
60163 TORNADO
New Steam for the Main Line


2007 PRINCE OF WALES
Building Britain's Most Powerful Steam Locomotive


3403 ANON
Recreating Gresley's last design

THE COMMUNICATION CORD

No. 63 Autumn 2021

Bob Hughes

Eight-coupled at last! *Prince of Wales* is a Mikado.

2021 CONVENTION *by Graham Langer*

The A1 Steam Locomotive Trust's 2021 Convention was again held at the Kings Hotel in Darlington and was, as ever, very well supported with over 120 people attending. Mark Allatt opened proceedings, welcoming Covenantors and introducing the team before President of the Trust, David Champion, took over. David gave an entertaining preamble, covering some of the history and significant events of the first 30 years of Trust activity, noting that, like the motto of RAF Cottesmore, "We rise to our obstacles".

Steve Davies followed on from David Champion, chairing his first actual Convention after last year's had to be held "virtually". Steve delivered a detailed overview of the Trust's current situation ➤

CONTENTS

Photos: Mandy Grant

David Champion.

Steve Davies.

and the formidable challenges it faces in the next few years and covering the current state of the group's financial standing. Steve also mentioned the need for the Trust to recruit more volunteers and paid tribute to those who already devote a significant amount of time to the organisation. He also welcomed Air Commodore (rtd.) Rick Peacock-Edwards to the role of Vice President of the Trust.

Graeme Bunker-James.

Graeme Bunker-James then covered *Tornado*'s forthcoming overhaul (see page 22), progress with the two boilers and fundraising for the overhaul. He then conducted a commercial review of tour operations, emphasising the usefulness of repeat itineraries such as 'The Aberdonian' and mentioning the successful working relationship that has been established with West Coast Railways culminating with *Tornado's* use on a series of 'Northern Belle' excursions at the end of the summer.

Mark Allatt took over from Graeme to look at marketing and P2 fund-raising (see his detailed report on page 32) as well as media relations and advertising, noting that we continue to gather good press coverage for both *Tornado* and *Prince of Wales*. Trust events restarted with our annual Convention and we can now start to plan Roadshows and open days at Darlington again. Although Covid-19 had limited our activities we have continued to deliver *The Communication Cord* quarterly and the monthly ebulletins *The Tornado Telegraph* and *The Mikado Messenger.* Mark also emphasised the benefits to the Trust of Covenantors remembering it in their wills!

Paul Bruce took a look at some of the exciting developments involving the Trust in the new Darlington Heritage Quarter and how the new Darlington Locomotive Works (DLW2) will fit into this ambitious project. Much of this effort is focussed on the approaching Stockton & Darlington Railway bicentenary in 2025 in which we hope that the A1 Steam Locomotive Trust will be "front & centre".

Paul Bruce.

David Elliott.

After an entertaining question & answer section, Steve Davies wrapped up the morning session since, in a change to the normal formula, David Elliott's P2 engineering talk was to be delivered during a live walk-round the locomotive at DLW. Lunch was therefore followed by transfer to Hopetown by a pair of vintage buses.

Once everyone was in the Works, Richard Courteney-Harris introduced David Elliott who was able to screen a video showing the design process featuring himself, Rob Morland, Daniela and Alan Parkin. Following this David conducted a very thorough and entertaining live tour of No. 2007 (details of which are covered on page 26 - Youtube video link https://youtu.be/PQHIatRqrqE). After this Covenantors were able to walk round (and under!) *Prince of Wales* and admire the extraordinary quality of construction and finish produced by the team at Darlington Locomotive Works.

Following an immensely entertaining day, Covenantors returned to the Mercure Kings Hotel for dinner, once again enjoying good food, wine and company. TCC

Photos: Mandy Grant

Members of the Board at the Convention.

Covenantors in Darlington Locomotive Works.

EDITORIAL *by Graham Langer*

With so much to report we have had to compress some sections of this edition of *TCC* a bit, the Convention report is a little shorter than normal but this compensated for by the availability of core sections on YouTube. With things slowly returning to some sort of normality it is good to report that we have been able to resume the P2 roadshows and hosted an extremely successful Convention in Darlington during September allowing supporters of the Trust the chance to view progress on No. 2007 *Prince of Wales* for the first time in nearly two years. If you read the archive section at the end of this edition of *TCC* you will find that we were at a very similar stage in the construction of *Tornado* in 2006 to that on No. 2007, less than two years before No. 60163 made her first moves in steam. To ensure we hit this target we have a huge amount of work still to complete and a lot of money still to raise – you know what to do! With Christmas coming it is a good time to start thinking about buying a Dedicated Donation for one of your friends or loved ones. Mandy Grant has worked wonders with the Dedicated Donations scheme which has already raised a staggering £440,000 and there are still plenty of components seeking a sponsor.

Tornado is reaching the end of one of her most intensive periods in traffic since she was built, often working five diagrams in a fortnight having picked up 'The Northern Belle' duties from a sadly side-lined *Princess Elizabeth*. The eagerly anticipated tours to be worked back-to-back with *Flying Scotsman*, alas, did not quite go to plan with the A3 suffering a recurrent AWS problem which meant *Tornado* had to work the last two trips alone. With a further half dozen trips to work on behalf of the Railway Touring Company, No. 60163 will not be able to take it easy until the end of December when she will undergo a well-earned heavy overhaul. It has been wonderful to witness our 21st Century machine thriving on hard work as much as her earlier sisters. It goes without saying that none of this would have been possible without our hard-working support crew or on train volunteers who must also be looking forward to some respite during the festive season.

On page 34 we reproduce an article which appeared in *Railway Wonders of the World* in 1935, profiling No. 2001 *Cock o' the North*, emphasising the awe with which such locomotives were viewed as the railways competed with each other to produce ever more efficient steam locomotives. One is able to see the achievements of Nigel Gresley through the eyes of a 20th century reader and it helps put the mighty Mikado into context. Let's hope that we can soon add No. 2007 *Prince of Wales* to our own list of 21st century "Railway Wonders of the World" alongside *Tornado*. TCC

TORNADO TOUR DIARY - 2021 / 2022

Below are the future operations *Tornado* is confirmed to be involved in. More details will be published on www.a1steam.com as trains are finalised.

- **Saturday 27th November** - 'The York Yuletide Express' - Ealing Broadway to York (steam to Chesterfield) - The Railway Touring Company
- **Tuesday 30th November** - Bath at Christmas - London Victoria to Bath and return - Steam Dreams
- **Thursday 2nd December** - Worcester Christmas Fayre - Norwich to Worcester and return (steam back to Peterborough) - The Railway Touring Company
- **Sunday 5th December** - Lincoln Christmas Market - London King's Cross to Lincoln and return - Steam Dreams
- **Tuesday 7th December** - 'The Bath and Bristol Christmas Express' - London Victoria to Bristol and return - The Railway Touring Company
- **Thursday 9th December** - Oxford Christmas Market Southend to Oxford and return - Steam Dreams - SOLD OUT
- **Saturday 11th December** - Edinburgh Christmas Market - York to Edinburgh and return - The Railway Touring Company - SOLD OUT
- **Thursday 16th December** - 'The Christmas White Rose' - Cambridge to York and return (*Tornado* - York to Peterborough) - The Railway Touring Company
- **Saturday 18th December** - 'The Christmas White Rose' - London King's Cross to York and return (*Tornado* off at Peterborough on return) - The Railway Touring Company

2022

- **Saturday 9th July** - 'The Yorkshire Pullman' - London King's Cross to York & Harrogate and return - Tornado Railtours
- **Thursday 21st July** - 'The Aberdonian' - Edinburgh to Aberdeen and return - Tornado Railtours
- **Thursday 28th July** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours
- **Saturday 30th July** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours
- **Saturday 13th August** - 'The Clyde Aberdonian' - Glasgow to Aberdeen and return- Tornado Railtours
- **Saturday 20th August** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours
- **Thursday 1st September** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours
- **Thursday 8th September** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours
- **Thursday 15th September** - 'The Clyde Aberdonian' - Glasgow to Aberdeen and return- Tornado Railtours
- **Saturday 17th September** - 'The Aberdonian' - Edinburgh to Aberdeen and return- Tornado Railtours

Tornado operates on the national network with West Coast Railways and DB Cargo and the Trust respectfully requests that anyone wanting to see *Tornado* follows the rules of the railway and only goes where permitted.

Tornado Railtours
01325 488215
a1steam.com/railtours

The Railway Touring Company
01553 661 500
railwaytouring.net

Steam Dreams
01483 209 888
steamdreams.co.uk

FROM THE CHAIR *by Steve Davies*

I believe I speak for all my colleagues at the Trust in expressing what an absolute delight it was to see so many of you – our valued supporters – at our recent Convention, confirming as it did that there can be no substitute for actual human contact! Apart from being able to socialize and generally interact, one of the greatest pleasures of the event was observing the looks of delight on people's faces on seeing the substantial progress which has been made with *Prince of Wales*. I hope you will agree that it was a seminal moment to see the coupling rods fitted (on one side at least!) thus giving a tantalizingly powerful sense of what the completed locomotive has in store for us. Two key components were of course absent from parade: the boiler and the cylinder block whose completion is not far off. Once received, the P2 really will begin to look the business. Our Flagship locomotive, *Tornado*, has been incredibly busy, delighting customers and the observing public in equal measure. The 'Aberdonians' were a major success, marking the locomotive's triumphant return to Scottish metals, and the welcome we received north of the border was as warm as ever. In this respect I would wish to place on record our gratitude for the strength of our partnership with the Scottish Railway Preservation Society without whom we would find the mounting of our Scottish programme challenging. Long may our friendship continue. Although *Tornado* will be coming out of traffic at the end of the year for a well-deserved heavy overhaul (which should last about five months) she will nevertheless be extremely busy right up to the point of withdrawal from traffic, engaged in a large number of trains that will see her operate across the UK. If you cannot travel with her in these last few months of her current ticket, I hope you will at least get to see her wowing the crowds on the mainline. It is at this point worth reminding you that we have established a specific A1 Overhaul Club, and I would ask that you give consideration to supporting it, not least to help guarantee that *Tornado* is back in traffic on time ready to meet the needs of what is already evolving into a busy and exciting 2022 programme.

At Trust level, your Council members are preparing to contribute to a major study into how we do our business, including a thorough overhaul of the functionality of our various managerial components. Our structure and general approach to business has served us well, virtually unchanged, for the last 30 years, but an increasingly complex and ambitious programme requires fresh thought. With the arrival of the P2 into traffic we will become a two locomotive operation, eventually leading to a third with the V4. We will also be occupying new premises located near Darlington's North Road Station which will give us a mainline connection for the first time. Should the operational support facilities we aspire to possess (turntable, ash pit, coaling and watering facilities etc.) come to fruition then, all of a sudden, we enable Darlington to become a major and regular destination for steam hauled charters, not just those we sponsor but from a variety of operators across the board. Exciting stuff, but a vision which will require adjustments to our business model if we are to optimize the considerable opportunities all this will bring.

They say that if an organization stands still it actually goes backwards, and I don't think any outside observer could accuse our Trust of lacking ambition! We have a huge amount to keep us occupied, but with the right people – and of course money! – we can deliver it all and more. I am indeed fortunate to have a strong and dedicated combination of volunteer and paid Trustees, advisers and staff to shape our ambitious plans, and I hope that you remain inspired by the vision we all share. Many, many thanks indeed for the support you have given, and continue to give, and please, if you can, consider deepening your involvement. TCC

A1SLT

Steve Davies presses the button to start machining the first component at Howco Engineering.

STOP PRESS!

As this edition of *TCC* was being put to bed the Chairman sent in a photo of the new Axle Driven Alternator (ADA) fitted to *Tornado*'s support coach, No. 21249, during a routine maintenance stop at the National Railway Museum in York. This will be the first of at least four of these units required by the Trust, one under each tender of No. 60163 and No. 2007 and one under each of the locomotives' respective support coaches. The culmination of a lot of hard work by Alan Parkin, the ADA may well become the 'go to' design for other main line registered locomotives or their support coaches

Right: The new Axle Driven Alternator (ADA).

TORNADO ON TOUR *by Huw Parker*

‘THE NORTHERN BELLE’ - FRIDAY 30TH JULY

***TCC 62* reported the move of *Tornado* at short notice to operate ‘The Northern Belle’ following the unfortunate failure of No. 6201 *Princess Elizabeth* and sadly the boiler issue appears to be somewhat more long-term than first thought. As a result, *Tornado* found herself operating once more over the Settle & Carlisle railway, standing in for another four trips before the end of September.**

Alistair Moulstone

Into the Fells on a typical Settle & Carlisle day.

‘THE ABERDONIAN’ – SATURDAY 31ST JULY

Mark Sweeney

A view as *Tornado* heads North across the iconic Forth Railway Bridge with ‘The Aberdonian’ on 31st July 2021.

‘THE NORTHERN BELLE’ – SUNDAY 8TH AUGUST

Another ‘Northern Belle’ service saw *Tornado* at the head of the train out of Glasgow and down to Carlisle for a quick service, before heading over the Settle & Carlisle to Hellifield. At Hellifield, *Tornado* handed the train over to a waiting diesel before travelling back to stable at Carnforth ahead of her next ‘Northern Belle’ duty three days later.

Liam Barnes

Under leaden skies *Tornado* works hard at Ais Gill.

‘THE NORTHERN BELLE’ – WEDNESDAY 11TH AUGUST

Taking charge of the train at Carnforth after it arrived from Crewe and Preston, *Tornado* headed north over Shap and down into Carlisle. After a short servicing stop and water, the locomotive was back on the train and set for an excellent run over the Settle & Carlisle once more. The weather steadily improved as she climbed Ais Gill and led to some great photo opportunities. After heading back to Carnforth, the locomotive was serviced and inspected again for a light engine move with the support coach back to Scotland to join ‘The Aberdonian’ the following day.

David Robinson

Right: *Tornado* passes through Kirkby Stephen.

TORNADO ON TOUR

'THE ABERDONIAN' – THURSDAY 12TH AUGUST

After an all too brief night's rest, the engine and crew were ready to join the train at Joppa, before heading into Edinburgh Waverley to collect the first of the passengers bound for Aberdeen.

Michael Denholm

Peter Backhouse

Above: An almost timeless image at Arbroath.

Right: In mixed weather conditions, the train returns via Forteviot.

SRPS 'FORTH CIRCULARS' – SUNDAY 15TH AUGUST

Mark Sweeney

Carrying a wreath in memory of Ian Boettcher, an SRPS member, *Tornado* is seen at Dalgety.

On Sunday 15th August, *Tornado* headed north again across the great Forth Railway Bridge, only this time she was hauling a train on behalf of the Scottish Railway Preservation Society and would cross the magnificent bridge another three times during the day!

John Martin

Pulling away from the water stop, *Tornado* heads towards the remaining chimney at Longannet Power Station.

Our route took us from Linlithgow north to Kirkaldy, before swinging back south and west via Dunfermline and along the north bank of the Forth. After a water stop at Newmills, a few miles short of the now decommissioned Longannet Power Station, our route took us along the single line through Alloa and on to Stirling. From there we headed back toward the Granite City passing Falkirk and back to our starting point at Linlithgow. Those passengers that joined only for the morning train left us here and the second circle officially began at Invergowrie but, on the way, we made a short servicing stop to take water, inspect and oil the engine at Dalmeny. The support crew worked hard here as five lengths of fire hose were required to provide water to the tender, but our thoughtful driver had stopped just after the road overbridge, so these ended right above the water filler! Good pressure meant that we were able to take a full tender and set off toward Invergowrie well within the allotted time. The weather was brighter during the second circuit, which must have pleased those with cameras watching for our passage, as well as the many locals who came out to see us pass. Under better skies, we were soon battling the undergrowth again on the single line sections along the north bank of the Forth. Approaching Longannet after the second Newmills water stop, a very poorly sighted signal obscured by undergrowth caused a sharp brake application which caused some consternation for footplate crew, stewards and diners alike! After reporting the obscured signal, we headed off to Stirling for the final visit of the day and then on to Linlithgow. From here, the final leg took the train back across the Forth Bridge to return passengers to Invergowrie before the train returned ECS to Bo'ness behind the WCR diesel that had followed the train after it had passed Linlithgow.

'THE CLYDE ABERDONIAN' – SATURDAY 21ST AUGUST

David Edgar

On a wet morning, the train runs under semaphore signals at Greenloaning.

Michael Denholm

An almost timeless view of *Tornado* pulling into Stirling on 21st August 2021 at the head of 'The Clyde Aberdonian'.

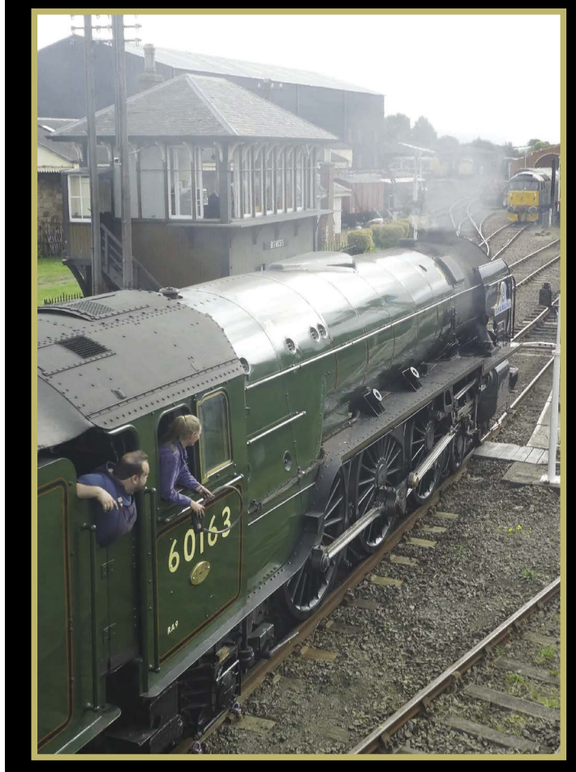
TORNADO ON TOUR

'THE ABERDONIAN' – THURSDAY 2ND SEPTEMBER

Mark Sweeney

Tornado **negotiates Markinch Viaduct with 'The Aberdonian'.**

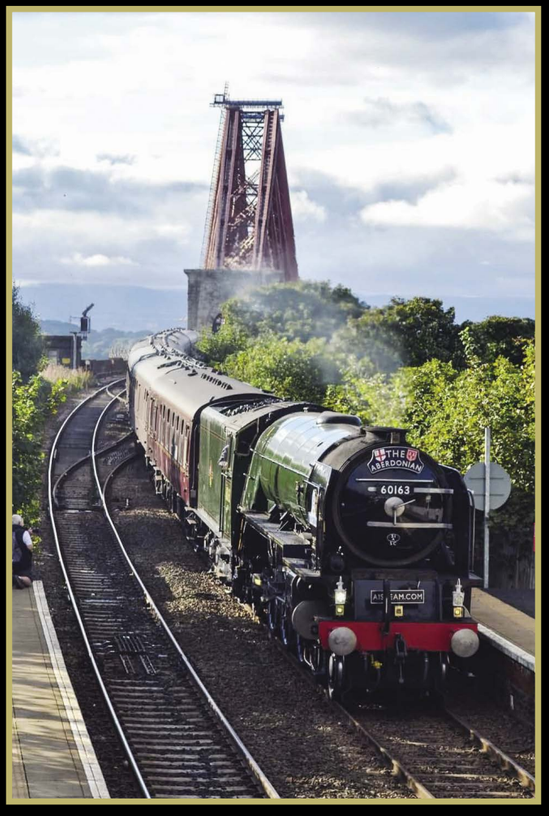
BO'NESS & KINNEIL RAILWAY SERVICE TRAINS – SATURDAY 4TH SEPTEMBER



Michael Denholm

Approaching Bo'ness, "Fireman" and A1 support crew member Faye Moore prepares to give up the token at Bo'ness as Jorge Gorman looks on.

'THE ABERDONIAN' – SATURDAY 11TH SEPTEMBER



Connor Gourlay

Tornado **runs off the Forth Bridge at North Queensferry.**

'THE JORVIK EXPRESS' – THURSDAY 16TH SEPTEMBER

Alan Weaver

'The Jorvik Express' approaches Sheffield.

Preparations for 'The Jorvik Express' began in Scotland, with the locomotive serviced and prepared at Bo'ness and then locomotive heading south behind a DB Cargo Class 66 leading *Tornado*, her support coach and the SRPS coaching stock as far as Preston. After taking water, *Tornado* and support coach turned at Lostock Hall Junction and then attached to the rear of the train for the remainder of the journey down into Liverpool Lime Street. *Tornado* was soon retracing her steps as light work was made of Edge Hill cutting, with the exhaust reverberating off the rock walls as we made the climb out to Edge Hill station before gaining speed, passing through Rainhill and the site of the original trials and Rocket 150 cavalcades of 1980. Some good running into Newton-le-Willows to pick up passengers followed and then we were away across Chat Moss and through the outskirts of Salford and into Manchester Victoria. After a brief crew change, *Tornado* dug straight into the climb out up Miles Platting Bank and climbing at a steady 20mph, the exhaust echoing back off the surrounding buildings before we were over the top and off around Stockport before climbing away

Huw Parker

Tornado **at rest in Crewe Heritage Centre in between working 'The Jorvik Express' and a transit move to the NYMR.**

TORNADO ON TOUR

Alan Weaver

***Tornado* accelerates out of Sheffield, heading for York with 'The Jorvik Express' on 16th September 2021.**

up towards Edale. Here a group of primary school children with a topic on engineering came out to the station to see us and, having asked in advance if we could blow the whistle for them, I believe they were not disappointed with the results! A good run through the Hope Valley and then we were dropping down towards Sheffield. A quick water stop at Brightside, topped the tender off nicely for the run North to Doncaster and on up to York.

Some hasty arrangements were needed at York to get the locomotive coaled and watered at the Railway Museum, before shunting the stock into Holgate Sidings and then turning on the turntable in the North Yard. Despite the tight schedule, we managed to return to the stock and propel back into the station for a right time departure back towards Liverpool. The route home saw some steady running as we wound our way back through Wakefield and along the Calder River valley. Plenty of people came to see us at the Brighouse water stop and after filling the tender once more, we were away again through Hebden Bridge and Rochdale and back down Miles Platting into Manchester Victoria for one last crew change for the run back to Lime Street. An early arrival meant plenty of time to meet passengers that had travelled with us as they headed home off the end of the platform. *Tornado* and the train then reversed heading for Crewe, where we stabled at Crewe Heritage Centre before a light engine move to the North Yorkshire Moors Railway to appear in their end of season gala.

Huw Parker

***Tornado* rests at the buffer stops at Lime Street after arriving from York.**

NORTH YORKSHIRE MOORS RAILWAY – 23RD – 26TH SEPTEMBER

Maurice Burns

***Tornado* departs Goathland on the NYMR with a service on 26th September.**

Huw Parker

Huw Parker

Above: The finished job looks good from the returning train – just the other side to do now team!

Left: *Tornado's* support coach was given some attention whilst at the NYMR support crew volunteers remove oil and grime from the paintwork and give the underframe a good clean too.

TORNADO ON TOUR

‘THE RIBBLEHEAD RAMBLER’ – THURSDAY 30TH SEPTEMBER

David Robinson

‘THE NORTHERN BELLE’ – SATURDAY 2ND OCTOBER

Chris Ainscough

Above: Back on ‘The Northern Belle’, *Tornado* storms up the grade at Greenholme.

***Left: Tornado* storms through Gargrave on ‘The Ribblehead Rambler’.**

‘THE NORTHERN BELLE’ – THURSDAY 7TH OCTOBER

David Robinson

***Tornado* worked yet another ‘Northern Belle’ (in less than ideal weather!) and is observed by the sheep at Hellifield.**

TORNADO & FLYING SCOTSMAN ON THE SETTLE & CARLISLE – WEDNESDAY 20TH OCTOBER

Kallum Buckley

A day when three steam locomotives navigated the Settle & Carlisle Railway. *Tornado* greets Battle of Britain Class No. 34067 *Tangmere* (on a test train) at Settle Junction.

FLYING SCOTSMAN & TORNADO ON THE SETTLE & CARLISLE – THURSDAY 21ST OCTOBER

Jorge Gorman

***Tornado* and *Flying Scotsman* together at Carlisle.** TCC

A1 ENGINEERING REPORT *by Richard Pearson*

After a busy summer I thought I'd show you a few pictures so you can see some of the jobs we have been doing to keep the wheels turning…

All photos - Richard Pearson

After a few weeks running out of Southall using the notorious London water and before we went to Scotland, both injector cones were removed for cleaning and de-scaling. The pictures above show the before (left) and after (right) on the live steam injector cones, the exhaust injector cones received the same treatment.

A few months' ago, just five minutes before a Fitness to Run exam was about to begin, the main boiler pressure gauge developed an internal leak when it filled up with steam and the glass fogged up - good job we carry a spare in the support coach. This defective gauge (right) has been away for repair and recalibration and is back in the coach waiting for the day when it may be needed again.

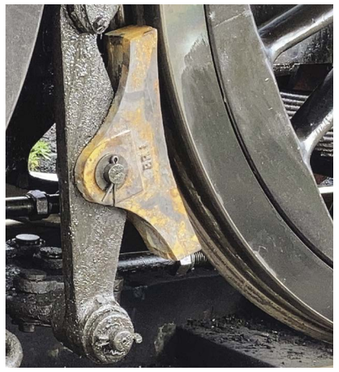
While at Bo'ness, the engine has had two A-Exam boiler washouts, one in early August and another at the end of August - here we see the locomotive on the pit at Bo'ness during the washout in early August.

During the boiler washout in early August, both the right-hand and left-hand injector steam valves and clack valves were removed for cleaning and re-cutting of the valve seats. The picture above shows volunteer Taylor Shaw refitting the left-hand injector steam valve while working under the supervision of Ian Greenan.

During a washout, everything receives a thorough inspection, and during the inspection it was noticed that the weld on the firehole door back plate had started to crack. The door was removed and repaired, and as pictured (bottom right) here we see it back on the engine complete with a fresh run of weld.

Another popular job that's done at every A-Exam is to grease the engine, we use around 30kgs of grease as we refill the roller bearing axleboxes, grease and the brake gear along with many other minor components which are lubricated with grease. Here we see Ian Greenan with the pneumatic grease machine getting ready to lubricate the engine.

During an S-Exam, a small air leak could be heard but initially couldn't be found and then eventually a small hole was discovered in a copper pipe in a very difficult to see and reach location, it was eventually repaired using solder while heating the pipe using the new mini gas torch, the before (top) and after pictures illustrate this.



Above left: On average we have to adjust the locomotive's brakes every other trip, and we continue to do this until they reach the minimum permissible thickness of 25mm before they have to be replaced as we did in August. The picture shows the new blocks in position before they were adjusted and set. The brakes on the tender don't wear at anywhere near the same rate as those on the engine and they only need adjusting a couple of times a year.

Above centre: The steam-driven generator also developed a loud noise when running that gave us cause for concern, so during one of the brief visits we made to Carnforth in between running 'Aberdonian' and 'Northern Belle' tours it was changed for the spare. The picture shows the old generator on the front of the engine during removal. The generator is now back at DLW and receiving an overhaul, after which it will be refitted to the engine.

Above right: Before every run we take boiler water samples and from the results we dose the boiler with water treatment. The mug (kept separate and labelled for use in this test only) contains a fresh sample of boiler water, the red instrument is giving a pH reading of 10.8 and the grey instrument is giving us a TDS (Total Dissolved Solids) of 1270ppm. Our target readings are for a pH of between 11 and 11.5 and the TDS must be as low as possible but no more than 3000ppm.

Right: The TDS can be partially controlled and lowered by doing a boiler blow down as seen in the photograph. A boiler blowdown helps get rid of any scale and sludge that builds up in the boiler between boiler washouts by blasting it out of the fully open boiler blow down valve, it also helps to keep the TDS in check between boiler washouts.

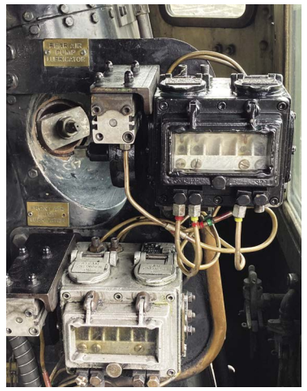
Centre left: Our duty engineers always keep a very close eye on bearing temperatures and oil consumption, and after every trip they measure the oil level in every oil pot and record the information in the 'oil consumption folder'. This information along with other observations has recently allowed us to turn the oil consumption feed rate down in the cylinder lubricator as it was using too much oil. The picture shows one of our engineers using the infra-red temperature gun to check the temperature of the left-hand big end.

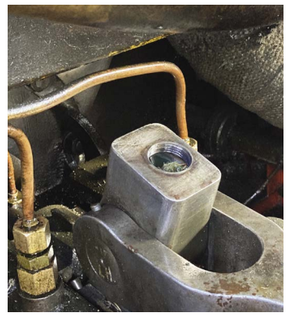
Centre right: As well as lubricating the engine, we also have to provide lubrication to the air pumps, and we do this using the pneumatically driven air pumps which are located in the cab as seen in the picture below. The pump which feeds oil to the rear air pump recently gave us trouble and had to be removed and taken to DLW for inspection and maintenance. The pump was repaired but it was thought that it was coming towards the end of its life, so it has now been replaced with a newly acquired and recently fully overhauled pump from DB Meiningen. The picture shows the new (black) pump in position.

The locomotive then returned south and then in October we carried out another A-Exam and boiler washout.

OCTOBER A-EXAM

Over the last few weeks, in between running 'The Northern Belle' trips we have been busy at Carnforth completing an A-Exam (and boiler washout) on No. 60163 and a No. 4 exam on No. 21249, and the pictures below show some of the tasks we have been undertaking.





Bottom left: On No. 60163 all the motion oil pots have had their caps removed and the trimmings cleaned and examined, and where necessary any contaminated oil has been removed and replaced with clean new oil. The picture shows the top of the middle combination lever with its cap removed, the trimmings and the clean oil can clearly be seen.

Botttom right: Once the boiler has cooled down it can be drained and then over 30 washout doors and plugs must be removed before the boiler washout can begin. Washing out the boiler can be a very cold, wet, and dirty job, and it uses large amounts of water, the picture shows the large puddles and the dirty water flowing from the boiler during the washout.

A man enjoying his work - we see Ian Greenan in the back of the smokebox while doing the boiler washout.

With the washout complete the boiler doors and plugs are all cleaned, examined and fitted up with new joints, the boiler was then examined before the process of refitting the 30 washout doors and plugs can begin. Here (right) we see Andy Morgan refitting one of the boiler doors.

All photos - Richard Pearson

During the A-Exam the engine also receives a thorough mechanical inspection and any outstanding repairs are complete, above we see Ian Greenan completing repairs and fitting a new piston packing to the left-hand piston rod.

Another important job that needs doing during the A-Exam is to deep clean the locomotive, above we see support crew member Chris Ardy cleaning the bits that we don't normally get chance to clean. On a normal rail tour prep day lots of cleaning and polishing gets done, but there isn't normally time to complete a detailed deep clean. So, from our Duty Engineers maintenance and inspection point of view, it's very much appreciated that the time is taken here to carry out this deep clean.

The locomotive is also greased during an A-exam, this is often a messy job and includes the greasing the locomotive axle boxes, the brake gear, the bogie, various linkages, and parts of the motion. The picture above shows Ian, complete with disposable overalls, greasing the bottom of the LH combination lever.

The support coach has also recently had a No. 4 exam, this being a periodic inspection that looks at both mechanical and electrical systems. Several small repairs and adjustments have been completed which included the repairing of the steam heating system, which was received as the most welcome of repairs by last week's support crew! The picture (above right) shows Andy Morgan working on the heat exchanger unit with various hoses and buckets employed to back flush the system and clear the blockage, all worked out quite well and we didn't get anywhere near as wet as we thought we would! TCC

Mike Watkinsshow

It is not always sunshine and smiles on the mainline and no matter what the weather *Tornado* gets stuck in. The locomotive is seen working one of the very successful 'Aberdonians' at Thornton North.

No. 60163 - 2022 OVERHAUL OUTLINE *by Ben McDonald*

Although the boiler on *Tornado* is not due to be overhauled until 2023, this period will be very busy with the appearance of No. 2007. The decision was therefore made to bring forward the overhaul of the locomotive to 2022 to spread the workload, and better enable the Trust to focus on both projects separately and with equal importance.

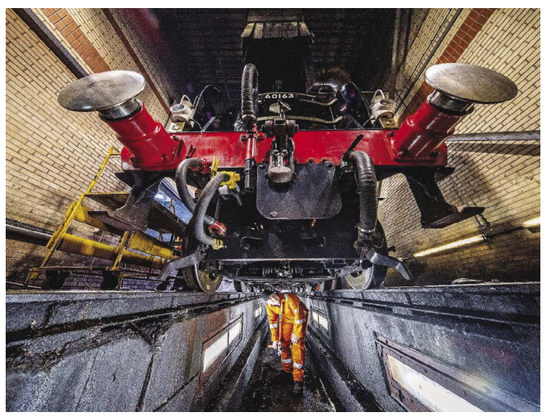
When stopped at the end of 2021, *Tornado* will have covered approximately 123,821 miles since 2008 (on its original tyres) and been in steam over 600 days since the last boiler overhaul in 2015. There are therefore some large items requiring attention by 2022. The intention is to move the engine to Locomotive Maintenance Services Ltd (LMS) in Loughborough in either late December or early January where it will be based for the duration of the project, expected to take around six months. The first major task will be to strip the locomotive into its major component parts to allow some to be sent offsite for work, and others to be prepared for internal or external contracting staff to work on. The major works planned are shown below:

LOCOMOTIVE

Boiler - The intention is to fit the first of the two new DB Meiningen (DBM) boilers directly into No. 60163. In advance of this is it proposed that a second ashpan for the locomotive is manufactured. This will act as a strategic spare, and also enable it to be fabricated and attached to the second boiler in advance.

Driving Wheels - The locomotive driving wheel and tender tyres require replacement. There is now insufficient material left for further re-profiling. The driving wheel tyres are currently in stock at DLW, and the tender tyres have just arrived at South Devon Engineering in Buckfastleigh who are booked to do the work.

Pistons and Valves - This area received significant inspection and work during the 2018 repairs. The current plan is to fit new cylinder liners, but only re-boring or honing of the valve liners. The pistons will be re-machined to suit the new liners, and new piston and valve rings fitted all round.
While everything is dismantled, the opportunity for access will be taken to de-carbon the steam passageways from any build-up since the last intermediate overhaul to ensure they are free flowing.



Charlotte Graham.

The big end, connecting rod and valve gear are carefully inspected between the frames.

Charlotte Graham.

Ian Greenan conducts an FTR check at York.

Motion - All the motion will be removed to enable the wheelsets to be sent away. This will also allow a thorough inspection and for subsequent repairs needed to any bushes and bearings.

Electrical Systems - Much of the electrical conduit on the tender is now considered life expired and will therefore be replaced before any issues begin to arise. During this period the cab electrical system will be both simplified and prepared for the future installation of the European Train Control System (ETCS) in-cab signalling system for the Network Rail East Coast Digital Rail programme.
To support the additional electrical demand of this programme, the overhaul window will also be utilised to fit a new Axle Driven Alternator and a second turbogenerator to the locomotive to power these systems and offer greater redundancy.

Ancillary Systems - Further attention will also be given to the rest of the locomotive with a range of tasks such as flushing and checking the lubrication system, overhaul of the steam valves, fittings, injectors and water valves. Key items of the air brake system will be inspected or sent for calibration and all the air receivers will receive mandatory inspection. A steam heat regulating valve will also be fitted which will prevent the need for the fireman to manually regulate the steam heat pressure dependant on the boiler pressure and the consequential number of leaks in the steam heat pipework on the coaching stock!

SUPPORT COACH

Bogies - A spare set of bogies has been procured from the Llangollen Railway. No. 21249's current bogies require replacement of the wheelsets and bearings along with refurbishment of the springs. This work is already underway to prepare the spare set for a quick swap under No. 21249. The set from No. 21249 will then be overhauled at a relaxed pace to be fitted to No. 35457.

Controlled Emission Toilet - Fitment of this system will be a requirement by 31/03/2023. It is planned to outsource this work to enable it to occur in parallel with the work on the locomotive. The overhaul window presents an excellent opportunity to complete this work with a suitable margin for overrun to prevent impacting any mainline operations. TCC

THE OVERHAUL CLUB *by Sophie Bunker-James*

It is recognised that steam locomotives, like teenagers, are expensive creatures and so it follows that *Tornado* is no different! Now in her 13th year in steam, *Tornado* is due to undergo an intermediate overhaul (as detailed in Ben McDonald's article). To help fund this engineering work, we have launched 'The Overhaul Club' to raise a target of £50,000 to supplement the capital already set aside. Donations to this Club will compensate for the interruption to our expected earnings caused by the pandemic.
We invite supporters to donate either £500 or £1,000 as a lump sum, or in instalments.

As well as the many perks of becoming an A1 Steam Locomotive Trust club member (including our excellent newsletters to keep up to date with progress), all Overhaul Club members will be entered into a Prize Draw.

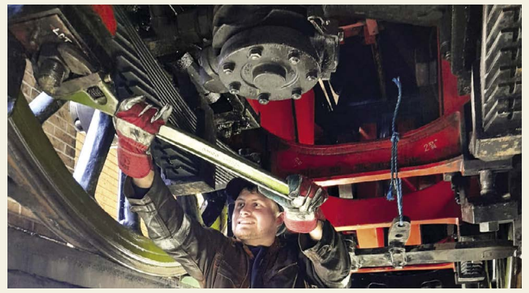
Our exclusive prizes include:

- a behind the scenes visit to the overhaul for a group of four
- a footplate ride at a preserved line
- a ride in the support coach on the mainline
- a pair of Premier Dining tickets on an A1SLT Railtour
- a smokebox number plate that *Tornado* has carried.

Those that donate £1000 will receive 25 entries, and those that donate £500 will each receive 10.

Familiar to the teenage experience, we plan to give the locomotive a full make over before it takes its exams in June. Work to be done includes:

- Fitting of new boiler
- New tyres for driving wheels and the tender
- Machining and fitting of new cylinder liners
- Preparation for fitment of European Train Control System
- Plus many other component overhaul, repairs and replacement.



Richard Pearson

At odds with other guardians of teenagers, we will be delighted to see her smoking at the back of the shed at the end of the day!

All whimsy aside, October marks *Tornado* no longer being the 'youngest' A1, as the locomotive overtakes No. 60153 *Flamboyant* for time spent in traffic. As the engine gets older it will inevitably require more frequent attention from our Maintenance Engineers.

We hope that our supporters will recognise this and consider increasing their monthly Covenants, one off donations and bequeaths to ensure that *Tornado* continues to make history on the mainline. Visit our website to discover more ways to support No. 60163 at **a1steam.com/the-overhaul-club** TCC

• SHED NOTICES •

This is a 'shed' notice in more ways than one! The North Yorkshire Moors Railway has officially opened its £4m 'Carriage Stable' at Pickering. The official opening saw VIP guests such as Professor David Stocker, Trustee of The National Lottery Heritage Fund and David Renwick, the Fund's Northern Regional Director alongside staff members, trustees, donors and volunteers of the North Yorkshire Moors Railway (NYMR). Guests were treated to a tour of the carriage care facility and got a chance to see *Tornado*.

The Carriage Stable is a five-track, single-story structure with a cantilevered roof and can house up to 40 of the railway's heritage carriages and will allow vital servicing and cleaning tasks to be carried out undercover. The Carriage Stable will be brought into full use during 2022.

NYMR

***Tornado* christens the new carriage stable at the NYMR.**

A1 PROFILE - No. 60134 *FOXHUNTER* *by Phil Champion*

This, Darlington Works' fifth A1, was constructed under an LNER January 1947 order for 23 Darlington A1s. When engine (fitted with boiler No. 3919) and tender No. 754 emerged as Works No. 2053 in November 1948 seven of the class had previously been completed. It was one of five (three Doncaster and two Darlington) to enter service that month. It was turned out in LNER style apple green with white and black lining and with 'BRITISH RAILWAYS' lettering but unusually, the top lining on the tender side was only three-quarters of the way up. Old gold was used for lettering and numbers, as on the LNER. Being Darlington built, countersunk rivets were used to give a smooth tender and cabsides. It was one of nineteen to have a Flaman speed recorder fitted from new.

Cedric Clayson

***Foxhunter* tears through Grantham on a Pullman train in 1962.**

Allocation on 5th November was to Copley Hill shed (COP) to become one of five based there. It was noted nine days later in Darlington station. Its first recorded working was on 4th December with the 15:10hrs up into King's Cross. Its regular duties were between Leeds and the capital, a number of workings being noted like the 12:45hrs Leeds–King's Cross on 2nd April 1949. However, it could still work into the North East as when No. 60134 was seen at Darlington again on 5th February. On 9th April 1949 it was seen on the down 'Yorkshire Pullman' in the London suburbs. Five days later it was on the up 'Yorkshire Pullman'.

Following a general overhaul, a repaint into BR blue with black and white lining plus the early BR tender emblem came in March 1950 as one of three that month to join the seventeen already in blue. Its name was fitted that October, again one of three dealt with. As twenty-two A1s were already named this means it was half-way through the naming process. One of thirteen racehorse names carried by A1s, Foxhunter was an illustrious horse, the property of Mr. E.Esmond, he had won the 1932 Doncaster Cup. Coincidentally it was also the name of one of the horses which took part in the British Show Jumping Team at the 1948 Summer Olympics where he won a bronze medal with Harry Llewelyn riding. That year he won the King George V Gold Cup as well.

In June 1951 No. 60134 revisited Doncaster for a general overhaul including the fitting of boiler No. 29842. Examples of No. 60134's workings were a down express from King's Cross on 9th August 1952 and the up 'West Riding' on 13th November, however, on the latter No. 60134 failed at Hitchin and was still on Hitchin shed a week later. It was one of the last to appear in BR green with orange and black lining in February 1953, the 47th A1 so painted. Back in 1950 No. 60134 had been fitted with the mechanical parts only of the Hudd Automatic Train Control (ATC) system but in early 1953 it was one of ten hurriedly fitted with a modified form of the ATC system. A working of another named train, 'The Queen of Scots' between Leeds and King's Cross *Foxhunter* was photographed in 1953.

Some of its workings were to and from Grantham. On 21st July 1953 *Foxhunter* worked a Leeds–King's Cross train as far as Grantham to return on the 14:18hrs ex-King's Cross to Leeds. Named trains from the capital included the down 'Bradford Flyer' on 21st September and the down 'West Riding' on 5th May 1954. Workings were made further afield. On 6th June it was seen in the North East in Newcastle. On 30th July it hauled the Sunderland–South Shields ECS then the 10:13hrs South Shields–King's Cross. 19th September found it on the 20:35hrs King's Cross–York parcels. Later 1954 records show some of its workings between Leeds and the capital when Pullmans were often hauled, 12th October ten Pullmans on the 07:50hrs KX–Leeds then the same load on the 16:45hrs return, ten coaches 07:50hrs KX–Retford, the 22nd with ten Pullmans 12:05hrs KX–Leeds when the steam brake was sticking on the engine, the 26th with thirteen coaches KX–Leeds to return on the 16:35hrs Leeds–KX, 16th November again with nine Pullmans 12:05hrs KX–Leeds then ten Pullmans on the same train on 22nd December.

Foxhunter returned to Doncaster in July 1956 for a general overhaul and replacement boiler (No. 29835) thereafter late 1956 and early 1957 show No. 60134 regularly on Pullmans and other King's Cross–Leeds trains. It hauled the down 'Queen of Scots' from 17th – 20th September, 5th, 13th and 27th – 31st October then on 2nd and 3rd March 1957. 'The Harrogate Sunday Pullman' was worked on 23rd September 1953 then the up 'Yorkshire Pullman' into the capital on 6th April 1957. From September 1953 to January 1957 No. 60134 could often be found on the 13:18hrs,15:40hrs or 18:15hrs King's Cross-Leeds. *Foxhunter* assisted A4 No. 60005 *Sir Charles Newton* between Sandy and King's Cross on 14th November 1957. A return to 'The Plant' for a general overhaul in May 1958 saw the locomotive leave carrying boiler No. 29837. Logged runs in 1959, 1960 and 1962 show it on the up 'Queen of Scots' from Leeds a lot. In May 1958 the later BR crest was applied to the tender. No. 60134 visited Doncaster again in March 1960 and received boiler No. 29839 during a 'General'. On 16th March 1962 *Foxhunter* was seen waiting in one of Leeds Central's Up bay platforms with coaches to attach to the Bradford portion of a King's Cross express.

In April 1962 No. 60134 moved from Copley Hill where it had been one of ten A1s to Ardsley (56B) along with three other A1s, Nos. 60121, 60131 and 60135. 'The Queen of Scots' was still hauled, as on 25th May and 5th June from Leeds to King's Cross. Other runs to the capital continued like the twelve coach Leeds Central-King's Cross express on 7th July. *Foxhunter* passed through Doncaster Works during September that year for its last overhaul and final boiler, No. 29801. Work during 1963 included the 18:28hrs King's Cross-York parcels on 22nd January and 3rd March, an extra Wakefield-King's Cross passenger on the 9th then an up freight seen in the London outskirts on the 13th.

A transfer to Neville Hill (55H) along with Nos. 60118, 60131, 60146 and 60154 was made on 28th July 1963. From then on *Foxhunter* worked north of Leeds regularly on summer Saturday extras to Glasgow and taking the 06:29hrs ex-Birmingham-Gourock CTAC special from Leeds to Glasgow on 3rd August and on the 23rd No. 60134 was seen at Ayr. It was noted working the ex-Marylebone car sleeper into Glasgow in October. The five A1s worked summer relief trains on the Settle and Carlisle line in 1964/65 as well as substituting for failed diesels between Leeds and Newcastle. Runs to the North East for No. 60134 included being serviced on Gateshead shed on 6th August 1963, then hauling the extra 1Z72 into Newcastle on 5th May 1964, bringing the 1N67 ex-Manchester into Newcastle on the 19th then being serviced on Gateshead shed afterwards and also from the 29th – 31st. Working the ex-St. Pancras overnight train into Carlisle at 04:49hrs to leave eleven minutes later brought No. 60134 to the north west border country on 5th June. It was used further north-east with the 2G85 Newcastle-Berwick stopping train on 29th June.

The last recorded working was a down passenger train at Darlington on 31st July 1965. A sighting of No. 60134 at Neville Hill shed was made on 21st August. Withdrawal on 4th October 1965 came later than many other A1s and with 36 already gone it was one of ten to go that month. It had carried five boilers, all of them diagram 118 designs, whereas the class average was seven. It was in service over a year and a half longer than the A1 average, 16 years 11 months as opposed to 15 years 2½ months. This was the fourth longest-serving A1. In November 1965 *Foxhunter* was sold to T.W.Ward, Beighton for scrap.

Robin Gibson

No. 60134 *Foxhunter* standing at platform 1, King's Cross, Circa 1957.

Robin Gibson

No. 60134 on 'The Yorkshire Pullman' at Welwyn in 1957.

Michael Denholm

No. 60134 at Newcastle Central station on 1st June 1965.

Bill Reed

A very clean *Foxhunter* at Grantham, date unknown but in late condition.

This history was compiled by Phil Champion based on the RCTS book 'Locomotives of the LNER Part 2A','The Pioneer' (A1 Steam Locomotive Trust), a database supplied by Tommy Knox of the Gresley Society and various published photographs. Revised and updated by Graham Langer, June 2020. TCC

P2 ENGINEERING UPDATE *by David Elliott*

General

Useful progress has been made on several fronts.

The impact of Covid-19 is at last diminishing with most of our suppliers working normally. So far none of the P2 engineering team has caught it and we are all double jabbed – in my case triple jabbed.

However, the disruption to manufacturing during the height of the pandemic is still having knock on effects with our suppliers, and with the opening up of the economy, we are encountering material shortages and substantial price hikes. Fortunately, with the work already done and with major components being the subject of fixed price contracts, our total exposure to the material price rises is limited.

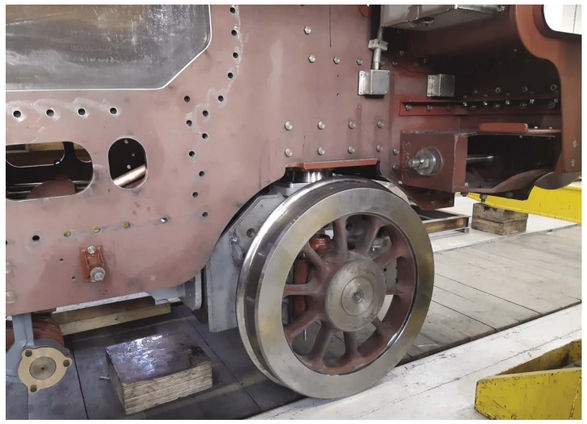
One thing which has slowed activity recently has been summer holidays, which have been re-established now that Covid-19 is receding.

Pony Truck

The pony truck saga rumbles on! It was returned to DLW for the Convention and trial fitted to the frames without the final machining of the manganese steel liners which had been causing problems for many months. For the Convention, the wheelset and cannon box were temporarily fitted – which was only possible as the replacement manganese liners for the cannonbox have yet to be welded on – delayed by us in order to enable the whole pony truck assembly to be in place for our supporters to see a Mikado.

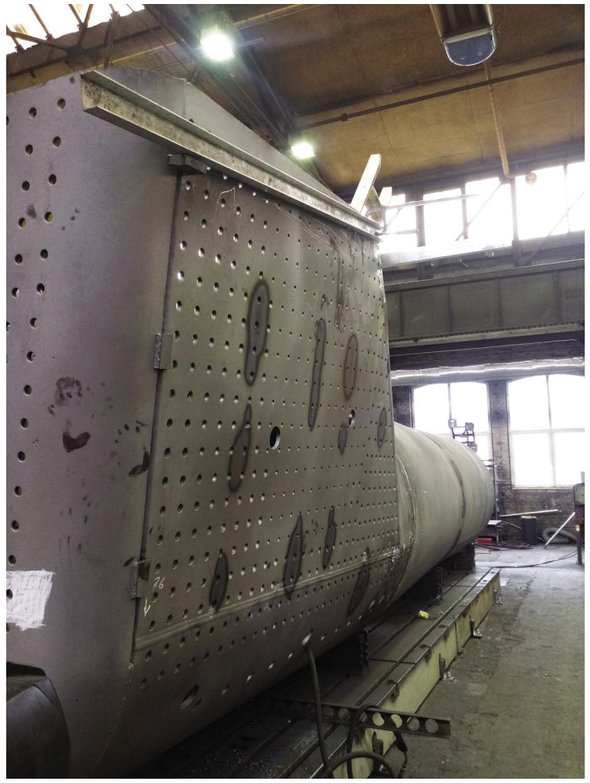
This gave us the chance to double check some of the vital dimensions between the cannon box and the bogie hornblocks. It immediately became apparent that the outer edges of the hornblocks were undersize by a few millimeters. Checks against the drawing quickly established that we were the victim of a (fortunately very rare) incorrect dimension. The dimension had been established by measuring the horn gaps on the cannon box. This had been done using our large Vernier caliper. When measuring inside dimensions it is necessary to add on the width of the parallel lugs on the ends of the jaws of the Vernier, and it appears that this was missed, and I failed to spot the error when checking the drawing (requiring me to slap my own wrist!). For once the continuing delays in finding someone to finish machine the manganese steel liners played into our hands, as to correct the error is relatively easy. The affected areas only experience compressive loads making the fix simple without compromising the structural integrity and Finite Element stress Analysis (FEA) already undertaken by our Daniela Filová. The outer side liners have been cut off, four spacers have been machined and had weld preps applied and new manganese steel side liners and fill-in pieces cut from stock material. As I write this report the pony truck frame is about to return to its fabricator to have these items welded on.

Meanwhile after an extended search a local machining company has been found with suitable machinery to complete the machining of the manganese liners to the finished dimensions – this is what had caused the delays in the first place due to the limited space between the face liners. Otherwise, the trial fit has confirmed that the pony truck is a good fit on the frames.



David Elliott

The pony truck under the frames.



BDMIA1SLT

The boiler under assembly at Meiningen.

Boiler

Following some delays due in part to Covid-19 and rectifying some dimensional issues on the first boiler (for our purposes it is essential that the two new boilers are the same shape and size and closely similar to the existing *Tornado* boiler to facilitate interchangeability), progress has resumed with both boilers. The consequent delay in delivery has proved beneficial to us in one respect as with Covid- 19 resulting in very few trains being run last year, *Tornado's* overhaul has been delayed by 12 months to the end of this year, and the expected completion of No. 2007 has been pushed out to 2023. If both boilers had arrived as originally planned it would have given us a problem to find warm storage for them!

Motion

The high spot of the last quarter has been the trial fitting of the first (left hand) set of coupling rods to the engine. We now have all the bushes and pins for the trial fit of the right-hand rods. This will be the acid test that the rods are the right length and that the "quartering" of the crank pins is correct. This will be tested by lifting the frames with the coupled wheels and rods fitted and, using the rotator originally manufactured for *Tornado,* to ensure that the wheels can be rotated smoothly without the rods binding anywhere. We are expecting the inside connecting rod assembly in the near future which will complete delivery of the "heavy" motion.

Cylinders and valves

Howco at Irvine, Scotland has made good progress with the initial machining of parts for the cylinder block and has commenced welding them together.

Meanwhile William Cook Cast Products (WCCP) has completed casting of the six steam port castings and delivered them to DLW, and a fine job they appear to be. We are in the process of having their joint faces skimmed so that they can be hydraulically tested to check for leaks. Whilst the entire cylinder block will be hydraulically tested by Howco prior to delivery, it is prudent to test the castings separately, as some faces of the steam ports will be inaccessible once they are welded on. Whilst WCCP has extensively subjected the castings to Non-Destructive Testing (NDT), we are aware that from previous experience with bronze castings, even with X-ray inspection, it is not always possible to see minute pin holes which might give rise to leakage, hence the belt and braces approach.

Alan Parkin has continued to produce some detailed machining drawings for the valve ports and cylinders. Checking of the valve gear and cam box drawings continues, and the one-third scale model of a cam box has been completed. Work continues to refine the material specifications for the critical items including cams and cam followers.

David Elliott

Above: The newly cast steam ports.

Centre right: Progress with the middle cylinder.

Far right: Welding up the middle cylinder assembly.

BDMIA1SLT

The boiler seen from the front tubeplate.

David Elliott

A 'Mikado' at last!

Howco

Brakes

We now have enough brake linkage to carry out a full trial fit whilst the wheels are under the locomotive, which will enable the final lengths of the brake pull rods to be determined. The remaining forked ends can then be welded onto the pull rods which will largely complete the engine brake rigging.

Tender

Ian Howitt's team has continued with detail components for the tender frames. The manganese steel liners have been welded onto the axleboxes which will enable final machining. The brake pull-rods and cross ties have been fully welded, so are effectively complete.

Profiles have been delivered for the 16 spring hooks. Work is presently centered on completing the eight spring planks which fit between the springs and the tops of the axleboxes.

David Elliott

The tender axleboxes with liners welded on.

Pipework and fittings

Further progress has been made on installing air pipework including the pipes from the air pumps to the wet tank which serves to unite the output of the two air pumps and to act as an oil and water separator for the air heading for the main reservoir tanks on the tender.

The materials for the LNER-style steam and water pipework are on hand and machining of fittings is underway. The fittings required in small numbers will be made at DLW whilst the few fittings that run to 10 or more will be subcontracted out for CNC machining.

Electrical System *by Rob Morland*

Work on the electrical system design is now almost complete and construction of key modules is about to start. Initial orders for components have been placed and more will follow in the coming weeks.

Next steps on the electrical system will include completion of design work on the tender systems. This is dependent on the Network Rail *Tornado* ETCS (cab signalling) project which is currently underway – we plan to use the same overall design for the tender electrical systems on both locomotives.

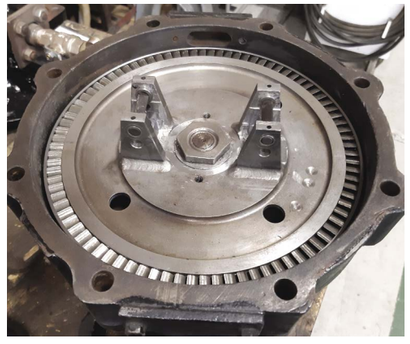
The testing of the new Axle Driven Alternator (ADA) has continued. Review of the design for certification indicated that at in the worst case (maximum output at minimum RPM) the toothed belts were stressed to a level which did not provide an acceptable margin. A minor redesign has been prepared which has involved increasing the width of the primary toothed belt to 30mm and changing the ratios so that rather than the entire 2.5:1 speed increase being performed by the primary belt, it is now shared between the primary and secondary belts roughly equally which reduced the peak belt tensions to an acceptable level in overall operating conditions. This has been achieved with new toothed belt pulleys and belts.

As this report is being written final arrangements are in place to carry out EMC (Electro Magnetic Compatibility) testing. In order to minimise the risk of variable frequency alternating currents interfering with signalling track circuits, EMC testing of all new electrical equipment for use on rolling stock is required. As the alternating current (AC) generated by the alternator is immediately rectified into direct current (DC) at 28v within its own casing, EMC problems are not anticipated.

Steve Davies

Testing the ADA with the traction engine!

The completed wheel.



David Elliott

The wheel fitted to the turbogen.

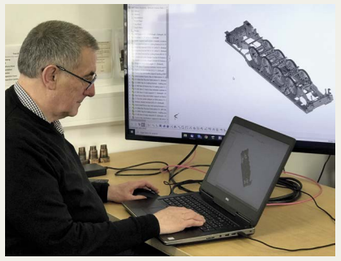
The present test rig which is designed to test the output of the alternator over a wide range of operations uses a 3-phase induction motor with an electronic variable frequency speed control. This kit is likely to produce electro-magnetic interference considerably in excess of the alternator, so a non-electric drive system was researched. An older style diesel engine operates with no electricity, however it is not capable of providing significant turning force (torque) from zero RPM. The ideal machine for this is a steam engine, so arrangements have been made to bring in a traction engine! We are grateful to Howard & Barry Stafford of Houghton-le-Spring for the loan of their road engine, a 1920 Leeds built 7NHP Fowler steam road engine *Providence*, the engine comes complete with belt and is a two-cylinder compound with a governor which makes it ideal for the task. They kindly donated their time and we supplied the coal.

Some years ago Meiningen Works, which provided the steam turbo alternator (turbogen) plus a spare for *Tornado*, had run out of serviceable second had turbine wheels which left us with a spares issue. In anticipation of fitting two turbogens to No. 2007, we took the decision to make a new turbine wheel using the original German drawings. Alan Parkin led this process with most of the fabrication being contracted to Durham Precision Engineering.

The intention had been to test this wheel on one of *Tornado's* turbogens. The turbogen which had been on the locomotive since the last overhaul eventually required changing due to excessive wear on the turbine blades which is an inevitable consequence of running it on saturated steam. The removed turbogen has been dismantled at DLW, worn components replaced and the new turbine blade fitted for setting up on air and running for a while on *Tornado* to check that it works properly.

In practice it is unlikely that we will make more wheels, as Meiningen has subsequently produced a new design of turbine wheel using 3D printing for the blades, none the less if these do not live up to expectations we have a viable method for making new turbine wheels to the original design using wire erosion for the stainless steel blades and CNC machining for the wheel and details. TCC

ASK DAVID ELLIOTT



Sandy Garden (Covenantor #601) asks:

"Please can David Elliott explain more fully the relationship between DHP and EDHP and why it is necessary to correct drawbar horsepower for gradient? This has puzzled me when looking at the figures for various locomotives and I have been unable to find an answer on the internet."

David answers, "Sandy, thanks for your e-mail. DHP (Draw Bar Horsepower) is the actual power available at the back of the locomotive and is what would be measured by a dynamometer car using a large calibrated spring attached to its draw hook for force, and the speed coming from the ninth (retractable) wheel under the car.

The problem is that most of the railway is not level, so if the train is climbing, the drawbar horsepower will be reduced by the amount of potential energy required for the locomotive to overcome gravity, and conversely if descending, the DHP will increase due to the contribution from gravity on the locomotive.

EDHP (Equivalent Draw Bar Horsepower) is a standardised measurement acquired by measuring the instantaneous DHP and adding the potential energy gained by the locomotive if climbing or subtracting it if descending. The loss or gain of potential energy is calculated from the weight of the locomotive, the speed and the gradient of the track at that point. EDHP is the "real" power developed by the locomotive and is therefore a good yardstick when comparing different designs. I hope that this is of help." TCC

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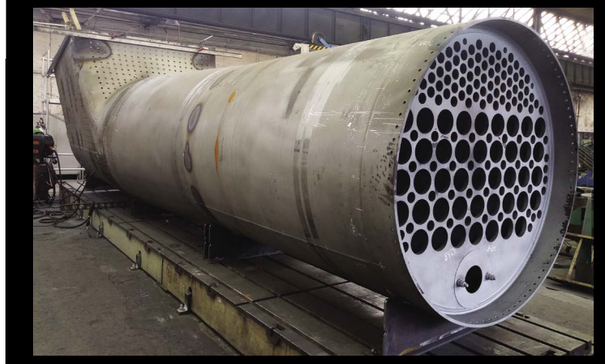
Help Britain's most powerful steam locomotive to build a head of steam

Join The Boiler Club today and help us to complete No. 2007 *Prince of Wales* in record time!



The boiler is the beating heart of a steam locomotive and to keep the construction of No. 2007 *Prince of Wales* on schedule for completion within two years, we placed the order for the boiler in 2019. We established The Boiler Club to fund the construction of *Prince of Wales'* boiler. Therefore our aim is to raise at least £600,000 for The Boiler Club from 300 supporters each donating £2,000 to the project (in up to 16 payments of £125 by standing order) - we are more than than three-quarters of the way there, having pledges of over £450,000 (excluding Gift Aid) so far!

Special benefits for members of The Boiler Club:

- **Opportunity to buy a ticket (seat already reserved) on one of No. 2007's first main line trips**
- **Reasonable access to No. 2007 at all times**
- **Opportunity to buy exclusive Boiler Club badge**
- **First choice of other components to sponsor**
- **Special limited edition version (signed/numbered) of the first official painting of No. 2007 *Prince of Wales* with No. 60163 *Tornado***
- **Special supporters' day with *Tornado*.**

Together we can build this remarkable locomotive - join The Boiler Club today!

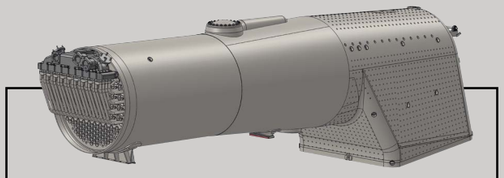


Diagram 118b boiler drawing shows fitted with Melesco type superheater header as used on *Tornado*.

No. 2007's boiler in detail

- Use of the diagram 118a *Tornado* boiler with detailed modifcations to improve life between overhauls
- Interchangeable with *Tornado's* boiler
- *Tornado's* boiler is 17in shorter than P2 boiler – No. 2007's smoke box will be extended within the cladding
- 250psi of No. 60163's boiler will be retained to improve economy and increase maximum power.

2007 PRINCE OF WALES
Building Britain's Most Powerful Steam Locomotive

For further information please visit **www.p2steam.com** email **enquiries@p2steam.com** call **01325 460163** or write to The Boiler Club, P2 Construction Fund, Darlington Locomotive Works, The A1 Steam Locomotive Trust, Hopetown Lane, Darlington DL3 6RQ

THE P2 SUPPORT COACH APPEAL PASSES THE 60% MARK!

by Mark Allatt

In 2020, a unique opportunity arose for The A1 Steam Locomotive Trust to acquire BR Mark 1 BSK E35457 for eventual use as the support coach for No. 2007 *Prince of Wales*.

A support coach and crew are an essential part of the operation of steam locomotives on Network Rail.

Since British Railways steam operations ended in 1968, much if not all of the static infrastructure and paid staff required to support them no longer exists, requiring the use of support coaches and crews to travel with the locomotive.

Support coaches are usually drawn from passenger brake coaches of the BR Mark 1 era, taking advantage of the existence of the guards/parcels van space for ease of conversion to workshop and store functions. The passenger area will provide mess room, seating and/or sleeping accommodation.

Brake Corridor Second (BSK) E35457 was built at Wolverton in 1963, is fitted with Commonwealth bogies and was most recently used as the support coach for BR standard class 4 No. 76084. In surprisingly excellent condition, E35457 will require minimal work other than the reinstatement of its dual-brakes and the addition of a similar electrical system to that fitted to E21249, No. 60163 *Tornado's* support coach.

Huw Parker

The support coach while it was in traffic on the Great Central Railway.

The A1 Steam Locomotive Trust is seeking to raise an initial £100,000 from at least 100 supporters to each donate £1,000 (in up to eight monthly payments of £125 by standing order) towards the acquisition, overhaul and conversion of BR Mark 1 BSK E35457.

In recognition of their support, donors will receive:

- Exclusive certificate signed by David Champion (President) and Steve Davies OBE (Chairman) of The A1 Steam Locomotive Trust
- The opportunity to buy a ticket (seat already reserved) on one of the first trains hauled by No. 2007 *Prince of Wales*
- Reasonable access to No. 2007 and No. 60163 at all times
- Special supporters' day with *Tornado*
- Two tickets (booked in advance) to travel behind *Tornado* or *Prince of Wales* in E35457 on a heritage railway and commemorative photograph with the locomotive and coach.

Launched in 2020 as part of The A1 Steam Locomotive Trust's 30th Anniversary Appeals, The P2 Support Coach Appeal has got off to a good start and by July 2021 had already attracted 54 supporters donating over £50,000 plus Gift Aid.

You can subscribe to The P2 Support Coach Appeal by going to our online donation page on our website at **www.p2steam.com/support/support-coach-appeal.** Alternatively, for further information please visit **www.p2steam.com**, email **enquiries@p2steam.com** or call **01325 460163**. TCC

The P2 Support Coach Appeal is raising funds for the acquisition and overhaul of BR Mark 1 E35457. If there are surplus funds left over following its acquisition and overhaul, we will use the money to purchase or manufacture other components for the Gresley class P2 that the charity would not otherwise have.

P2 ROADSHOWS, DARLINGTON LOCOMOTIVE WORKS OPEN DAYS AND PRESENTATIONS *by Mark Allatt*

In the light of Government restrictions, we suspended our P2 Roadshow programme, Open Days at Darlington Locomotive Works (usually held on the first and third Saturday of the month) and ad-hoc Presentations to external groups throughout 2020 and had to do the same during the first few months of 2021.

Following their suspension due to Government restrictions, we have restarted our P2 Roadshow programme, holding the first in Peterborough (Great Northern Hotel on Saturday 16th October 2021) and with plans for London (London Transport Museum on Saturday 29th January 2022). As previously, the presentations feature key team members including Mark Allatt and/or David Elliott and cover the background to the project to build new Gresley class P2 No. 2007 *Prince of Wales*, progress to-date, future plans and details of how to get involved. The two-hour presentations will start promptly at 11:00hrs and run until 13:00hrs and are open to existing supporters and interested members of the public.

We have also restarted our Darlington Locomotive Works Open Days . From August our Open Days have been back to their traditional open-house format on the first and third Saturdays of the month from 11:00hrs until last entry at 16:00hrs - please check the events page on www.p2steam.com or call the office on 01325 460163 for the current status.

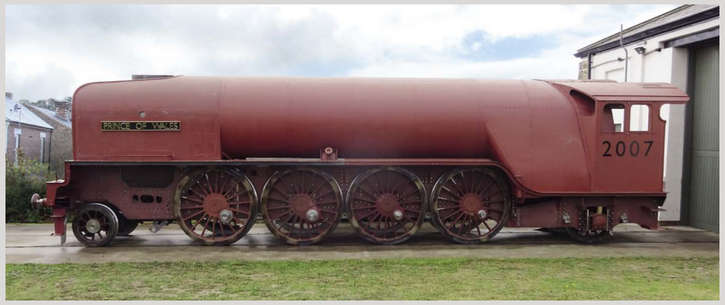
As the world slowly returns to normal we are also seeing increasing numbers of requests for presentations to third-party clubs, societies and other organisations. Please email presentations@a1steam.com for more information.

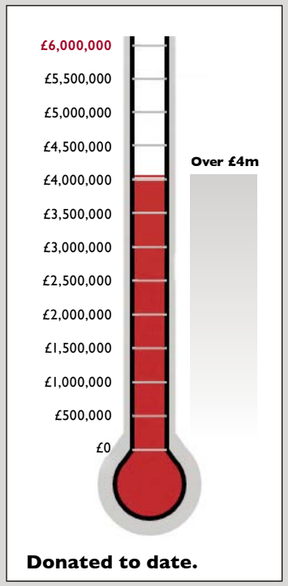
We would encourage you to attend our P2 Roadshows to find out more about our progress over the past 18 months and our Open Days to see this progress for yourself. Please do bring along friends and family members who would also be interested in hearing about the project - keep an eye on our websites and other communications for further details. Thank you in advance for your patience and understanding.

For more information on the P2 roadshows visit **www.p2steam.com**, email **enquiries@p2steam.com** or call **01325 460163**. TCC

P2 PROGRESS *by Mark Allatt*

Now two-thirds built with £2m to raise over the next two years to complete the project.





Donated to date.

As you will have read elsewhere in this edition of *TCC*, even in these challenging times our project to build Gresley class P2 No. 2007 *Prince of Wales* continues to make good progress on all fronts. It continues to be difficult to ascertain at the time of writing what the long-term impact of the coronavirus will be on our fundraising efforts, but we are carefully monitoring our financial position and building as much flexibility into our project plan as possible. As we know, our fundraising works as a virtuous circle, with donations generating progress which encourages supporters new and existing to support the next phases of construction.

Our biggest challenge at the moment continues to be the recruitment of new supporters due to the lack of opportunities to talk to potential supporters face-to-face – although we have seen some improvements here with our Open Days back to their traditional open house format from August and our first P2 Roadshow in Peterbrough in mid-October. A huge thank you to all our supporters who continue to give most generously to the project. At this time, we are still on target to complete the new locomotive within two years provided we can turn up the wick on our income growth.

Public interest in seeing a new Gresley class P2 become a reality sooner rather than later remains high and over 1,000 people have already signed up to the 'P2 for the price of a pint of beer per week' (£2.50 per week or more) Covenant scheme since its launch in March 2014. The average monthly donation is around £18 per Covenantor (including Gift Aid) and the projected annual income for our P2 project from the monthly Covenant scheme is now around £250,000pa – a remarkable achievement in such a short period of time and all thanks to the generosity of our supporters.

Because of the Government restrictions imposed on us due to coronavirus, we had to suspend our programme of DLW Open Days and P2 Roadshows in 2020/2021 and have therefore not had the face time with potential new supporters that we would normally achieve. Whilst we are doing what we can do raise our profile digitally and in the print media, I would encourage all of our existing supporters to try to recruit a friend to come on board as a covenantor or if possible, consider increasing your Covenant.

Our other fundraising initiatives continue to progress steadily. The Founders Club, The Mikado Club, The Cylinder Club, The Turbogen Club and The Pony (Truck) Club have all been closed having reached or exceeded their targets, raising almost £900,000 including Gift Aid. Our open fundraising clubs - The Boiler Club, The Motion Club, The Tender Club, The Injectors Club, The Cylinder Manufacturing Club and The P2 Support Coach Appeal - have so far raised almost £1.1m including Gift Aid. Our Dedicated Donation (sponsor a component) scheme has raised over £440,000 including Gift Aid.

Our order in June 2019 for two new boilers – an heir and a spare – from DB Meiningen makes it more important than ever that we reach our 300 members initial target for The Boiler Club as soon as possible. As of October 2021, we have already recruited 232 people – over three-quarters of the initial target - to The Boiler Cub, each of whom have pledged £2,000 to fund the boiler, meaning that almost £460,000 of the £600,000 initial target (excluding Gift Aid) is now pledged. With the delivery of the boiler for No. 2007 now scheduled for summer 2022, we need an average of eight new members a month – please do consider becoming a member of The Boiler Club if you are able. If you are already a member of The Boiler Club, please do consider joining a number of Club members who have taken out a second membership to fund No. 2007's share of the spare boiler.

We launched The Tender Club in April 2019 to raise the funds to manufacture No. 2007's tender. We set ourselves the challenge of raising at least £450,000 through The Tender Club from at least 250 supporters each donating £1,500 (plus Gift Aid) to the project in up to 15 payments of £100 by standing order. The Tender Club got off to a rather slow start, but progress has been steady, and we have now recruited 108 people – over 40 per cent of the initial target - as of October 2021 which is still in stark contrast to the tender's progress! As you can read in David Elliott's engineering update, work has progressed steadily on the tender frame since the last edition of TCC. We still have a long way to go to be able to fully fund the tender and will therefore need to more closely align its pace of construction with the availability of funds over the coming months. Please help us to close the gap and get on board The Tender Club.

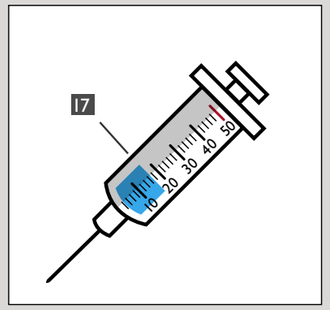
The P2 Support Coach Appeal was launched in August last year to acquire, overhaul and convert BR Mark 1 BSK E34547 into the support coach for No. 2007. Our target is to raise £100,000 from 100 supporters each donating £1,000 and we are delighted that as of October 2021 we have already recruited 60 supporters which is fantastic progress - if you haven't already done so, please do consider stepping on-board.

Our latest mini-club, The Injectors Club, was launched in June to raise funds for the acquisition of live and exhaust steam injectors. It has an initial target to raise at least £50,000 from 50 supporters each donating £1,000 plus Gift Aid (in up to four payments of £250) – as of October 17 members have already joined.

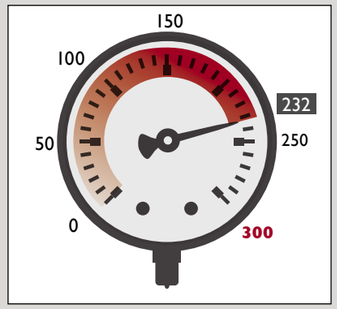
Having commissioned Howco Group Plc to fabricate the new cylinder block using steel castings supplied by William Cook Cast Products Ltd, in July we launched The Cylinder Manufacturing Club to raise the required £250,000. The aim is to raise an initial target of £250,000 from 250 supporters each donating £1,000 plus Gift Aid (in up to eight payments of £125) – as of October 34 members have already joined.

Our Dedicated Donations initiative continues to generate substantial income for the project, with over £440,000 to-date from existing supporters sponsoring a variety of components. There are still a considerable number of wheeling-related Dedicated Donations still available for sponsorship, ranging from a driving wheel spoke at £600 (or from £25 per month for 24 months) to a Cartazzi axlebox casting at £1,300 (or from £50 per month for 26 months) to a driving wheel casting & proof machining at £12,000 (or from £200 per month for 60 months).

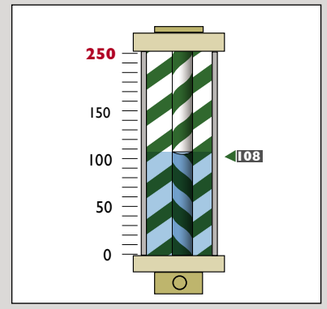
We are delighted with the level of support that the project to build Britain's most powerful steam locomotive has received since its launch. This means that over £4m has been converted into metal and more than £4m raised of the estimated £6m required.



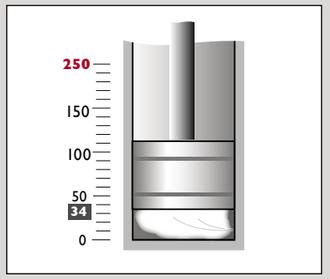
Injectors Club - 17 members.



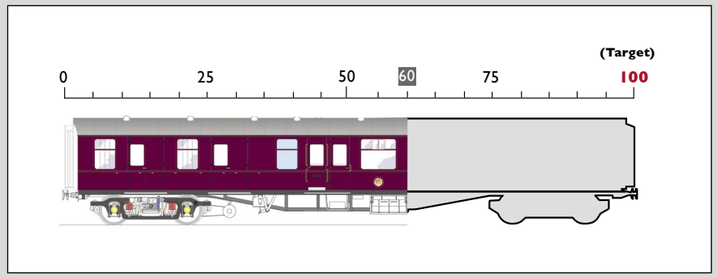
Boiler Club Gauge - 232 members.



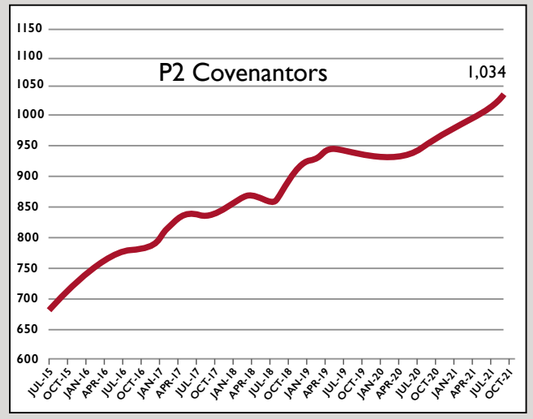
Tender Club Gauge - 108 members.



Cylinder Manufacturing Club 34 members.



The P2 Coach Appeal - 60 supporters.



We now have a rolling chassis and we remain on-track for completion of the new locomotive within two years. However, to maintain this rate of progress we need to raise more than £80,000 per month, which given the nature of the regular donation scheme becomes more challenging as each year passes. Last financial year on average we raised £50,000 per month (including legacies) and so we will have to work harder over the next two years to reach our target.

We would encourage all our supporters who haven't yet contributed to this exciting project to help us to meet these deadlines by becoming a 'P2 for the price of a pint of beer a week' Covenantor, (regular donor) by going to our online donation page on our website at www.p2steam.com/support/regular-donations. Alternatively, for further information please visit www.p2steam.com, email enquiries@p2steam.com or call 01325 460163. TCC

COCK O' THE NORTH in *Railway Wonders of The World*

Railway Wonders of the World was a weekly magazine published in 50 parts during 1935-1936 and had a cover price of 7d. The following is an article from edition No. 13 which was published on 26th April, 1935. The article was entitled "Cock 'o the North – Secrets of one of Britain's most famous locomotives".

Competition is always stimulating. There is no question that the competition of other forms of transport has stirred the locomotive engineers considerably. Diesel railcars, for example, have established a new mode of high-speed transport on rails. Electrification, where traffic conditions are sufficiently dense to warrant the heavy expenditure involved, has been carried out on an extensive scale. Competition from outside the railways, on the roads, and in the air has to be fought unceasingly.

But "King Coal" is determined to hold his own. On a thermal efficiency basis the steam locomotive of traditional design does not rank very high. Even in the best conditions, not much more than seven per cent of the heat units developed by the burning of the coal on the locomotive fire-grate is turned into useful work in moving the locomotive and its train.

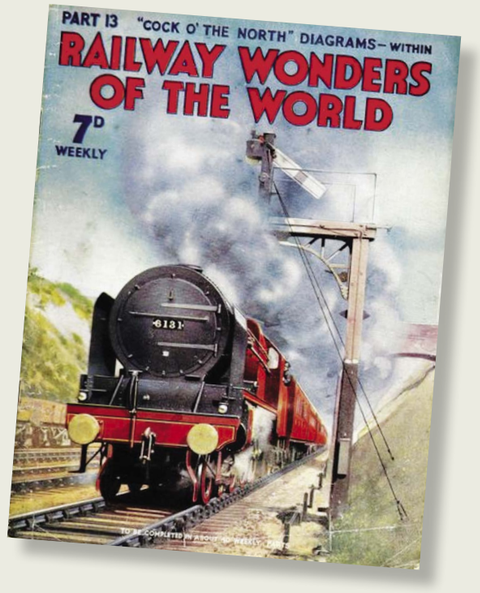
There are, as previously explained, many reasons to account for this figure. The use of the exhaust steam to furnish a draught for the fire necessarily means that power for the purpose must be thrown to waste out of the chimney, whereas in a stationary power-station the steam would be condensed, and its heat, at least, would be trapped. Similarly, the limitations imposed in length and diameter on the locomotive boiler involve the loss up the chimney of much of the heat from the fire.

Some years ago the locomotive engineers of the Paris-Orleans Railway of France made an exhaustive study of all the features of locomotive design which have a bearing on efficiency. Their study concentrated on the "flow" of the steam from the time it left the boiler until the moment of its rejection, as exhaust, from the chimney. It was realized that much could be done by the use of larger and more direct steam-pipes and passages, and of improved inlet and exhaust valves to the cylinders, to facilitate that flow. Measures could also be taken to speed up the circulation of the water in the boiler, and this would increase the capacity to raise steam.

An existing "Pacific" locomotive was rebuilt in the Paris-Orleans workshops at Tours to embody the results of this research. The effect was startling. The reconditioned engine, though weighing no more than one of the London and North Eastern "Pacifics", created new standards of combined speed and weight haulage on what was already a very speedy line. It was proved that trains weighing over 800 tons could be hauled not merely to scheduled time but well within it.

A series of these earlier "Pacifics" was reconditioned, and the next experiment was to convert another "Pacific" to the 4-8-0 wheel arrangement, with a similar boiler, cylinders, and valves, for working over the extremely difficult route through Central France from Vierzon (to which point the trains are worked electrically from Paris) to Toulouse. Again the results were successful.

These developments attracted attention all over France. Other French railways followed suit, and as some of the Paris-Orleans steam locomotive stock was becoming superfluous, owing to the extension of main line electrification from Paris to Tours as well as Vierzon, the Paris-Orleans rebuilt many more of its "Pacifics" for transfer to the Nord and the Est Companies. The news of these Paris-Orleans transformations spread to England when the London and North Eastern Railway was



The cover of *Railway Wonders of the World* No.13.

about to build new locomotives for service over the heavily-graded east coast main line between Edinburgh and Aberdeen.

This is one of the most difficult main routes, from the locomotive point of view, in Great Britain. Gradients as steep as 1 in 70 abound. There are also numerous sharp curves demanding reductions of speed, most of them at the beginning of long adverse gradients so that the drivers are compelled to slow down severely just when they are in most need of the impetus for the climb that follows.

From Inverkeithing, for example, after slowing round the curve to twenty miles an hour, drivers of south-bound trains have an ascent for two miles at 1 in 70 on to the Forth Bridge, and north-bound trains face a similar, though shorter, grade up to Dalgetty.

From every intermediate stop, also, the trains have to accelerate up steep gradients, in some cases, indeed - as in both directions from Arbroath and Montrose, and southwards from Aberdeen - long and arduous climbs. The consequence has been that most of the heavy modern East Coast expresses have needed "double-heading" - that is, the provision of an assistant locomotive - over this section. The new type of engine had to be sufficiently powerful to obviate this.

It was decided that to give an increased tractive force to enable the engines to get away more rapidly from these frequent stops and slowings, and also to move these heavy trains at higher speeds up the banks, the driving wheels should be reduced in diameter from the 6 ft 8 in of the "Pacifics" to 6 ft 2 in, and the diameter of the cylinders increased from the 19 in of the high-pressure "Pacifics" to 21 in. The next essential was to provide greater adhesion, so that this increased power might be transmitted to the rails without slipping, and the decision was made to use eight-coupled instead of six-coupled driving wheels.

Why It Was Designed

These points are important, as "Cock o' the North" was not designed, as has been widely supposed, for high-speed long-distance running, but for the difficult conditions of the Edinburgh-Aberdeen route. It was the first eight-coupled locomotive built for express passenger service in Great Britain.

However desirable it might have been to provide the engine with a leading four-wheeled bogie, the increased length would have made it necessary to replace the turntables along the route by tables of larger diameter. It was not thought necessary to incur this additional expense, and the locomotive was therefore designed, like the 'Moguls', with a two-wheeled radial truck at the leading end. Another pair of wheels at the rear end carries the immense firebox, and the wheel arrangement of the engine is thus the 2-8-2, or 'Mikado' type, as it is generally known.

Examination of the internal economy of the "Cock o' the North" shows that the designer of this notable locomotive - Mr. H. N. Gresley, the Chief Mechanical Engineer of the LNER, - has adapted to British conditions certain of the principles, which proved so effective on the Paris-Orleans Railway, and has incorporated them in the engine.

The fine sectional picture of the engine, which appears below, reveals what a mass of detail has been crowded within the smooth external casing of the locomotive. It also shows the difficulties experienced by the designer of the modern locomotive in compressing, within the narrow limits of the British loading gauge, all the working parts of an engine capable of exerting over 2,000 hp on the draw-bar of it train.

At a working pressure of 220 lb per sq in, steam passes

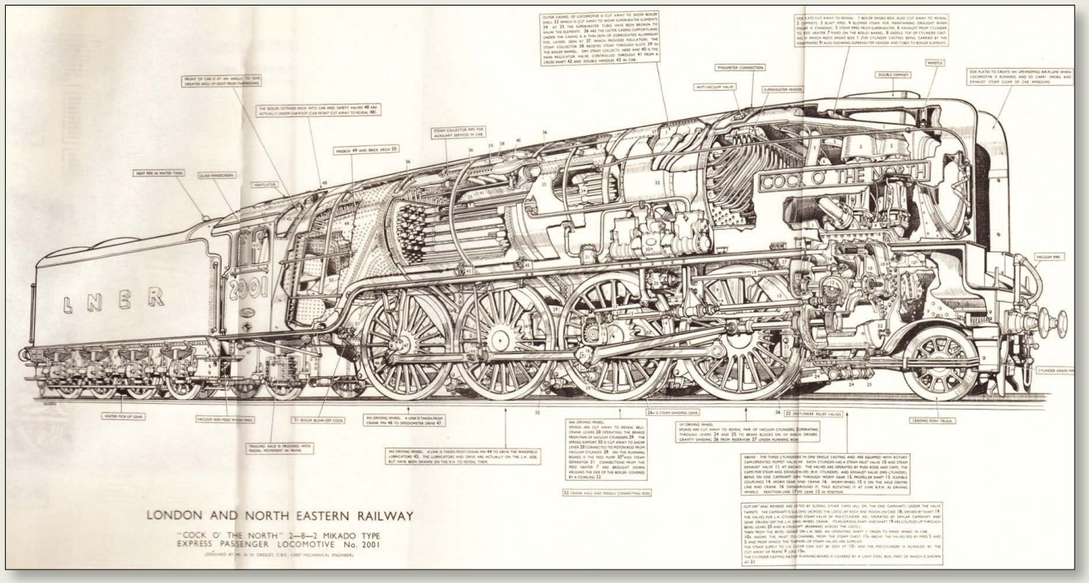
One of the LNER publicity images that accompanied the *RWotW* article.

from the boiler through a series of long narrow slots up into a cavity of pressed steel, which has been riveted on to the top of the boiler at the rear of the dome. From the regulator the steam passes into a main steam-pipe having the unusually large diameter of 7 in. The next stage of its journey is through a 43-element superheater, from which it is led down to the cylinders.

Large poppet-valves of 8-in diameter admit the steam to the cylinders, and 9-in valves are provided for the exhaust; the valves are worked by a rotary cam arrangement, instead of the ordinary Walschaerts valve-motion.

The last stage of the journey of the steam is into a blast pipe which branches into two, leading up to a double chimney which has three telescopic sections from the bottom to the top, and is known as the "K.C." blast-pipe*, after its designer, Monsieur K. Chapelon of the Paris-Orleans Railway.

All these arrangements so facilitate the passage of the steam that the engine is capable of doing high-speed work with heavy trains at no more than ten per cent cut-off - that is to say, steam is admitted for one-tenth of the stroke only, and for the remaining nine-tenths does its work by expansion.



The superb, annotated, cut-away drawing of No. 2001 that was included.

One result of this ultra-short cut-off working is that the pressure at which the steam is finally exhausted is very low, and there would be a tendency for it to drift along the top level of the boiler and obscure the front windows of the driver's cab, were special precautions not taken to prevent this. It is here that the external casing at the front end of the engine, with its wings on either side of the smoke-box, serves both as streamlining and also to make a strong up-current of air when the engine is running at speed, which lifts the exhaust steam from the double chimney, and carries it well clear of the cab.

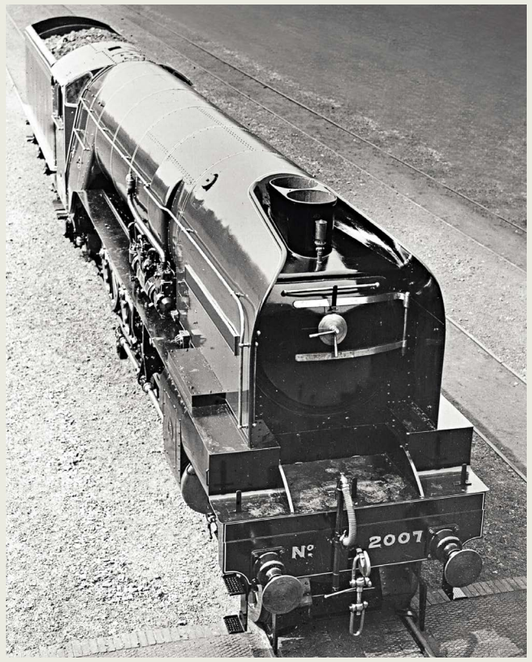
The cab-front also is V-shaped, to assist in the streamlining effect, but, despite the enormous size of the boiler, there is an excellent look-out ahead. Inside the external boiler casing there is found another aid to efficiency in the feed-water heater, of the A.C.F.I. type, which uses some of the exhaust steam in order to heat up the feed-water on its way from the tender into the boiler. This means that less heat is required inside the boiler to convert the feed-water into steam.

A novelty is provided in the shape of a chime whistle in front of the chimney, which was the only convenient place in which it could be put. The tender is of the standard LNER eight-wheeled type. "Cock o' the North" is the heaviest locomotive built, up to the time of writing, for passenger service in Great Britain, and weighs 110¼ tons in running trim; with the tender the total weight is 165½ tons.

Shortly after the "Cock o' the North" had emerged from Doncaster Works, a test run was made, with a train weighing 650 tons, from King's Cross to Barkstone, just beyond Grantham, and back. The long gradient to Stoke Summit, partly at 1 in 200 and partly at 1 in 178, was surmounted at an average speed of a mile-a-minute for the whole distance, and without speed at any time falling below 56 miles an hour. The engine developed at the draw-bar the hitherto unprecedented figure for Great Britain of 2,090 hp.

Whether we like it or not, locomotive fashions are fast altering. Both internally and externally revolutionary changes are being made, and from recent developments - of which the "Cock o' the North" is only one example - it is clear that we must accustom ourselves to locomotives unlike those which have become familiar.

Those who lament the radical external changes in locomotive design sometimes forget that higher and even higher speeds are being called for in this hurrying age. The greater the speed the more potent is the resistance of the air through which the vehicle passes. Streamlining has become essential for all vehicles designed for rapid motion, and we must expect, therefore, that streamlining should be extended to the steam locomotives of the future. It is not the aim of the designer merely to obtain higher speeds. If he can lessen the resistance at high speeds coal consumption will be reduced, and efficiency will be increased proportionately. The "Cock o' the North" is one of the heralds of the new order of things in the locomotive world.



Another illustration from the article.

** Clearly a mistake, the Kylchap blastpipe was designed and patented by French steam engineer André Chapelon, using a second-stage nozzle designed by the Finnish engineer Kyösti Kylälä and known as the Kylälä spreader; thus the name KylChap for this design. Ed.* TCC

P2 DEDICATED DONATIONS UPDATE *by Mandy Grant*

The period 18th July 2021 – 17th October 2021 has seen a steady increase in component sponsorship, with five items being sponsored, raising a further £1,180.00 before gift aid. This brings the total number of sponsorships to 651!

Components sponsored during this period include:

- Backward driving sandbox left-hand fabrication
- Exhaust injector exhaust steam pipe bracket over rear coupled hornblock
- 4in pipe "P" clip (one)
- Brake Hanger Bracket (two) left-hand Casting
- Brake Hanger Bracket (two) right-hand Casting

We are most grateful to all of our supporters who have responded to the Dedicated Donations campaign so far!

Looking for an unusual gift? With prices ranging from one of many castellated nuts for £30.00, to the Leading right-hand coupled wheel casting and proof machining at £12,000.00 and many items in between! Why not treat the rail enthusiast in your family to something different and help us to complete this iconic locomotive!

Whatever your budget, please email Mandy at **dedicated.donations@p2steam.com** for more information.

If you know of a business owner or company who may be interested in sponsoring an item on No. 2007 *Prince of Wales*, please contact dedicated.donations@p2steam.com. TCC

•WORKSHOP NOTES•

A1SLT

D6898 outside Darlington Locomotive Works, flanked by Sir Peter Hendy and Councillor Heather Scott.

CLASS 37 AT DLW

The Trust recently played a part in the preparation and siting of the last diesel electric locomotive built in Darlington, to be presented to the town by Network Rail at a hand-over involving the latter's Chairman, Sir Peter Hendy. No. D6898 (latterly Class 37) was built by Robert Stephenson's in Darlington in 1964, its final role being the operation of Network Rail infrastructure trains. The locomotive was presented to the Leader of Darlington Borough Council, Councillor Heather Scott OBE, by Sir Peter in a ceremony performed just outside Darlington Locomotive Works, on Thursday 14th October 2021. Afterwards, the assembled company was given a tour of our Works and were able to admire the P2 under construction.

A1SLT

In full view, the immaculate Class 37.

DAVID ELLIOTT AT THE RH&DR

Regular readers of *TCC* will remember that David Elliott's first memory of steam was at the Romney, Hythe & Dymchurch Railway. This summer he was joined on an epic round-Britain gricing tour by Daniela Filová, a trip that concluded in Kent with a visit to the RH&DR. The pair are seen at New Romney.

Graham Nicholas

David and Daniela with RH&DR No. 3 *Southern Maid* of 1927.

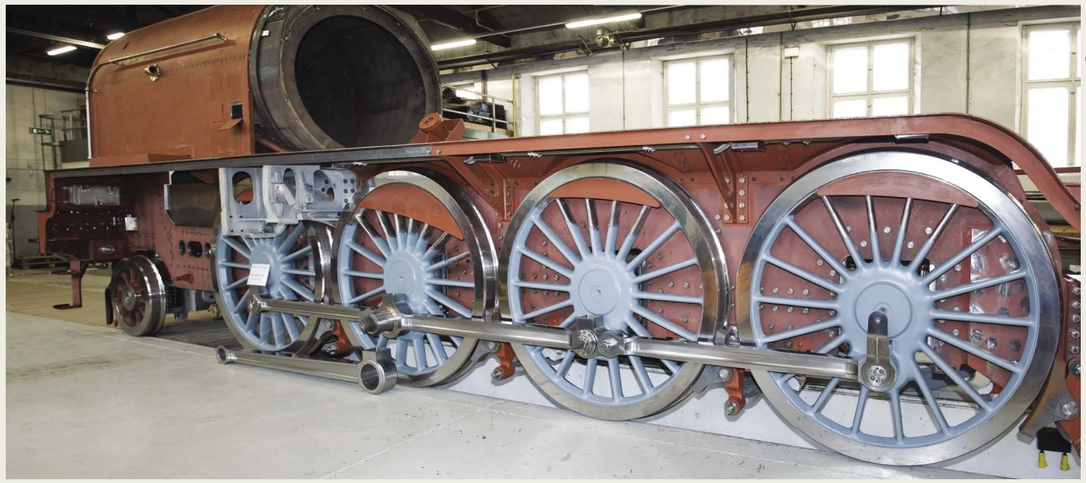
David Elliott

***Providence* at DLW.**

CAPTION COMPETITION?

The juxtaposition of *Providence* with No. 2007's tender begs the question. Even though traction engines have a limited water capacity, isn't this rather an extreme solution?

LAST CALL FOR THE MOTION CLUB! *by Mark Allatt*



Bob Hughes

The coupling rods in place on No. 2007.

In April 2018, The A1 Steam Locomotive Trust launched a new appeal to raise the funds to manufacture the motion for new Gresley class P2 No. 2007 *Prince of Wales*. The Motion Club was established with the aim of raising £210,000 from 175 supporters each donating £1,000 (plus Gift Aid) to the project in up to eight payments of £125 by standing order. In just seven weeks the appeal had already reached over a quarter of its £210,000 target and by October 2021 we had recruited 180 members to The Motion Club, with over £210,000 pledged, including Gift Aid.

In May 2018 we were delighted to announce that we had placed a £181,000 order with Stephenson Engineering Ltd of Atherton, Manchester for the heavy motion No. 2007 *Prince of Wales*. The order included the forging, machining and heat treatment of the nine heavy motion rods - intermediate coupling rod LH/RH, trailing coupling rod LH/RH, leading couple rod LH/RH, outside connecting rod LH/RH and the inside connecting rod assembly (including strap, gluts and strap nuts and washers) – and the combined piston and rod. Following a delay due to lack of resources our supplier, the first heavy motion forgings – the two middle coupling rods – were completed in October 2019 and one was exhibited at Darlington Locomotive Works during the Convention in 2019. As of October 2021, eight of the nine rods have been delivered to DLW with inside rod and strap due to be delivered by the end of 2021. The coupling rods have also been trial fitted to the engine, with the driver's side on show during the 2021 Convention. Orders to follow for the motion include rod bushes, oil box covers and miscellaneous components.

In return for supporting this appeal, special benefits for members of The Motion Club include:

- Opportunity to buy ticket (seat already reserved) on one of the first trains hauled by No. 2007 *Prince of Wales*
- Reasonable access to No. 2007 at all times
- Opportunity to buy exclusive Motion Club badge
- First choice of other components to sponsor
- Special supporters' day with *Tornado*
- Special limited-edition version (signed/numbered) of Stuart Black's drawing of No. 2007 *Prince of Wales*.

The work involved in designing and manufacturing the motion includes:

- Redesign of coupling and connecting rods to use modern material (pre-war nickel chrome steel alloy proved prone to fracture
- Incorporation of late-pattern BR-type continuous white metal lined crank pin bearing bushes
- Use of the late-A1 design of inside connecting rod which overcame the tendency for the original design of inside connecting rods on LNER 'Pacifics' to big-end failure
- Open die forging of six coupling rods, two outside connecting rods and the inside connecting rod and strap
- CNC machining of all rods
- Manufacture of oil box lids, coupling rod knuckle pins, nuts and washers and bearing bush keys
- Casting of leaded gunmetal and phosphor bronze castings of crank pin bearing bushes
- Machining and white metalling of bearing bushes
- Fitting oil box tops
- Assembly of bearing bushes to rods
- Polishing rods.

We may have passed the initial target of 175 members of The Motion Club but there is still an opportunity to come on-board if you haven't already whilst the motion is being manufactured as there have been a couple of dropouts.

You can join The Motion Club by going to our online donation page on our website at **www.p2steam.com/support/motion-club**. Alternatively, for further information please visit **www.p2steam.com**, email **enquiries@p2steam.com** or call **01325 460163**. TCC

The Motion Club is raising funds for the manufacture of the motion for the new Gresley class P2 No. 2007 *Prince of Wales*. If there are surplus funds left over following the manufacture of the motion, we will use the money to buy other components for the Gresley class P2 that the charity would not otherwise have.

FROM THE ARCHIVES *by Graham Langer*

Gordon Edgar

***Tornado* battles the weather as she approaches Carlisle with 'The Caledonian *Tornado*' in 2011.**

Autumn 2001 – As part of an overhaul of the Trust's communications with its supporters, a new quarterly journal was launched. *Top Link* replaced the Trust's previous in-house journal, *The Pioneer*. Issue No. 1 dealt with the thorny problem of a number of non-conformances in the construction of *Tornado's* frames and the solutions arrived at to resolve them. In better news, good progress continued to be made with the motion including the fitting of the slide bars and the machining of the outside radius link brackets. The Engineering Link, the Trust's Vehicle Acceptance Body, had started the process of recording the assembly of No. 60163.

Autumn 2006 – Since the boiler's arrival, the work rate had been increased to an unprecedented level – five days a week with two to four contractors and volunteers. Additional work had been done. To use resources effectively, completion of *Tornado's* outside motion had been brought forward while the inside motion was being machined and fettling of the outside coupling and connecting rods had been completed. The air pumps had been delivered and the air cylinders were in the UK and ready for collection. In fitting steam and vacuum pipework between the frames, the steel pipework was almost complete while the copper pipe had been delivered and work was due to start soon on its installation.

Autumn 2011 – On 11th September, *Tornado* tackled one of her biggest challenges to date, 'The Caledonian Tornado', Crewe to Glasgow over both Shap and Beattock, all of which was accomplished in horizontal rain driven by a gale. Despite this, the locomotive performed superbly and showed what an appetite she had for climbing big banks! After a busy summer for the A1, she was "front & centre" at Barrow Hill for the Trust's 2011 Convention, held in Chesterfield. Further progress had been made on our own support coach including the fitting of air brake equipment, installation of the electrical system and a central heating system and overhaul of the windows.

Autumn 2016 – *Tornado* once again worked 'The Torbay Express' during the summer and the year was one of the most successful for No. 60163, having covered most points of the compass hauling Trust trains. October brought with it the annual convention in Darlington and this proved to be one of the best attended to date. The hotel was packed and there little or no room at Darlington Locomotive Works once everyone was transferred there; most were astonished by the sight that greeted them there, *Prince of Wales* with frames adorned by smokebox, chimney and cab! TCC

The A1 Steam Locomotive Trust is pleased to display the logos of organisations giving us their ongoing support. Their contribution is gratefully acknowledged.

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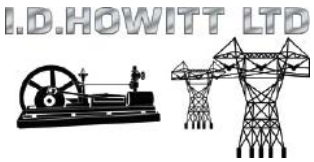
The Gresley Society Trust



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* All information correct at the time of going to press mid November 2021. For up-to-date information and dates please check the website www.a1steam.com.

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Darlington Locomotive Works is normally open to the public on the first and third Saturday each month (11am – 4pm).
Access to the works is via Head of Steam: Darlington Railway Museum where Covenantors are entitled to free entry (with Covenantor card). Charity registration No. 1022834.
The Trust respectfully requests that anyone wanting to see *Tornado's* main line passenger trains follows the rules of the railway and only goes where permitted.