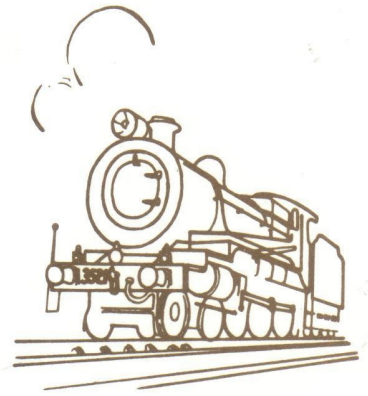


Sydney Live Steam Locomotive Society

Anthony Road, West Ryde, N.S.W.

'Newsletter'

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February 2023



The Ted Esdaile 'Ajax' back in service with new owner Wayne giving Bindi and Janette a sample of its easy running on our New Years Eve run.

November 2022 Running Day

We were fortunate with the weather, no rain, warm and clear skies. There were a good selection of locomotives in the GL loco depot. All the setting up was attended to by the members present. John L trimmed the vegetation around the perimeter of the elevated track and Dennis O'B cleaned all the passenger car seating.

The Allison C3609 was out on the outer main track early with the blue set to test a new exhaust arrangement. This

modification proved successful as the loco was raising steam on the upgrade as well as burning anthracite successfully. Ray L coupled up C3374 in front of the C36 and the pair of 4-6-0's ran well for the rest of the afternoon with Tony E as guard. The second train on the outer saw the green carriage set running with Craig D and TGR R class 4-6-2 as train engine with Graeme K and 4-6-2 2401 running as pilot. With Peter D riding guard the train ran without trouble for the afternoon. Ian T was station attendant.



November Running Day: Above Left: David C and Nigel Gresley leading Simon and Gazelle on the elevated track, while Above Right: Evan and the heritage 2-8-2. Right: Scott and the Shay.

The inner main had the Mick M Shay coupled to the Central West car set. Scott was the principal driver and Mick was guard. The second train was an interesting diesel outline combination. Coupled to the car set was David L with his

Our elevated had a number of different combinations. Simon C had his 4-6-0 B1 Gazelle running



train engine with David C and his 2-8-0 Nigel Gresley

as pilot. Paul T ran his 0-4-0 Hunslet on two cars and Evan L steamed the heritage 2-8-2 and also ran a two car train. Our second four car train had Brian K and his 45 class coupled to the car set and Bernie C ran his 0-4-0 Blowfly as pilot. All trains ran well for the afternoon and the station and guard duty was looked after by Wayne F, John H, John L and prospective member Trevor O.

Gate keeper was John S with assistance from Mike D. Peter W was ticket seller with some assistance from Joy E late in the afternoon. We had 542 visitors and gave 1581 rides and it has been interesting

double Commonwealth GM's and in front of them was Neal B and his 442 class. The locomotives and associated riding carriages were almost as long as the passenger cars. Jo-Ann T was guard for this train and the station was attended to by Chris D.

to see that the elevated track has carried more than its fair share of passengers. The signal box was attended to by Martin D and James P. The kiosk was seen to by Elizabeth T and Joy E. The afternoon's activities were under the watchful eye of track superintendent David T. We managed well but a

More November scenes, above Ray and 3374 leads Andrew and 3609 on the outer main. Below left: Bernie and Blowfly leads Brian and his 45 class on the elevated while below right, Graeme K and 2401 leads Craig and the R.





Left: Paul T and Hunslet on the November day.
 December Running Day: Left, Scott and the Shay,
 Below: Ross and Toneya; Below Right: David L and the
 GM; and Below: David C and Nigel Gresley with Harry.
 (Photos John L)

nately the rain stayed right on or well off the coast. We were expecting a crowd of about 300 and the gate was attended to by John S and Mike D and Mike mentioned that a more than usual number turned up in thongs! We had a good number of members attending early to get things ready for the afternoon's activities. On the elevated track we had a number of two car trains operating. Ready to start our service at 1.30pm was David C and his 2-8-0 Nigel Gresley. Brian K was here from the west with his 45 class electric powered diesel outline loco on our second train. It took a while for our visitors to find their way over the foot bridge to the outer main or the elevated so eventually we had some passengers to carry. Our third train was hauled by Paul T with



few more members would have eased the work load for the afternoon.

December 2022 Running Day

Our last running day for the year and the first of the summer season. We could have been excused for not realizing this as the day was rather cool and cloudy but fortu-



Editorial
 This year, 2023, we will celebrate a significant milestone, the 75th Anniversary of the Society. We can look back with pride at what the Society has achieved in that time. Good leadership and a willing band of members over the years have provided the facilities that we have today. The very nature of our railway means that there is always maintenance to be carried out and in the case of the elevated track renewal is needed.
 We continue to see great examples of model engineering from our members and some of this means embracing some of the most up to date processes to produce our components.
 Our public running days provide an interface with the local community and a means of raising revenue to support our activities. With luck this year we will not have so much rain to hinder what we do and for our public running days we need as many members on hand, as possible, to see that the days run smoothly and that we can comply with our responsibilities and run a safe operation.
 John Lyons - Fill in Editor

his 0-4-0 Hunslet. We did very well during the afternoon keeping our visitors allocated to the trains managing to keep groups together or provide the opportunity to ride behind steam or diesel. John L ran the station, and points, with assistance from young Harry C and Ben (Elizabeth T's grand son) taking turns as ticket collectors. They were basically in the right place at the right time except on one occasion when Harry was carried away as station photographer for the passengers and forgot that tickets were needed to be collected.

Paul ran the Hunslet into the loop at about 3.00pm for a break at about the same time as Brian came off in order to have an early departure. Brian's set of cars was then coupled up to David L's Commonwealth GM diesel locomotive to continue running till the end of the day. A couple of visitors mentioned that they were very happy we were running again after the Covid disruptions and asked how we manage maintaining things during that time.

On the outer main we had a triple header, Graeme K with 4-6-2 2401 in front of Garry B and his C38 and train engine Graig D and the TGR R class pacific. This looked very impressive and performed well all afternoon with Tony E as guard. The second train on the outer was hauled by the Hurst Mountain 4-8-2 with John H and Arthur H alternating with driving and guard duties. Station attendants were Paul B and Peter D.

The inner main was served by the big locomotives. One train was hauled by Ross B and his Fowler "Toneya" 0-6-2 cane locomotive, Jo Anne was guard. The other train saw the Wolgan Valley Shay running well all afternoon with Scott M and Mick M taking care of driving and guard duties between themselves. Station attendant was Chris D. The signal box was run by Martin D and James P, all ran well. Track superintendent was Neal B and we had the services of Elizabeth T and Joy E in the Kiosk. Ticket selling was looked after by Peter W. In all it was a very successful day but we could have done with a few more members. Running without guards on the



January Running Day, Above: Enthusiasts gather at the level crossing to record the action. Below: David T and 3609 leads Ray and 3803 on the inner with a light load.



elevated did save on staff but extras would be good.

January Running Day.

We were very lucky to have a rain free day, humid but not excessive, for our first public run for 2023 as we had rain on both the Friday and Sunday. While we were getting underway Ray L had a steam test on his C3803 with David T officiating. Ray cleared a blocked blower and the loco passes and is now set for another four years! Graeme K did a lot of leaf litter clearing with the blower and the car-

Below: Graeme & 2401 leading Garry and 3807, and Craig and the R on the December running day.





Left, Ken B and Simplex leads Craig and the R down the outer main on the January running day.

John H had left the 4-8-2 Mountain class in loco as a means of rationing staff. It was a reasonable afternoon and all members present worked very hard.

Following the running on the elevated a small team consisting of Arthur H, John S, Chris D, John L and Warwick A got to work with a couple of angle grinders and removed and cut into smaller sections the track and anti-tip rails in preparation for the work that would proceed on the Sunday morning. It gave the Sunday crew a flying start!

Works Reports.

Fence Panels.

Since the last Newsletter there has been need to replace some fence panels on the northern side of the elevated track. On the Sunday of the Small Gauge Weekend a fire started in some dry rubbish behind the fence between the GL loco and the signal box. It was surprising that the rubbish was dry enough to burn considering how much rain we had re-

riage seats were again cleaned by Dennis O'B. On the elevated we had three trains running. David C ran 2-8-0 Nigel Gresley on two cars. Paul T was there with his 0-4-0 Hunslet hauling two cars and eventually Wayne F arrived with Ajax the Ted Esdaile built 0-4-2 Lion and took one car. The station was looked after by John L with young Harry C as ticket collector. John L adds, young Harry is a very efficient worker. If it looks human and breaths it should have a ticket but we have exercised some judgement at times. Harry is also photographer to the passengers with their phones. Sometimes there is a confusion of roles and he has to be reminded to continue collecting the tickets. He keeps the waiting passengers informed as well. All waiting are shown big lumps of Gunnedah coal and informed that this was what the locomotives run on. There were some shocked faces when he declared that the track was to be "destroyed" the following day. They were relieved when informed that it was only a small part to be demolished for the track rebuilding program! We were able to sort out the loading to suit the motive power and the afternoon went well finishing running about 4.20pm.

About afternoon tea time David L relieved John L so he could get tea or coffee for the elevated team.

On the ground level inner we saw Ray L with C3803 following its steam test as train engine on the Central West car set and The Allison C3609 running pilot. David T was the main driver of the 36 during the afternoon with Arthur H as guard. The second inner train was the Pullman set with train engine 2401. Graeme's K's 4-6-2 and Garry B's C3807 running at the head of the consist. Chris D was guard for this train and Ian T was the station master and also took a turn as guard.

There was only one train on the outer main and this was the green set of cars. For motive power we had the TGR R class coupled as train engine and pilot Ken B's 0-6-0 Simplex. They ran well all afternoon, Bernie C was the guard and the station was taken care of by Peter D.

The signal box workers were Martin D and James P. Track superintendant was David L and the canteen was in the care of Mike D and Warwick A. Peter W sold the ride tickets and the entrance was cared for by John S.

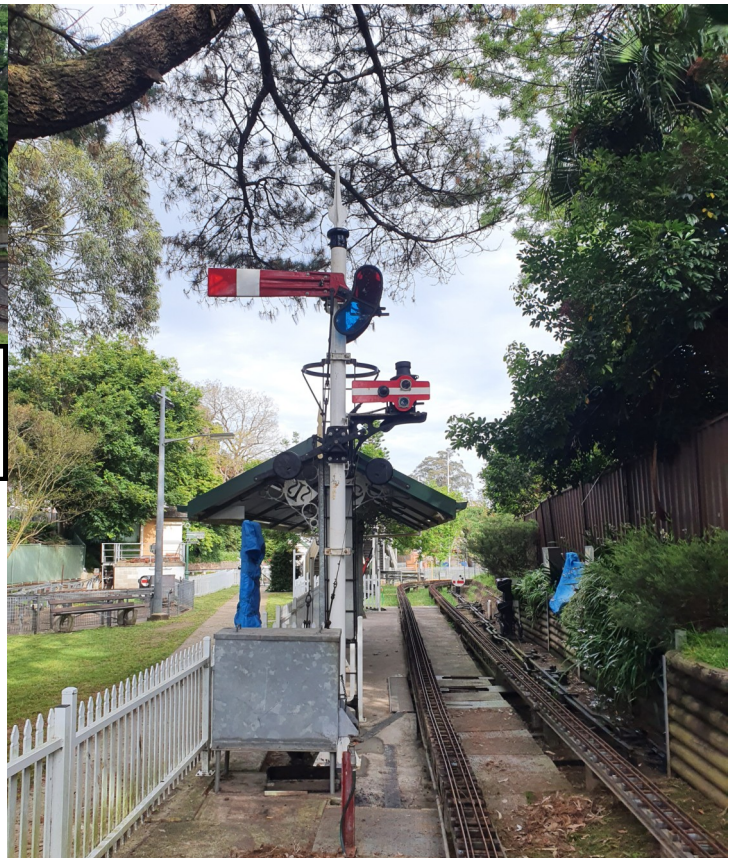


Above: Beam removal was a very quick affair. Here Chris and Andrew slide a beam onto a service car for delivery by rail to the disposal area. Below: The team march the first of the new channel sections into position. Note the raincoats.





Above: Mike and Geoff attach reclaimed sleepers to the new track. Right: the newly installed steel post for 9 & 10 signal was completed with all fittings in time for the Small Gauge Festival with final concreting being completed.



ceived in the preceding months. Fortunately there were enough members on hand to get the fire out quickly with only two panels damaged. These panels were replaced by mainly Robert W, Andrew and Warwick A.

The second section was down past the location of the inner carriage shed. A banana bush had started growing on the neighbour's side of the fence and as banana bushes do it just grew, and grew, and grew and pushed the fence out of the way. Craig D and Chris D with help from others removed the plant and disposed of it then poisoned the roots. Martin D mixed the weed killer. There are still some posts to be replaced.

Elevated track replacement.

By the time you are reading this Newsletter the third section of this project should be back in service. As mentioned in the running day reports following the February running day the steel work, track, anti tip rail and brackets were removed and set aside for work to get underway on the Sunday morning. There were 10 beams to go and these were taken by Brian K. He had set up a borrowed trailer so that the beams would fit securely and safely for the run to Mudgee! With assistance of John H and his tractor Brian was loaded up and ready to depart at about 10.30am. Despite the rain on and off during the day piers were located, beams placed on them and track sections put in place by Andrew A, Warwick A, Mike D, John H, John L, John T, Geoff H, Chris D, Garry B, Jo T, Neal B (sorry for anyone left off the list) Over the following Saturdays welding the joints and alignment of track so that by late

on the first Saturday in February a rough test run was made with one of the work wagons.

Ground level track.

The team Peter D, Paul B and Craig D have spent the summer months planning and with the approach of autumn they will be back to work, there are plenty of stainless steel sleepers on hand to continue with this very important maintenance.

Signalling work is continuing for the inner bottom curve. David L and Peter W have fitted another track detector section and many wires have been terminated. This is ongoing.

Signal Post.

On the last Wednesday of 2022 we had a team at the grounds to erect the post for #7 signal. A lot of preparation had been



Below: John H lifting beams into Brian's trailer with Geoff H's assistance. Left: John T welding up elevated track sections with Arthur's assistance.





Right: Manoeuvring the new post over the elevated. Left: Raising the post. Centre: Martin D's very professional electrical works for 7 signal in its new (recycled) box. This used to be the green switchboard near the inner platform. Left below: John S and Chris installing the mounting rods. John L and the ladder and landing repairs. Bottom: Martin D contemplating the reed switch mountings on the ground frame. Below Right: The finished job, awaiting a final paint touchup from John S.



carried out in and between previous weeks with John S epoxying then painting the post, Warwick A locating the many holes that were needed, making a drilling jig for the hole drilling and John L making and welding in place pieces

needed for the refurbishment of the platform and ladder. John H was on hand with his tractor to assist with the moving of the post from the work area to its location. The top and bottom holes for locating the post had been drilled so the top threaded spindle was located first and the post pivoted on this to its vertical orientation and the bottom spindle fitted. The final two holes were drilled by John S watching the left to right alignment and John L sitting back on the signal frame side trying to watch the horizontal alignment. The holes were drilled from both sides

and between them they did a reasonable job as the two remaining spindles went in without too much big hammer work. After that some of the fittings were hauled up and fastened into position. Chris D assisted and Martin D has been attending to the electrical works. The signal should be fully operational for the February Running Day.



New Years Eve (photos centre pages)

1. Warwick Reinhardt giving Buffalo a good workout.
2. Graeme Kirkby and his American Mogul engaging in the talk of the time with Tony and Peter.
3. Trevor Oakley driving Andrew's A10.
4. Mike Dumble and Gill giving the 4F a romp.
5. The late afternoon sun illuminates Andrew and the Mule.
6. Now the sun is gone and Mule lights the way. Its first night run for many years.
7. Andrew Allison servicing the A10 for Trevor while Stuart Kean looks on.
8. Andrew and the A10.
9. Buffalo is on the turntable while Mike steams the A10.
10. Neal Bates steams up Butch.
11. David Chenery gives the family a ride behind Nigel Gresley.
12. The New Years Eve feast!

New Year



ars Eve



Bruce's Bits

Part 6b – Bruce's Boiler Bits - Water Pump

Chris Denton

The water pump for Bruce always concerned me. On the original engines the water pump is a single (double-ended) piston, dual action plunger type pump driven by a crank attached to a set of gears from the crankshaft. A diagram is shown as Photo 1 below. It functions much the same as an axle driven pump on a loco but is a whole lot more complicated. To scale it was pretty small and there were no castings available so it was a fabrication job. There was just cause for my concern.

Undaunted, I rummaged through my bits and pieces containers to find what I could use. Plenty of brass oddments pre-

lathe, mill and Oxy-LPG but not necessarily in the order.

Slowly I came to realise this was a tedious undertaking. All the bits needed machining and then soldering together and then more machining. The parts looked fairly straightforward on paper but there were a lot of them and turning the caps, cutting the seats and drilling the passage required a degree of finesse that proved challenging. However, after a couple of aborted attempts, the pump began to take shape and ended up as shown in Photo 2 (less piston). The rough finish on the pump body was meant to imitate a casting finish and round the sharp edges as much as possible – considerable work in this regard is still required.

Unfortunately and tragically, it was the wrong shape! Again, what looked OK on paper did not translate to OK in real life. It was somewhat too big – out of proportion to the engine. How unlucky, I thought.

A solution to this dilemma was required. Despite my best attempts to look at pump Ver #1 from many angles, different sets of glasses and lighting it just would not reduce in size. The only real solution was a re-design and start again.

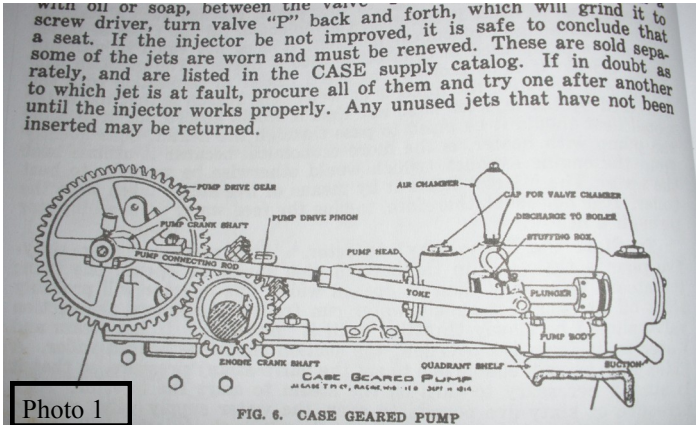
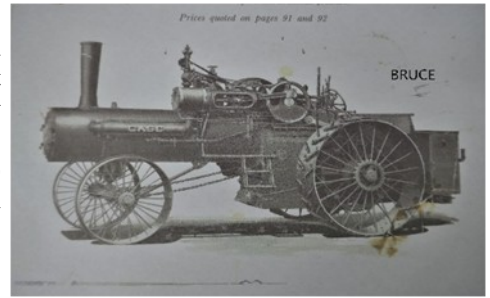
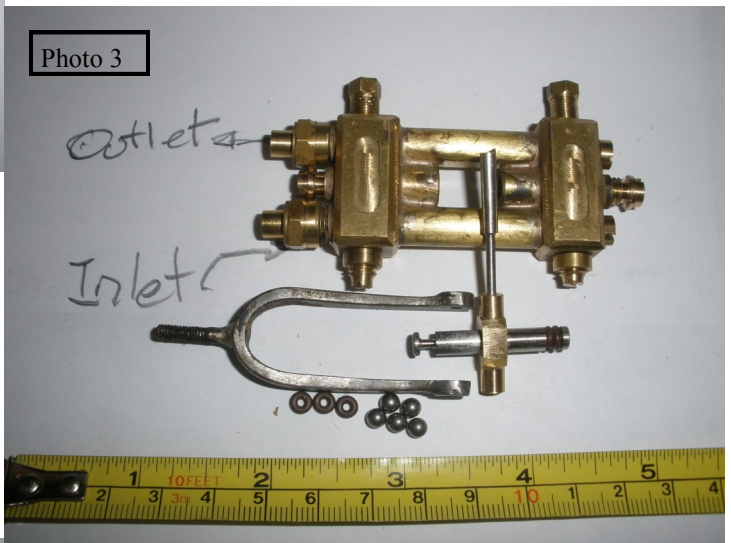


Photo 1
Gear-Driven Pump. Among the various kinds of pumps used for feeding a boiler, the geared pump is conspicuous for its simplicity and reliability. Like a cross-head pump it receives its power from the main engine instead of comprising a small engine in itself, as independent pumps do.

sented themselves so the decision was made for me. The plan was to form the ends from square section brass with round connection pieces between. The stainless steel piston would be installed from one end and operate in two bosses. All the valve gear (ball valves) would be included in the square section ends. All the components would be silver soldered together and eventually hand-finished to look something like the original. My concerns were well founded!

After a few “design” sketches it was time to fire up the

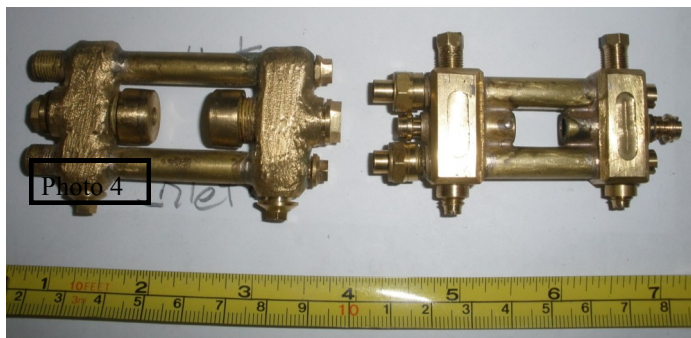


An all-new Ver #2 was required. More “design” sketches and a bit of scaling from the available literature resulted in Ver #2 as shown in Photo 3. This included the stirrup to drive the piston shaft. It got me thinking about the crank and gears to drive the pump but I suddenly developed a headache and decided to put that off to a later date.

Ver #2 was more to scale (see Photo 4, and yes it was worth the effort, probably) but it did not allow gland sealing for the piston so I decided to install Viton “O” rings on each end of the piston. The piston was reduced in diameter so it was getting pretty small and while the “O” rings were tiny, the ratio of their thickness relative to their diameters was high. Trial fitting of the “O” rings highlighted the limited flexibility of Viton. They usually broke when I tried to stretch them over the piston shaft. As the pump only has to cope with



coolish water, more flexible Nitrile or Silicon rings may suffice and these will be ordered in due course. I am not convinced I have a practical solution just yet but I have had a few thoughts about contingencies. Good old packing is a possible way out as is making the ends of the pistons removeable (which would probably entail internal/external threading 1/16" dia. SS – what could go wrong?), and install the “O” rings on that way. I also have high hopes for the effectiveness of the injector
 These are all actions for the future – after my headache goes away.
 Lesson learnt – definitely put off until tomorrow what you could do today, a headache is a convenient excuse.



SLSLS Christmas Party Day

The child care group were to arrive at 11.00am and from early morning the childcare workers were busy preparing all they needed. Brian K and John L provided access to wheel barrows to make it easy for the workers to transfer

Election of our 2023 Board – Request for nominations

Our Annual General Meeting will be held in June. Our Rules require **all** Board Members to retire each year at the AGM. This permits **any** member to nominate for **any** board position for the incoming year. While the group of people willing to apply their energies to Society Management tends to remain fairly stable, we have been fortunate in recent years to have had the benefit of new Board Members. The role of Secretary is currently vacant, with President Mike and Treasurer John jointly Acting Secretaries. Both would welcome a nominee to formally take on the position of Secretary.

New Board Members provide an opportunity to expose the issues facing the Society to fresh ideas, and this is vital for longevity. We therefore encourage all interested members to put their names forward.

The Board comprises of 7 positions, with the present holder and their intention noted:

- President (Mike Dumble – renominating)
- Vice President (Neal Bates – renominating)
- Secretary (vacant)
- Treasurer (John Hurst – renominating)
- Director (Ross Bishop – renominating)
- Director (David Lee – renominating)
- Director (John Simpson – renominating)

Please consider this opportunity to contribute to the future of the Society as a Board Member.

Nomination Forms are available in the clubhouse and can be provided by email on request. Please follow the instructions on the Nomination Form, which must be given to Mike Dumble or John Hurst by **Thursday 4th May**.

Diary

25-26 February	Orange ME Allcomers Weekend.
3-5 March	LMLSLS 70th Birthday Run
7 March	Directors Meeting
18 March	Public Running Day
25-26 March	Toowoomba Live Steamers
1 April	Special General Meeting
6-10 April	Easter Convention, Tullamarine LSS.
15 April	Public Running Day
29-30 April	Moira Steam Spectacular
2 May	Directors Meeting
20 May	Public Running Day & next Newsletter.
3 June	Presidents Breakfast and AGM
10-12 June	Hot Pot Run
17 June	Public Running Day
Upcoming Special Events	
29-30 July	SLSLS 75th Birthday Weekend
11-13 August	QSMEE Track n Tent
4-5 November	Small Gauge Festival

the food from the top of the grounds to the marquee. When the visitors started arriving at 11.00 am trains were set to run.

On the elevated the blue set was split into two and each pair of cars formed two trains. Steam power was provided by David C with 2-8-0 Nigel Gresley while the second train was hauled by Brian K's 45 class diesel outline locomotive. It took a while for the visitors to discover the elevated and the outer main GL but very soon there were full trains on the run.

On the ground level inner main it was good to see Ross B's 0-6-2 Fowler back running again. Ian T and John H were noted riding as guards while Carolyn L was in charge of the station. The outer train was run by Craig D with the TGR R class 4-6-2 running un-assisted. Craig was handling the locomotive very well managing some rather large loads. Peter W was guard on this train and Bill P was station master.

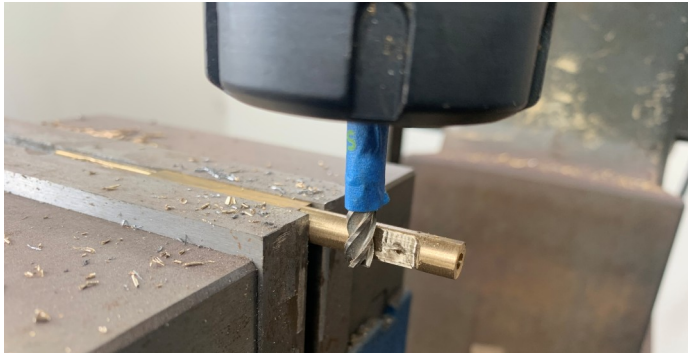
Lunch was provided by the centre and it was very good providing a good choice of healthy, delicious food.

Following the WRNCC lunch members had their own BBQ dinner accompanied by some running. Graeme K and 2401 and the Allison 411, CC79 class were running into the evening.

Making Turnbuckles

Andrew Allison

On full size timber rolling stock the truss rods are an important feature to counteract the car sagging under its own weight. As the timber shifts and changes over time, the truss rods would require periodic adjustment to keep the car body level - or rather, slightly cambered up at the middle. On some designs the truss rod was tensioned by nuts on the end of the truss rods, however many employed a more convenient turnbuckle at the midpoint of the truss rod with the far ends firmly anchored near the bogie piv-

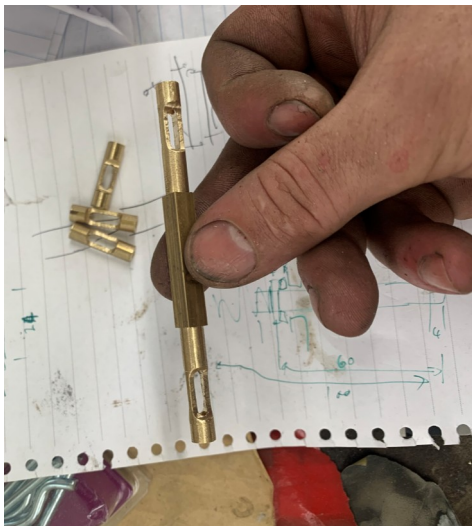


ots. Our models generally have no technical need for truss rods however they are an interesting visual feature with an important function in full size that is worth representing.

I had previously modelled turnbuckles in 16mm scale by filing a slot into a piece of tube and silver soldering it all together with truss rods and a couple of dummy nuts. These turn out nice but with the need to produce a quantity of turnbuckles in 1.125"/foot scale a method of producing them with consistency, simplicity and a higher lever of detail was required.

There are a couple of things I have learnt painfully slowly over the years. One is that round stock is generally the worst thing to use for any job. The other is cutting stock to length is the worst first move to make.

The method used to make the turnbuckles was to start with a piece of 1/4" square stock. It was chucked in the collet,



turned down to diameter and drilled 5BA tapping. The stock was then turned end for end and the process repeated on the other end of the stock.



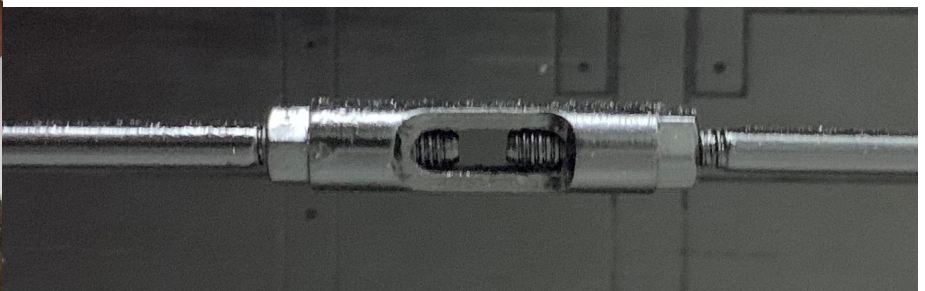
The bar was transferred to the mill with one turned end out the side of the vice. Being square and long, it was super easy to grip and ensure was parallel. The sides were recessed in by setting the cutter to just break through to the side on the tapping size hole. The Y axis was locked off and the X length traversed.

From this point, only the Z and X axis of the mill was required. The cutter was wound down into the job, the job traversed and cutter withdrawn and returned to the starting 'X' position. The bar was spun over 180 degrees and the same cut repeated. Then the stock was flipped end for end and the process was replicated for the embryo turnbuckle on the other end of the stock.

With the through tapping size hole just broken into, it was simple to then run a 1/8" drill into a few places along the slot, then a few strokes with a needle file to clean it out. Again worth noting this slot was easy to index 90 from the waisted sides as the stock was square.

With that completed it was back to the lathe where the blank was parted off the stock, and the process repeated for the next 2, the length of stock gradually reducing from both ends. Once all blanks were made, the ends of the turnbuckles tapped. And no, they don't work as I don't have a left hand 5ba tap!

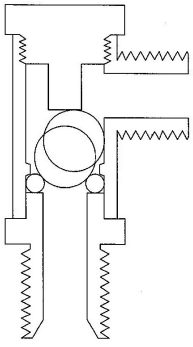
While there is probably a limited interest in mass producing turnbuckles, the technique and principles of 1) not automatically using round stock for round things, and 2) keeping things attached to stock for as long as possible, are shown to advantage by this example and easily applicable to many other loco or wagon components.



Clack Nirvana

The search for a seal

Simon Collier



Check valves, or clacks, as we call them, seem to be one of the most problematic areas when running out steam locomotives. Specifically, leaking clacks caused by the ball not sealing adequately on its seat, allow steam and water from the boiler to blow back through the pipes to exit the injector's overflow outlet. This makes the injector hot. If the leak is not too bad, turning on the water to the injector for a few seconds before turning on steam, will cool the injector

enough for it to start. In a worse case, the water supply might have to be left on, counteracting the heating from the blow-back. A really bad case will empty the boiler and abort your run. I had that happen at the Hot Pot once. I immediately bought a new check valve from the merchant present at the event, fitted it, and it was no better than the failed valve it replaced. Clacks are one of those things in the hobby that you really have to make yourself to ensure success.

Traditional clacks use a stainless steel ball on a brass or bronze seat. Ideally it is sized such that the tangent to the ball where it contacts the seat should be about 45 degrees. A 7/32 ball on a 5/32 seat gives this result and is the usual size I make. The method given in books from LBSC onwards is to drill the body to depth, use a D-bit to square the bottom of the hole, drill and ream the hole which will form the seat, and using a sacrificial ball on the seat, hold a brass dolly against the ball and "give the other end a sharp biff with the hammer" (Shop, Road and Shed- LBSC). Then a new stainless or a bronze ball is used in the valve. Sounds simple, but it certainly is not. I'm sure there are model engineers who swear by this method, and will say they never have a problem. Most, I suggest cannot make satisfactory clacks this way.

A lot has been written in magazines and on internet forums about the clack problem, but the information is not always easy to find. For me the first imperative is to make a separate screw-in seat section. In this way, the surface can be finely faced ensuring a good finish. Once a ball has been struck, pressed or burnished to form the seat, the results

can be inspected with magnification. You can also turn the seat at 15 degrees which is advocated by some authors. Something of a breakthrough came from reading one of Kozo Hiraoka's books. He stressed that you want a narrow but complete circular seat visible under magnification, as a broad seating requires much more pressure on the ball to seal the wider area. He then says to test the seat by sucking the ball onto the seat with your mouth (warning: Tap Magic tastes terrible), sealing with your tongue, and if the ball holds for 10 or more seconds, the clack will be satisfactory. I've done a fair bit of this in my testing, and a couple of times the ball and seat piece stayed on my tongue indefinitely; the perfect seat and hence, clack valve.

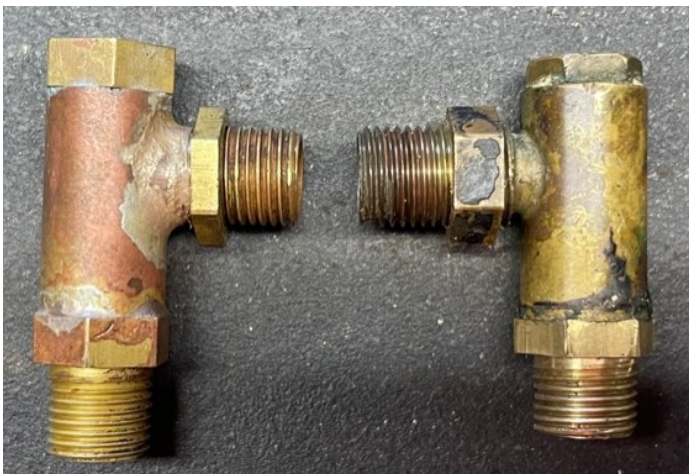
Well, not so fast. The easiest way to test a new clack is to apply 100 psi of compressed air to the boiler connection, and hold the water inlet under water. Even a perfect seat by the tongue test will issue a steady stream of bubbles. It is near impossible to get a metal ball with metal seat combination that can pass this, admittedly, torture test. They will be satisfactory in service, but can't be called perfect. I should say that I am talking about 90 degree valves that screw into the boiler, in my locos, the backhead.

One of the exacerbating factors with readily available stainless balls is that they are often not very stainless, and not very round. My supply is magnetic, so not the best grade. Bronze balls have always been around but I have no experience of them. The perfect alternative these days are ceramic balls made of silicon nitride. Warwick Allison put me onto these. They are very hard, and round to high precision. They are expensive, but you don't have to throw away the one you bashed to make the seat. We buy them from Acer Racing in the US.

Alternatives to metal on metal that people have turned to include using rubber balls, using O-ring seats, and using a "washer" instead of a ball where an O-ring face seals against the seat. Valves sold by Steam Fittings, UK have this arrangement. Nitrile balls are readily available from the hobby suppliers, but the more heat resistant Viton balls are less easy to come by. I've read that nitrile balls survive OK in inline clacks away from direct boiler contact. Barry Potter has used and advocated these for years.

I wanted to try a Viton O-ring seat so I came up with the drawing shown. The inlet hole is 5/32, the O-ring is 5/32 i.d., 9/32 o.d.. The ball is stainless. The body was drilled through 1/4, then drilled 9/32 from each end to leave the small land which prevents the O-ring from moving upwards. The inlet was silver solder in but it could be screwed, which would make O-ring replacement easy. The O-ring was manipulated into place from the top past the land with blunt probes and it was difficult. Only a small dental hook would get it out and it would be destroyed in the process. The threads are 5/16 x 32, the cap 5/16 x 40. When the clack was tested with 100 psi air and the inlet submerged, not a suggestion of a bubble escaped. Concurrently I made a clack with a nitride ball. The seat was formed by pressing the ball into the brass seat. The result was a perfect tongue test. However this valve blew a stream of bubbles on air test.

The valves have not been tested in service. The main question is how long will the Viton O-ring last before needing replacement. These O-rings are readily available however, so replacement should be straightforward.



An Experimental Dynamometer

Warwick Allison

Warning!: This article may contain words foreign to you! It is modern and geeky! Please bear with me!

The quantification of steam engine performance has always been a rather specialised task, hampered by varying operating conditions and the vagaries of coal, track conditions, weather and the driver's and fireman's particular styles.

In the model engineering field, early ones were basically mechanical integrators that combined drawbar pull and distance travelled in an ingenious machine to output the work done. For comparison to other locos the work done is usually given a time element as well, often separate to the integration device (i.e. a clock). The last International Model Locomotive Efficiency Competition run by Model Engineer (IMLEC) used a traditional mechanical dynamometer owned by the Guildford (UK) society. You can also purchase an electronic version from Station Road Steam. that also has a cylinder pressure input so that cylinder diagrams can be produced on an Ipad. The Dyno and Ipad are connected via Bluetooth.

In Australia there have been a few efficiency contests conducted. Most have been written up by John Lyons in Live Steam or Model Engineer at the time (they were a while ago). I think ILS had a traditional mechanical car while later Arthur Mears produced an electronic version. I don't recall much about it but I do recall the large printed circuit board that was covered in integrated circuits!

There are others too, one being built by Tim Constable and getting the AME Under 25s award and a South Australian Dynamometer car built by John Lyas and Alan Wallace. This car used a wheel sensor and load sensor and inputted the signals to a laptop computer for computation. Details are here:

<https://www.avocetconsulting.com.au/modeleng/>

Model Engineer described one builder in New Zealand who has produced a micro controller based on one using some digital scales for the strain gauges and adding his own compact arrangement with bluetooth.

Recently I had some experience with Arduino micro controllers in a system to divert solar energy into my storage hot water system. This was a steep learning curve to refresh my programming skills and this time learn some C++.

This led to a couple of other projects and led me to think of its application on a 5 inch gauge dynamometer.

As an adjunct to the Arduino microcontrollers there is an ever increasing range of sensors that can be used in conjunction with them.

Some of the more interesting are:

HX711 Analogue to digital converter and used for interfacing strain gauges to the microcontroller.

HX710B Another analogue to digital converter but this time packaged onto a very small vacuum/pressure sensor.

BME280 This provides temperature, humidity, altitude, and air pressure.

MPU6050 is a gyro/accelerometer used for the control of drones.

Infrared sensors for speed measurement.

Voltage sensors used to measure voltages on batteries.

DS3231 Real Time Clock - a battery backed up clock that keeps track of real time.

SD Reader- a card reader that can take a micro SD card for storing and logging data files.

LCD Display can show actual readings to the driver.

As well, other newer micro controllers have come on the market. A WEMOS development board is tiny (about 25/30mm square) and has wifi capability and runs at 80 MHz (The Arduinos are much slower) while the ESP32 is a fully featured board, much smaller than an Arduino with 240MHz clock speed, 2 cores and 32 bit processing. It has 4MB onboard memory and lots of input and output pins and bluetooth and wifi built in too!

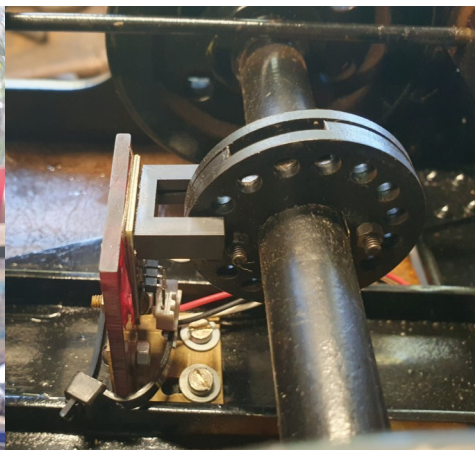
To top it all off the sensors and processors are extremely cheap. A few dollars each for the sensors and \$10 (maybe less) for the ESP32!

All this means that for a low outlay I could make a track recording car that did much more than a dynamometer alone.

The thinking goes like this:

1. Distance measurement: A disc with holes on an axle and an IR sensor can count the holes for a time period and determine the speed.
2. A strain gauge (or two) mounted in a load box attached between the loco and first wagon can deduce the drawbar pull.
3. An altitude sensor can sense the height changes and with distance measurements can determine the gradient.
4. The temperature sensor can just record ambient conditions.
5. The vacuum sensor could record smokebox vacuum

6. The gyro/accelerometer can determine the change of angle when travelling. Knowing the change of angle and distance travelled allows calcu-



Far Left: The load box on a riding car.
Left: The infrared sensor for distance measuring.

lation of the curve radius.

7. Elapsed time is a function easily done in the micro controller.
8. All the data can be time stamped and logged to the SD card for download into Excel for further analysis.
9. Real time data can be sent to a phone or Ipad via Bluetooth.
10. The onboard battery can be monitored so it can be re-charged before the system fails.

The whole lot can be programmed through the free on line Arduino Integrated Development Environment (IDE). Each sensor and the processors have on-line libraries. These libraries contain all the code needed for the device. This means you don't have to know how the device works etc, some one has already done it all for you. You just have to use the data you want in your program (or code). It is somewhat like lego. You get the blocks you want and plug them together. Now while this means you do not really need much electrical or computing knowledge to put a working device together, there is usually something that stops it working and the debugging and fault finding process can indeed be frustrating and time consuming.

This is especially true when you don't actually understand the example code they provide!
Embarking on a project with such a multiplicity of sensors in the one project also significantly increases the risk of creating issues. I had to have a go!

The Load Box

The load box was made using some bathroom scale sensors obtained on line. They came complete with the A to D HX711 amplifier card which I wanted mounted near the sensors as the strain gauge voltage variations are tiny. The box devised is shown in the photos and amazingly worked first time.

A baggage scale was used to calibrate it. Alas this had a maximum load of 50kg and the load box is designed for 100kg (or actually 980 Newtons). So calibration remains an issue, but it is in the ballpark.

The Wheel Sensor

A 16 hole disc was designed to be able to be attached to an axle to the recording car. An infrared sensor is positioned to detect a beam through the holes. The breaking and making of the beam can be counted to determine the distance travelled. This simple concept gave much trouble!

The Control Box

An ABS (plastic) box is positioned on the car to hold all the micro controllers and other sensors. It has an LCD display for the driver. It also has an On/Off switch and a reset switch to zero the elapsed time and distance for a new run. There is also a display reset button in case the display corrupts, (which of course has not been needed since version 2 was built!)

Testing

The first run of the device occurred on the Small Gauge Festival with my 3½ inch gauge Britannia. Graeme Kirkby had a drive but I think was largely oblivious to the device! This test proved the speed and distance measuring and also the draw bar pull but unfortunately the cables between the speed sensor and load box were subsequently damaged bringing the trial to an end. Since then there has been a significant change to the cabling and control box. If members are interested the trials and tribulations can be further elaborated on in future newsletters!

Below: Inside the load box showing the load cells and HX711 analogue to digital amplifier.

Bottom: The control box being tested.

Right: Calibrating the load box.



Duty Roster.

- March:** Ross Bishop/Neal Bates, Tony Eyre, Jo-Anne Topp, Ray Lee, Peter Wagner, Paul Taffa, John Tulloch, John Simpson, David Judex.
- April:** Mick Murray, Andrew Allison, Wayne Fletcher, Graeme Kirkby, John Noller, Ian Tomlinson, Glen Scott, Chris Denton, Warwick Reinhardt, David Chenery.
- May:** Evan Lister, Simon Collier, Garry Buttel, Scott Murray, Graham Tindale, Paul Brotchie, Mike Dumble, Deven Shirke, Craig Deacon, James Pritchard.
- June:** David Thomas, Bernard Courtenay, Greg Croudace, Stuart Larkin, Shaun Sorensen, David Lee, Geoff Hague, Martin Dewhurst, Ken Baker, David Coulshed.
- July:** John Hurst, John Lyons, Matthew Lee, Jim Mulholland, Martin Yule, Warwick Allison, Tony Kidson, Nigel Woolley, Bill Perrin, Eddie Jones.

Gate Roster and Track Superintendents: To be advised.



Above: The top of the grounds at night on New Years Eve.

Below: Garry Buttel and his 3807 leads Graeme Kirkby and 2401 on an inner passenger train on the January running day.



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Telephone: (02) 9874 8696. **Postal Address:** The Secretary, PO Box 453, West Ryde, NSW, 1685

Web Page Address: <https://www.slsls.asn.au>

Public Running Day is the **THIRD** Saturday in each month from 1.30pm. Entry is \$6 adults, \$3 children. Rides are \$2.50 each.

To ride on the trains, enclosed footwear must be worn.