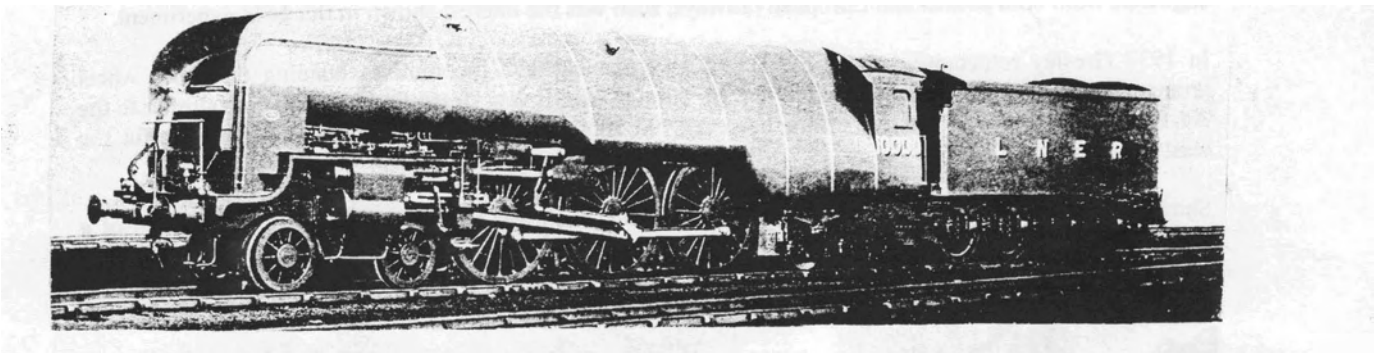


RAND SOCIETY of MODEL ENGINEERS

NEWSLETTER 2007-1
March 2007

A BOLD EXPERIMENT



The above print shows the U.K's London & North Eastern Railway's No 10000, Class W1 ('Hush-hush') 4-6-4 locomotive of 1929. Hush-hush because the boiler was, as far as rail locomotives were concerned, entirely novel. Chief Mechanical Engineer, Nigel Gresley, had for some time been impressed by the efficiency of high pressure marine boilers of the Yarrow 3-drum type as used in a great many Royal Navy vessels. Such boilers could respond readily to fluctuating steam demands and could be fired-up relatively quickly from cold. The high efficiency of water-tube boilers in general service is due to the fact that radiant heat is directly applied to so much of the heating surface.

Nigel Gresley approached Harold Yarrow of Glasgow in 1925 and together they laid down a detailed design for a 3-drum boiler for the new (secret**) 4-cylinder 4-6-4 compound loco being built at Darlington. An order was placed for one such boiler in 1928. Boiler working pressure was 450psi. The boiler had two parallel water drums at the rear connected by arched tubes to a single steam drum mounted as high as possible within the loading gauge. The firebox was placed between the two parallel water drums. In front of these was a further pair of parallel water drums, slightly closer together, with their arched tubes to the steam drum.

Compounding was of course essential to fully utilise the steam at 450psi. This was achieved using two high pressure (HP) cylinders of 12in. dia. by 16in. stroke and two low pressure (LP) cylinders of 20in. dia. by 26in stroke. The two HP cylinders drove the front coupled axle and the LP cylinders the middle coupled axle. The diameter of the coupled wheels was 6A. 8in. The engine had Walschaerts valve gear, the inner (HP) cylinders had their valves actuated by rocking shafts from the outside valve gear.

In operation there were many problems. As built, the superheater produced steam at a temperature of 900F. This was reduced to 700F by shortening the elements but then condensation occurred in the LP cylinders greatly reducing their efficiency. An intermediate superheater (reheater) was installed adding about 100F to the temperature of the LP steam and served to lower the smokebox temperature and improve efficiency. Other shortcomings included leakage of cold air in at joints in the boiler casing resulting in (cold) air being drawn in over the fire instead of through the grate and consequent steaming problems.

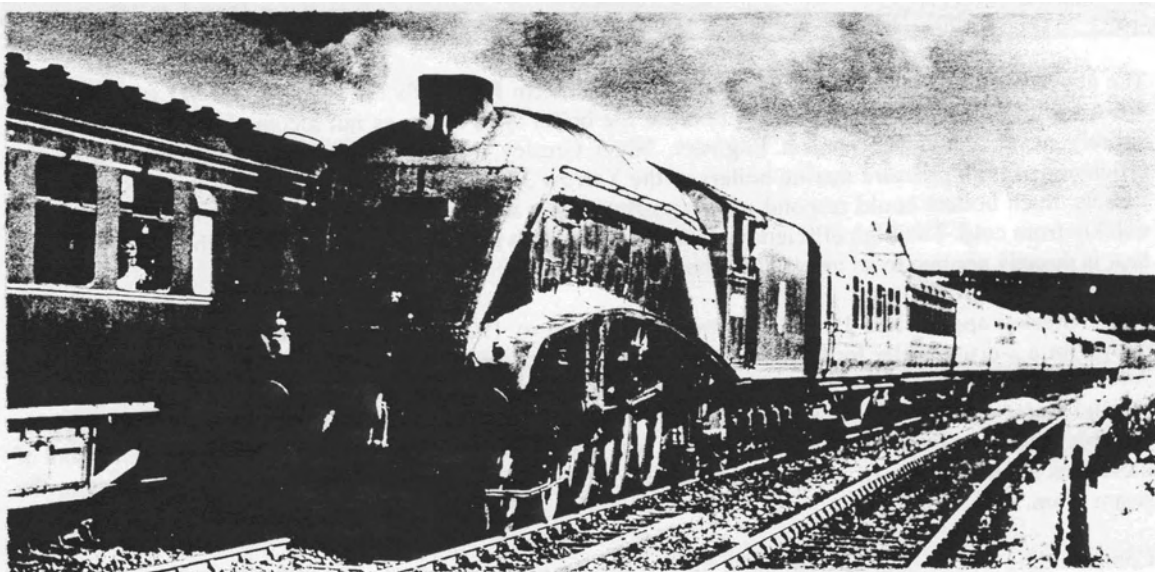
Probably the most severe defect was the seemingly endless leaking of the boiler tubes. It has to be remembered that watertube boilers were (and are) designed for land or marine installations and as such would not be subjected to the battering received by an express locomotive in its everyday activities. Had more modern metal specifications and welding techniques been available the boiler may well have been a success with tubes welded into the drums and headers.

In the year 1930 despite all the shortcomings No 10000, when attached to a Gresley patent corridor tender, was able to haul the non-stop FLYING SCOTSMAN, Edinburgh to London, arriving on time. So the potential **was** there. Just a pity about these darned expanded tube joints! At some stage early in its life No 10000 had had the HP cylinders bore reduced from 12in dia. to 10in dia: no explanation was picked up. This increased the already high volume ratio HP to LP of 1:4.5 up to 1:6.5. Surely this could not have helped the already existing problem of condensation in the LP cylinders? No information has been found on this matter. The engine did not prove to be economical in everyday service and could not compete with the Gresley Pacifics. It was laid up in a Darlington siding for several years.

In 1931 Nigel Gresley read his paper on High Pressure Locomotives to a distinguished gathering at the Institution of Mechanical Engineers. Among those present were many chief and senior mechanical engineers from both British and European railways, such was the interest shown in this bold experiment.

In 1937 Gresley reluctantly rebuilt No 10000 as a conventional locomotive retaining the 4-6-4 wheel arrangement but having 3 cylinders 20in dia. By 26in. stroke. It was streamlined in a manner similar to the A4 Pacifics. In terms of tractive effort, however, No 10000 was 17% more powerful, and powerful she was!

Shown below is No 10000 in her final form, overtaking a slower train and attracting the attention of a young passenger on that train.



**Hush-hush or 'Secret' was a bit of a joke, half of Darlington must have known about it and no doubt the Clydeside marine engineering fraternity was well informed of it!

RSME CONTACT PERSONNEL

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REGULAR RSME EVENTS

CLUB DAYS: first Sunday in the Month FAMILY DAYS: third Sunday in the Month

CLUB EXCO Meetings (as required): second Saturday in the Month @ 14h00

FROM THE SOAPBOX

By your Editor

Quite a few new locomotives, or at least new to your editor, have been seen at Len Rutter Park recently. Of these, two seem to stick out in my mind.

One is a brightly coloured 7¼ in gauge 'American' (4-4-0) old timer that was doing some good work. Unfortunately I was unable to speak with the builder at the time.

The other is Mario Patini's 5in gauge Mallet articulated loco with the unusual wheel arrangement of 0-6-6-4. Most components are in stainless steel and this includes the boiler – quite an undertaking! There is still a bit of work to be done but the engine runs well and with 12 driving wheels should be a good passenger hauler.

An apology is offered for the mix-up on the first page of Newsletter 2006-1 whereby the person actually doing the copying wrongly got hold of the covering letter thinking it was part of what had to be copied!

A warm thank you to Yvette Etter of Knysna and to Peter Glanville of Middelburg for your well-wishing letters. They are much appreciated.

A couple of months ago Vice Chairman Brian Nicholl displayed some examples of spark erosion machining of components normally too hard, physically, or too difficult from an access point of view to machine by conventional methods. The finish and clean square corners in rectangular holes on hard

material really impressed me. Later I asked Brian if he could provide a few words on the subject for publication.. He responded with the article which appears on page 5. Thank you Brian.

Cheers

Tom D Campbell
72, 3rd Avenue
Edenvale 1609

AROUND THE CLUB

FROM THE SECRETARY'S DESK - March 2007

Well, the new year has got off to a great start with a full party diary for the next few months. The new committee had its first meeting on 10 February at which the chairman was certainly cracking the whip. Prominently on his list of 'things to do' were the re-vamp of the clubhouse interior and remodelling of the station.

To date there has been no feedback from the Council regarding rates relief but we are hopeful of success in this direction.

On Tuesday afternoon, 13th February, we were visited by the Tractor and Machinery Holiday Club from the United Kingdom under the leadership of Rob Rushen-Smith. Apart from England, Scotland and Wales accounting for most of the visitors Ross and Tricia flew in from New Zealand and George Bayliss popped across from British Columbia in Canada. There were 37 participants on the tour with 27 of them making the visit to RSME. The rest choosing to catch up on some sleep at the hotel after landing that morning at 06.00 and straight into a tour of the Military Museum after breakfast.

Ron, Deon, Fanie, Brian Armstrong and Pat Ackerman saw to it that all the machinery was cleaned up and performing to standard. This evoked some praise from the tour regarding the standard of restoration and the variety of examples in working order.

The tour members were also treated to a few rounds on the track behind the diesels piloted by John and Daniel before adjourning to the lapa where Cathy Ackerman and Ria Armstrong had laid on a marvellous spread of snacks and tea/coffee.

A great time was had by all present. It was most enjoyable chatting to the visitors, exchanging news, views, opinions and stories until their departure at about 17.30.

Thanks to the members mentioned above who took the time to make it all happen.

Colin Retief

NEW MEMBERS

A very warm welcome to the following:

JOHANN HATTINGH, a B747 flight engineer of Hartbeespoort, has been attracted to the RSME by the friendliness of members and the facilities offered. He is also a member of the Bloemfontein Model Ingenieurs Vereniging. Johann can be contacted on (H) 012 244 3190 or (W) 072 210 4988

JASPER VAN S.S. LOCHNER a medical doctor of Rustenburg, is keen to drive live steam locomotives. Well, he could not have come to a better place! Jasper can be contacted on 014 592 0046. (Contd.)

STEWART LAWRENCE PATERSON an engineering designer from Rivonia is keen to pursue model engineering and to learn machining skills. Our club should be able to help him get started. Stewart can be contacted on (H) 011 803 1483 or (W) 012 677 9927.

EDDIE WENTZEL a computer programmer from Vaalpark enjoys steam trains particularly in model form. Eddie can be contacted on (H) 016 971 3651 or (W) 082 852 5765.

ANNUAL SUBSCRIPTIONS

Please note that subs will be due by 31st July 2007

ITEMS AND REMINDERS FOR YOUR DIARY

The 27th NSLM will be hosted by the **Bloemfontein Society of Model Engineers**. This function will be held over the weekend 27th, 28th and 29th April 2007. Further information can be obtained from Pearl Snowdowne, their secretary, on 082 538 7654. This meeting will also celebrate the Club's 50th anniversary.

The 28th NSLM will be hosted by the **Johannesburg Live Steam Club**. The date in 2008 is yet to be advised.

CLUBS RUNNING DAYS

1 st SUNDAY EACH MONTH	-	RAND SME CLUB DAY
3 rd SUNDAY EACH MONTH	-	RAND SME FAMILY DAY
3 rd SUNDAY EACH MONTH	-	CENTURION SME
4 th SUNDAY EACH MONTH	-	JOHANNESBURG LIVE STEAMERS
EVERY SUNDAY		BLOEMFONTEIN SME
1 st SUNDAY EACH MONTH	-	PIETERMARITZBURG MES
1 st SATURDAY EACH MONTH	-	WESTERN PROVINCE LIVE STEAMERS
2 nd SUNDAY EACH MONTH		DURBAN SME

(11h00 to 16h00)

RSME 7¼in GAUGE LAWLEY LOCOS

The boiler (steel) is what we are waiting for now. It will be recalled that Bill Mitchell prepared the drawings, and with Mike van den Bergh, procured and prepared carbon steel plate conforming to the Australian code for such pressure vessels. We now await the rolling, prepping and welding of the boiler components by Charles Viljoen.

STATIONARY ENGINE PRESERVATION (SEPS)

Although nothing specific was reported from SEPS, Colin Retief has given us a rundown on a recent visit from an overseas club to our stationery engine museum. See **FROM THE SECRETARY'S DESK** on page 4.

ELECTRICAL DISCHARGE MACHINING (EDM)

(Also known as spark erosion)

By Brian Nicholl

Electrical Discharge Machining (EDM) is a process that uses discharges from an electrode to erode an electrically conductive material. It is possible to erode or 'burn' the shape of the electrode into the work piece. An EDM system is comprised of a power supply, a servo system, a dielectric liquid and filtration system. The work piece is placed in the work tank and connected to the one side of the power supply. The tank is filled with a hydrocarbon dielectric (paraffin), which ionizes in the presence of an electric field. The electric field is created by applying a voltage between the work piece and the electrode (known as the gap).

Since the gap in an EDM machine is typically maintained to a few thousandths of an inch, the applied voltage does not need to be very high for a spark to occur, typically 25-50VDC. The servo system then maintains the arc, continuously moving the electrode nearer and further to maintain the gap voltage and hence the arc. As each spark occurs a small amount of metal is vaporized and a small crater is left in the work piece. The dielectric fluid cools the vaporized metal and the resultant metal particles (*swarf*) are removed by the circulation of the dielectric and trapped by the filter.

The EDM process is repeated millions of times and as a result it is possible to erode various shapes into the work piece

WHY WOULD I WANT AN EDM SYSTEM?

It is possible to erode any electrically conductive material of any hardness.

With a square electrode it is possible to cut a square hole i.e. no rounded corners.

Using a curved electrode one can cut steam engine expansion links.

The electrode does not slip off a curved surface: one can burn through the ball of handrail stanchions.

It is cheap to run, the copper electrode costs only a few pence, as opposed to the cost of an end mill.

It can run while you are doing other things.

It can remove broken-off taps, drills and 'Easy-outs' from any material, usually without damaging the threads or bore in the job.

Using the carbide insert of a tipped tool, one can burn that shape into a length of square bar to fashion one's own index-able lathe tools.

It is not as slow as one might expect a typical rate is 0.006" per minute for a 3/8 diameter electrode. Normally one would remove the bulk of the material by drilling etc..

Regarding safety, as long as the arc is at least 25mm below the surface of the dielectric, there is no chance that the dielectric will catch alight. Other dielectrics can be used but are normally significantly more expensive.

For a comprehensive book on a DIY machine see 'The EDM How-To Book' by Ben Fleming.

I would be willing to answer any queries members might have or give a demonstration of the machine in operation.

(Brian can be contacted on (011)-762-3788 Ed)

SALES AND WANTS

Peter Glanville wants to dispose of some 5in gauge track. It is of 20mm x 5mm flats, both rails and sleepers. There are 4 off 6m straights and 6 off 6m curves at about 5.7m radius. If you want it-come and collect it!

Contact Peter who is at Middelburg on 013 282-6389 for directions.

Also members might like to know that there is a very good second hand tool store here in Middelburg called 'Tools& Things'. Phone 013 243 5792, Tel/Fax 013 282 1192, E-Mail toolsandthings@xsinet.co.za

Regards

Peter Glanville

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Angus Walker, (Hon Life Member of RSME living in the Western Cape) has brass castings available of steam domes that will be suitable for 5in gauge South African Railways 1st, 3rd, 5th, 6th, 8th and 10th Class locomotives. Dome castings are priced at R500 each.

Angus can be contacted on 021 852 4464 at home, on 021 852 9909 during working hours or on his mobile phone 072 198 5354.

SWARF

Out for a duck?

A sports reporter arrived at the Wanderers pavilion. South Africa would soon start batting. The reporter went to the SA changing rooms and asked for Graeme Smith. One of the cleaning staff replied "Graeme has just gone down to bat, but he won't be long."

Managers

A group of managers, whilst on a course, was given the assignment of measuring the height of a flagpole. They go out to the flagpole with ladders and tape measures, but they continually fall off the ladders and drop the tape measures. The whole thing is just a mess.

An engineer comes along, sees what they are trying to do, walks over and pulls the flagpole out of the ground. He lays it flat, measures it from end to end, gives the result to one of the managers and walks away.

After the engineer has gone one manager turns to another and laughs, "Isn't that just like an engineer - we're looking for the height and he gives us the length."

Potato Problem

Piet van der Merwe senior was busily digging his potato crop. He was doing very well as he had heap of potatoes as high as the cost of living. Things were very different forty-five years ago when he hadn't a bean-only a potato, a wife and a ten year old son.

A fellow farmer asked Mnr van der Merwe how he was getting on these days. Van seemed very worried as he replied, "Man I'm not too bad but I'm sommer worried about sex" he said. "Ag ja man-here I got all these blerry potatoes and not enough sex to put them in."

AND THEY ASK ME WHY I LIKE RETIREMENT

- Question: How many days in a week?
Answer: Six Saturdays, one Sunday.
- Question: When is a retiree's bedtime?
Answer: Three hours after he falls asleep on the couch
- Question: How many retirees to change a light bulb?
Answer: Only one, but it might take all day.
- Question: What is the biggest gripe of retirees?
Answer: There is not enough time to get everything done.
- Question: Why don't retirees mind being called Seniors?
Answer: The term comes with a 10 percent discount
- Question: Among retirees what is considered formal?
Answer: Tied shoes.
- Question: Why do retirees count pennies?
Answer: They are the only ones who have the time.
- Question: What is the common term for someone who enjoys work and refuses to retire?
Answer: NUTS!
- Question: Why are retirees so slow to clean out the basement, attic or garage?
Answer: They know that as soon as they do , one of their adult kids will want to store stuff there.
- Question: What do retirees call a long lunch?
Answer: Normal.
- Question: What is the best way to describe retirement?
Answer: The never ending Coffee Break.
- Question: What is the biggest advantage of going back to school as a retiree?
Answer: If you cut classes, no one calls your parents.
- Question: Why does a retiree often say he doesn't miss work, but misses the people he used to work with?
Answer: He is too polite to tell the whole truth.
- Question: What do you do all week?
Answer: Nothing Monday to Friday, Saturday and Sunday I rest.

Share this one with all the retirees you know. I'm sure they can relate to some of them! AND, if you have not yet retired, see what you have to look forward to.

