

Reading Society of Model  
Engineers  
www.prospectpark  
railway.co.uk  
Charity Number 1163244

# The Prospectus

April 2019



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**Free to members**



A happy Cliff Perry with his lovely London, Tilbury and Southend 4-4-2T at Prospect Park. Photo John Spokes

**MEMBERSHIP RENEWAL 2019  
2019 ANNUAL GENERAL MEETING  
MEASURING THE TRACK  
TRIALS AND TRIBULATIONS**

JB155

## NOTIFICATION OF 2019 ANNUAL GENERAL MEETING

Notice is hereby given that the 2019 Annual General Meeting of the Reading Society of Model Engineers ('RSME') will be held in the Clubhouse, 82 Bath Road RG30 2BE, on **Thursday 30th May 2019 at 7.30pm**.

Any ordinary member over 16 may apply for election to a vacant Trustee post. Any nominations for Trustee should reach Stuart Kidd on or before 29th April 2019. Each nomination should be signed by the nominee indicating their willingness to serve, and by a proposer, both of whom should be paid up RSME members over 16.

The following details of the nominee should be provided:

- Full name
- Address
- Date of birth (if under 18)
- Any existing charity appointments.
- Vocation/profession

Three Trustees retire by rotation this year.

John Billard, appointed by the Trustees as an additional trustee in recognition of his role as Prospectus editor, retires at the conclusion of the AGM.

Any motions for consideration at the AGM need to be submitted to Stuart Kidd also by 29th April 2019 and must be proposed and seconded by paid up RSME members.

Stuart Kidd

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## RSME GENERAL DATA PROTECTION REGULATIONS 2018

In accordance with the GDPR 2018 we will be asking members for their consent that the RSME may store the personal data provided on the Membership renewal form. This data will be kept for the sole purposes of the administration of the RSME and communicating with you about the RSME, its events and activities. Also, to provide emergency contact information should the need arise.

The RSME will not share or disseminate this personal data to third parties. The information will be kept up to date, secure and deleted three months after your membership ceases.

Members have the right to inspect their personal data record and to withdraw their consent at any time upon giving reasonable written notice to the RSME Membership Secretary, who acts as the RSME data controller. This policy will be reviewed in April 2020.

Please ensure you advise the Membership Secretary of any changes to the information.

Note: To comply with the Southern Fed regulations on boiler testing, the RSME will store copy boiler test certificates and retain data on the expiry dates of hydraulic and steam tests.

## 2019 MEMBERSHIP RENEWAL

Members are reminded that their subscriptions are due on 1 April 2019. Membership forms are being circulated and require completion by the applicant.

Rates are unchanged and are:

Ordinary Member		£42	
Member 65 years +		£28	
Junior Member	*	£14	
Associate Member	*	£14	
Joint Member		£63	
Family Member		£70	



Mike Sinclair and his excellent 1946-built Royal Scot “Lancashire Witch” at RSME on 8 March 2019. Photo John Billard

# PONDERINGS

by 61249

## More Virility Symbols

Railway technicians and engineers have succumbed to the way of all flesh in developing a love for symbols of power and authority to bolster their image. Some of these have connections to the modern task, others less so.

When I worked at Paddington for the Western Region the Chief Civil Engineer (who had the best main line track on the whole BR system), had a huge office and desk, above which on the wall behind him was mounted Brunel's walking stick. At the time I believe he was the 14<sup>th</sup> holder of this artefact, so in any interaction with him in the office there was the reminder of his greatness and authority transferred through the ages by that stick. A talking piece as well – very clever, allowing him to state that there had only been thirteen holders before him. The stick itself is now where it belongs, in a museum (not sure if it is Swindon or the National Railway Museum in York). It is slender, in three parts with two hinges, so that when opened out it has two brass nipples which are a magical 7' 01/4" apart. Neat.

The modern equivalent for today's Infrastructure Manager is also associated with track measurement and is a useful piece of kit. It is of course the Track Recording Car, or train if you are really full of testosterone. Here the game is "mine is bigger/stronger/faster than yours and does more things". In BR Research track measurement had been a specialism for some time so we were facilitators in providing the necessary vehicles and technology. We could mount the kit, test it, calibrate it and deliver it in a specially adapted vehicle, all done in the workshops at Derby.

Network Rail's "Yellow Banana" train came out of this stable, with some very clever attributes that make it still (probably) the cleverest train in the world. It is quite possible that the technology on the train has changed more than once since the train was new so may carry little that came from the time I was involved, but I must have done a good sales job on Railtrack as I spent a week with their chief engineer touring the US of A looking at the best they could offer.

In some areas I had to admit they were better than us, measuring things such as track stiffness which we had never done in the UK. Against this, in key areas we were streets ahead, and basic track geometry measurement was one such. What BR Research had learnt was that the traditional measurements taken by Civil Engineers did give some view of track quality, but the really important feature was the impact that geometry had on the train, the ride and the risk factors. There had been more than one derailment of container trains where normally stable bogie vehicles had derailed at reasonable speeds – 60 mph or slightly more, and these were not solved by measuring the track in the immediate area, but could be shown to result from long wave length variations in level and twist over hundreds of yards giving rise to resonance issues and bounce resulting in significant offloading of individual wheelsets which would then not have the stability to negotiate track irregularities which at the point of derailment might well be in tolerance.

At AEA we understood this type of issue very well, due to the investment in

“Vampire” the wheel rail modelling programme into which we had input all that the best brains understood about the subject. Not only did this programme help predict and manage Rolling Contact Fatigue, as readers of January’s article will know, but it also enabled the Yellow Banana to predict what would happen to any train on any defect it discovered on the railway. Owing to the speed of modern computing, and the processing efficiency of the Vampire programme, this can be done at line speed, which was amazing in the early noughties.

Probably now it can be done on a mobile phone, such is the power of modern data processing. The ability to spot a rough ride or give a quantified derailment risk as the recording train went along at 125 mph was revolutionary at the turn of the century, and we were the only place in the world where it could be done. All it needed was a model of the trains using the route, and the track geometry measurements including long wave variations, brought together in a running “Vampire” model. This capability was built into the train as new, and then we hit something of a technology gap. That I define as the gap between what is possible technically, and what is actually useable, or used. This gap is pretty wide in track engineering. It is one thing to have this clever train go to bed one night in Derby or wherever with knowledge that there is bad track in Slough, and another to put that defect right in a useful way. That gap can be days, weeks, even months. It starts with a credibility gap in that the local engineer might not even believe the data he is given by the train, preferring to go by what his own traditional methods reveal. Rough riding reports, visible defects etc. can be just as, if not more, important to him (her). Just like your average smart phone, the utilisation of the upper end capability in the technology tends to be quite low, and not many of us use our phone’s computing power in super clever apps, but stick to texting, pictures and phone calls.

In AEA at this time we did make a wrong call which others got right. We were approached by a track engineering company to investigate (mostly at our expense of course!) the use of video and image recognition in track maintenance. We did not foresee how quickly video digitisation would make it possible to deal with the huge amounts of data involved and declined. That was a mistake and comparing images to see what was happening to the track, spotting changes and defects is well into the useable spectrum now, much more quickly than we imagined twenty years ago.

In one aspect we were well ahead of the market, and that is in the use of Unattended Geometry Measurement Systems (UGMS). These are devices that can be fitted to a service train to measure the track. For the virility symbol, this has no value at all, the train looks like any other, it does not even belong to the Infrastructure Manager and is therefore not painted in a special livery. Furthermore, it can be reasonably shown that it is not as accurate in the measurements it makes, rendering a failure in the virility symbol stakes. Rejecting it on this basis is the same as Kodak in 1990 rejecting the threat to traditional photography by predicting that cameras in phones gave such a poor image quality that they would never catch on.

Industry calls this a disruptive technology, it starts off not being as good, but has the power to change the whole market. Measuring the track three or four times a day as the service train passes over using £100k’s worth of kit actually tells you more

about the track and necessary maintenance than a £10m train every 6 months. It gives you a video, not a snapshot. The speed of degeneration tells you where the fault lies, in the ballast or lower. As for accuracy, the repeated measurements give a mean reading that with a little data analysis to get rid of the rogue readings is just as useable, and probably as accurate, as the single pass from the special train.

The market will get there eventually, but at the moment, decades after it became possible, the concept of measuring the infrastructure from a service train and using those measurements as the base for maintaining the track etc. is still gaining ground very slowly. Similarly the reverse process, - measuring the train from the infrastructure. The engineering silos do have a difficulty with these interfaces sometimes!

## The Trials and Tribulations of a Baldwin Owner

### by Mike Manners

The general public and quite a lot of club members have no idea what goes on behind the scenes in terms of the work and maintenance that goes on around the club. Similarly, a Baldwin turns up at every public running day and works away all afternoon and then just disappears to magically reappear at the next public running day and carry on with the work. What goes on behind the scenes is not trivial and takes up a considerable amount of time and effort as the following may illustrate.

Nigel Penford's Baldwin has been performing well for some time but we have been aware of a few things were beginning to show signs of wear and there were things that we knew were not right and needed looking at.

The axle pump had been out of commission for some time and there has been a knocking noise that was becoming more pronounced as every public running day progressed. Wear in the main bearings and in the little ends was also becoming evident. Nigel decided that once the Christmas commitments were over he would start work on some major maintenance. Little end bearings would be renewed as would four of the six main wheel bearings. The two on the front axle had already been replaced so we knew exactly what to expect. Nigel had already worked out a system of supporting the very heavy engine so that it was secure and safe to work underneath. Previous work on the front axle had shown that the roller bearings would have to be replaced and, as the rollers ran directly on the axles themselves, there was significant wear on the axles meaning that new axles would have to be made. Nigel had the various materials on the bench ready to go so come the New Year work started.

The first job was to get the engine securely supported and drop out all of the wheels and axles. The next bit looked rather brutal but was the only way to proceed. The axles were cut in half. It was the only way they could be mounted on the hydraulic press to remove the axles from the wheels. Putting the wheel sets in the band saw looked dramatic but was the quickest way to proceed. Then came the tricky job of

making new axles. They would be a press fit in the wheels and held in with keys and Loctite just for good measure. Making the new axles was time consuming and exacting work as each axle end had to be individually match to the appropriate wheel and sized to achieve the appropriate press fit. The axles then had to have the keyways machined being very careful to ensure the 90 degree quartering was maintained and that the appropriate wheel was leading.

The next step was back to the hydraulic press to broach keyways in the four wheels. Nigel had made a broaching guide that he had used on the previous wheel set to ensure the keyways were all in the correct location.

It was then on to making the four keys. Another job requiring some very careful machining, filing and fitting. Next it was then back to the hydraulic press to fit the wheels back on the new axles making sure all the appropriate axle boxes and eccentrics were in place. The actual job of pressing the wheels onto the axles went very well. As it turned out a little too well. A Baldwin wheel set is relatively heavy so putting them back onto the locomotive is not easy. Its almost impossible to support the weight and fiddle the axle boxes into the guides. In the end we came up with a system of bungee straps over a ladder suspended from the workshop ceiling to support most of the weight. The job then became so much easier.

The big test of all this work was going to be trying to get the coupling rods back on and would the wheels then rotate. At this point things started to not look good. Getting the coupling rods back on was a real struggle. Things looked even worse when we tried to rotate the wheels or push the Baldwin along a track.

Nigel tried a few things but it quickly became apparent that there was a serious problem. It was time for us to go away and have a bit of a think. How could there be a problem? Everything had been done quite precisely and the broaching had been done with a jig. We had already done the same work on the club loco with no problems. What had we done wrong? I suggested to Nigel that the only way to find the problem was to take out all the wheel sets and check them against each other. Not something that Nigel was over keen on doing.

After struggling for a day or two to solve the problem Nigel decided to remove all 3 wheel sets and try and find the quartering problem by measurement. John Marrington was consulted and he came up with a technique for establishing accurate quartering measurements. This quickly showed similar quartering measurements on two of the wheel sets and that the other set was a long way out. Just how this had occurred is a real puzzle and we still don't know the answer. Anyhow, what to do about it?

After some discussion and further measurements Nigel pressed off the offending wheel. It was agreed that the only real solution was to manufacture a stepped key and press the wheel back on with the stepped key inserted. I used AutoCad to produce an accurate full size drawing from the measurements previously taken. This allowed us to work out the exact size and shape of the stepped key and produce a ten times full size drawing. Nigel then had the very tricky job of making the key. A stepped key of the size required is not only tricky to machine but also very difficult to hold in the machine vice. To cut a long story short, the key was produced and the wheel pressed back on the axle. This time the coupling rods went back with a lot less trouble, the

wheels went around and the loco could be pushed up and down the track with little difficulty. It was looking like the problem was solved. The big test would be the next public running on the 3<sup>rd</sup> March.

Nigel decided while he was working on the locomotive, he would take the cylinder end covers off and have a look at the condition of the cylinders. It was at this point that an interesting discovery was made.

An inspection of the inside of one of the end covers showed a very slight mark in the centre of the cover. It was just possible to make out a hexagon shape. The only way this mark could have been made was by the nut that retained the piston on the piston rod impacting the end cover. It was just possible that the cause of the knocking noise had been found. The next question was why had this started to happen? The noise had not always been there. It was something that had developed over the last 12 months or so. The only reason I could think of was that the significant wear in the axle and other bearings was allowing the piston to travel further up and down the cylinder than it was designed to do. Now that the various bearings had been replaced the piston would be restrained in its travel and the knock would probably be gone.

Just for good measure Nigel reduced the thickness of the nut and increased the thickness of the end cover sealing gasket.

March 3<sup>rd</sup> arrived and the Baldwin was back in steam doing the usual public running. Had all the work been worthwhile? Very much so, the knocking noise had gone and everyone who drove it said that it sounded and felt like a different engine. Well done Nigel. A long hard and at times rather worrying slog but well worth it in the end.



Baldwin with two axles missing



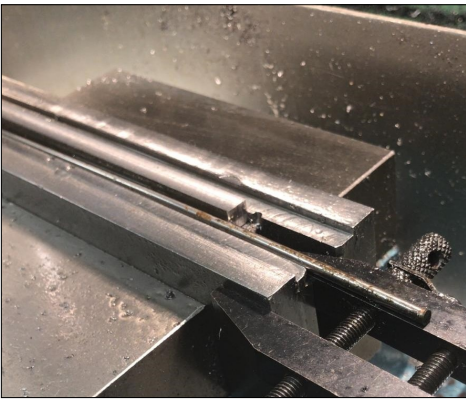


*Above* Axles cut in half

*Right* Axles pressed out

*Below* Cylinder end cover with impact mark

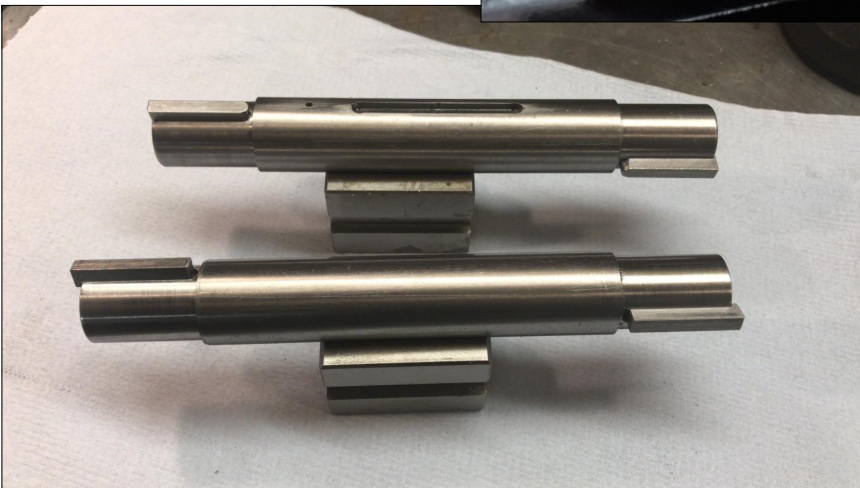




*Left* Key ready for machining

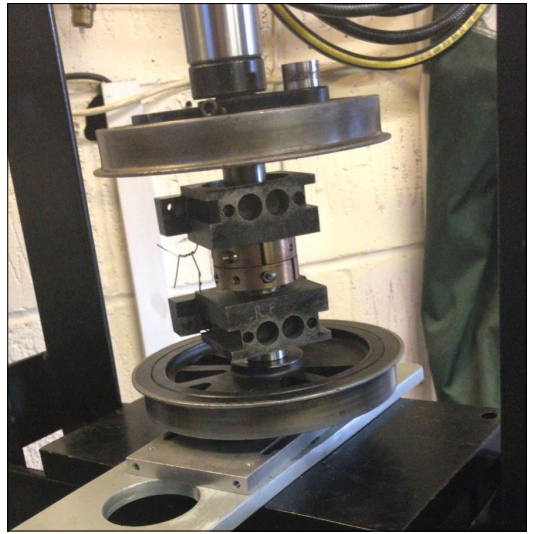
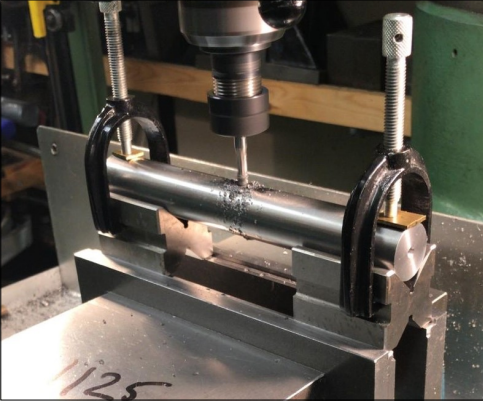
*Right* Wheel broaching

*Below* Two new axles ready for wheel fitting

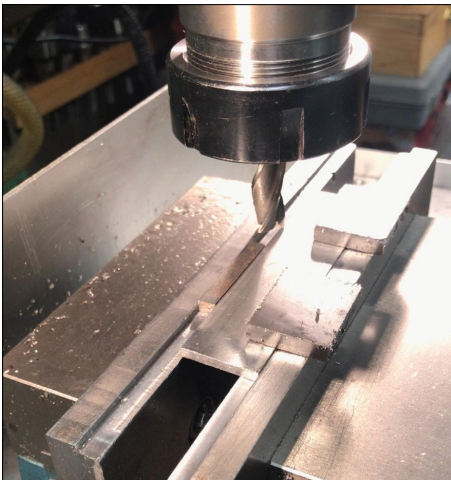


*Right* Wheel being pressed on to new axle

*Below* New axle being machined



*Right* Wheel broaching guide



*Left* Stepped key being machined - not easy to hold!

All photos—Mike Manners

## DIARY

### April 2019

Saturday	6 <sup>th</sup>	Birthday Party	11:00 to 13:30
Sunday	7 <sup>th</sup>	Public Running	13:00 to 16:00
Saturday	13 <sup>th</sup>	Club Running	11:00 onwards
Monday	15 <sup>th</sup>	Trustees Meeting	19:30
Monday	18 <sup>th</sup>	Special Needs	13:30 to 16:00
Friday	26 <sup>th</sup>	Young Engineers	18:00
Saturday	27 <sup>th</sup>	Young Engineers	
		Club Running	11:00
Sunday	28 <sup>th</sup>	Birthday Party	11:00 to 13:30
		Birthday Party	14:30 to 17:00

### May 2019

Saturday	4 <sup>th</sup>	Birthday Party	14:30 to 17:00
Sunday	5 <sup>th</sup>	Public Running	13:00 onwards

**Comments by RSME members on any subject appearing in Prospectus are always welcomed by the editor.**

Opinions expressed in PROSPECTUS are the personal views of the contributor and cannot be taken as reflecting the views of the club committee or editor.

**The deadline for the May issue is 18 April. This is the final date.**

Contributions may be submitted in hard or soft copy to the editor.

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