Newsletter No. 4-2 - Aug. 2017 **Editor: Cedric C Lodge.**

We commenced our Newsletters with the intention of issuing them in the spring and early autumn of each year. The last issue (No. 4, issued in March) was followed by a supplement in May containing our Chairman's report on the Birmingham Workshop on the Future of Steam on the Mainline which, for reference, has been designated Issue No. 4-1.

This edition (designated Issue 4-2) has been put together for the purpose of circulating an article that was submitted to us by Brian Gregson, a new member of ASTT, which we thought worthy of distribution to other members. It also gives Chris Newman and John Hind the opportunity to circulate updates on several other matters relating to the Trust.

Note: If anyone can offer us an article or a response to Brian's article that might appear in a future newsletter, please e-mail it to the editor at cedric.lodge@advanced-steam.org.

Going back to our lead contributor, Brian Gregson began his career in 1947 as an apprentice fitter/turner at the BR works at Stratford (E London) and Darlington, also spending some time in the Doncaster drawing office and at the Rugby locomotive Test Plant. From 1954-56, he worked as a draughtsman at the Doncaster drawing office, designing modifications to steam locomotives. Thereafter he moved into other industries and into other countries, spending 15 years in car and truck chassis design, ending his career with GMC in the USA.

Brian contributed an article on the design of Gresley's Hush-Hush locomotive which was published in a recent issue of the 'Gresley Observer', magazine of the Gresley Society.

Note: By coincidence, it appears that Brian preceded me by a couple of years during his apprenticeship at North Road Works in Darlington.

Some suggestions for future improvements to steam locos. Brian Gregson.

(Intended merely to stimulate thought.)

Steam Pressure

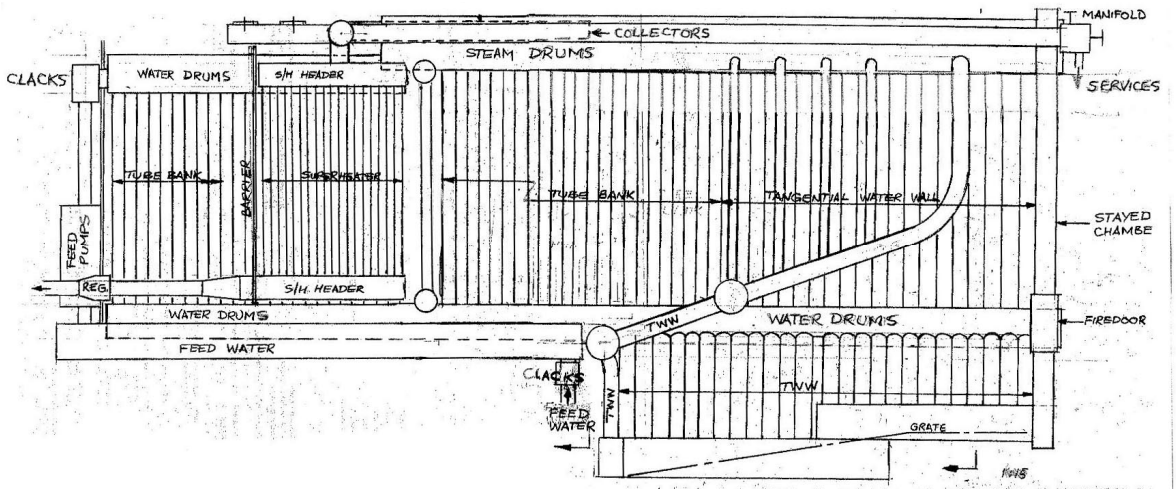
It seems to be agreed that an increase in steam pressure does improve the efficiency of a steam driven mechanism, but on the main British railways little has been done to really exploit this. With the one exception of Bulleid, designers have considered 250psi to be the limit with a conventional firetube boiler, though two notable attempts to improve on this pressure were made by other means. One, the LMS Fury, failed mainly on economic grounds, but the other, the Gresley W1, did spend some years in revenue earning service, though was costly on account of various malfunctions and with the approach of WW2 was rebuilt in a conventional form. But it had all the signs of having been designed by a committee: Yarrow, with no loco experience, being mostly responsible for the boiler; Gresley nominally in charge but with domestic worries at the time; and his staff, which included Bulleid, doing the rest. Personally, I have some queries, unanswerable now, about the background to the whole enterprise, but with hindsight approaching 90 years it is easy to see the faults in the design and inadequacy of construction methods which have been improved so considerably in the interim.

In the effort to achieve the not huge pressure of 450psi it was necessary to turn to a water tube boiler of course, and in turn the high pressure, and dubious valve gears then available, demanded compounding, which in all cases where it has been tried in the UK except one has proved a failure, the reason for the one exception being quite simple - but another story. So the end result, which Gresley wished to be as like an A1 as possible, had very little resemblance to one.

However there was one less well known production by a British firm of locos with water tube boilers, that is by Sentinel for the Belgian and Columbian Railways. The Douglas Self website has a good article on these, but essentially there were two six wheel bogies powered by Doble steam motors which supported a frame on which were the coal and water, a cab, and a boiler based on the Woolnough water tube type. This produced steam at 550psi, and although the locos were initially successful their fate in Columbia is unknown and it is assumed that they succumbed to lack of maintenance expertise.

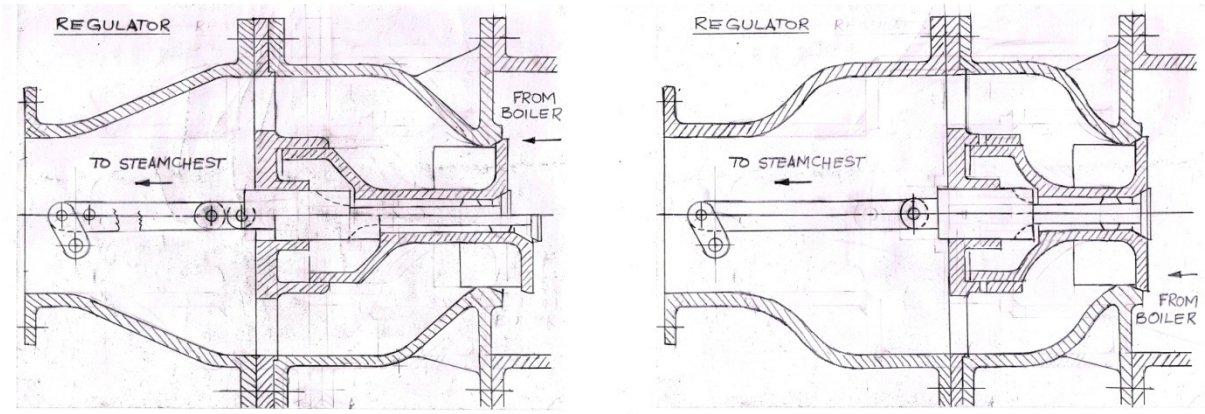
A compromise was achieved by Austrian engineers and was used by the Hungarian Railways, where the cost of coal was severe, and that was the Brotan-Defner boiler, which had a fire tube barrel but a water tube firebox. This provided some fuel savings but was limited in the pressure, though in the USA some were built with pressures up to 500psi, the weight penalty then leading to route availability restrictions.

Whilst on the subject of boilers I noticed that the Bulleid boilers had a good reputation for steam production, but the only apparent difference from the conventional was the Nicholson thermic siphons. These gave so much trouble that they were removed during rebuilding, but it occurred to me that a substitute could be in the form of water tubes, an idea which I was pleased to see adopted by Alan Haigh in his last design of a boiler within the LNER 100A profile, but it still seems to me to be sensible to have as much of the heating surfaces as possible in the hottest part of the fire flame, something easy to do in a design for a water tube boiler *(see over)*.



Valves, Gears and Regulator

I've no doubt that the internal streamlining of the steam passages did much to help Mallard's record achievement, but there were still restrictions in the form of the regulator and the area around the piston valves. The former was the balanced Lockyer design, but there could still have been eddy restrictions in the passage of the steam through it. I have a provisional design for placing it in the line of a steam pipe (see below) which seems to show a smoother path for the steam. However it might be worth taking a look at the variety of commercial valves intended for this purpose.



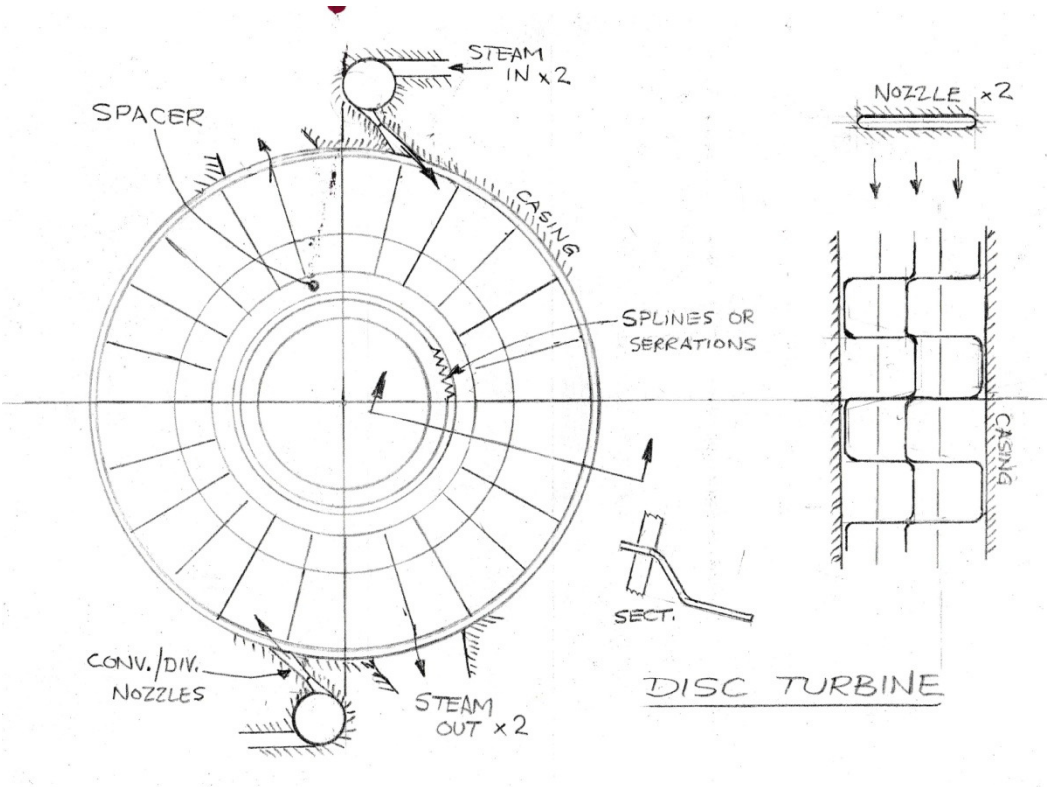
For valves, poppets appear to have advantages in sharpness of control which should, with the right gear, permit smaller cut-offs and remove the requirement for compounding in the use of higher pressures. A rotary camshaft has the great value of allowing the exhaust to be open for the whole of the piston stroke, a virtue displayed I believe by the LNER D49/2s which congregated at Hull Dairycoates, where they had a reputation for free running and where, presumably, it had been figured out how to maintain the complex gear system which was far from being to average British railway liking. But Lentz and Caprotti should not be mandatory, though the control of reverse does need some thought. And balancing of a poppet valve is a good idea to relieve the load on the operating gear, but they do still disturb the flow of the steam just before entering the cylinder. So yet another possibility is a return to the piston or even the slide valve, but in two separate parts independently driven by cams, based perhaps on the Cossart idea, which is a cam-operated piston valve, permitting, it is said, a cut-off as low as 5%. A rotating camshaft should give scope for a better control over cut-off, which could make compounding less necessary with higher pressures.

Exhaust Pressure

Even with the advanced Porta exhaust the force at the chimney, I believe, still varies with the amount of work the loco is doing, so might it be useful to vary the cross sectional area of the passages, perhaps in the Kordina, without of course interfering with the function of that device in limiting the backflow of steam. This could be controlled by the pressure of the exhaust steam, and could produce a more even draught on the fire.

Turbine Drive

Considering the revolution that Parsons created in shipping with his turbine it seems a little odd that it raised no interest in British railway circles - that is, of course, until someone else, the Swedes, had made it work, though in a too elaborate manner. All credit then to Stanier for applying it to an existing class to create the single Turbomotive. That this gave good service for 14 years in the top link until the turbine needed replacement seems to me adequate justification for the principle and turbine development has, like much else, improved in the last 82 years. The loco was criticised for its inadequacy in reverse, but that might be overcome with the use of an epicyclic gearbox in the drive. A first reaction to a turbine might be the cost, with its need for a gear train, but possibly a less costly form of turbine, which occurred to me after discovering the Tesla turbine, might be devised. As it stands, the Tesla would be unsuitable for steam, though it works well with fluids; but the discs could be cheaply reformed to turn it into an impulse turbine. Another turbine application could be to a loco booster, where the space saving could be quite beneficial and the problem of cut-out at speed overcome with a one way rotary clutch.



Superheater

This could be seen as a serious restriction in the steam flow to the cylinders, though with a water tube boiler this could be minimised easily. With fire tubes though, the problem of getting heating at the right level is considerable, unless perhaps the combustion chamber, if there is one, could be extended to a point where the gases are not too hot and a header placed in the chamber to allow the superheater tubes to pass through to another header in the smokebox. Or could enough heating area be achieved with tubes in the sides of the combustion chamber, placed so as to ensure access to the tubes for expanding?

Steam Loco Driving Technique

I think it is accepted that the best way of utilising the expansive qualities of steam is to drive with a wide open regulator and to vary the cut-off to suit conditions. This is in theory, and some drivers try to apply it in practice, but ergonomically the control of the regulator is so much easier than that of cut-off that the reverse practice has I believe been more common. Control of the reversing gear has usually, on modern locos, been by the operation of a wheel, a more laborious task than jiggling a regulator handle. Bulleid did try a steam-operated reverser on his Pacifics with limited success, but steam assistance is more logical and might allow a lever to be used - as on shunting tanks like the GER 'Buckjumper' tanks of which the J69 was one, and which were habitually reversed with an open regulator.

A Really Modern Loco

This would surely have to incorporate the now well developed electric propulsion system, for which a pattern would be the Diesel Electric loco with its power plant mounted on a frame, in turn supported on two power bogies. For steam this is an elderly configuration, going back at least to the Meyer system in the early 1930s. The diesel power plant could simply be replaced by a steam one if enough power could be generated and fuel and water carried in the space available. The steam would have to power a turbo-generator. Alternatively, the bogies could be steam powered, by turbines perhaps, and of course a variegated path to this was established by Bulleid with the Turf Burner, which was probably modified by his assistant Crick. A square section boiler is perhaps not to be recommended, but an ideal substitute would be a water tube one, with more compact dimensions producing a higher pressure suited to turbines. But in general we are back to the Sentinel Columbia loco, an example capable of development I feel.

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Anecdote: "A new Classification for clinker formation" From an email by Cedric Lodge.

Friday 14 July 2017 - I have just had 2 days firing on the WHR. Wednesday was fantastic. We had No. 143, and everything went like clockwork. I had made some new fire irons: a rake formed of a rectangular plate at the end of an 8 ft shaft, and a clinker paddle (another rectangular plate but set in line with the shaft). Both worked extremely well, and helped make the day a success.

Yesterday, we had No. 87. She was clinkered when we took over at Dinasd, but I was able to clear most of it when we turned round at Caernarfon. We got up to Rhyd Ddu, but it was not easy. At Porthmadog we have 20 minutes in which to turn round. Clinker had formed like toffee all over the grate. I got most of it off from the rear RH side of the grate, but could not clear the LH side by the time of departure. The run up to Beddgelert went fairly well and I began to think we might make it up the hill. We got away from Beddgelert in fine style, but after a mile and a half it was evident we were losing it and the water level was falling relentlessly. Then, just above Hafod Ruffydd, we had to stop for the inevitable 'blow up'.

Back at Caernarfon, I tried to clear some clinker to enable us to get back to Dinas. The trip up to Dinas was taken very steadily, and we got there without having to stop.

When it came to cleaning the firebox, we encountered toffee clinker all over, which we could not shift, so we had to shovel the fire out manually - I think only the second time I have had to resort to that. And even then, the clinker persisted. Not until it had cooled down considerably, did it yield.

There are now four types of clinker: 'cow pat', as described and easy to deal with; "gravel" clinker where the fire is dead and feels like gravel to a fire iron; "toffee" clinker, which is spread thin all over the grate; and "13 July" clinker which sticks like glue!

In my experience, the best way to deal with "13 July" clinker is to sprinkle cupfuls of water on it with the blower on.

We welcome short stories, anecdotes and articles from members for inclusion in future newsletters. Comments on Cedric's cold water recipe for dealing with "13 July" clinker will also be welcome.

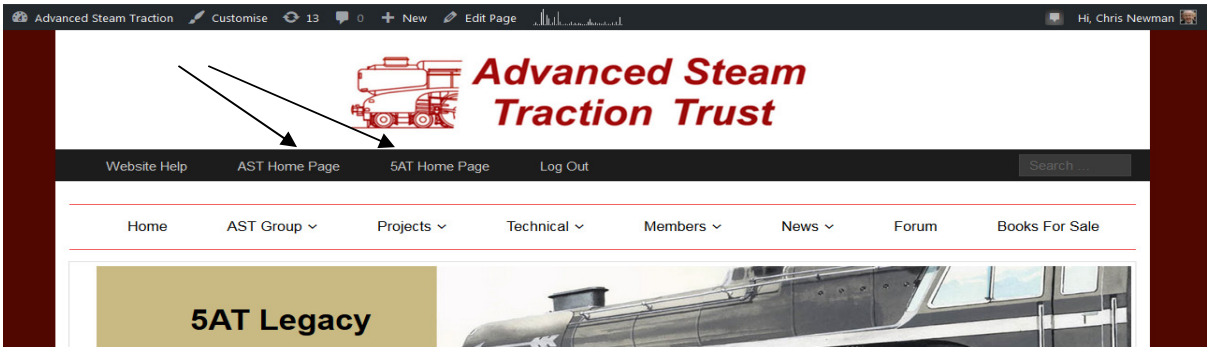
Website updates

Chris Newman (ASTT Webmaster)

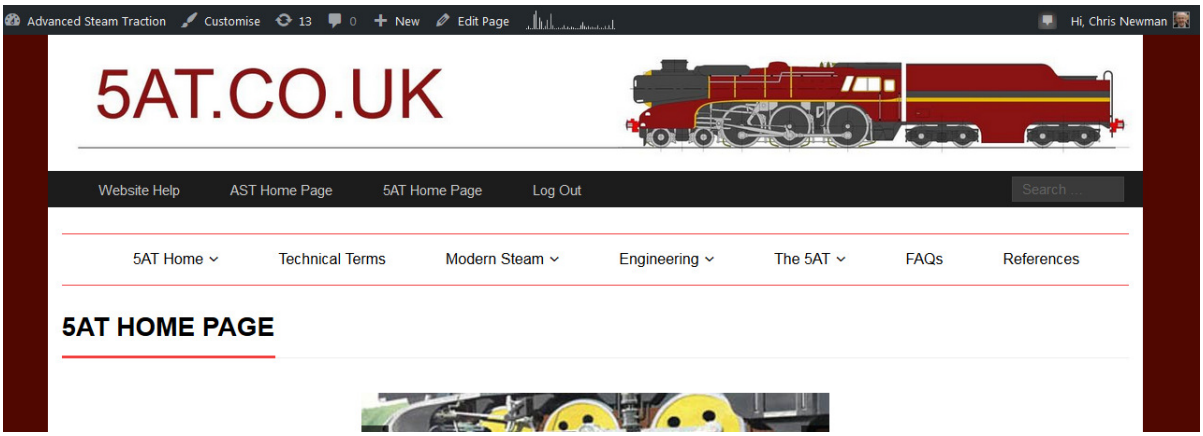
The most recent (and ongoing) development to the website has been the incorporation of the old 5AT website pages into ASTT's website. The 5AT website died without warning in May when Godaddy Inc. which hosted the site (and which hosts ASTT's site), moved the 5AT files onto a new server. The move caused a loss of vital links which rendered the site defunct.

As might have been expected, Godaddy blamed the website's structure for the failure and were not prepared (or able) to do anything to help recover it, and the cost of engaging professional help would have been prohibitive. Luckily it was possible to recover most of the site's content from "cached" copies (files temporarily saved) on Google's and Yahoo's search engines. Equally luckily most of the pages that were lost were less important ones.

The 200-odd pages that were thus recovered have been reinstated on the back-end of ASTT's website where they can now be accessed through a link in the "black" menu immediately below the logo header (see below).



Viewers will find the 5AT section retains its own header (differentiating it from the ASTT section) and its own menu structure that is similar to the old one (see below).



Despite the intention to retain as much of the old 5AT website as possible, some new features have been added. In particular long drop-down menus have been replaced through use of a new FAQ "plug-in" [software package] in which questions or topics are listed on a single page and answers (or explanations) revealed by clicking on the question or topic. This reformatting has so far been applied to the "FAQ", "Technical Terms" and "References" pages (all accessed from the main menu); it's also been applied to the "Principles of Modern Steam" page which is accessed through the Modern Steam drop-down menu. Feedback on this FAQ format has been positive, so it may be applied to some ASTT pages as well.

The Forum section has been rather neglected in recent months as members have reverted to cluttering up each others' inboxes with emailed debates. Feedback and suggestions for improving the forum facility will be welcome.

As always, members are encouraged to offer suggestions for new pages for the website and to contribute content for them. Members' feedback, both constructive and critical, is also welcome. The website is not just a shop-front for ASTT, but a communication channel for its membership.

Help needed: ASTT is currently dependent on a single person to maintain its website. For long-term sustainability, we need someone not only to help with the work but more importantly to be able to take over as and when required. The website has been developed on a WordPress platform (an industry standard), and while it involves a bit of a learning curve for those not familiar with it, it becomes quite easy to use with practice.

Membership

by Chris Newman (ASTT Membership Secretary)

ASTT membership now stands at 40 representing an increase of two since May when the last newsletter was issued. New members are:

- **Brian Gregson** from Wiltshire: Brian began his career with a 3½ year apprenticeship with BR, followed by 35 years as a mechanical design draughtsman in several industries and in several countries. Brian has contributed the lead article featured in this newsletter.
- **John Tasker** from Grimsby: John served an apprenticeship as a machinist and has worked in component manufacture including locomotive gear casings and motor yokes. Currently he works for "Station Road Steam" dealing with second-hand locomotives in various gauges, and preparing to run new-build locomotives of predominately 7¼" gauge.

2017 Autumn Conference

by Chris Newman (Conference Organizer)

Planning continues for ASTT's 2017 Autumn Conference and a new "flyer" has been prepared to circulate to potential attendees together with a set of "Abstracts and Speaker Introductions" (both included in this Newsletter).

Approx 30 people have accepted invitations that have been distributed, and it hoped that by the time of the conference we will have close to the target (maximum) figure of 50. Some ten of our members have not yet responded to the invitation, so **any wishing to attend are urged to register** their intention to ensure that a place is reserved for them.

Admission fees have been set at £40 for both days of the conference or £25 for a single day's attendance. A £5 discount on both prices is offered to ASTT members. Invoices will be sent out shortly to all those who have requested reservations; they will be issued immediately to any new registrants. It is thereby hoped that it will not be necessary to handle payments on the day.

As noted in Newsletter 4-1, members are invited to put forward suggestions for alternative venues for ASTT's 2018 AGM and Autumn Conference.

Book Sales

Chris Newman (ASTT Marketing)

Book sales have been disappointing of late which is not altogether surprising given that ASTT's website does not yet have nearly so great a following as the 5AT site enjoyed; nor does it have the same Google ranking. Luckily ASTT isn't dependent on book sales for its survival. They do however provide useful income, so members are encouraged to take advantage of the 20% members' price discount that we apply to most of the books that we offer.

The current book situation is summarised as follows:

- **5AT FDCs:** One further book has been sold, being the last in stock. Camden Miniature Steam has just placed an order for an additional five copies, so the opportunity will be taken to print three or four extra for ASTT's stock. Edinburgh Copyshop is happy to print copies in small numbers as and when required. Sales of the FDCs now total 169 copies.
- **5AT Feasibility Study**: This publication continues to disappoint as no further sales have taken place. Copies are printed on-demand by Lightning Source, so no stock needs to be held.

- **Crimson Lake books**: Adrian Tester's books continue to draw interest, and four copies of his "*Defence of the Midland/LMS Class 4 0-6-0 – also why frames cracked and axleboxes ran hot*" have been sold since the last newsletter was circulated. Both this title and his "*Introduction to Large-Lap Valves & Their Use on the LMS*" are recommended reading for all steam enthusiasts who are interested in theoretical aspects of locomotive design and performance.

  Note: It is especially pleasing to report that Adrian has another two-volume publication on its way which we hope he will permit ASTT to market. Its working title is "*Physiology of the Locomotive Boiler*" which will be the subject of Adrian's presentation at the forthcoming Autumn Conference.

- **Here be Dragons**: Camden Miniature Steam expects to have Phil Girdlestone's autobiography ready for sale in the autumn. It is still possible that the book launch will coincide with ASTT's conference which Adam Harris has expressed interest in attending. The book is more a "techno-biography" than autobiography in that it reveals almost nothing about Phil's life beyond his work with steam locomotives.

- **The Red Devil and Other Tales from the Age of Steam**: Camden Miniature Steam has produced a 5th print run of this iconic book which is now available for purchase through AST's website. Only 300 copies have been printed, so members and investors are encouraged to buy up while stocks last and before second-hand prices rise yet again to astronomical values. Seven copies have so far been sold through ASTT's website over the first month of sales. This compares with 233 copies sold through the 5AT website over the period Mar 2013 and Apr 2014, but (as noted above) the 5AT website had a much greater Google presence than ASTT's currently has.

- **Design Calculations for "Lyn"**: An ISBN has been purchased for this publication and forwarded to Ian Gaylor so that he can include it on the book cover. It is hoped that once "Lyn" is fully operational, Ian will find time to complete the book for ASTT to publish on his behalf of the 762 Club.

- **Porta Papers**: Chris Newman has now completed the transcription of Porta's 1986 paper titled "*Advanced Steam Locomotive Engineering Facing the Oil Crisis - or - Adhesion in the Kingdom of Railway Stupidity*". The paper will probably seem dated to modern-day experts in the field, but for less expert students of railway technology, it could be an eye-opener. Like all Porta's papers, it is like a gem with many tantalizing facets, a few of which oblige the reader to discover their meaning for himself.

  This and several other transcriptions are now with Shaun McMahon who is proof-checking them prior to publication. Altogether Chris has so far transcribed 19 of Porta's papers filling 647 pages of A4 typescript. Shaun's proof-reading may therefore to take some time.

  ASTT plans to publish the papers in three volumes using Lightning Source's "on-demand" publishing service, meaning that there should be no outlay getting stocks printed in advance of sales. (ASTT used the same Lightning Source service to publish the 5AT Feasibility Study, and plans to use it also for Ian Gaylor's "Lyn" calculations.)

  A royalty of 10% of proceeds will be paid to Porta's children who own the copyright over the papers.

New Build New Locomotive for the Lynton & Barnstable - John Hind (Chairman)

On Saturday 8th July, Cedric Lodge and I were invited to the first public steaming of *Lyn* at the Alan Keef Ltd workshop in the Forest of Dean.

Lyn is a modernised version of a Baldwin 2-4-2 tank originally supplied to the Lynton & Barnstable Railway by the Baldwin Locomotive Works in 1898. Ian Gaylor (one of our members), designed the replica locomotive and gave a memorable presentation about his work at our 2016 Conference.



The new *Lyn* ticks many of the recognised 'modernisation' boxes: GPCS, Lempor Exhaust; Kordina; Roller Bearings; Superheat (original was not superheated); Higher Boiler Pressure; Spark Arresting Smokebox; etc. For Ian it was the fulfilment of 10 years of effort.

Lyn is currently being finish-painted in readiness for its public debut at the Lynton and Barnstable Gala on the weekend of 30/9/17 – 1/10/17, (coincidental with our conference, which is a worthy excuse for Ian not attending!!). The engine will be based on the line, which is currently about 1 mile long. Planning permission has just been given for the next phase of the extension and there are ambitious but realisable plans for recreation of the full 19 mile line from Lynton to Barnstable. In the meantime, in the autumn of 2018, there are plans to test *Lyn* on the more challenging Welsh Highland Railway.

At the Lynton & Barnstable Gala, L&B's Chairman Peter West will to announce their intention to build a modernised version of the Manning Wardle locomotives originally supplied to the line. Over time they may build a fleet of them – something that will be unique in the heritage world and something that ASTT may be able to help with.

New e-mail Addresses – John Hind

The subscription for our 5AT e-mail account provider runs out in November and will not be renewed. With this is mind a number of us are now using new ASTT e-mail addresses. These include:-

- John Hind – Chairman: john.hind@advanced-steam.org
- Cedric Lodge – Secretary: cedric.lodge@advanced-steam.org
- Paul Hibberd – Treasurer: paul.hibberd@advanced-steam.org
- Richard Coleby – Auditor: richard.coleby@advanced-steam.org
- Mike Horne – Director: mike.horne@advanced-steam.org
- Iain Jack - Member: iain.jack@advanced-steam.org
- Chris Newman – Webmaster: info@advanced-steam.org

Other committee members or full members wishing to have ASTT email addresses should contact the webmaster to arrange it.

