

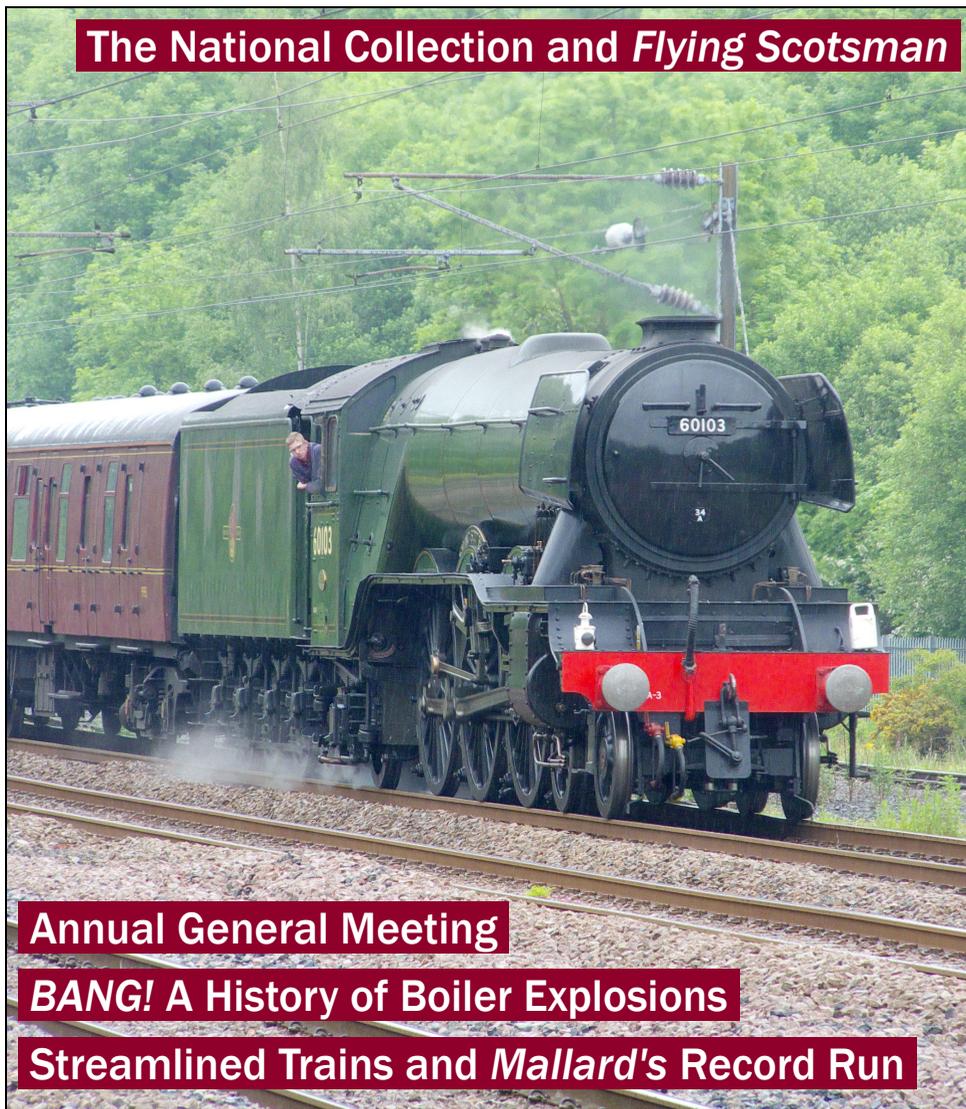
Friends of Darlington Railway Centre and Museum

Newsletter

Spring 2016

Free

The National Collection and *Flying Scotsman*



Annual General Meeting

BANG! A History of Boiler Explosions

Streamlined Trains and *Mallard's* Record Run

BOILERPLATE: Anyone think this page should be called "Footplate"?

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Introduction

This is the second Newsletter of 2016. Copies of the first were posted in time for the AGM in April and I make particular note of this because, at the May meeting, some members mentioned that they had not received theirs. There is a little more about this in Mixed Goods but if you are a member of the Friends and have not seen the last issue (with *Deltic* on the cover) please get in touch- contact details are below.

The Editor is aware of the comic possibilities of putting this note in a Newsletter that, as far as he is aware, is no more likely to be delivered safely than the the last one but does not consider it funny.

Tim Ruffle, Editor

Front Cover: Since there were no photo's taken at the AGM I have made do. A3 Pacific *Flying Scotsman*, in BR green numbered 60103, coasts into Ferryhill Station at the head of the Railway Touring Company's *Tynesider* raittour in June (p. 10). *Photo' Tim Ruffle.*

Contacts

If you have material for the newsletter, be it an article, photo' or a short anecdote to fill the last few lines on a page, do send it- it might not get in but it will be considered. Information and announcements for members may well end up here and on the website, which I also look after, but such things should be sent to the Committee.

I much prefer to be contacted by e-mail, especially if it saves me some typing, but you can reach me by post. Note that, In a desperate attempt to be organized, the web-site has its own e-mail address. Material for both can go to either address as long as that is clear.

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The Friends of Darlington Railway Centre and Museum devoted the first part of its April meeting to its Annual General Meeting. Report by Bill Ferguson.

This years AGM was held on 4th April and well attended by over 30 Members. It began with Gillian Wetherell's report on the previous year:

The Chairman's Statement

The last year has been an interesting one for the Friends. There have been rather more endings than beginnings unfortunately, but more of that later.

We have maintained our membership reasonably, losing some old friends over the year but gaining younger support steadily and I welcome all our new members most warmly. Many have joined because of our monthly talks and these were, as usual, well attended. We learned about the progress of The Grand Central Railway since 2009 when they last visited us, and had an excellent afternoon with the Representative from Hitachi, who told us all about the establishment of their new Locomotive and coach works in Newton Aycliffe. We had excellent talks from three of our own members... 'Steam in and around York' by Chris Nettleton, 'The Hackworth Brothers' by Jane Hackworth-Young and 'Hidden Gems from the Archives' by Sam Woods., as well as several talks about steam railways, their triumphs and disasters.

Arthur Peacock and Don Whitfield continued their stalwart support by running the sales stall on the platform, with total sales in 2015-6 of 714.33p. This money, with a little more from our funds, enabled us to support the Museum by giving £1,000 to The Ken Hoole Centre to complete the scanning and conserving of the records of engine-men and firemen in their Record Books in our collections. We have taken a lead in a major clean-up of The Brick Train and its environs and have been closely involved with other like minded societies in the discussions on Darlington's Rail Heritage and plans for the 2025 celebrations.

Sadly, however, ill health has overtaken several committee members and we have had two resignations from the committee- Mrs. Doran our Administration Secretary and Mr. Don Whitfield who handles Museum liaison and on site sales. This, together with the absence of Mrs. Palmer for six months following a stroke and my own deteriorating breathing problems, has made our committee very small and the work has not been done as I would have liked. I myself have continued to book speakers until the end of this year, and Mr. Carter has continued to do the accounts- although both of us want to stop doing these tasks.

So, please help us out. We must have new committee members prepared to do something useful for the Friends, as we approach the 200th Anniversary of the birth of passenger railways here in Darlington. It would be tragic if we had to mothball the organisation at this stage, but that is what will happen if the members are apathetic. It is up to you.

Thank you all for your support over this last difficult year, which I greatly appreciate. When Leona comes back after her maternity leave, am sure we all want to look forward to a busy and fruitful year.

Gillian Wetherell, Chairman

The Chairman's report was discussed and received as were the Accounts with a minor correction. There were 114 Members who had renewed or joined, some of the non-renewals will be contacted. Although the subscriptions will remain unchanged for the following year, it was pointed out that these do not cover the cost of printing and distributing the Newsletter. There will be four issues of the Newsletter now that material is

being written for it (thanks to Bill Ferguson, John Lawrie and Richard Wimbury so far this year- Editor) and Members are encouraged to contribute articles. It is possible that some Members may prefer to receive the Newsletter by email and this will be explored.

Elections were then held with results as follows:

President Bill Ferguson

Chairman Gillian Wetherell

Vice Chairman David Porter

Treasurer, Secretary and Programme Secretary posts remained vacant. The rest of the Committee consists of June Palmer (Membership Secretary), Tim Ruffle (Newsletter) and Stephen Baker plus Richard Wimbury, Alan McNab and John Lawrie who answered the Chairman's plea for new members.

Under any other business, there was a discussion on how to better cater for Members who were in full-time employment and therefore could not come to Meetings held on weekday afternoons. It was agreed that as an experiment, some Meetings would be arranged for Saturday afternoons.

The AGM closed at 2.45pm and was followed by an interesting talk by Bob Gwynne from the NRM, York.

Since the AGM Alan McNab has agreed to take over as Treasurer and he, Richard Wimbury and Bill Ferguson will share programme responsibilities.

The Data Protection Act

The Friends keeps personal records about members and must do so in compliance with the Data Protection Act. The Act sets out conditions to protect the interests of individuals about whom data is held. One stipulation is that those individuals be kept informed hence this note.

Personal data must be gathered and used lawfully, comprise only what is needed for the stated purpose, held securely and for no longer than necessary, be accurate and must not be given to third parties without the subject's knowledge and permission.

What data does the Friends have? Nothing terribly sensitive. A member's record comprises name, contact details (including e-mail address and telephone number when supplied), membership number and the date their current subscription expires.

Who has the data? This information is kept by the Membership Secretary June Palmer and our Chairman Gillian Wetherell who are currently sharing membership duties. Both can be e-mailed at membership@friendsofdrcm.org. Names and addresses are also kept by the Newsletter Editor so the Newsletter can be distributed. The records are held on personal computers with up to date security software running on them. In your Editor's case the file is on a flash drive that is not left connected.

Reasonable efforts are made to keep the records up to date but we are largely dependant on the members keeping us informed if they move or change 'phone numbers etc. Records have never been passed on to third parties and that is not about to change.

Under the terms of the Act individuals can demand a copy of data held about them. A reasonable fee may be charged for this however that is discretionary and anyone getting in touch simply to check that information held about them is correct need not fear a bill.

Thrill seekers can find comprehensive information about the Data Protection Act, including its complete text, at www.gov.uk/data-protection/the-data-protection-act.

Don Whitfield

The Newsletter was ready to print when the unwelcome news of Don Whitfield's death arrived. Don was a mine of information and a tireless supporter of the Museum and the Friends resigning from the Committee only recently. He was well known to many members having seldom missed a meeting and will be much missed. Condolences may be sent via the Committee. There will be more about Don in the next Newsletter.

TALK: Streamlined Trains and *Mallard's* Record Run

3 March 2016

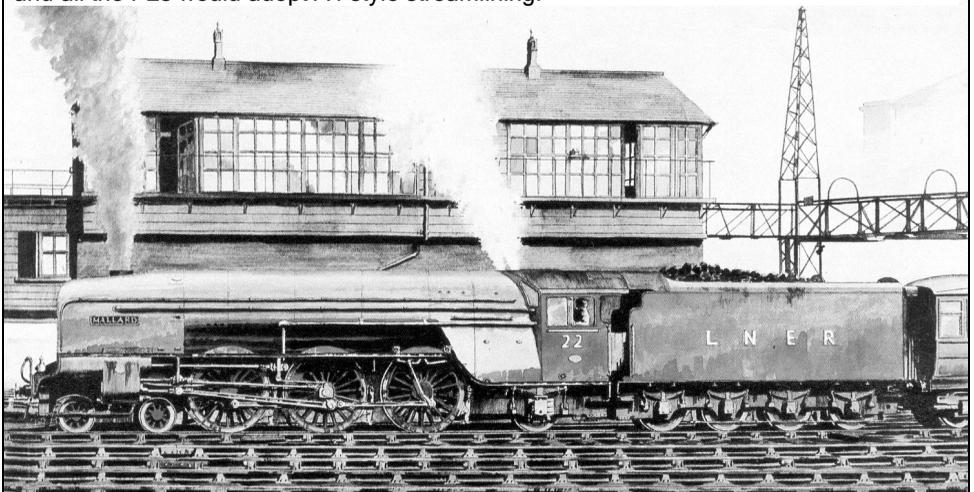
Chris Nettleton is a stalwart of the Gresley Society (www.gresley.org) as well as a long-time member of the Friends who has already given several talks always meticulously researched, with well chosen images and film clips. Report by Bill Ferguson, illustrations furnished by Chris Nettleton.

Chris' talk began with a burst of "Streamline Train" by The Vipers. In the 1930s, streamlining was in fashion- literally. Streamline Moderne, a development of the Art Deco style, saw not just vehicles being streamlined but almost everything else including buildings and pianos. Although it was just a style it does illustrate the growing awareness of the usefulness of aerodynamics.

Naturally streamlined locomotives appeared but the celebrated streamlined trains were Diesel-electric units- the *Burlington Zephyr* in the USA and the German *Fliegender Hamburger*- the *Hamburg Flyer* or, to the delight of English speaking children ever since, the *Flying Hamburger*.

In 1931 the German Schienenzeppelin (Rail Zeppelin) had set the outright rail speed record for an experimental vehicle at 143mph- unsurpassed until 1954 and still the record for a petrol driven train. The Rail Zeppelin was a streamlined, ultra-light, propeller-driven railcar never intended for service, no sane passenger would have gone near it, but it paved the way for the *Flying Hamburger* introduced in 1933. Running between Berlin and Hamburg, the line on which the Rail Zeppelin had set its record, it was the fastest regular rail service in the world averaging over 77mph. Nigel Gresley was determined to beat this on the East Coast line. Some

An impression of the A4 Pacific as conceived during development bearing a strong resemblance to the P2 with rotary valve-gear and "semi-streamlining". The shape was similar to that of the W1, Gresley's experimental marine boilered compound better known as 10000 or the Hush Hush, and was further developed for the first P2s. The front was sloped but had smoke deflectors- the very antithesis of streamlining. Eventually 10000 and all the P2s would adopt A4 style streamlining.



early test runs in 1935 proved that Kings Cross to Newcastle could be done in under four hours.

The result of these tests was the Silver Jubilee train, serviced by streamlined A4s, *Silver Link*; *Quicksilver*; *Silver Fox* and *Silver King*. We saw a very exciting clip of *Silver Link*'s press run when a speed of 112.5mph was achieved, taking back the world's record. The service was named to commemorate the Silver Jubilee of King George V in 1935. The German railways then retaliated and took back the record.

Following the success of the Silver Jubilee service (primarily for business travellers and Chris showed some mouth-watering menus for lunch and dinner) Gresley turned to the Kings Cross Edinburgh run. Trials determined that this could be done in six hours so the Coronation service was inaugurated. More engines were needed so five more A4s were commissioned including *Union of South Africa* and the *Dominion of Canada*. Special carriages were built including a beaver-tailed observation car and weight was saved by eliminating the restaurant cars and serving meals at passenger's seats.

The demonstration run was on 30th June 1937 and the service began on 5th July 1937, named in honour of the Coronation of King George VI. Although there had been very few failures on the Silver Jubilee service, there were more on the Coronation service to Edinburgh because the run was more exacting.

Yet another streamlined service began in September 1937 with the West Riding Limited to Bradford and Leeds.

We then moved on to the LMS streamlined trains, the Coronation Scot from Euston to Glasgow. Trials proved a target time of six hours or less was

The first A4, 2509 *Silver Link* at Kings Cross on 14 September 1935. She would take the Silver Jubilee demonstration run to Grantham on the 27th, reaching 112.5mph, and inaugurate the service on 1 October. Historically 2509 was every bit as important as *Mallard* but not deemed worthy of preservation. She was cut up in 1963.



Streamlining Development

When the "silver" A4s and streamlined Princess Coronations entered service with their bespoke rolling stock there was speculation that they were just jumping on the Streamline Moderne bandwagon. There may be some truth in that, especially in the case of the LMS, and the publicity departments did go to town but both companies did devote considerable effort to producing trains with effective streamlining.

Nigel Gresley had travelled on the *Flying Hamburger* and been impressed but neither it nor the *Burlington Zephyr* could carry even 100 passengers. It was by no means certain that a Diesel train could be "scaled up" for the East Coast expresses and the potential cost was off-putting. He believed that an improved A3 Pacific would better meet the LNER's requirements. Trials began during which *Flying Scotsman* (still an A1) reached a verified 100mph. Later A3 2750 *Papyrus* ran at 108mph nearly matching the *Hamburger's* average speed with a full length train in tow.

Mechanically the A4 is an evolution of the A3- steam passages are straightened, the cylinders are slightly smaller allowing for larger valve diameters and the boiler pressure was raised to 250psi (from 220) to compensate. The two are similar enough for A3s to be fitted with A4 boilers and several were in BR days, limited to 220psi, when an A3 boiler was not available as was *Flying Scotsman* in preservation.

Of course the streamlining was completely new. The shape was inspired by a Bugatti railcar Gresley had seen in France and further developed at the National Physical Laboratory. Tests were run on a Plasticine model which could be shaped and retested in the wind tunnel easily and an aerodynamic profile was developed quite quickly but the shape also needed to lift smoke clear of the cab and this proved a greater problem. At one point it looked as if the design would have to be compromised with smoke deflectors before they had a stroke of luck when someone handled the model carelessly leaving a thumb print just behind the chimney. Perhaps a little desperately it was tested in this condition and found to clear smoke very effectively.

At the LMS William Stanier (like Nigel Gresley he had yet to be knighted) was concerned that streamlining a locomotive would add weight and maintenance difficulties that would not be offset by the benefits. He was absent for much of the Princess Coronation's development most of the detail being left to the Chief Draughtsman at Derby Tom Coleman including the streamlining.

The Princess Coronation was developed from the Princess Royal class with larger driving wheels and boiler fed by an enormous firebox with a 50 square feet grate. Overall the LMS main line was less straight and level than the LNER and not so well suited to high speed running. Sustained power was more important and the Princess Coronation was the most powerful express passenger class of its day.

In contrast with the more integrated approach taken with A4s the Princess Coronation is a locomotive with an aerodynamic casing added to it almost as an afterthought but the streamlining was wind tunnel tested and proved effective. What it was not good at was lifting smoke clear of the cab which remained a problem. 14 of the 38 Princess Coronations were built without streamlining with a weight saving of nearly three tons. Although the same class they were commonly known as Duchesses although the crews called them Big Lizzies.

With the outbreak of war availability and ease of maintenance became more important than speed and the valences over the A4's driving wheels and cylinders were removed to improve access during servicing. Oddly the LMS only began removing the streamlining from the Princess Coronations in 1946. As Stanier had feared the casing did get in the way of maintenance making the streamliners unwelcome visitors to the works. All but three had been stripped of their streamlining by nationalization and only one, 46243 *City of Lancaster*, carried a BR number while streamlined.

achievable and the scheduled time was six and a half hours. There was a film clip showing the construction of the Princess Coronation at Crewe and excerpts from the press run when a speed of 114mph was reached.

In 1939 the LMS sent the *Duchess of Hamilton* to the USA for the World's Fair in New York and subsequent tours in the States. The advent of WW2 meant the engine and its carriages did not return to the UK until the 1940s.

Chris moved on to *Mallard's* record run when Gresley wished to retake the speed record held by the Germans at 124.5mph. Brake tests were carried out early in 1938 since braking ability was crucial for any speed attempt and Westinghouse were heavily involved. The engine chosen for the attempt was *Mallard*- the first A4 to have been built with a double Kylchap blast-pipe. *Mallard* had entered service four months previously- she was new but old enough to be nicely run in.

Invited guests were not told of the attempt, the train, consisting of *Mallard*, a dynamometer car and six carriages, started at Kings Cross and turned south at Barkston. All stops were pulled out and the train reached 126mph for a short distance. Gresley only claimed 125mph subsequently although the measurement did show 126mph. The effort proved too much for *Mallard* which pulled up at Peterborough with a failed big end but the world record for a steam locomotive had been secured and still stands.

After the War, British Rail made some attempts to re-introduce special services including the Tyne-Tees Pullman; the East Anglian; the West Riding; the Caledonian and the Talisman. These never achieved the pre-war timings nor the glamour associated with the Silver Jubilee and Coronation services.

Six A4 Pacifics still exist making them the most numerous LNER class in preservation. Three Princess Coronations are preserved including 6229 Duchess of Hamilton in the National Collection which has been re-streamlined. A few years ago Project 130 was announced in the USA with the aim of setting a new steam speed record but appears to have been abandoned.

The first three LMS Princess Coronations 6222 *Queen Mary*, 6221 *Queen Elizabeth* and 6220 *Coronation* on display at Crewe in Caledonian Railway blue with silver lining.



Meanwhile...

Chris focused on the LNER and LMS but did mention the other Big Four companies whose efforts at streamlining are less celebrated with good reason.

The GWR is famous for doing things its own way and that is certainly true of its approach to streamlining which was atypically half-baked and much to do with an image conscious company trying to keep up with the neighbours. The first 18 AEC Diesel railcars, introduced in 1933 under Collett, sported graceful streamlining inspired by the *Flying Hamburger*. They were rounded, waisted and none more '30s in style but wind-tunnel tested and all but the under-powered prototype could crack 80mph. The remainder had practical, angular "Swindon" bodies and a top speed of 70. Examples of both are preserved.

In 1935 an attempt was made to streamline 5005 *Manorbier Castle* and 6014 *King Henry VII* with little technical finesse in evidence. Both loco's were defaced with rounded smoke-boxes, overall wheel splashers, various cowlings cobbled on and a fairing around the buffer-beam, steam pipes and cylinders. The result was pretty useless as streamlining and did not enhance Collett's designs being described as "an iron lung on wheels".

The fairings impeded maintenance and were removed almost immediately but the bullet-noses and some cowling lasted until the '40s.



If locomotives could look embarrassed... 5005 and 6014 in their short-lived streamlining.

If the GWR's experiments seem tentative the Southern Railway barely put a toe in the streamlining water. Streamlining was fitted to Schools Class 935 *Sevenoaks* (renumbered 999) but one wonders why since it seems she never left the works in that condition. The "Air-Smoothed" casing familiar on Bullied's Pacifics looks sleek at first glance but the flat front makes no concession to aerodynamics. In fact the casing helped with smoke deflection and made it possible to clean the loco's in a carriage washer!

SR 935 renumbered (and apparently renamed *Southern*) in her unused streamlining.



TALK: The National Collection and *Flying Scotsman*

4 April 2016

Bob Gwynne is Associate Keeper Rail Vehicles at the NRM and author of books on railway preservation subjects including *Flying Scotsman*. He stepped in at short notice on behalf of a colleague who was to have given this talk and the Committee is grateful to him. Report by Bill Ferguson, illustrations furnished by Bob Gwynne unless noted.

The National Collection at the NRM has a large number of vehicles, some 3,000 in all, as well as thousands of smaller items. Bob illustrated some of the vehicles with images including a Zambian loco donated by David Shepherd, the APT-E and the HST prototype being renovated and repaired.

Various other aspects of the Collection were listed including safety; partnerships; wagons and carriages; challenges; offers; display preparation and loans. All were illustrated with colourful examples. Bob also gave some amusing examples of visitor comments and questions such as, “the paint work on *NER 1275* is poor, surely this locomotive is in need of a re-paint?” Although she may look faded *1275* was repainted when she entered preservation in 1927 by people who had worked for the *NER* and could hardly be more authentic.

“Where is the corridor tender normally coupled to *Mallard*?” *Mallard* has never been displayed with a corridor tender. She has a tender of the type she first had when in service, a decision that was taken when she was preserved in 1963.

LNWR loco's Improved Precedent Class 790 *Hardwicke* and 3020 *Cornwall*. Photo' Tim Ruffle.



55002/D9002 being repainted two-tone green at Locomotion and work on “Project Miller”- the restoration of 41001, the sole surviving prototype HST power car- www.projectmiller.org.uk. Photo' of 55002 Tim Ruffle.



"Where is *Flying Scotsman*?" For a long time the answer has been, "not here because she's not in the National Collection." In fact this has been asked so many times that when the opportunity to buy 4472 arose the response from the NRM was that they might as well since everybody thinks they own her anyway. This brings us to the second part of Bob's talk and clearly his great enthusiasm, "Why is *Flying Scotsman* so popular? The Train, the Locomotive, the Legend."

He began by drawing a clear distinction between the train and the loco, something not always clear to the general public. The Train has been in operation in one form or another from 1862 to the present day, hauled by a variety of loco's.

Flying Scotsman the Locomotive has been popular with the public throughout her long history. As the first locomotive out-shopped by the new LNER and named after the flagship service she was the star of the British Empire Exhibition 1924-1925 where she captured the imagination of a four years old Alan Pegler. She was a radical design, much liked by crews and the media were especially complimentary. She provided much-needed optimism in the difficult economic climate of the 1920s and 1930s.

Among her milestones in service she hauled the inaugural non-stop LNER *Flying Scotsman* in 1928, upstaged all the human stars of the 1929 feature film *The Flying Scotstman* (one of the first British "Talkies" - she has the best lines) and was the first locomotive verified to have achieved 100mph in 1934. She was one of the last A1 Pacifics to be rebuilt as an A3 in 1947.



In 1984. Alan Pegler had *Flying Scotsman* fitted with a single chimney and painted LNER apple green to better resemble the A1 Pacific that so impressed him in 1924. *Below:* An inspiration and national Treasure. Unmistakably an A3 but still in apple green being welcomed to the NRM after being bought by the National Collection.



Bought by Alan Pegler in 1962, she went on a tour in the USA in 1969 and Pegler's bankruptcy was not because of any failing of *Flying Scotsman*. She was bought by Bill McAlpine and virtually smuggled back to the UK to avoid any attempt by Pegler's creditors to lay claim to her. Later she was purchased by Dr. Tony Marchington, by now modified into a Super Pacific.

An ill-fated attempt by Marchington to sell shares and turn her into a company in 2002 imploded and in 2004 the media mounted a "Save Our Scotsman" campaign which resulted in this national treasure being acquired by the NRM but extensive repairs were necessary to ensure her long-term running capability and these were not finally completed until 2016 when vast crowds turned out to see her in steam once more.

Bob finished with a relevant excerpt from an A.E. Houseman poem and all agreed that Flying Scotsman was a symbol of the past but also a Legend.

The NRM (www.nrm.org.uk) plans to bring Flying Scotsman to Locomotion in late July. A website dedicated to her is www.flyingscotsman.org.uk. Bob's book The Flying Scotsman (ISBN: 978-0747807704) is published by Shire Library.



Restored to BR Green and drawing the crowds again after her long sequestration. *Below:* Back on the East Coast Main Line and pausing to take on water at Ferryhill Station in June 2016. *Photo' Tim Ruffle.*



TALK:

BANG! A History of Boiler Explosions

5 May 2016

Ray State is a railway historian and a rail safety consultant. His talk, subtitled The facts and myths surrounding the most frightening of events, is the latest of many he has given to the Friends. Report by John Lawrie, illustrations furnished by Ray State.

There was an excellent turnout for Ray's talk in the anticipation of some fireworks from a speaker well known to members.

Steam power had been experimented with and even exploited to some extent since the first Century and, as is often the case with such advances, many people contributed individual developments but it was Thomas Newcomen in 1712 who made the first engine that was commercially useful. It worked by letting steam into a cylinder allowing the piston to rise then condensing it which formed a vacuum. Atmospheric pressure pushed the piston back down the cylinder for the power stroke.

In the 1760s James Watt, an instrument maker at Glasgow University, was interested in steam power and jumped at the chance to repair a model of a Newcomen atmospheric engine. He noted that most of the steam condensed when admitted to the cooled cylinder which did not begin to fill until it had warmed up. This made the engine cycle slow and wasted an immense amount of energy. Watt began making improvements firstly adding a condensing chamber separate from the cylinder. This increased the engine's speed and thermal efficiency by several hundred percent making for engines that were commercially useful for companies that did not own coal mines.

Watt never ceased improving his designs and engines become more efficient throughout the rest of the 18th Century but his work was all concerned with low-pressure steam where the ultimate limit is atmospheric pressure- to increase the power one must increase the size of the piston. In some respects a static engine can be built as large as necessary and some Watt engines had cylinders with bores of 100" but there are limits.

The use of "strong-steam" or high-pressure steam, where the piston is pushed by the steam itself, had been advocated almost since Newcomen's day. The

Brunton's Mechanical Traveller or Steam Horse. It was thought that smooth rails lacked adhesion and this peculiar contraption used its legs or crutches to push itself along the track at about walking pace.

A Brunton Traveller enjoys the dubious distinction of causing the world's first railway disaster when one exploded during a demonstration at Newbottle Colliery in 1815 killing at least 11 people. It remains the worst boiler explosion in British railway history.

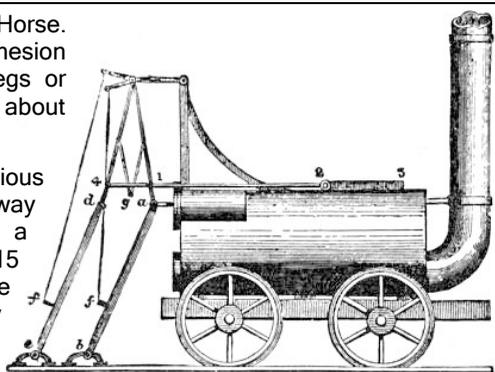


FIG. 1. BRUNTON'S TRAVELLER, 1813.

power depends on the steam pressure- increase the pressure and you increase the power. In a low pressure engine because the steam is used just to fill a space the boiler does not have to cope with great stresses and can be quite simple- just a tank of boiling water. For high-pressure engines the pressure is built up in the boiler which has to contain it.

“High-pressure” in this context means anything appreciably above atmospheric and early high-pressure boilers developed only 25PSI or so but this is still more than a ton and a half per square foot. Watt was acutely aware of the limitations of tool-making, materials and fabrication techniques in his day. He thought those limitations made high-pressure steam boilers inherently dangerous and, with his business partner Matthew Boulton, used his patents to obstruct its development wherever he could. Doubtless he had commercial reasons as well but, given the subject of this article, he had a point.

In spite of Watt's best efforts the harness of high-pressure steam was being experimented with during the 18th century including its use for motive power. Richard Trevithick in particular had done much to improve boiler designs and was confident that high-pressure boilers could be safe. He is thought to have made a working high-pressure static engine by the turn of the century and produced his road-going Puffing Devil in 1801 which tested well but briefly catching fire when left unattended. He patented high-pressure steam engines in 1802 and built an engine for the Coalbrookdale Company which worked at 145PSI- an astonishing figure for the time.

The early boilers were manufactured from a large horizontal tube with plates fixed on the ends the weakness in this construction being between the plates and the boiler body, this resulted in the plates being blown off the ends. The first recorded boiler explosion was in 1803 involving a Trethivick engine at Greenwich

Gathering Speed

High-pressure engines are smaller for a given power output and mechanically simpler since the condenser and associated plumbing becomes unnecessary (which also got around some of Watt's patents). This made them cheaper to build giving them an advantage even for static use but for motive power there could be no argument. Although low-pressure steam was tried in boats it proved unsuitable for locomotion lacking the power to weight ratio needed to move itself and a load.

In France Nicolas-Joseph Cugnot produced his road-going Fardier à Vapeur (steam wagon) in 1769- around the time Watt began filing patents. Its tiny boiler's working pressure is not known but it could manage only a few hundred yards before it ran out of breath. In Britain William Murdoch made working models of steam carriages starting in 1784 and was keen to develop them further.

It is not clear if Murdoch ever made a full sized vehicle but his efforts were forestalled by Watt who, on Boulton's advice, included the concept of steam powered vehicles in his patents. “I have given such descriptions of engines for wheel carriages as I could do in the time and space I could allow myself;” he wrote, “but it is very defective and can only serve to keep other people from similar patents.”

That Boulton and Watt should have inside information on Murdoch's work is hardly surprising. He was a valued employee of theirs erecting and inspecting engines and producing innovations that the firm patented including, it is thought, the Sun-and-Planet gearing system. Without support from Watt Murdoch's work on motive power came to nothing but he is known to have shown one of his models to Richard Trevithick.

with four fatalities- an incident much exploited by Boulton and Watt. Trevithick's future designs incorporated dual safety valves and a lead plug at the minimum water level. If the water level dropped low enough to expose the plug to the fire it would melt releasing steam and warning operators in time to drop the fire. He also began testing boilers using hydraulics.

Early safety valves were quite simple- a small hole in the top of the boiler was covered by a disc held down by a lever with a weight on it. If the boiler pressure rose above the limit it overcame the weight, the disc was pushed up and steam was released. The system was effective and could be adjusted by the operator by moving the weight along the lever to set the maximum pressure. It did have its drawbacks though particularly on a locomotive where vibration could make the weight bounce releasing pressure. It could also be tampered with in a misguided attempt to raise more pressure by adding extra weight or even tying it down- a great temptation for engine crews frustrated by the poor steaming of early locomotive boilers. This was the direct cause of the Wylam Newbottle Colliery explosion in 1815 with 12 fatalities, and was followed by other explosions on colliery railways. In 1818 an explosion on the Middleton railway involving the locomotive *Salamanca*, killing the driver was also due to the pressure valve being wedged.

By 1825 experiments were being made with alternative types of valves and the location of the valves was moved to make it difficult to tamper with while Timothy Hackworth's blast-pipe made boilers steam much more readily- finally a locomotive boiler could produce steam as fast as it was being used removing the temptation to tamper. In 1827 Hackworth experimented and fitted a double spring valve to his *Royal George* engine, whilst Robert Stephenson continued to use the lever and weight system.

Yorkshire and North Midland Stephenson 0-6-0 number 1839 after a boiler explosion at Saddlethorpe in 1850. The boiler's plates had wasted.

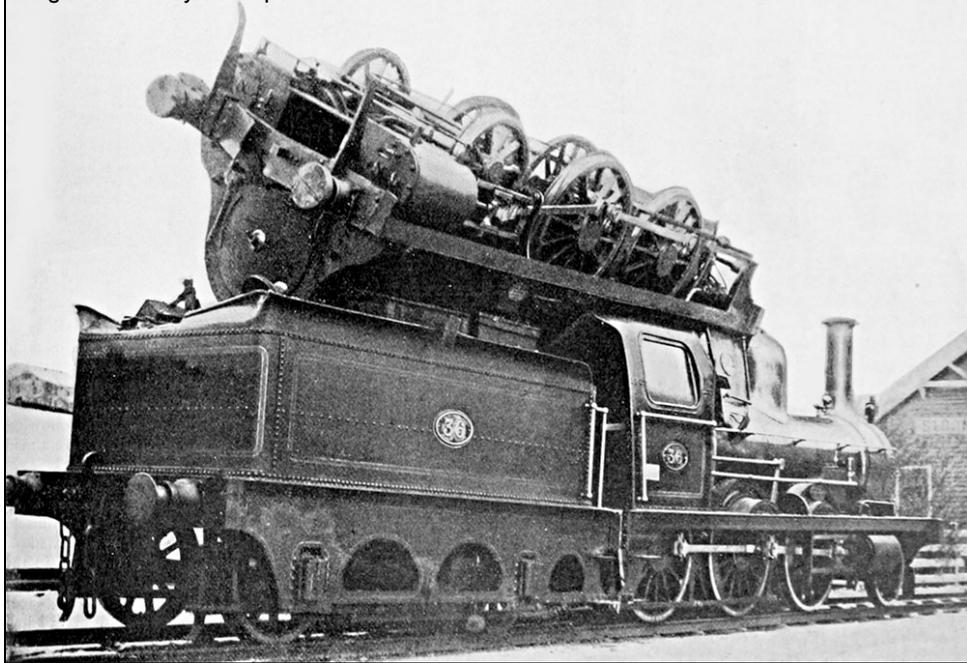


One of the difficulties encountered in maintaining the correct water level in the boiler was with the mechanical water pump which was driven by the engine. Locomotives had to be moving for such a pump to work and would be rocked back and forward if they had been standing long enough for the water level to drop. This was overcome by the introduction of steam operated injectors.

In 1830 a Salter spring valve was introduced with difficulties in calibration due to variations in the springs, this was eventually overcome and this became the standard for all future safety valves. In 1829 Stephenson's multi-tubed boiler introduced at the Rainhill trials enabled pressure of steam to be further increased, this combined with the integral firebox changed the nature of the failures causing explosions. A firebox will melt if not surrounded by water and the crown sheet at the top, which will be the first part exposed if the level drops, gets hottest.

Water gauges and fusible plugs became standard for all steam pressurised boilers the latter a development of Hackworth's system consisting of a threaded metal plug with a centre core of lower melting alloy which would fail at a predetermined temperature. Improvements in boiler design and safety valves greatly reduced explosions in the U.K. From 1840 to 1860 there were 52 boiler explosions recorded, from 1860 to 1880 there were 75 but that was against a much greater number of loco's. The number fell to 14 for the period from 1880 to 1900 while from 1900 to the end of steam there were four boiler explosions. Two of those occurred in U.S. built locomotives imported for the War being driven by British crews who may not have appreciated differences in operation.

Norway in 1893. Much of the force of this crown sheet failure was directed downwards through the grate with the result that the locomotive somersaulted forward onto its neighbour. They are reported to have been towed back to shed like this.

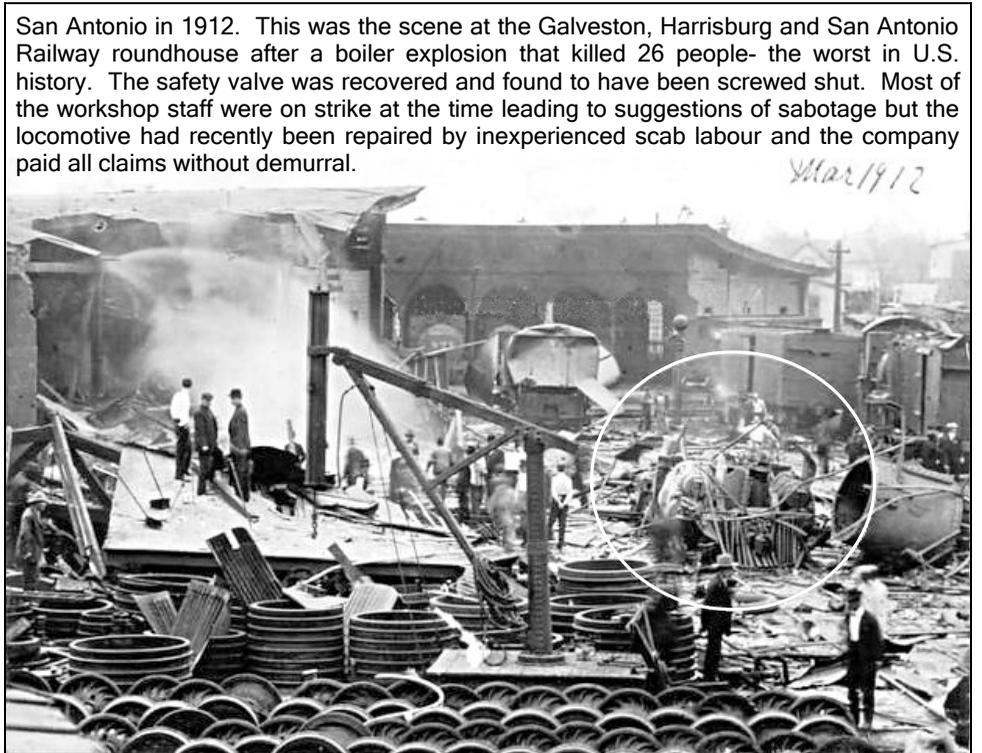


In the United States the picture was slightly different as they used steel to manufacture fireboxes, compared to the European practice of using copper. A copper firebox forms cracks as it begins to fail allowing water to jet through damping the fire and relieving some of the stress. This is still quite ruinous for the boiler and alarming if you are nearby but does give some warning and tends to forestall explosions. By contrast steel remains impermeable even as it melts and bends out of shape before failing all at once. Combining this with much larger boilers and fireboxes resulted in some catastrophic explosions in the early 1900's. This led to the introduction of low water level warning systems.

The comparison between the American practice and the U.K. had a bearing on the type of explosions for example the American view that the introduction of cold water into a failing boiler would create greater metal stress due to the difference in temperature. Tests showed that this was unfounded.

Oil firing being more common in the States, an explosion in an enclosed firebox would release some of the pressure through the fire door but tended to throw the boiler forward like a missile or blow it apart. This is compared with a coal-fired boiler in which most of the pressure would escape downwards through the fire grate launching the boiler skywards.

Finally improvements in metallurgy, regular cleaning to remove scale, rigorous inspection procedures and the need for test certificates eliminated the hazard of exploding locomotive boilers.



Missing Newsletters

At the May meeting it became apparent that at least a couple of members present had not received the last Newsletter. All copies were posted at the same time and should have been delivered well before the AGM in April. Assuming that the fraction of the membership that attended the meeting is typical there may be a dozen or more copies that have gone astray.

This matter will need to be taken up with the Post Office but it would be well to have some facts first. If you are a member of the Friends and did not receive the last Newsletter please get in touch (contact details are on page two) with your full address. It actually costs more to post a copy of the Newsletter than it does to print so to then lose copies in the mail is doubly galling but one can hardly blame the Post Office if they turn out to have been wrongly addressed.

Digital Newsletter Option

Speaking of the Newsletter digital copies in form of PDF files, readily readable on computers and tablets, already appear on the website shortly after printing. It has been noted that the Newsletter could be distributed to members thus either by sending the file attached to an e-mail or e-mailing a link to its location on-line.

Nobody is about to lose their printed Newsletter- this would be a choice that members can opt into but each copy costs over a pound to print and post which would be a welcome saving. If you would *prefer* to receive your Newsletter in electronic format please e-mail the Editor.

Crown Street Library Closure

A couple of years ago the Museum was threatened with closure due to cuts in Darlington Borough Council's operating budget. Had the Council not backed down in the face of the outcry that met this proposal Darlington would not have a Railway Museum now- a faintly ridiculous prospect given the town's central role in railway history and the approaching 200th anniversary of the Stockton and Darlington Railway's opening.

Now Darlington's Crown Street Library is in the cross-hairs due to the same budget cuts. The Library was a gift to Darlington from "The Father of Railways" himself Edward Pease. The Crown Street site, building (now Grade 2 listed) and contents were paid for with a £10,000 bequest from him. The Council proposes to sell off the building and operate a reduced library service from the Dolphin Centre. As happened when the Museum was threatened this proposal has been greeted with dismay and a great deal of support has been voiced by local groups and media particularly since the cost of the move is expected to be around £750,000.

The Council still has to operate within the budget cuts that made it consider closing the Museum- it will have to stop paying for something and few would envy it the decision. You are however urged to add your voice to the calls to keep the Library at Crown Street perhaps by looking into ways of reducing running expenses or introducing some paid for services. There is much more information on-line including a petition at the time of writing.

Bishop Auckland Railway Memories

The Four Clocks Centre in Bishop Auckland has a display of railway photographs from the area and the banner of the Bishop Auckland Branch of the NUM. The banner is one of only three known to still exist and is around a century old. The display was created in collaboration with the Bishop Auckland Railway Group and will be a permanent fixture at the Centre which is in the old church on the High Street backing on to Morrisons' car park. Many will remember it overlooking the northern approach to the Station. www.fourclockscentre.org.uk

Train Simulator 2016

If you are not a member of the Friends and saw the last Newsletter you may have wondered about the offer elliptically referred to in the introduction. The offer was, indeed still is, available to members of the Friends only and details were included on a separate insert.

The feature about Dovetail Games' Train Simulator 2016 was a big clue. The offer is for a free copy of TS including the Weardale and Teesdale Network in the '60s route described and illustrated in the feature. The route (really several routes) is centred on Bishop Auckland and allows players to drive the lines to Wearhead, Durham, Darlington, Barnard Castle and on to Middleton in Teesdale, the line from Darlington to Barnard Castle and the branches to Crook and Spennymoor.

Such was the offer's success that at the time of writing there are only 19 copies left to give away. Hmm... If you are looking for a reason to join the Friends (other than the already excellent reasons) and if you have a Windows PC of suitable specification this may be it. See www.friendsofdrcm.org/ts2016 for details.

Posters

Posters have been created for the Friends' programme of talks and are available to download and print or for the asking if you can arrange to collect them at a meeting. The print file has been laid out to use a minimum of colour ink and includes some instructions for those to need them.

If you can put a poster in your window or arrange for one to go on display please get in touch or see www.friendsofdrcm.org/downloads for the file to print them yourself.

Rail Tours in the Region

This information is taken from www.uksteam.info, www.railtourinfo.co.uk and the various rail tour operators own websites. No locomotive movements are listed-although websites do list some movements they tend not to be arranged as far ahead as tours and are much more subject to change. This list is not claimed to be comprehensive and, although the information here is repeated in good faith, you are advised to check nearer the time. How much information there is available about rail-tours varies greatly from operator to operator.

Thursdays from 7 July to 25 August. West Coast Railway Company's (WCR) *Scarborough Spa Express* will run from Cornforth to Scarborough and return alternating between two different routes though the schedule for arrival at York and thence to and from Scarborough does not vary. There are no details about locomotive(s).

York d. 11:49, Scarborough a. 12:54, d. 17:15, York 18:15.

Tuesdays and Thursdays into August. WCR's *Dalesman* from York to Carlisle and return has been cancelled.

Sundays 10 and 17 July, 7, 14 and 21 August and 4 and 11 September. The Railway Touring Company's (RTC) *Waverly* will run from Leeds to Carlisle and return via York, Durham and Hexham behind LNER A3 Pacific 60103 *Flying Scotsman*. No times are listed between York and Carlisle.

York 11:43, Carlisle a. 16:03, d. 18:15, York 22:23.

Saturday 23 July. UK Raitours' (UKR) *The Ancient Kingdom* will run from Kings Cross to Alnmouth and return using the Northern Belle Pullman set behind a Class 66 or 67 Diesel. There are no timings north of Peterborough.

Saturday 30 July. RTC's *Coast to Coast Express* will run from Liverpool to Scarborough behind either LMS Royal Scot 46115 *Scots Guardsman* or an LMS Jubilee- either 45690 *Leander* or 45699 *Galatea*.

York 11:00, Scarborough a. 12:00, d. 15:10, York 16:15.

Saturday 6 and Monday 8 August. UKR's *The Edinburgh Tattoo* will run from Kings Cross to Edinburgh using the Northern Belle Pullman set behind a Class 66 or 67 Diesel or a Class 90 Electric on Saturday returning on the Monday. There are no timings north of Peterborough. Again.

Sunday 14 August. Steam Dreams' (SD) *Cathedrals Express* will run from Kings Cross to York and return behind LMS Princess Royal 6201 *Princess Elizabeth* according to SD's own website but both 6201 and LNER B1 61306 *Mayflower* are mentioned on the UKSteam website so there may be some uncertainty.

York a. 14:45, d. 17:05.

Saturdays 20 August and 3 September. Statesman Rail's (SR) *Beamish and Durham Statesman* to Newcastle from Cambridge on 20 August and Hereford on 3 September topped and tailed by Class 47/57s are listed on raitourinfo but not Statesman's own website so have probably been cancelled.

Saturday 3 September. The Railway Magazine's *Independent Yorkshireman* (with Virgin and DRS) will start from Chester behind a Class 57, hand over to two DRS Class 37s at Stafford and carry on to York and Scarborough and return to Crewe via York. Timings are yet to be announced.

Saturday 10 September. An overnight leg of GBRf Charity Raitours' *GBRf 15* tour will run from Stratford to Edinburgh Waverley behind a Class 86 from the AC Locomotive Group. It will pass York at 02:45 and Newcastle at 04:00.

Saturday 10 September. PMR Tours' (part of the Princess Royal Class Locomotive Trust) *North Eastern* will run from Leicester to Newcastle and return behind LMS Princess Coronation 46233 *Duchess of Sutherland* between Derby and Newcastle.

York 09:55, Durham 11:05, Newcastle a. 12:00, d. 15:45,
Durham 16:15, York 18:15.

Saturday 17 September. SR's *Yorkshire Coast Statesman* from High Wycombe to Scarborough and return topped and tailed by Class 47/57s is listed on raitourinfo but not Statesman's own website so has probably been cancelled.

Saturday 24 September. PMR's *Yorkshire Coronation* will run from Crewe to Scarborough behind 46233 between Derby and Scarborough.

York 11:45, Scarborough a. 13:00, d. 16:15, York 17:20.

Tuesday 27 September. WCRs *Jorvic and Scarborough Spa Explorer* will run from Dumfries to York and Scarborough and return topped and tailed by Class 47/57s.

York 11:45, Scarborough a.13.15, d. 16:15, York 17:15.

Friends Meetings for 2016

Meetings are at the Museum usually taking place in the Conference Room on the first Thursday of the month. To reduce the expense to the Museum of hosting the Friends *all* meetings for the foreseeable future will take place in the afternoon allowing it to save considerably on lighting, overtime, etc. Meetings commence at 1:45pm with the talk starting after announcements to members.

All the dates listed are Thursdays, usually the first Thursday of the month but please note that there are two exceptions. The second September talk near the anniversary of the Stockton and Darlington Railway is on the 22nd (yes- the S&DR actually opened on the 27th so the 29th would be closer to the anniversary but we avoid having meetings on consecutive weeks). The December meeting is on the second Thursday (the 8th) a little nearer Christmas. There is no meeting in August as usual.

August **No meeting.**

1 September **Locomotion Under New Management and *The Flying Scotsman*.**
Gary Campbell.

22 September **Hitachi Rail, Newton Aycliffe- The First Year.**
Darren Cummin or Simon Richards.

6 October **Rescues and Restorations** Richard Pearson
(Workshop and Rail Operations Manager, Shildon).

3 November **The Railways of Sierra Leone.** Anthony Coulls.

8 December **Christmas Get-Together.** Christmas quiz and film show.

This list is offered in good faith but errors can creep in and plans can change due to unforeseen circumstances. The programme is listed on the Events page of the Friends' web-site which will updated as soon as possible in the event of any change or correction.

Museum Programme

See the Museum's website (www.head-of-steam.co.uk) or call 01325 405060. For details of the Museum's educational workshops for schools please contact the Museum's Access and Learning Officer Sarah Gouldsbrough (sarah.gouldsbrough@darlington.gov.uk or 01325 405541) or, again, see the Museum's own website or programme.



Exhibitions

Safe and Sound, Stories of Emergency Response in the Tees Valley. Saturday 9 July to Sunday 4 September. Telling the stories behind the modern emergency services keeping our communities safe and sound.

The Splendour of Steam. Saturday 10 September to Sunday 30 October. Artist Stephen Bainbridge's works in acrylic, limited edition prints, and cards.

Loco's and Famous Expresses on the York to Darlington Line. Wednesday 7 September to Wednesday 30 November. Curated by NERA.

Little Works of Art. Saturday 5 November to Sunday 8 January 2017. 100 years of Greeting Cards with 280 Christmas, New Year, Easter, Birthday and Valentines cards from 1850's to 1950's.

150 Years of the Forcett Branch. Wednesday 7 December to Wednesday 22 February 2017. Curated by NERA. *This is the freight only Forcett Railway which joined the Darlington and Barnard Castle line east of Gainford not the Fawcett Branch, wherever that may be, as it appears in some listings.*

Activities, Events and Talks

Where prices are not mentioned entry will be covered by the Museum's usual charges. Year pass holders or Friends of DRCM members are free unless otherwise noted.

Shakespeare at the Station. June and July. Performances in collaboration with the Green Theatre using the Museum's portico as the stage. Schedule and pricing to be arranged- contact the Museum for details

Summer Fun Sunday. Sunday 17 July, 10:00am to 4:00pm in the Museum and gardens. A family fun day with entertainment, face painting, mini train ride and other activities including a special themed trail. £1, under 5s and family pass members go free.

Family Arts and Crafts. Thursdays and Fridays throughout the summer holidays from 1:00pm to 3:00pm. Craft sessions for all the family.

Time Travel Tuesdays. Tuesdays 2, 9, 16, 23 and 30th August, 10:00am to 3:00pm. A taste of life at a different historical period each week. Activities provided by That History Bloke included.

Darlington Model Railway Club Exhibition. Saturday 3 and Sunday 4 September, 10:00am to 4:00pm. Members and visiting layouts from the North East in various scales and gauges.

Heritage Open Days. Saturday 10 and Sunday 11 September, 10:00am to 4:00pm. Free entry to the Museum including guided tours by the Friends.

Victorian Family Fun Day. Sunday 25th September 2016, 10:00 to 4:00pm in the Museum and gardens. Children's entertainer, flea circus, punch and Judy, face painter, mini train ride, arts and crafts and a Victorian themed trail. £1, family members go free.

Halloween at Head of Steam. Sunday 23 October, 11:00am to 3:30pm. Children can wear their Hallowe'en costumes to the decorated Museum and enjoy spooky storytelling, balloon modelling, treasure trail, face painting, mini train ride and arts and crafts.

Family Arts and Crafts. Thursday and Friday 27 and 28 October (half term) from 1:00pm to 3:00pm. Craft sessions for all the family.

Santa at the Station. Weekends 10 & 11 and 17 & 18 December, 10:00am to 4:00pm. Meet Santa in the Museum grotto (booking essential) or just enjoy the face painting, mini train ride, Christmas music, arts and crafts and Christmas themed trail.

***THE FRIENDS:* Introducing the Friends and Darlington Railway Museum**

The Newsletter is given to all members of The Friends of Darlington Railway Centre and Museum but other copies circulate so it is possible that it has been your introduction to the Friends and even the Museum. If that is the case it is hoped that you have enjoyed reading it and that it has piqued your interest. Presumably your having read this far is a good sign.

Darlington Railway Centre and Museum

The Museum, also known as "Head of Steam", is housed in the old North Road Station building the main part of which was built by the world famous Stockton and Darlington Railway in 1842 and much expanded over the following 30 years. The S&DR marks the point in the history when industrial wagon-ways trundling from mines to the nearest canal or harbour became modern railways and the Museum tells the line's story with George Stephenson's *Locomotion*, built for the Railway's opening in 1825 and the first steam locomotive to haul a passenger train, taking pride of place. She stands with three Darlington built locomotives surrounded by interactive displays, artefacts and vintage photographs illustrating the history of railways and Darlington.

Visitors unfortunate enough not to have a consuming interest in railways, perhaps accompanying those who do, will discover much about the general history of Darlington, a varied programme of exhibitions on non-railway subjects and can enjoy refreshments. The Museum's facilities include the Northern Rail Activity Room, a children's play room, a meetings room with A/V equipment and the Ken Hoole Study Centre with its extensive archive of railway records, books, papers and magazines and other media.

The Friends of Darlington Railway Centre and Museum

The Friends is a non-profit organization existing to help promote and support the Museum. It presents a year round programme of talks principally for members but which all-comers can attend although we do ask non-members for a donation. The programme is varied so whether you are interested in the history or future of railways, their engineering or operation it is likely to have something for you. Benefits also include this Newsletter and free entry to the Museum and you do not have to visit very often for it to be worth joining for that reason alone. There are rates for senior citizens and the unwaged and joint memberships for couples and families.

If you think you might be interested in joining the Friends you can download an enrolment form from the website listed below or contact the Membership Secretary June Palmer at membership@friendsofdrmc.org.

To find out more about the Museum or the Friends please visit one of the websites listed below. Remember if you do not have Internet access your library does.



www.head-of-steam.co.uk

www.friendsofdrmc.org



The British Association of Friends of Museums (BAfM)

The Friends of Darlington Railway Centre and Museum is itself a member of the British Association of Friends of Museums (BAfM, www.bafm.org.uk), an independent organization for friends groups supporting not just museums and galleries but anything of historic interest including preserved railways, ships, parks, bridges and castles.

The BAfM has links to organizations including The Museums Association and the Department for Culture, Media and Sport, holds national and regional events and publishes handbooks and pamphlets full of useful information as well as a thrice yearly magazine. It can also arrange public liability insurance for organizations that may need it.

D49 62712 *Morayshire*, NER M1/LNER D17 1621, LNER V2 4471 *Green Arrow*, GNR large-boilered C1 Atlantic 251 and GNR Stirling Single No. 1 on the apron at Locomotion last year. Only 62712 is not in the National Collection (p. 10).



Also at Locomotion the steam speed record holder *Mallard* in 2010 and LMS Princess Coronation 6229 *Duchess of Hamilton* with one of the Coronation Scot carriages in 2012. Both are in the National Collection (as is 55002 *Kings Own Yorkshire Light Infantry* which brought 6229 to Shildon) and exemplify the rival streamlined expresses of the '30s (p. 5).

All photo's this page Tim Ruffle.

