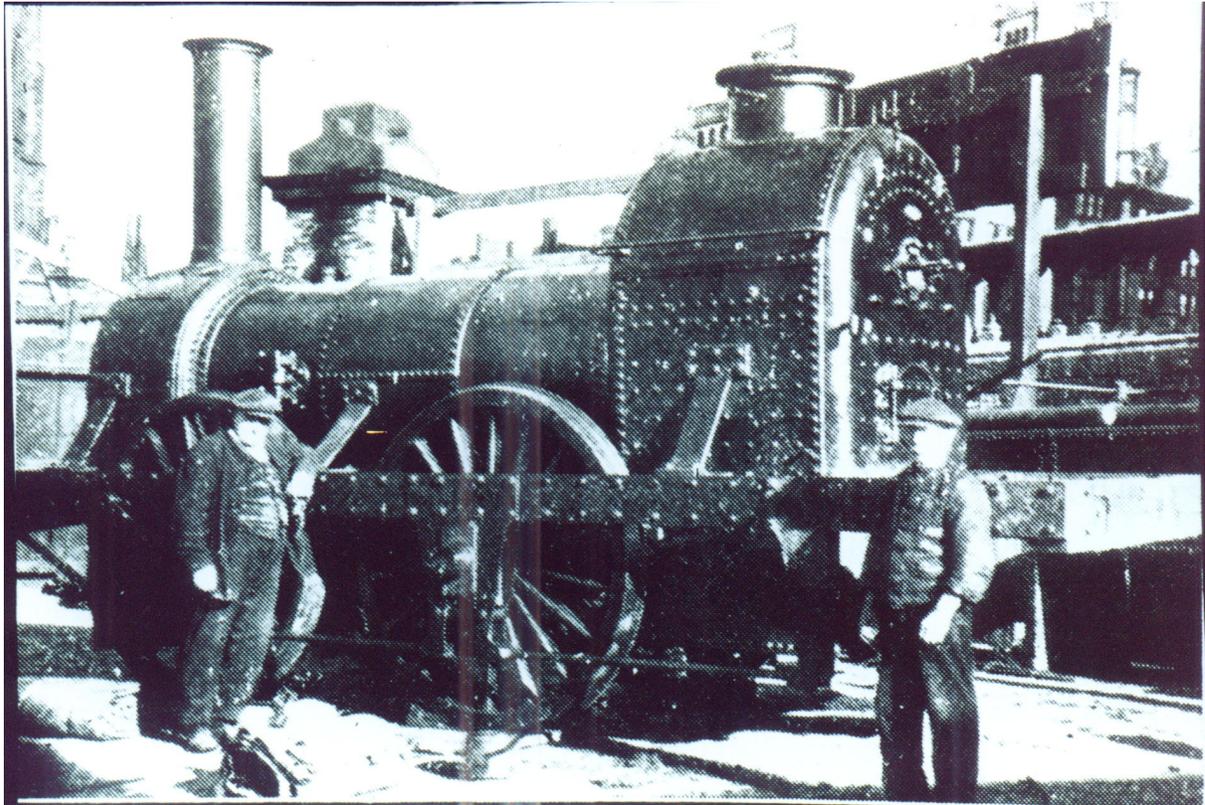


LIONSHEART

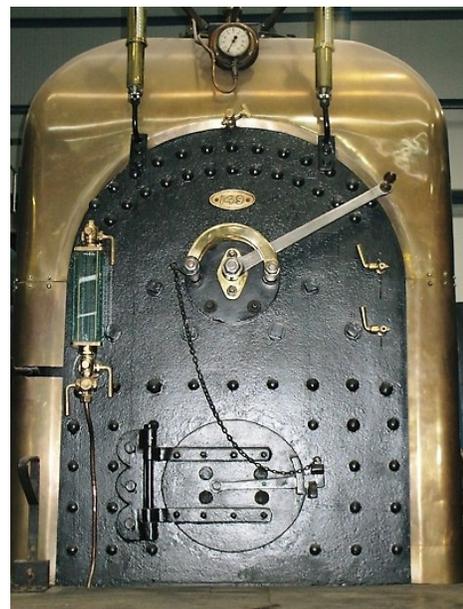
Number 67

April 2010



Lion, as rescued from her pumping duties in 1929

Index	1
Cover Story	2
It's That Bottle Again	4
The Editor's Bit	5
Lion Replica in Sight?	6
Items for Sale	6
I've Started, so I'll Finish	7
Dates for your Diary	8
Contact Details	8



Lion's impressive Backhead, Photo - JPH
(And there's more below the footplate)

HOW “ORIGINAL” IS *LION* ?

Part 1

We like to say proudly that

“Lion is the second oldest operable locomotive in the world”

But what do we actually mean by that? – Are all the components that Robert Stephenson is reported to have inspected on his visit to the old weaving shed with the weaver at the other end, still fitted? Even accepting that there may have been some (how many?) replacements for a variety of reasons, do any “really original” bits, still remain?

With a machine as old as Lion, there are bound to have been replacements, and being one of a class of four similar locos operated by the same railway, it may well have been that parts were swapped between members of the class during repairs or overhaul. Certainly the only time I saw “Flying Scotsman” close-up (at Crewe Works just after she had been rescued from the USA), it was remarkable how many items of her side rods and valve gear bore the numbers of other members of the class; and I read that for a considerable time recently she has been running with an A4 boiler.

Also, Lion spent more of her working life not owned by a railway company, than with one, so the situation is further complicated. She was sold out of service in May 1859, barely 20 years after she was built. Why was this when the railways in general were still rapidly expanding? One or two simple thoughts may help to explain.

Lion belongs to the first generation of “serial production” locomotives that the new railway companies urgently needed to handle their rapidly expanding traffic. But there was, as yet, no solid build-up of operating experience to guide either the purchasing railways in what they should specify or the locomotive builders to think up in the way of improvements they could offer. The result was that by about 1850, only 20 years after the Liverpool and Manchester opened, there was a large stock of not very reliable motive power inadequate for duties required. The situation was not made any better by the fact that although the materials available, particularly wrought iron, were known to be not quite up to the requirements as they revealed themselves, processes to make steel cheaply and in large quantities were still in the future (the late 1850’s in the case of Bessemer steel).

There is interesting evidence of this in a book by the celebrated Dr Dyonisius Lardner who, after having put it about that railway passengers would be suffocated by travelling through tunnels, became a great fan of railways and published a book called “Railway Economy” in 1850. For this he had been provided with data from the newly formed London and North Western Railway, which, on 30 June 1849 had 504 locomotives to work 670 route miles of railway. One of these was Lion. 47 were in store, new and not yet worked. The total engine miles accumulated in the twelvemonth was 7,532,230, of which the passenger engines worked nearly twice the mileage of the goods engines, each engine running about 45 miles per day.

But the interesting point is that in the same period they had only about 275 drivers and the same number of firemen, so that apparently each footplate crew had roughly two engines available to them. But what I think this means is that the locos had no more than 50% availability. The book of Kitson Invoices I have for the earlier 1840’s bears this out because most of the orders are for various parts clearly needed for repairs - wheels and their components like tyres, often being called for. “Lion” was one of the locos of this generation. So you needed 2 locos on your books in those days to be reasonably sure of having one in action.

What is more, locomotive design progressed, as it was realised that more powerful machines than had been imagined originally, were needed for the traffic, and even without steel being available, there had been design improvements – in valve gears for instance.

So, as the railway companies consolidated and settled down to the business of operating a railway rather than merely achieving building and equipping it, they started to have a surplus of locomotives still with some life in them, but inadequate for their now known needs, and often also with design shortcomings in the light of bitter experience.

About the same time it was also realised that for other new industrial applications, like docks, there was a requirement for small individual sources of power away from what could be provided by large stationary engines and line shafting. A ready built self contained power unit available with its own boiler and of something like the power capacity required – and GOING CHEAP – was therefore attractive.

There was a recent paper to the Newcomen Society describing how the two warships of Franklin's tragic expedition to try to discover the North West Passage round Canada, were each fitted with a second-hand "Planet" type locomotive unit, driving a retractable screw propeller. Neither the ships of this expedition (HMS Erebus and HMS Terror) nor any remains of their crews have ever been found.

Although by the time Lion was withdrawn in 1857, hydraulic power had been applied in docks to operate cranes and lock gates, the system was not really applicable to working most types of pump; and although beam engines for working piston pumps had been available for over a century, new engines and boilers cost money and the project for which Lion was acquired by the Harbour Board was the conversion of an old entrance lock into a drydock. Such a dock requires only very intermittent pumping. Also, in Liverpool, a conventional piston pump of any type could not be used because Mersey water has the unfortunate characteristic that if moved at more than about 2 mph, its turbidity is stirred up, which, in suspension in the water, is simply incompatible with the small clearances needed for satisfactory working of pistons or valves. Centrifugal pumps - which can be designed to overcome this problem - had not been invented. A "Chain Pump" therefore had to be used to dewater the dock.

Typically, such a chain pump consisted of an inclined timber trough with a cross section which, in the case of a typical pump of this type tested by the Harbour Board, was specified as 2'6" x 6¾". In this worked a series of timber "floats" specified as 2'5" x 0'6" x .0'1¾" hung at each end from chains made of ¾" rod, at a distance of 15½" between the centres of the floats. This spacing indicates an inclination of the trough of about 30° to the horizontal. Such a pump was run at a nominal linear speed of 550 ft per minute, giving a theoretical pumping capacity of 767 cubic feet of water per minute. On test such pumps showed a pumping loss approaching 20% of their nominal capacity, but could pump to a lift of 40 feet.

Lion's notional power of 30 hp drove such a pump on this intermittent duty as required, from the mid 1860's until the late 1920's. She cost the Docks and Harbour board £400 in May 1859, but seems not to have been installed at Princes Dock until 1865 when she was given a new boiler at a further cost of just over £300, so we can be sure that the present boiler is not "original". This is verified by the fact that the backplate of the new boiler has dimensions greater than any plate known to have been produced up to the time the loco was originally built. This plate has also been "flanged" in a hydraulic press, another process not developed in the late 1830's.

Lion's arrangement with frames outside the coupled wheels allowed these to be kept as flywheels, with only the right hand outside crank of the driving axle having to be removed and replaced by a bevel gear. One wonders how the main bearings for the crank axle were re-arranged so that instead of transmitting the weight of the locomotive on to the axle and so to the track, the crank axle assembly was supported from below with the weight of the loco itself on blocks. The springs on both coupled axles were removed, as well as the coupling rods

The bevel gear on the axle drove another gear on a shaft parallel to the centreline of the locomotive and running out past the smokebox to where there was another pair of bevel gears driving a shaft off to the right as viewed from the footplate and along the inside of the wall of the rather handsome brick built engine shed. At the end of this shaft, another pair of bevel gears drove a shaft going out through the shed wall to drive the sprockets at the top of the pump trough. A very simple layout drawing of this drive arrangement still exists as well as more detailed views of the shed, which has been demolished in recent times.

What the drawing does not show is that in some way the frame of the locomotive was too long. The pair of trailing wheels under the footplate were therefore removed (but merely thrown to one side in the yard, as it happened) and the frames were cut through more or less on the centreline of the axle. As far as we know, this was all that was done. Judging from the few rather fuzzy photographs of the installation that are available, there was no boiler lagging. Coal was cheap and the shed would probably have been cold and damp otherwise.

There is no record of what happened to the original tender. It was probably scrapped for the same reason that the loco had been withdrawn - by that time, experience had shown that it was too small, so it was of no use as a spare.

So, we have now got the somewhat modified LION into the shed where she worked for about 60 years. The story of how she was rescued has been told elsewhere, often with misrepresentations which we need not go into, but after that came the restoration process at Crewe Works in 1929, where she had to be re-born as a locomotive. What else was changed or replaced in this process - that we know of?

To be Concluded



Yours Truly going about his Business

Photo – Jon Swindlehurst

You may remember that I left you at the end of the last issue with a tailpiece – The Hanging Bottle. Well, here it is again, but this time you see the bigger picture. This was an attempt by myself and Jon Swindlehurst to nail, for once and for all, the profile of Lion's 'Haycock'. This huge brass item, manufactured by the LMS at Crewe during Lion's restoration in 1929/30 has intrigued and puzzled many of our members for years. Why is it there? Some think it's an excrescence, whilst others think it sets off Lion quite nicely, giving her, along with her wooden cladding, an 'olde worlde' look.

Certainly, the boiler needs some sort of clothing – you can't go around with all those naked rivets showing – and, of course, there is the need to provide some sort of insulation against heat loss. As far as I'm concerned, it's just another item to be measured, but I'm so glad that I've been privileged to see underneath that cladding, when she was in a pretty heavily stripped down condition at the works of Dorothea Restorations in Whaley Bridge, back in the early 1990s.

Anyway, the haycock has been interpreted in many ways by builders, both in 3 1/2" and 5" gauge. Most have stuck to LBSC's rather messy arrangement of casting and ugly screws – not the best reproduction in miniature form, even when highly polished. Keith Miller did a grand job, described in Model Engineer vol/issue 152/3723, dated 17th February 1984, under the heading 'Lion's Crown'. More recently, though, I've seen some praiseworthy attempts to make models that conform much more closely to the real thing.

One problem facing everyone has been the lack of dimensions. The LBSC casting started off at the top with a slope down to a radius which blended with the vertical sides of the boiler, but even this didn't give much away – and was wrong in any case. I suspect that quite a few builders have attempted to scale from photographs, a notoriously tortuous method, as I know to my cost. I've put more than one shape on my drawings, but never been happy with the result. I once tried making cardboard

templates of back, front and each side, but they were unsatisfactory. And of course, THAT CASTING had a square aperture at the top – not right!

Now at last, dear reader, we have the real picture, thanks in no small way to the help I received from Jon Swindlehurst way back in November last year. Jon and I had resolved some weeks previously to measure the profile, but the problem was how. Finally, we agreed that a series of coordinates should be taken. There was then the question of how to set about the task.

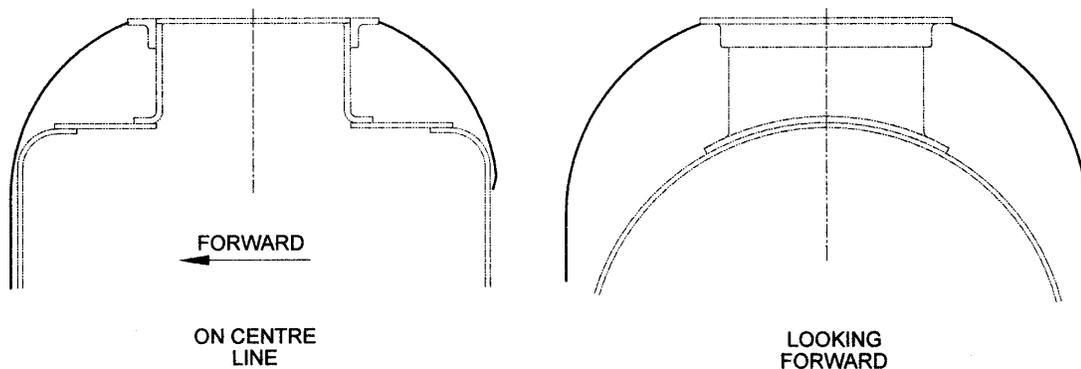
In the end I constructed the strange device you see pictured above. It comprises a calibrated vertical column, set and clamped in position, with the zero datum corresponding to the top surface of the footplate. Sliding up and down the column is a carrier, in which is mounted a sliding horizontal probe. The device is simple and effective – the carrier displays vertical (Y) increments above the footplate and the probe is slid out until it just makes contact with the haycock surface. The datum for the probe was a little more difficult, since we had to mount the column in whatever position afforded us the most suitable for clamping in place. In the end we set the end of the probe against the flange of the manhole at the top of the boiler, called that zero and recorded increments of horizontal movement as we lowered the carrier down the column, an inch at a time.

But why the plastic milk bottle hung on high? Well, the carrier, a substantial wooden lump, needed counterbalancing, hence the string going up over the pulley at the top. The balance weight is a lump of copper, weighing some 4 ½ lbs. (Sorry folks, no metric equivalent here – you're editor is of the old school) Thus, the column supported an offset load of 9 lbs and would have tended to bend at a point above the clamping position. So a roughly equivalent weight had to be added on the side opposite the pulley. Now, all this was done in bit of a hurry on the night before I travelled up to Liverpool. The only thing to hand which would do, and which would not damage the haycock if it fell, was this 6 pint container full of water – not quite an equal weight, but near enough when midnight loomed.

We measured the right (pictured) and rear curves before running out of time, since there was plenty more measuring to do. Jon wrote down the figures as I played with the sticks. We each worked out the curves when we got home and came to a fair degree of agreement. Jon drew the coordinates on an A4 sheet and reckoned that the right curve is of 21", with the rear coming out at 18.9". My CAD attempt produced 20 5/8" and 19 respectively. So there you have it. I think we must assume that the left mirrors the right. The front would be quite difficult to measure, so I may make up a cardboard template to match the rear and just try it on the front. All that being said, I can't help thinking that, assuming these panels were shaped around some sort of former, those who constructed this item would hardly have used, let alone made up, formers of two different curvatures.

Visible just behind Lion's footplate are her tender wheels, the tender body having been moved further back in the workshop due to space constraints.

Now, if you think that measuring device is crude, just wait until you see my Lion valve gear lash-up. I'm still trying to understand how that works! I hope one day to get that into this newsletter, but don't hold your breath just yet.



SECTIONS THROUGH 'HAYCOCK'

The Editor's Bit, by John Hawley

This is a fairly brief and compact Lionsheart. Firstly, the AGM is approaching and I want to give you all plenty of warning in order that you can plan your diaries. (See 'Dates for your Diary' on back page). Also, I hope to make this the first issue that is sent to those members who have email. I make a plea for you to send me articles for publication. Surely, some among you must be working on a project or have opinions on topics raised herein? My contact details are on the back page. If you didn't receive this news letter by email, but would like to, then please email me to that effect. If you did, I would appreciate an acknowledgement, so that I know I have your correct email address. Thank you.

Lion Replica in Sight?

Reports in certain sections of the press suggest that a replica Lion may be closer than we think. Secret discussions between a possible builder and UK heritage authorities are advanced to the extent that designs are being considered. Due to the vast gulf between what was considered feasible when Lion was built (and indeed what was possible, given the early stage of engineering development) and modern health and safety legislation, the proposed machine will be very different in detail from the 'old lady' we know and love so well, though in outline there would be very little to disappoint the casual observer.

It is very possible that the replica will be based on the LBSC design of 1953! (Oh dear!) Since the above H & S quagmire wasn't even a twinkle in anyone's eye back in 1953, it may well be that very little of the LBSC input will end up in the replica. Obviously such awful bits as the cast boiler top and his slant on the gab valve gear cannot be allowed to go through to full size on safety and workability grounds. As seems to be the case nowadays, boiler pressure will be considerably higher than on the original – perhaps even three times as much (ie, 150psi).

All measurements will be metric, since few designers in present day industry are able to work in Imperial measurement, (except of course, in America). Naturally, I'm a bit sad that they don't want to use my drawings. In any case, design and construction may well take place on the continent, or possibly even in the Far East.

Certain restrictions on authenticity are bound to be forced on the designers. The boiler will be welded. The present high cost of materials, especially those based on copper, mean that compromises have to be made. Friction reducing materials, traditionally the bronzes, will be substituted by carbon impregnated PTFE. Emissions restrictions dictate that she will be gas fired, the gas container being hidden under a pile of false coal (or perhaps a thin layer of the real stuff) in the tender.

Practical and political considerations apart, the biggest problem in projects of this kind is usually that of finance. However, this may well be the least of the problems facing the backers. Foreign oil money would appear to be behind the proposal. Russian oil millionaire Olezka Gark is behind the idea. He says that a great deal of Russian steam disappeared during his childhood and the present climate in his country is not conducive to significant revivals, even if there were many locomotives in store. He regrets that the Soviet authorities had no equivalent to our 'Barry Island' and other scrapyards. Olezka ('Olly', to use the Russian diminutive) Gark is quoted as saying "In Russia we have embraced a certain amount of western capitalist ideas. We have some competition, bright ideas are nowadays permitted and we have many supermarkets. We even have, within these supermarkets, the idea of two for the price of one and so on. What we like about this project to build the replica Lion is that we are being offered nought for two, so that has to be a winning formula."

So, there we have it. All we have to do now is to sit back and wait for the dream to become reality.

For Sale

The following items, currently located in Sudbury, Suffolk, are offered for sale.

- Half set of Lion wheel castings(unmachined):
 - 2 large 8" dia. (Probably one off each driving and leading)
 - 2 small 6" dia. (Probably Tender)
 - 1 small 5 3/4" dia. (Probably Trailing)
 - 1 block with 2 holes (Probably Cylinder Block)
 - 2 blank circular castings 4 1/2" and 3 3/4" dia. (Thickness and purpose unknown)

Also:

- Colchester student 6"x24" safety lathe, with chucks, faceplates and steadies. Possible Serial No: 24784a
- Small Hobbymat universal lathe
- Taylor Hobson engraving machine
- Treadle guillotine - 24" blade (for sheet metal).

Electrics are single phase. I've included some shots of the machinery below. Please direct enquiries, offers, etc to:

Mr Chris Grout
1, Glebeside
Foxearth
Sudbury
Suffolk
CO10 7JB

Tel: 07891576672 day; 01787 311008 after 6pm.

Email: chris.jill@chrisgrout.eclipse.co.uk <chris.jill@chrisgrout.eclipse.co.uk>

Successful bidders to arrange clearance and transport.



Colchester Student Lathe



Hobymat Lathe



Taylor Hobson Engraver



Treadle Guillotine

Some of the Items for Sale

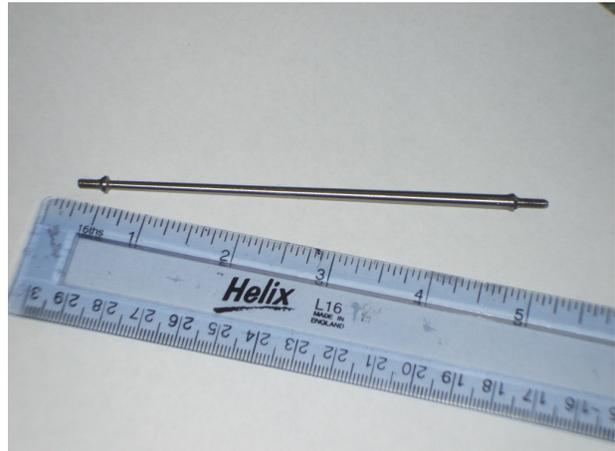
I've started, so..., by John Hawley

At last, I've cut metal. Not much, but

Some weeks ago I resolved to commence work on my 7 ¼" Lion, but which part to start with? It was the middle of winter, so I didn't want to work out in the freezing barn. I managed to borrow a small lathe – a Cowells ME90, a beautiful machine, though hideously expensive to purchase new. I thought that something simple would be ideal, so chose to make one of the stanchions of the footplate railings. Simple? Ha!



The Cowells ME90 lathe with Stanchion
Note the tailstock, just grimly hanging on



The Finished Stanchion

Photos JPH

This item is tapered and is so flimsy that it causes great difficulty when turning. I'm not saying it's impossible to do at one setting, but I had to turn the tapered portion in three stages, starting at the thinner end and turning about an inch length down to size. Once this was done I could release the chuck, extend the bar by a further inch, set true and do the next portion. Of course a supporting centre is needed at all stages of machining. After turning the final, thickest portion, I was able to run a very fine file over the 'joins' to get rid of any steps. Each end is threaded 6BA. I found myself wondering how the full size stanchions were made. Their slenderness ratio is identical. Being tapered, it is not possible to support the item with a running steady. One can of course, set over the tailstock and carefully turn the whole length in several passes, but at the time I had no centres and was impatient to get on.

I was relieved that the whole process did not end in tears. That's one small step for model engineering – one giant leap for me! (with apologies/acknowledgements). Mind you, as Jon cruelly pointed out, there are only another five to go – and that's just the start of it all!

Dates for your diary

AGM

To be held in Lion's lair – 21 Juniper Street, Liverpool, L20 8EL. This is an important meeting, probably the last we shall see of Lion close-up before she goes into the new museum on Liverpool's waterfront, so it's important that we all make an effort to attend. I look forward to meeting you at the meeting. Please let me know if you intend to come, so that we can have some idea of numbers (ie, large or small tea urn). If you would like directions, again, contact me.

Lionsmeet 2010

Lionsmeet will be on Saturday 31st July at the track of Kinver MES. Details on competition rules and how to get there will be published closer to the date.

Editor's Contact Details

If you would like to contact the Editor on any issues raised in this newsletter, or for any other reason, the details are below:

Mr J P Hawley

Rock House

Downside

Backwell

Bristol

BS48 3DH

Tel: 01275 472023

Email: ringjph@talk21.com