

**Reading Society
of Model
Engineers
Charity Number
1163244**

The Prospectus

January 2022



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Excitement grows as The Santa Special Express arrives at

**THE SANTA WEEKEND
SPARKS**

**LBSC MYSTERY
NORFOLK HOLIDAY
BOILER WORK**

**A HAPPY AND HEALTHY NEW YEAR
TO ALL OUR READERS**

A VIEW FROM THE CHAIR

John Billard

Though I was only able to attend on the Saturday RSME was at its absolute best in running the Santa Weekend. The good response from the public has been immense. I am including a report from Peter Culham and others. Happy smiling faces all round and a job well done. See more on page 6.

This was a culmination of a year where the club in emerging from the worst of the Covid pandemic organised a record breaking public running, the acclaimed Federation Rally and did its best to resume more normal activities with increased club running, more boiler testing and a string of private events. So to bring this about we should congratulate all the hard workers that have made RSME something of which we must all be proud. Whatever 2022 brings we shall stay in good heart.

Near to home I am continuing on my work on the Claud. This being in part a self design makes me appreciate those who have published designs in the magazines. The earlier and most prolific was LBSC (again see later), Martin Evans seemed to continue where he left off. What is noticeable is that later commentators tend to be critical of these earlier outputs. This is mostly unfair. These were people of their time. I started my workshop with a converted treadle lathe and but have come a long way since then. It is noticeable that modern designers take for granted workshop machinery undreamed of not that long ago.

Most fortunately it is still possible to build to the “words and music” a “Maisie”, a “Maid” or a “Butch” and probably in quicker time too. They will retain their pleasure on tracks reaching far ahead.

The pre Christmas season included a fascinating quiz set by Stephen Millward in the club house. If anyone of thought we’d know all about railway engine cabs, engineering personalities, the sound of diesel locos, recognise a screw thread and the scent of oils? Well they were wrong! However the worthy winners were awarded a prize of a roll of blue paper, presumably to mop up the opposition. Thank you Stephen. Come back next December!

Sparking Plugs

by Stephen Millward

Last year the government announced the end of sales of new petrol and diesel cars by 2030. This probably also means the end of internal combustion engine powered vehicles, as any hydrogen powered vehicles will presumably use fuel cells. So this could also mean the demise of the most taken for granted component in an engine, the spark plug. I’m sure all RSME members will have experience of diagnosing engine problems and the first action is often to change the spark plugs, which quite often affects a cure, even though the plugs are not the root of the problem. Here is a brief account of spark plug engineering, their history and how British spark plug ingenuity played its part in WW2.



The job of the spark plug is simply to provide a gap within the engine combustion chamber across which a spark can pass to ignite the mixture. The plug is exposed to high thermal and mechanical stress, where temperatures and pressures can momentarily reach 2000 Deg C and 1000 psi. All the while the electrode connected to the HT lead must be electrically insulated from the engine. There are two main processes that cause a spark plug to fail, firstly erosion of the electrodes widens the gap, which means higher voltages are required to produce a spark. Secondly, a build of deposits on the insulator, or fouling, results in an easier path for current than across the

gap, which reduces the voltage available for producing the spark. Eventually after a number of hours, the available voltage is less than the required voltage, at which point the plug fails.

The problem of electrode erosion was dealt with by altering the metallurgy of the electrode. Whilst fouling was addressed by operating the spark plug at a temperature where deposits were burnt away. This can be difficult to achieve as most IC engines operate over a wide range of conditions, with periods of low output, when plugs might be too cool and at risk of fouling or conversely periods of high output, when plugs would get too hot. If the plug was allowed to get too hot, the electrode erosion would increase or worse there was a risk of pre-ignition and burning a hole in the piston crown. In Britain, plugs for low duty engines were referred to as *soft*, whereas in high duty engines they were *hard*. The Americans however used the terms *hot* and *cold*, which confusingly meant a hot plug for a low duty cool engine and a cold plug for a high duty hot engine!

The temperature rating of a plug is determined by its gas capacity and seating height. The gas capacity determines the ability for the flame to play around the insulator, which needs to be hot enough to burn off debris. The seating height determines the rate of heat transfer away to the cooler engine casting. So a soft plug has a large gas capacity and a long seating height, which slows down heat transfer away from the insulator. The optimum temperature is in the region of 500-700 deg C, called the self cleaning range.

The first spark plug was made by the French engineer Lenoir in 1860, which used porcelain insulation, as did most plugs until around 1911. Porcelain, which is made from clay, has poor thermal and mechanical strength, which

resulted in pieces breaking off and damaging the engine. A solution to this was found by a Brooklands racer, Kenelm Lee Guinness, who developed mica insulators. Guinness set new standards for plugs, which took his initials as the brand name KLG.

Guinness enlisted at the outbreak of WW1, however his war role proved to be managing his business, as spark plugs were recognised as being essential for the war effort. Manufacturing mica spark plus was laborious and involved splitting lumps of mined mica into layers that were a few thousands of an inch thick. The insulator was then built up by layering the mica around the electrode, the layers being held together with shellac. The mica wrapped electrode was then placed in a sleeve that was either swaged or shrunk on, so as to achieve a joint strong enough to withstand the hot gases from the engine. Some mica plugs also had mica washers at the lower end, which were machined to form the gas space.

In the early part of the 20th century the power output of IC engines increased and the problem of fuel pre-ignition put a ceiling on engine power output. This was solved in the 1930s with the addition of tetra-ethyl-lead (TEL) to improve fuel octane ratings, however the products of combustion from these fuels also attacked the mica insulation and increased plug fouling. At this time refractory ceramic materials based on metallic oxides were being developed by the Lodge Plug Company as well as Siemens and Bosch in Germany. This led to mica insulators being replaced with ceramic insulators, which were manufactured using a sintering process. Typically, a mix of powdered alumina and silica was formed into a mold around the electrode which was then kiln fired. The main plug manufacturers had their own brand names for their ceramic insulation materials, Lodge called theirs Sintox (i.e. sintered oxide), Bosch's was Pyranit and KLG's (Corundite).

The products of combustion from higher octane TEL fuels also attacked the grain structure of the electrode, which up until this point had been made from heat resisting steels or nickel alloys. In the case of Rolls Royce and Bristol aero engines this led to the development of more sophisticated alloys using precious metals. A successful example was the Lodge Plug "S" alloy, comprising 96% platinum and 4% tungsten, named after their Chief Metallurgist Dr. Smithalls. This was apparently essential for the Merlin engine in 1940s, which at the time was blowing the electrodes off the plugs.

Engine development during the Second World War resulted in considerably increases in power output. For example, the power of the Merlin was approximately doubled from the 1939 Merlin III to the 1944 Merlin 66. Aero engines were also required to operate under a wide range of conditions, sometimes at high output for combat, whilst at other times at much lower output in order to extend a plane's operational range. This drove British improvements in spark plug technology which meant that by the time the Americans entered the Second World War our plugs were far superior. The KLG and Lodge

companies set about designing plugs for the American engines which were fitted as soon as planes arrived in Britain. This contribution was recognised in a tribute given by President Roosevelt in an address to Congress in 1944:

“Before and during the Battle of Britain, when the RAF had to work its outnumbered planes around the clock and the Spitfire and Hurricane engines got punishing treatment, the British developed a new-type of airplane spark plug. It has a life from four to five times longer than the standard airplane engine spark plug.”

“Since early 1943 virtually every United States Flying Fortress has taken off from British Bases with these plugs in each of its four engines. It would be impossible to estimate how many thousand United States bomber crews may since then have owed their lives to these plugs, but the performance record of the plugs speaks for itself.”

The high tension circuits in early aircraft engines were unscreened which effectively meant they acted as aerials for a spark gap transmitter, which rendered radio communications all but impossible. The solution to this problem was the development of radio screening by, conduits, braided cable and integrally screened spark plugs. A side effect of this screening was a reduction in spark plug life due to electrode erosion, which was found to be due to the screening acting as a capacitor and increasing the stored electrical energy. The RAE at Farnborough investigated this issue and found that a low value resistor in the HT circuit reduced electrode erosion. Eventually these resistors were incorporated into the plug itself.

All plugs in general use for aviation and vehicles have used metric threads, 18mm, 14mm and 12mm. This is probably due to the earliest plus being made in France and much early IC engine development being in Germany. The imperative to reduce the plug thread size was driven by consideration of engine weight and cooling characteristics. The cross sectional area of a 14mm plug is at least 60% less than an 18mm plug. The weight saving of twenty four 14mm plugs in a 12 cylinder engine was around 1.5 lb.

Some RSME members might remember the motorcycle and scooter boom of the 50s and 60s, when the spark plug manufacturers took a lot of criticism for plug failure. The problem was as much to do with the petrol and oil mixture causing a deposit to build up on the electrode. At the time someone got hold of an expensive platinum aviation plug which they adapted to fit a motorbike and which seemed to do the trick. The long term solution was eventually found by oil companies producing oils with different detergents.

All the above information is taken from a booklet, “The Vital Spark”, written by Keith Gough and published by the Rolls-Royce Heritage Trust. If anyone would like to know more, I have donated my copy to the clubroom library.

Photograph on page 3 is of a wartime KLG plug (John Billard)

THE SANTA WEEKEND

by Peter Culham



Firstly, it's appropriate to thank all of our volunteers who attended to ensure that the event went so well over the two days.

We were very fortunate with the weather which meant that all the planning was relatively easy to follow. An early start on both days saw all the gazebos put up and the reception area covered with lights and decorations before our

first visitors started arriving at about 10:30 in time to meet Santa from the train. With nearly three hundred children and their parents/relations attending, the team who operated the grotto area did exceptionally well throughout the weekend and their efforts were much appreciated.

Because of the covid situation, a one-way system was used in the club house and observed really well, which meant that everyone was able to come through, collecting hot / cold drinks and mince pies. With plenty of tables and chairs under and around the big gazebo being used to the full, it looked almost like winter picnic time. The ladies in the refreshment bar kept everything running smoothly, so well done there. The outside workshop was used for volunteers refreshments.



Overall a very satisfying and pleasurable weekend and the efforts were certainly appreciated by our visitors who posted numerous compliments and thanks on fb; email, and mobile. Just a few of those messages follow (without the Christmas wishes or Emojis which accompanied the messages !) Thank you to all who gave their time. *(And thank you Peter and your lovely family that did so much for making such unforgettable memories. Ed)*

Fiona *As always, the best Santa day out, perfect, thank you*

Hayley *The best Father Christmas we've seen. Thank you for spending so much time with my little boy. He loved it.*

Vickie *Our boys had a fantastic time, thank you for putting this on*

Jo *Wonderful. It's the start of Christmas for us. Lovely Santa. Our daughter was thrilled he knew some information about her. Thank you*

Louisa *Brilliant time, loved every minute, thank you soooo much for a great day*

Tarnia *It was brilliant thank you*

Bianca *Children had a great time. Santa was brilliant with the children.*

Lou *Excellent as always*

Daniel *Kids and adults loved it. Excellent.*

Cheryl *Noah and I (nanny) had a fabulous morning; well done all, extra special day with Santa*

Wayne *Terrific. Running days always fun*

Charlie *Makes memories*

special



Photos Peter
Culham and
John Billard

As part of the Christmas quiz Stephen posed, "What was LBSC's birth name?" This has prompted Alec Bray to contribute. As background for a younger audience, LBSC was the pen name of an engineer who produced well over a hundred designs of engines in the smaller gauges writing for some 40 years until the 1960s. He practically invented the coal fired miniature locomotive. His easy writing style led to a world wide following. Ed.

WHO WAS LBSC?

asks Alec Bray

Brian Hollingsworth's book "'L.B.S.C": His Life and Locomotives" does a good job in describing the working life of Curly Lawrence, but some of the more interesting parts of his life are rather skimmed over. Brian, for example, checked the Register of Births in England and Wales for the years 1882 and 1883, and only found a single Lillian Lawrence registered - and that led him down a completely false trail. For Curly Lawrence, L.B.S.C wasn't born under that name!

Geoff Johnson (Mid Cheshire Society of Model Engineers) and Ian Pollard have written an article "WHO WAS L.B.S.C?" in *Engineering in Miniature*, and discovered that the person known as L.B.S.C was born with the name **William Morris Benjamin**, later changed to William Morris Benjamin MATHIESON. It seems that the whole family rather liked changing their names. The change of name to Lillian Lawrence must have occurred sometime between May 1902, which is the last record of William Mathieson in the LB&SC Railway archives, and his marriage in 1908, which took place under the new name of Lillian Lawrence.

So why did Bill become Lill? Nowadays we would certainly say that he was confused as to his gender - to be a member of the LBGT+ group - and there are hints of this throughout Brian's book - the soubriquet "Curly", there from a young age, and the nickname "Dolly" at his secondary school- the "girl" with the long golden locks. Interestingly, when he designed the 3.5 in gauge "Schools" locomotive, he called it "Roedean" as there were no girl's school names in the list of prototypes' names!

It is quite likely that Curly Lawrence would nowadays be considered to be somewhere on the autistic spectrum - "...throughout his life an enigmatic and rather private person..." In the Foreword to Brian's book, George Barlow remarked about "...Curly's unusual make-up and his reclusive style of life for many years..." His/her mono-mania for model engineering is perhaps another indicator.

I have read one or two of Curly's articles, but by no means the whole canon. so can offer no personal perspective - but undoubtedly Curly was an engineer of the first order, a draughtsman (draughtsperson) and an author who could easily connect to his/her audience.

None of this detracts from Curly's achievement. If anything, it should make us more aware of what (s)he did. It must have been awful growing up gender

-confused in a society in which homosexuality was a crime - how on earth could one admit to wanting to be girl? It is difficult enough nowadays, with advice everywhere and specialist clinics - it is not so unusual a situation, it seems - there is a continuum from M to F! Curly found a role in life - in spite of whatever he or she was - and made a huge success of it. Hats off to LBSC!

Alec adds: My younger daughter is a member of the assessment and support team for special educational needs (SEN) children in West Berkshire. I sent her the first page of Brian Hollingsworth's book, the article "Who was LBSC" and a copy of my article above. She has replied:

"... I have read through the documents and information and it would appear that 'Curly' if born in the present times may well identify as a Trans Woman, or be part of the LGBT community.

If this is the case then there may well be a number of reasons regarding the change of name and also may shed some light on the fact that Curly reports that their father died at a young age - but we know that this is not the case.

It is a very interesting read, and I do wonder if 'Curly' would present differently in the current time. ...?"

A SEVEN MONTH PURCHASE and a HOLIDAY

David and Lily Scott

With a shutdown country, plans of an overnight dash up to Darkest East Anglia were thought out. Two previous visits in 1965 and 1970 and having had an Aunt from Lowestoft may come in handy in case we were stopped by a roadblock and had to explain. Aunt Dorothy did have a wonderful accent and a way with words. And an identical twin, which when small, many children find fascinating. This was rejected as both of us had unfortunately out of date Passports.

Our contact Flying Fox and I kept in touch and his railway featured in many more photos. Hemsby! I studied various maps as we were going to collect very soon..... March. My e-mails contained various workshop bits and what I was also up to in 7 1/4" gauge. Then it went silent for several months. As did an Ebay purchase on some wheels!

The 24th of May we had an update, a message from the grinder sat under the bench, and suggestions of extending the visit to The North Norfolk Railway and the Bure Valley Railway while we were in the area. And it had stopped raining. The map had also shown the various beaches so there was something for Lily. Extending her Pebble collection to balance out the cutter grinder on the other side of the car.

NR294HA was put into the navigating device and we set off in the rain. A404 and the 25 thing which had queues, and the roundabout for the petrol stop was being worked on. The morning was a workshop visit and a com-

plex bit of curvature on an A4 discussed. 16 locomotives built by Flying Fox and a first look at the grinder at last! It was Monday the 9th of August. Lily walked round the garden which was superbly kept by his wife. The afternoon we followed them to a Broad and some boating fun watching. Plus teas in the sun, ice creams and more boats crashing into each other. Let's blame the sunshine over the Quarter Deck!



We eventually headed off to a station car park and booked in for the 11.00 up the Bure Valley. Waiting of course for the last train of the day to arrive. A lovely walk by the river into the small town and some Breakfast Bacon Buns sat on a bench watching more boats.

The Bure Valley was very bumpy. I looked out for a guy in the workshop at the other end recommended by Flying Fox, they had met at 14. Chatted and we bounced back. It seems they do not do 15 inch gauge tamping machines! Visited a model railway collection and headed into Norwich.

Lily sat in the garden and I was treated to some lovely machines and of course homemade accessories. I hinted upon stamping postcodes and he beat me to it on each! I made notes on a smokebox door turning radius thingy that fits in the lathe. A Super 7. It was growing dark as we hit the larger workshop... I lugged brass sheets back to the car and we drove to another camp. Wednesday night was to be in a bed and breakfast and shower so we headed to the village, parked and explored. They had so very hidden their Broad.

Public parks tend not to like postcodes so directions had been given and upon a drive round found the sliding gate. Parked and lugged the Drill/Driver loco passed the impressive brick built clubhouse and into the main area. Some young guys had come across an abandoned cement mixer that had just done one job and had converted the engine to run on rails. A lovely gearbox and a Lister unit the whole thing in Lister green. We were lent a guards carriage and we set off. Two circuits to great applause.

Then the food and lots of chatting to some very friendly members. Quite a big club with them



organising professional caterers. Then the main event was the opening of their new tunnel. A tunnel in East Anglia. There has to be a first one somewhere and not even cut and cover.

IN SHOPS THIS MONTH—BUILDING A CLAUD

by John Billard

The Boiler Part 5



Progress continued in December with the fitting of the firehole plate. Not straightforward as the position of the firehole in relation to the inner and outer wrappers is critical. Farmer takes several pages to describe this operation. With

some care, and one rivet, the plunge was taken and it was soldered in. With relief it all fitted together. See *above and right*.



The backhead then came in for treatment requiring internal pipes for the injector steam feed. This took some thought as there is little space with the inner firebox intervening. The feed is taken to the top of the steam space as shown *right*.

There will also be pipes from the backhead to the front of the boiler to take the water output from the injectors. As these run internally for the whole length of the boiler support brackets have been incorporated. See *left*. All this will make for an interesting soldering session next time.



To be continued.



DIARY

January 2022*

Sunday	2nd	Public running	13.00 onwards
Wednesday	6th	Wednesday Warriors	10.00 onwards**
Thursday	7th	Club night	19.30 onwards
Saturday	8th	Club running	11.00 onwards
Monday	10th	Trustees meeting	19.30
Tuesday	11th	00 meeting	19.30 onwards
Tuesday	18th	Club Running	11.00 onwards-,

These events are subject to official advice on Covid.

***Regular club events will continue subject to public and club announcements.**

**** Every Wednesday unless notified.**

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

The deadline for the February issue is 18 January

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

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***Please write for Prospectus. Photos welcomed.
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