to do so with increased economy in coal and water consumption. Some higher powers were recorded than any in the interchange trials





of the previous year. Both engines steamed well and the firemen had to exercise skill in preventing the engines from blowing off. The exhaust was clean and there was little black smoke. On one of the Leeds to King's Cross runs with 490 tons, the 'A1' burnt only 33.86 lbs of coal per mile, which was the lowest of all the tests and with over 600 tons the 'A2' recorded the best result of 43.8lbs coal per mile.

In everyday service it was the consistency of performance and general reliability which distinguished the 'A1s'. If there was an 'A1' on the front of the train you would generally be sure of a good run from the locomotive point of view. This could not always be said



First of the Peppercorn 'A1s', No. 60114, as yet to receive its name *W. P. Allen*, during an open day at Doncaster in 1948. **H.M. LANE/COLOUR-RAIL**



The first of 49 new Peppercorn 'A1s', No. 60114 *W.P. Allen*, passes under the superb signal gantry at High Dyke, near Grantham, with a King's Cross to Leeds express on August 29, 1958. **T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**

in the early 1950s of all the other classes in use on the main line. C.J. Allen stated his finest run with an 'A1' was with No. 60140 substituted at York for a failed diesel in 1958 which caused a 26 minutes delay. With King's Cross driver Dick Turner and a load of nine coaches, 308 tons tare, the train would have been early into King's Cross but for a signal stop just outside the station. The net time for the 188 miles was 158 minutes, an average speed of 71.4 mph or four minutes less than the 162 minute schedule of the 'Coronation' from passing York.

The one feature complained of by enginemen particularly at King's Cross where many drivers



Peppercorn 'A1' No. 60129 newly out-shopped in June 1949 at Doncaster, before it had been allocated its name. **H.M. LANE/COLOUR-RAIL**



Fresh out-of-the-box 'A1' No. 60122, as yet un-named, leaves Grantham with a Newcastle to King's Cross express on June 7, 1949. **T.G. HEPBURN/RAIL ARCHIVE STEPHENSON**



a total of 8.53 pence per mile which was by far the lowest cost for any multi-cylinder locomotive in the class 8 category. The class consistently averaged over 100,000 miles between classified repairs and the roller bearing locomotives 118,000 miles, the highest average of any of the LNER 'Pacifics'. One of the roller bearing engines at King's Cross achieved 197,000 miles between general repairs.

The first of the class to be withdrawn was in 1962 and the last in 1966. Life mileages for locomotives withdrawn after 1962 were not recorded but it is known that a number exceeded 900,000 miles in their short lives. None were preserved but almost unbelievably a new 'A1' named *Tornado* has been constructed and is a regular sight on lines across the country. ■

'A2' No. 60123 *H. A. Ivatt* severely damaged after a derailment at Offord on September 7, 1962, whilst hauling its first ever freight train, the 8.20pm King's Cross to Leeds. It went to Doncaster works for repair on 24th, but was condemned on October 1, the first of its class to be withdrawn. **COLOUR-RAIL**



'A1' No. 60134 *Fox Hunter* on a special 'Bulbfields Excursion' in May 1960. **COLOUR-RAIL**

had regular engines was the riding. The bogie used on all the Thompson and Peppercorn 'Pacifics' had side bearers instead of the weight being carried on the centre and this proved to be sensitive to any points, crossings and other track irregularities. The track of today has largely eliminated these features. Also some engines oscillated from side to side which was eventually overcome by increasing the tension on the bogie side control springs. Wedges on the axlebox horncheeks were not now fitted and there was no means of taking up wear. This was partly overcome by the use of manganese liners. There were also difficulties keeping the front end

tight and further strengthening was carried out, but the numerous out of course visits to works of the Thompson locomotives were largely eliminated. The use of inside valve gear, difficult of access for the driver to lubricate, did occasionally cause a failure on the road which the conjugated valve gear on Gresley 'Pacifics' did not. The latter was grease lubricated by shed staff and if a pin fractured which was very rare it was found on shed.

The maintenance of the 'A1s' was exceptionally light and this was reflected in the repair costs per mile produced for a number of classes by British Railways under a long term costing exercise. During 1953-55 the selected 'A1s' averaged



## 'A1' NUMBERING

60114 to 60162 (all BR from new)  
Nos. 60153 to 60162 built with Timken roller bearings





Peppercorn 'A1' 'Pacific' No. 60152 *Holyrood* is seen between Mawcarse Junction and Glenfarg with the 4.05pm Edinburgh Waverley to Perth train in 1958. **W.J. VERDEN ANDERSON/RAIL ARCHIVE STEPHENSON**



Last of the Peppercorn 'A1s', No. 60162 *Saint Johnstoun*, is seen near Heriot on the Waverley route with a Carlisle to Edinburgh Waverley express on April 15, 1961. **D.M.C. HEPBURN-SCOTT/RAIL ARCHIVE STEPHENSON**





# CHAPTER FIVE

# TORNADO: REALIZING A DREAM

BY MARK ALLATT, CHAIRMAN, THE A1 STEAM LOCOMOTIVE TRUST

In terms of preservation, the 'A1' represents a missing link in the evolution of East Coast Main Line express passenger motive power. It has been stated that the 'A1s' were the finest express passenger locomotives ever built in Britain. Superb as they were, the class were destined

to have a very short life owing to rapid dieselisation. Extinction is forever and this acted as a clarion call and so was born The A1 Steam Locomotive Trust.

The project caught the imagination of the media and when the first steaming took place, three TV companies were present. In a

two page story by the *Daily Mail*, the reporter, struck by the size of this behemoth and its massive, "Brunellian weight" wrote: "Since 1995, a team of around thirty enthusiasts, contractors, volunteers and staff have turned up every day to an old shed and happily milled and turned, cast, drilled, bored,

welded and torqued mountains of gleaming brass, copper and nickel-silver steel to create a machine that belongs to a bygone age." Also at that unforgettable first steaming, the fire was lit by Mrs. Dorothy Mather, the widow of Arthur H. Peppercorn. It was a deeply emotional moment and she stated





how proud Arthur would have been to have seen this new realisation of his life's crowning achievement. Unbelievably this was topped by the 'media scrum' at *Tornado's* first public move in steam, broadcast live on the BBC and covered as far away as China and Australia.

Following the completion of extensive test and trials on the Great Central Railway, *Tornado* completed three main line trials based out of the National Railway Museum in York during November 2008. The final 75mph test run from York to Newcastle and back on November 18 was witnessed by thousands from the lineside. Although *Tornado* entered traffic on the nation's main line network with her first train on January 31, 2009, the phenomena that is *Tornado* only really hit us on the February 7 'Talisman' from Darlington to London King's Cross. We'd been blessed with exceptional weather conditions – sun and snow, well-wishers had waved us by all along the southern end of the East Coast

*Tornado's* boiler is fitted into the locomotive's frames at Darlington Locomotive Works on June 28, 2007. Now the boiler is returning to Germany for minor repairs during No. 60163's winter intermediate overhaul having completed over 80,000 since its commissioning in 2008. **DAVID ELLIOTT**



New-build 'A1' No. 60163 running-in on the Great Central Railway on October 11, 2008. **SIMON LATHLANE**

Main Line and now here we were, emerging out of the gloom of Gas Works tunnel into the iconic King's Cross station. The 'A1' was coming 'home'.

But what was this? The platform ends were not dotted with young trainspotters, clutching their notebooks. Instead we entered the trainshed past a huge crowd of people, every inch of platform space filled with young and old, straining to get a look. Cameras were held aloft in a vain hope of getting a half decent picture. This was a film star reception! The run had been publicised in both national and local papers and the general public had responded. There was a 'happening' at King's Cross that day and they wanted to be part of it.

The station management had been anticipating a crowd of a 'few hundred'; no-one knows exactly how many people descended on King's Cross that day but a conservative estimate would be at least 2,000 and most probably a lot more. For an hour the station

was overwhelmed. It has become a defining image of what is now generally referred to as the '*Tornado* effect'.

On that day it was apparent that a significant proportion of the crowd were not die-hard railway enthusiasts, rather ordinary members of the general public, captivated by the story of success by a little private endeavour in a shed in Darlington. For many people at the station – particularly the young children held aloft on Dad's shoulders – it was probably their first ever sight of a 'steam train'. Steam had come to the masses and was followed just over a week later with the naming of *Tornado* at York railway station by TRH The Prince of Wales and The Duchess of Cornwall.

Of course *Tornado's* most high profile performance challenge to date was the 'Great Race to the North' - the April 25 London King's Cross to Edinburgh special train for the BBC *Top Gear* programme.

What else is there to say that has not already been said about this

#### FACT FILE: PEPPERCORN 'A1' TORNADO IN DETAIL

<b>BUILT:</b>	Darlington
<b>IN SERVICE:</b>	2008-present
<b>WHEEL ARRANGEMENT:</b>	4-6-2
<b>DRIVING WHEEL DIAMETER:</b>	6ft 8in (2.03m)
<b>BOILER PRESSURE:</b>	250lb/sq in
<b>FIREBOX GRATE AREA:</b>	50sq ft (4.6m²)
<b>CYLINDERS:</b>	Three, 19in x 26in (483mm x 660mm)
<b>VALVE GEAR:</b>	Walschaerts
<b>MAXIMUM SPEED:</b>	100mph (160km/h)
<b>OPERATIONAL SPEED:</b>	75mph (121km/h)
<b>WEIGHT:</b>	105 tons 1cwt (109.9 tonnes)
<b>NUMBER BUILT:</b>	1



## A WELL EARNED BREAK

On October 28, 2014, *Tornado* returned to its Darlington birthplace for dismantling as part of an intermediate overhaul having completed 80,000 miles over the preceding six years.

The boiler has been dispatched to the works at Meiningen in Germany where it was manufactured and is expected to return in time for the locomotive to be reassembled, ready for a return to steam in May 2015.

The frames of No. 60163 now stand alongside those recently constructed for the Trust's new 'P2' 2-8-2 No. 2007 *Prince of Wales*, the first time ever that a Peppercorn 'A1' 'Pacific' and a Gresley 'P2' 'Mikado' have stood side-by-side, the 'P2s' having all been rebuilt by Thompson as 'A2/2' 'Pacifics' before the first Peppercorn 'A1' saw the light of day.

During *Tornado*'s 'intermediate' there will be a full inspection of

the boiler, including removal of all the boiler tubes, replacement of a considerable number of firebox stays and renewal of the foundation ring corners.

At Darlington, the frames will have their hornblock/axlebox clearances re-set which will entail the removal of all driving wheels. There will also be a thorough inspection of the frames including all bolted and riveted joints, along with improvements to pipework, fitting of air pumps, a clear out and inspection of the tender, and preliminary work for the installation of the new ERTMS (European Rail Traffic Management System) equipment that comes into use from 2016.

When *Tornado* returns in 2015, she will be resplendent in the Apple Green livery she carried when named by HRH The Prince of Wales and the Duchess of Cornwall in 2009.



No. 60163 *Tornado* in express passenger blue. **STUART BLACK**

most remarkable of trains? Days like this don't just 'happen' – the run was months in the planning, the Trust's representatives using the good working relationships already built up with Network Rail and DB Schenker to steer a course between

the more outlandish requirements for a TV show and the practicalities of running an operational railway! What resulted was an 8-hour, four-stop schedule, representing one of the stiffest performance challenges ever faced in the preservation era.

On Friday April 20, 2012, No. 60163 *Tornado* took place in a photocall to simultaneously open the new Llangollen Railway extension to Bonwm Halt and launch the Steel, Steam & Stars III gala it was to star in over the following nine days. Here she leaves Berwyn heading for the ceremony at Carrog. **DAVID WILCOCK**







It came down to who had the best share of luck on the day. Don't believe the conspiracy theorists; this was a genuine race. A rasping start and sustained high-speed running at the southern end of the route saw to it that *Tornado* claimed

her fast path up Stoke bank, ahead of the following service train. Yet records tumbled throughout the day as she kept impeccably to her path to achieve the first single-headed ECML end-to-end run by steam since 1968. Actual time on the move was a shade under 6½ hours – an 'Elizabethan' performance!

And so what if the car 'won' – in terms of comparisons within the railway field, the run ranks alongside the best of ECML performances and was a triumph for the main line steam movement in general. And the subsequent showing on prime time TV, with the inevitable repeats, has been the single best bit of publicity for *Tornado* to-date.

And this has been followed by appearances up and down Great

Britain, whether hauling the UK leg of 'The Winton Train', rescuing stranded commuters from the snow in Kent, acting as cupid to a romantic proposal on February 29 or an unprecedented third appearance on the Royal Train which included over 500 miles and the first steam hauled sleeper for almost 50 years.

We are all absolutely delighted with *Tornado's* outstanding performance to-date. It is down to our more than 2,000 regular monthly and other donors, our sponsors lead by William Cook Cast Products Limited and the hard work of our volunteers and contractors that we have got this far. And during her short life the Trust has worked hard to keep the magic alive, including the wearing of all the historic 'A1' liveries of

Apple Green, Brunswick Green and the latest Express Passenger Blue.

And so completes the miracle; *Tornado* is already on the way to becoming as legendary as *Flying Scotsman* and *Mallard* and the Trust has already started its next project; the building of a Gresley class 'P2' 2-8-2. Without doubt, No. 60163 *Tornado* will continue to bring fascination and pleasure to millions.

For details of how to help *Tornado* visit [www.a1steam.com](http://www.a1steam.com) or email [enquiries@a1steam.com](mailto:enquiries@a1steam.com). ■

## NUMBERING

*Tornado* carries the next available number in the Peppercorn 'A1' series, No. 60163, but its official TOPS number is 98863.



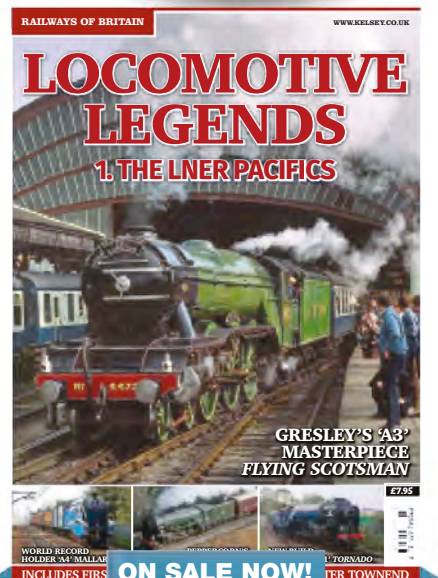
No. 60163 *Tornado* passes Grove Road crossing 'box near Retford, on May 10, 2012. **ALAN WEAVER**



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