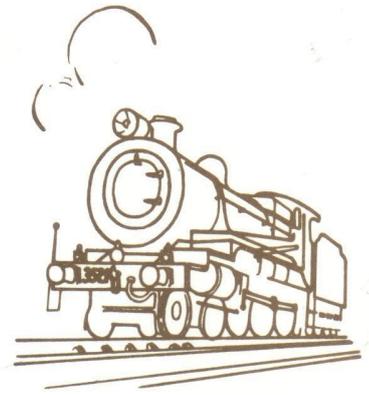


Sydney Live Steam Locomotive Society

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

'Newsletter'

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Here is Andrew Allison's brand new scratch built Gauge 1 Perry No. 9. It is an 0-4-2T and is coal fired. It is complete with an axle pump and the side tanks actually hold water, a bit unusual in this scale. The first run was impeccable.

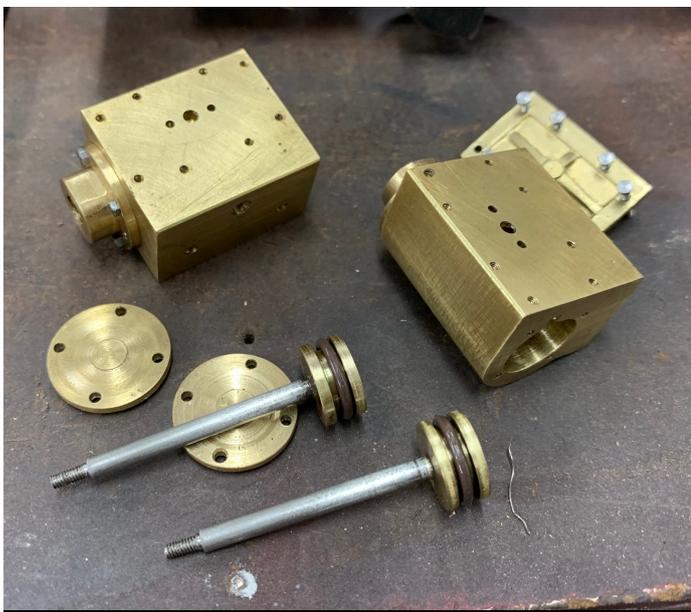
A lockdown loco

About 10 years ago, Brian Wilson's book 'steam trains in your garden' was published. This book took the garden gauge world by storm being a very complete and well presented design for an attractive loco based on the Kiama Quarries Fowler 0-4-0.

Henry Spencer had a desire to build one and suggested I should build one as well. Brian Wilson was selling some laser cut components and lost wax detail castings for the

loco, so between us 2 sets of parts were purchased. With Henry's health declining rapidly, while he started on his chassis, I would make bits from the 'top down' - enough for both of us, to speed up progress. I started with the boilers, coal fired for me and gas for Henry, then sand domes and that was about as far as it got before Henry passed away. Henry's laser cuts and castings, along with the boiler I had made for it eventually ended up with Simon Collier who used it to build an attractive Eric to the published design.

After Henry's passing there was not much motivation to



Pistons and cylinders

continue and certainly no rush. Interest waned and the project was shelved.

At some point I visited the Illawarra Light Railway museum at Albion Park where the full size Kiama Fowler resides. This awoke the interest again and I took lots of photos of it but when I got home and started planning the next steps I became fixated on the valve gear. The Fowler Walschaerts valve gear is unique in its appearance with the valve spindle directly over the piston rod, double combination levers and a very short stubby expansion link. The model design had none of these features so I set about trying to work out how these elements could be incorporated. I concluded it would

Valve gear sub-assembly.



entail a full redesign of the gear and cylinders and the laser cut rod profiles I had purchased could not be used. This seemed a bit of a waste.

Looking through other pictures I had taken on that day of the other locos I realized that the Perry locomotive had valve gear that was actually very close in appearance to the Eric design. I found a General Arrangement drawing of an 0-4-2 Perry in Light Railways Magazine, issue 141 June 1998, and this confirmed that it was close enough that the Eric design could be used as an acceptable basis for a Perry, the few bits I had made - boiler, wheels and smokebox - along with the laser cut profiles for rods - could all be used. With this bit of motivation, new frames were designed and laser cut, and the distinctive 'PERRY' smokebox door was made while etching some other plates.



Top of tank detailing showing sanding gear and stones turbo generator.

That is as far as it got before distraction intervened and other projects took my fancy. However, in the intervening years I did make some components such as frame stays, axles, cranks, crankpins and cylinders when making similar items for other locos. These all went into the box of bits.

While rebuilding the gas fired 'Retta' - described previously - my frustrations with trying to get the gas burner performing made me briefly toy with the idea of making a coal fired boiler for it. I dug the Perry bits out to use that boiler as a gauge, and on doing this realised that I had about half a loco there! This time the box didn't go away and the components I had made so far were assembled.

Editorial

Since our last Newsletter we had another 51 days of Covid-19 lockdown. The restrictions were more onerous for some than others depending on the Local Government Area we were living in. Some of us had a travel limit of 5kms to contend with. Again, for the second year in a row, we must thank Mick and the rest of the Executive for the work that they have done in keeping us updated with the changes in rules we have had to abide by especially once things started to ease and approach "normal" again. And to complicate matters the rules were changing every day or so.

Some members have been able to make good use of their time in their workshops and we can look forward to seeing some new locomotives on our tracks for the first time very soon.

I would like to take this opportunity to wish all SLSLS members and friends a very happy Christmas and a safe and happy New Year. We all hope that 2022 will see a return to the sort of life style that we have always taken for granted. I suppose we will still have to follow the rules set by the government and do our best to stay safe.

John Lyons



Return cranks take 2!

Once I had started, from that point things seemed to go very quickly. The drawing from light railways was photocopied up to 16mm/foot scale and measurements taken directly off the drawing. Because of lockdown, most other 'everyday life' activities were cancelled. Working from home saved a couple of hours in travel each day too, much of this time spent in the workshop instead. Heavily relying on the published design for guidance also made things very quick with most of the thinking already done. While the design is primarily for a gas fired loco, I must say the design really is very good. Most of the alterations I made to suit my own preference, as a result of coal firing or 'squash' things into a Perry instead of a Fowler shape!

There is really only 3 places where I thought the design could be improved. The position of the motion bracket is not clear, the return crank is too short to get the stated valve travel and the weighshaft at top of the link collides with the tanks, meaning full gear is not possible.

This last one is relatively well known and the general solution seems to be either put a cutout in the tanks or not to worry about it too much! This is okay if you mostly want to travel in forward, and if forward gear is set up with link down. However neither of those were acceptable to me! I am not quite sure where the idea that 'link down = forward gear' comes from. It seems to be the most common arrangement for mainline locos (but not universal) however for smaller locos it seems to be the opposite - link up for forwards is far more common. Certainly this was true of Fowlers and Perrys. The arrangement of weighshaft and lifting levers was altered to fit in behind the tank, to allow full gear with link up. The tanks, cab and other details were mostly made of brass and stainless. The side tanks only hold about 140ml of water, as the bottom of the tanks is recessed to allow

H wagon ready for paint



for pipework, filters to be fitted and reach rod, etc to pass underneath. The handbrake stand is the bypass valve. The cab also houses the displacement lubricator, water gauge, regulator and blower valves. The headlights front on rear are fitted with grain-of-wheat globes for night time running (unlikely!) There is a Goodall valve under the front sand dome. The boiler is Briggs style with 7 x 5/16" tubes. The water gauge is glandless, clamped between silicone washers top and bottom. The lower attachment, onto the lower portion of the barrel ahead of the dry firebox, is fitted with a blowdown valve. The grate is 1mm stainless plate drilled with 3.2mm holes on 8mm centres for 12.5% air.

Painting was all done with Rustguard spray cans. The general rule for cane locos is that no two adjacent components can be the same colour! Lockdown still was in force by the time the loco was completed so attention was turned to making an open wagon to act as a tender. This was made primarily from paddle pop sticks and other bits and pieces that had been accumulated over the years.

Finally lockdown lifted and we were able to take it up to the Cripple Creek Tramway for its first steam up. Opening the regulator, after a couple of revolutions to clear the condensate, away it went. The tanks required fairly frequent replenishing, but performance was quite amazing. 2.5 hours later, steaming was dulled by clinker and accumulated rocks in the firebox. Very satisfied, the grate was dropped and the loco passed for regular traffic.

Steam trials at Cripple Creek.



Here are some views taken by John Lyons of the vegetation taking over the grounds during lockdown. The lower picture shows what can be achieved after two solid working days to clear things up in time for the Small Gauge Festival.



for the next stage of the elevated track renewal. Bill P and John L completed these by the end of October. John L bought back to the grounds an expansion joint that he had taken home to assemble. He has since cut and prepared the rails ready for welding the track sections to complete the remaining two expansion joints.

The railing for the rebuilt toilet steps have been fitted by Mick, Scott and Ian T ready for the Small Gauge Festival at the beginning of November. Martin D and Sheila have tended the club house garden and Martin has been busy spraying to keep the weeds under control.

The biggest job to tackle was to get the grounds back into good shape. While John H had kept the grass under control there was a lot of cleaning up to be done around the edges, raking up leaves and mulching the many branches that had come down. We were fortunate that for most of time we were in the winter season so growth

was limited.

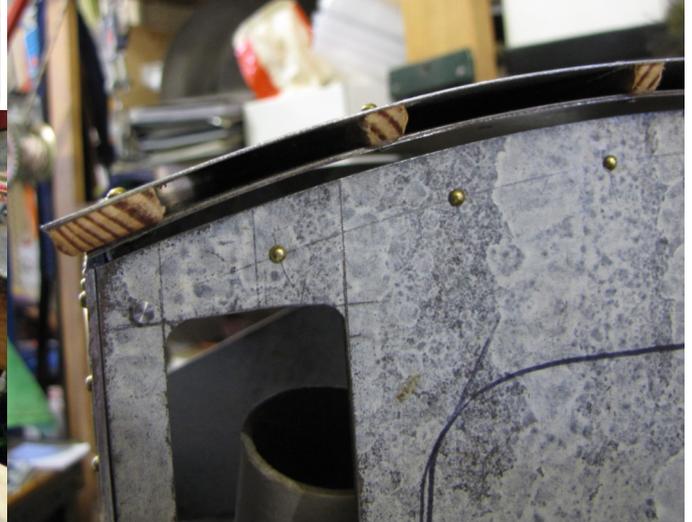
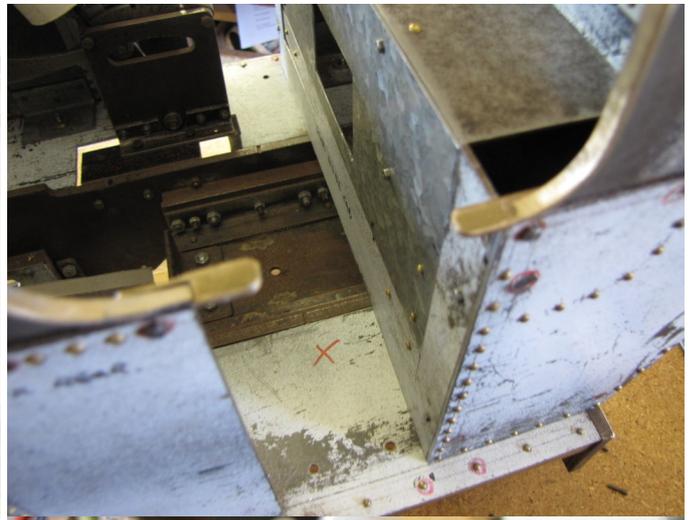
Around the Grounds!

Works Report.

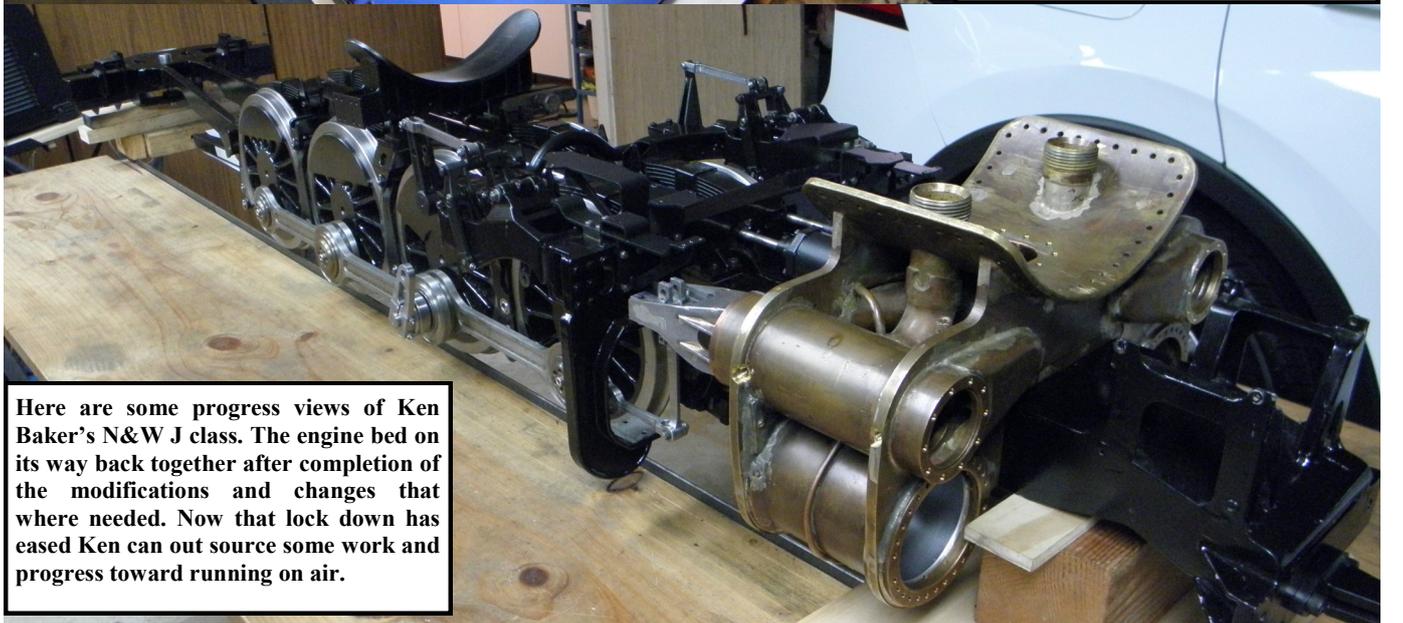
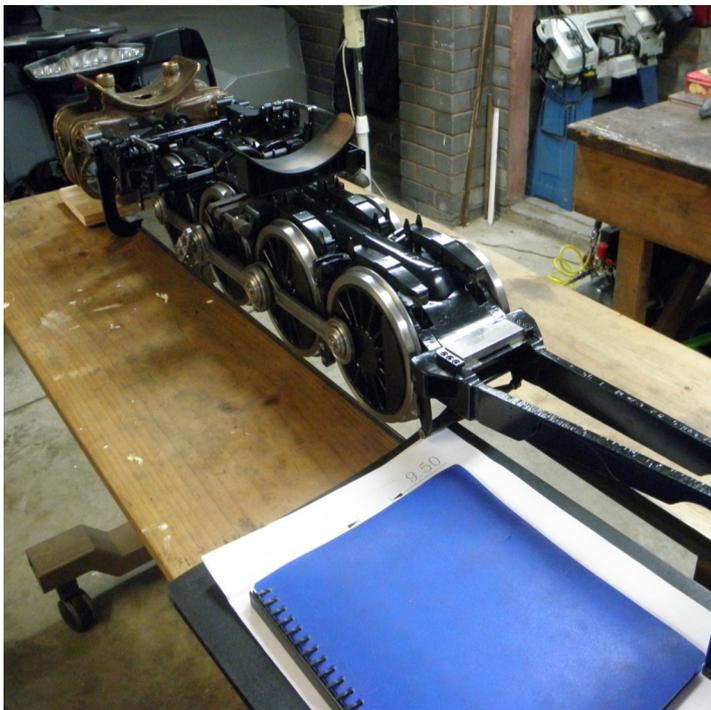
From the 26th June the lock down lasted 106 days, it certainly limited what we were able to manage. Fortunately some members were not in the severely restricted LGA's and could do some checking of the grounds. John H had six visits to the grounds to facilitate the connection of the NBN. With some of the visits the NBN technicians did not arrive so John ran the mower around the grounds to keep the grass under control. By the time you are reading this Newsletter it should all be connected as Mick, Scott and John have been busy sorting out the final connections, Once back at the grounds we had four more piers to pour

Diary

4 December	SLSLS Christmas Party
18 December	Public Running Day
31 December	New Years Eve Run (Friday)
15 January	Public Running Day
19 February	Public Running Day & next newsletter!
19 March	Public Running Day
15-18 April Easter	AALS Convention-Wagga Society of Model Engineers
16 April	Public Running Day



Above are 3 views of Johns Lyon's Avonside platework. This 0-8-2T was part of the Newcastle coal field's fleet and is indeed an unusual prototype. It should certainly be a good passenger hauler.
 More details of the prototype are here: <http://www.australiansteam.com/smr14.htm>



Here are some progress views of Ken Baker's N&W J class. The engine bed on its way back together after completion of the modifications and changes that where needed. Now that lock down has eased Ken can out source some work and progress toward running on air.

Christmas Shopping.

John Lyons.

At the present time there is much talk about shortages of goods or late delivery for the coming Christmas season due to problems with international shipping. It has reminded me of an incident in 1959.

I had completed the Leaving Certificate in 1959 and within a week I had landed a job at Hobbyco, 561 George St., Sydney on the model railway counter! What could be better? As you would expect the run up to Christmas had been very, very busy. The main train sets being sold were Hornby Dublo three rail, Triang and Marklin. The Marklin sets were in very short supply but there was a shipment due for early December. The shipment had arrived in the country, the office had all the paper work but somehow between the Darling Harbour wharves and the shop the shipment was "lost". It was considered at the time that a lot of water side workers may have had Marklin trains to play with on Christmas Day!

Move on to Christmas Eve at about 5.10pm, closing time 5.30pm, and a customer arrives wanting to purchase a train set! It was very easy to determine that he had consumed a few too many glasses of Christmas cheer before remembering what was required to complete his Christmas shopping. We did wonder how he managed to navigate his way down the stairs to the model railway department. There were no boxed sets of any brand left and so he was shown a Hornby catalogue and suggested what sets we could assemble. He settled on the 8F goods set and everyone on the railway counter got to work assembling what was needed, the track, a controller, the 8F 2-8-0 goods locomotive, a guards van and a set of goods wagons. It was all wrapped up as well as we could, he paid for it and left for home. We all hoped that he got home safely. That was the best example of last minute shopping I have ever encountered.

I worked at Hobbyco through my two years at Teachers College and for the week before Christmas for the first two years I was teaching!

Small Gauge Festival

Usually the SGF is held on the weekend before the Melbourne Cup. Now why is that one says? Well, it is because the Great Southern Steam Up is held on the weekend after the Melbourne Cup. We usually have attendees who wish to take in both events, and what better way is there to have a week of little trains! This year however, like last year, we have had lockdowns and borders were closed preventing any visitors from making their annual pilgrimage. With the lifting of lockdown being uncertain it was not clear whether the weekend could be held at all.

Eventually we reached 70% double vax, but the restrictions would still not permit a successful festival. The reaching of 80% made things possible, but alas there really was not adequate time to prepare for the previously set weekend. So as interstate travel was still restricted and there were no other events to conflict, the decision was taken to move it back a week to 6 & 7 November. This allowed us to have two weekends prior for preparation and indeed we needed every bit of that time.

The next difficulty was the weather! A period of rain for some weeks was being forecast!

Not much could be done about that (it rained somewhat last

year too) but to studiously exam the long range forecasts. As the day got closer it seemed the Saturday was going to be the best of the days and that Sunday might get a bit wet in the afternoon. As that is a good driver to pack up, all seemed in order! In fact our attendees must have thought so too because Saturday registrations went from 30 to 60 in the final week despite the gloomy forecast. It certainly looked like everyone was expecting a good weekend!

Setup on the Friday was helped by John S, Garry B, David L and Wendy. Wendy gave the clubhouse kitchen a thorough clean, and vacuuming and it certainly looked better after a massive tidy up as well. John S mowed some of the more virulent weeds and with David did general tidying up. David L, myself and John S spent some time erecting banners and bunting to make the place look festive! Garry B erected his portable 45mm gauge track and entertained us with his Thomas and it's moving eyes.

Saturday was sunny with blue skies and ended up quite warm. Mick was greeting the arrivals and there were plenty of locos in evidence. The elevated loco was full and there were locos on display as well. The display was setup on tables outside to limit those entering the clubhouse. Inside the clubhouse was a Hornby clockwork set displayed by John H, some HO scale locos and train sets from Neal and some antique O gauge steamers from Dennis O'B. Also on display was a part built Fayette looking like a German Pacific and an enlarged Juliet. Ayesha was showing off, and the display was enhanced by visitors John Martin's K1 45mm Garratt and Geoff Wilhelm's Tich. There were a number of Ellies on display (including Warwick R's lovely chassis and milled nameplates) and other garden items. David Archibald (SSME) showed his 5 inch SRC wagon.

Ben from Bolton Scale Models and Barry from Bathurst and Orange arrived with a load of coal which now fills our coal shed. Ben distributed various items that had been ordered. A freebie table was popular and some items taken. In the kitchen we had Mandy, Hana, Wendy and Jo serving the covid safe morning teas and lunch. At lunch we had the very fortunate attendance of our very own gastronomical chef Ian T who cooked our sausages to perfection.

Locomotives running on Saturday were Heisler, Austere Ada (2.5 inch gauge), David C's Dyak (2.5 inch gauge), Climax, Max's 38, Rays P class, our only other club visiting loco Dennis' Juliet, Garry's 36, Beaver and Warwick R's Buffalo. There was certainly a lot of talk happening too! A number of new drivers tried out Beaver. The Heisler ran well until its lubricator drive came adrift and then a piston rod parted company with a crosshead. Warwick's Buffalo had some injector issues but were soon rectified.

Sunday was a bit gloomy and after setup we took the opportunity for a cup of tea while the light drizzle emptied itself out which it soon did. First out was Britannia followed by the B2 and Garry's 36. These locos ran until lunch, or just after, with a number of drivers. Neal had his diesel out for a short run as well. The remaining sausages were cooked by Jo and Neal and morning and afternoon teas were provided



Preparation for the Small Gauge Festival occurred on the Friday before. Above here Wendy gives the clubhouse its first real clean in a long time.

Above right, David Lee takes to the heights to erect some bunting supervised by Garry Buttell, Right, David Lee and John Simpson relocate untidy leaf piles into the bin.

Below right: Warwick R shows off his finely CNC routed Ellie nameplate. His Ellie chassis just needs a boiler and body.



by Wendy and Hana. The sky looked a bit more gloomy and after a short shower it was decided to pack up, which was done successfully without any further rain to disrupt proceedings. We were locked up and away at about 3pm. Sunday saw 13 attend, including two members from Hornsby ME.

A BIG thank you to everyone who assisted in the weekend, including those gardening crews for the previous 2 weeks, the Friday set up, our entry supervisors, and most of all the ladies who provided for our sustenance and let us enjoy the day!

Centre Pages Photo Captions:

1. Dennis Coomer (BMRS) with his Juliet.
2. The Covid Safe luncheon queue.
3. Elevated loco was a scene of action.
4. Dennis' antique O gauge locos with Neal's HO collection.
5. Alas blurry, Mandy, Hana and Wendy serving lunch.
6. Britannia ran on Sunday.
7. Andrew driving the Heisler.
8. James P driving Beaver.
9. David Archibald's SRC van.
10. James Sanders at speed with the B2 Royal Sovereign.
11. Ray Lee and his P class.
12. Beaver this time with Trevor Oatley driving.
13. Beaver was popular with Harrison learning the road.
14. Warwick R with his Buffalo (beavers cousin).
15. Garry Buttell's 36 class was the noisiest loco present!
16. Britannia's injector gets close attention.
17. David Judex puts the Brit through its paces.
18. Garrys 45 mm layout had some protection from showers.



Small Gauge



ge Festival!



Chris Denton on Bruce's Bits

Part 1 – The Big Picture

You may be familiar with my flirtation with a model traction engine named Bruce which will, in time, take his place among the other treasured possessions of SLSLS members. Bruce will be loosely based on a J.I. Case 80HP Steam Tractor as advertised in Case's 1916 catalogue. I took a shine to the Case tractors as they are big, bold and simple (so I thought). I also thought the Case models would be well documented.

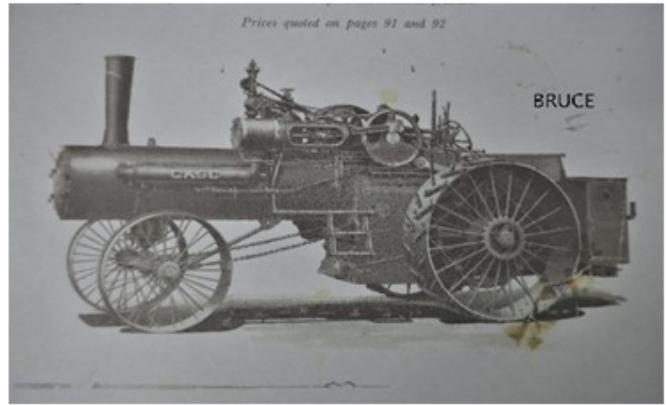
I used the term "loosely based" as I am not confident I can replicate the original to the satisfaction of discerning and critical eyes. So I am establishing, up-front, my excuse for expected deviations, indiscretions, interpretations and mistakes. However, Bruce should be easily identified as a Case. The catalogue price for the base Case 80HP was US\$2,350.00. It is likely that Bruce's material costs alone will exceed this amount, but that's how inflation works.

As far as documentation goes, I have been a little disappointed. There is information about but not in the quantity/quality that I anticipated. Maybe just not that much was freely documented back in the early 1900s? We oldies know only too well when the web and electronic media were barely even pipe dreams.

I have chosen to stay with binary gender identifiers i.e. he, him, etc. This may displease some more enlightened members of the community. However, Case tractors can never be seen as other than having both X and Y chromosomes, with the Ys in abundance. Rustic or ugly, take your pick but not pretty, unlike many English traction engines.

I have chosen the model and scale based on a desired outcome, i.e. an engine big enough to be "useful" but small enough to be transportable without a trailer and/or alterations to my vehicle. That equates to approx. 600-700mm long. Playing around with Case's published dimensions the 80HP fits the bill at 1.25 scale (1.25" to 1 foot). Decision made, probably the quickest but maybe not the most enlightened thus far.

Materials were an early issue. I decided to stay with traditional materials available at the time i.e. steel (shafts, gears, wheels, fixtures, etc.), cast iron (cylinder, miscellaneous bits), brass (fittings and miscellaneous bits), copper (boiler



and tubing) and bronze (boiler and miscellaneous bits). I plan to avoid plastics and aluminium but some stainless steel for specialist pieces may be used (boiler fixtures, grate, ashpan, etc.). The material for the boiler left me in a quandary. Copper is relatively easy to form and corrosion resistant but steel is much cheaper, stronger and more rigid. Strength/rigidity is an issue as the boiler is the main structural element supporting all static and dynamic loads. Never-the-less I decided to go for copper and the design would have to be clever and conservative – conservative is OK but I'm not sure that I do clever very well.

All source dimensions are in imperial but will have to be converted to metric to suit my (too few) measuring instruments, tools and machinery. All bolts, threads etc will be imperial – probably another dubious choice but it is in keeping with a by-gone era.

Commitment time is now well behind me. I have stuck my hand deep into my pocket and purchased a collection of materials, as shown in the attached photo (Photo 1) to get me going. No doubt there will be much more to come. Its all go from now on.

In the following "Bruce's Bits" parts I will relate some of my trials, tribulations and hopefully triumphs in making Bruce a reality. Experienced modellers are not likely to learn much but memories of their learning years may be stirred. Novices will probably be put off for life.

Learning from this episode – do more research, its easier to see where you are going when your eyes are open.

Part 2a – Bruce's Big Heart – steam cylinder

Bruce's heart is the steam cylinder – where all, or more correctly some ... come to think of it, a small amount of the thermal energy liberated from the coal, is converted to mechanical work. Unfortunately what is not converted will be another driver for Climate Change. But I have a cunning plan to offset that with carbon capture via my Bonsai collection.

The basic cylinder dimensions of a Case 80HP engine are 11"x11", which scales to about 28.5mm x 28.5mm, or an appropriate fit for 1 1/8" piston rings, give or take. After a rudimentary preliminary drawing and a quick trip to my nearest steel merchant I was in possession of a length of 55mm dia CI round rod and ready to rip.

My first effort looked OK but after boring out the cylinder I realised I did not allow enough "meat" for the steam chest. Hmmmm. Back to the drawing board.

In my second effort I allowed plenty for the steam chest and turned down a short distance each end of the cylinder to





provide a reference point and gripping surface – clever me. Unfortunately when I did a few more calculations I realised I needed the full length of the cylinder for the steam chest so the part I machined off made it too short. Hmmm again. I am pretty good at rectifying mistakes as I have had a fair bit of practice at it. I soon found out how obstinate cast iron is to attachment of other “bits” so this position was irredeemable.

By the third attempt I had it off pat – I was getting pretty good at this but there was an alarming amount of shavings in the tray of the lathe.

A photo of my collection of steam cylinders is attached (Photo 1).

The blank was finally machined correctly. But this was not the end of the task. Now came boring, drilling and tapping. Boring for the cylinder was straightforward and, for me, disaster free – after all it was my third attempt. It was bored for 1 1/8” piston rings and finished off with a honing tool.

In all, a total of 31 more holes had to be drilled or drilled and tapped. Now as simple as drilling sounds, I have never mastered the challenge of getting correctly dimensioned holes in the exact position they are meant to be. I started with the easiest holes, those for the far end cover.

The end cover was turned from a short piece of leftover

bronze bar. The first attempt resulted in a cover thinner than I intended once I shaped the aesthetically pleasing recess. I could have used it but in this early stage I was resolved to get things right so it was relocated into my ice-cream container full of failed parts. Even though I now had an even shorter piece of bronze to work with I re-made the cover, drilled the six holes for the cover bolts, located it on the cylinder and drilled the first tapping hole in the cylinder and stood back to admire progress. To my horror I noted that the next tapping hole was going through the

cylinder drain plug location. The six bolt arrangement was fine for my vertical engine but not so for the horizontal cylinder that required the drain holes at the bottom of the cylinder. I could not just rotate a six-hole cover because an orientation that suited the drain ports compromised the transfer ports. What to do?

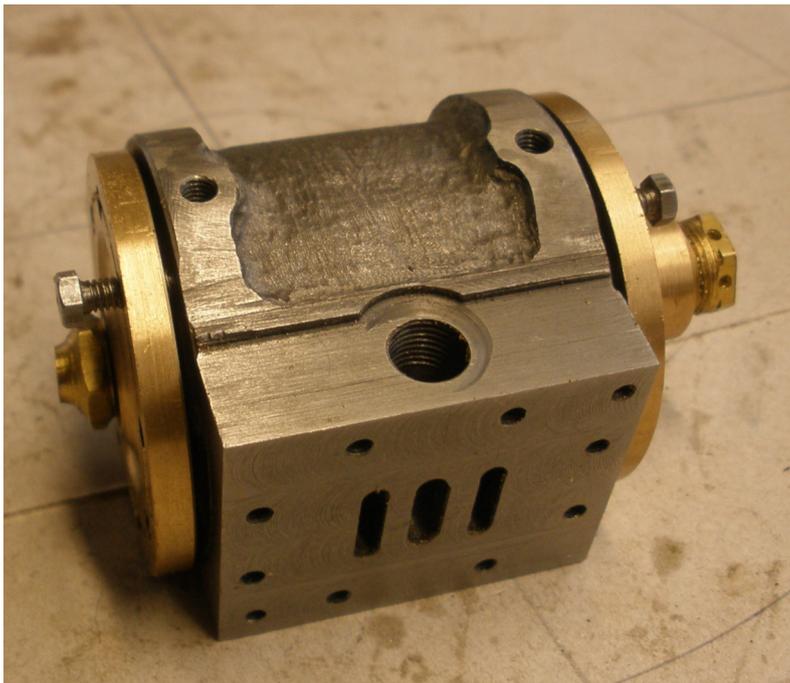
The options were limited. Finally I resolved to abandon the hole already drilled in the cylinder and re-make the end cover (again) and opt for an eight bolt arrangement. Unfortunately the new arrangement meant that one of the new holes intersected the abandoned hole - did I ever really expect it to be otherwise! The hole had to be plugged, re-drilled and tapped. Equally unfortunately, the only remaining material for the end cover already had a hole bored its length. It occurred to me I could tap the hole, make and fit a plug and say it was always intended for inspection access! On the third attempt all the holes were drilled and tapped. I call it a win even if the cover will only fit in one orientation.

The near end cover was more complicated as it contained the piston rod gland but as it was a simple screw down arrangement it proceeded surprisingly well. Viton ‘O’ rings are being used as gland packing.

To form the flanges at the ends of the cylinders there had to be large scale removal of surplus material. This was a bit tedious as I do not have indexing equipment. I made up a wooden mandrel and mounted it in the cylinder bore. The mandrel was longer than the cylinder and the bits that stuck out were located in an aluminium plate at each end. The whole lot was clamped in the vice with the cylinder effectively clamped between the plates. The mandrel took no load. I could then run an end mill lengthways leaving a bit for the flanges at each end. The cylinder was then indexed around by hand and the milling repeated, and repeated, and repeated.... until the desired shape was achieved. The fillet between the flanges and the cylinder wall was achieved with a round nose end mill. The mill lines were taken out with a file and finished off with a burr in a Dremel to give a sand cast texture.

And so I now have a cylinder fitted with end covers as shown in the attached photo. There is more to work on the cylinder to come but that is for another discussion.

Learning from this episode – buy significantly more material than you think you need.

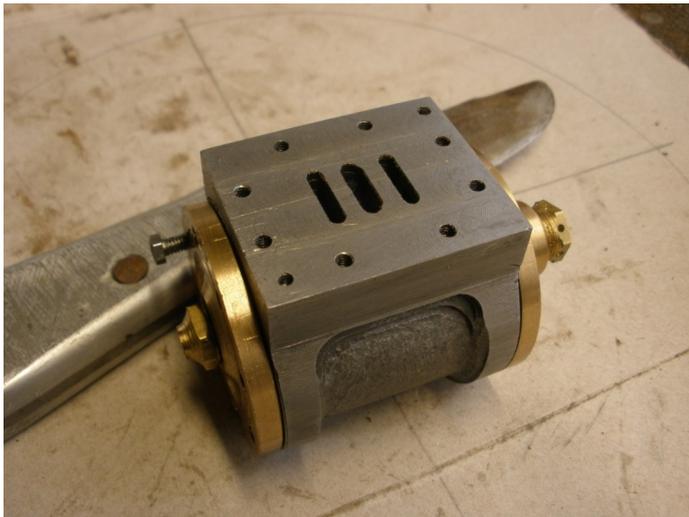


Part 2b – Bruce’s Big Heart – steam cylinder valve chest

Further to Part 2a, it was now time to turn my attention to the other critical part of Bruce’s big heart, its valving.

A conventional slide valve will be used and as discussed earlier the valve chest seems to require the full length of the cylinder – much longer than on the full sized engine but that’s the downside of not being able to do everything to scale.

I used a reprint of a text published in the late 1800’s(?) for sizing the ports. I assume nothing much has changed since then. Anyway, the porting gave pretty much the same size and shapes as used on my vertical engine that is of similar dimensions. Come to think of it that design probably came from the same era. It occurred to me that



port arrangements are pretty “standard” and the real performance differences is a function of the linkages. Bruce will have Woolf (sometimes spelt Woolfe?) actuation gear that will be a nightmare to sort out but that is not the issue at the present. The attached photo shows the porting (Photo 1).

The steam chest was cut from what remained of the CI round purchased for the cylinders – lots more swarf in the

drill/mill tray. Just as well CI is relatively cheap and I over-ordered because there was just enough left after the multiple cylinder attempts. The valve cover was made from left-over bronze round bar with stiffening ribs silver soldered on. The CI bar was just a gnats whisker smaller in diameter than ideal. So that explains why I do not have sharp corners on the valve cover!

Drilling and tapping the bolt holes was thankfully without incident. I used the bolt holes in the cover as a template for the other holes. Keen observers will note two larger extra holes on the diagonals. They are for countersunk screws to retain the valve chest in place if the cover is removed for whatever reason. The really keen will have seen I did the same thing in the near end cylinder cover so the piston etc. can be removed/replaced/maintained as one assembly.

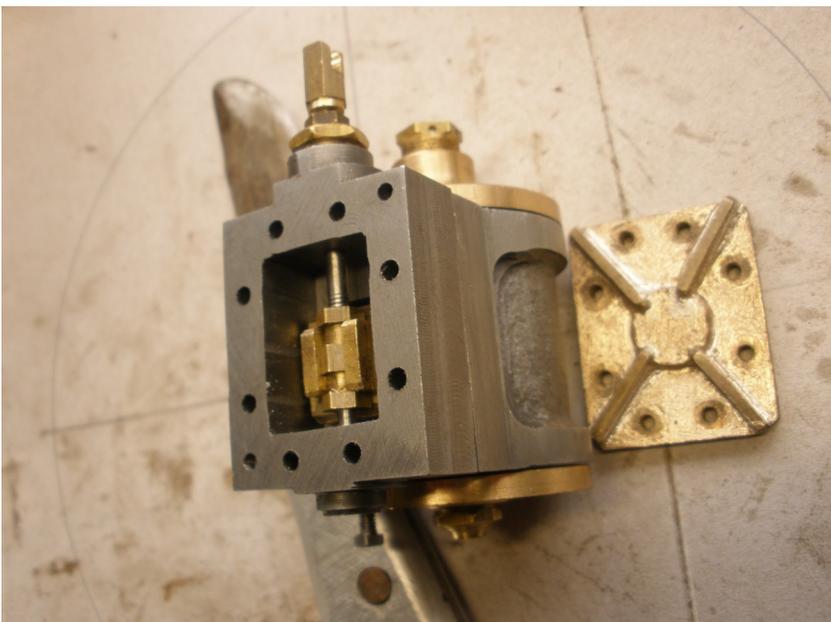
The slide valve spindle is made from 1/8” SS. I was surprised to find 1/8” BSW dies seem to be hard to come by. The web and a BA equivalent are always alternatives but I thought BSW stuff was still plentiful. Maybe it’s the small size that is the problem. The spindle goes into the far end of the valve body but ONLY JUST when the valve is moved to the nearside end. I am contemplating installing a bushing and lengthening the shaft to add more support and eliminating the possibility that it could drop out with fairly disastrous consequences – making a new shaft, re-drilling and tapping the hole, lining up the bush etc. etc. - what could possibly go wrong? Leaving well enough alone is only for the sane.

The slide valve itself was made from brass and here my good run ended. The only brass stock I had was insufficient for the length of the valve – by a tiny amount, or that is the story I am sticking to. I may have cut it too short. Never-the-less after all the effort that went into shaping the valve, I decided it was not going to be scrapped so I silver soldered “extensions” to the each end of the valve opened up the opening on the underside of the valve and re-dressed the sealing faces. Looks better than before but it was probably quicker and more straightforward to make a new part. After all, its always easier the second time around.

What was that saying about leaving well enough alone again?

Before the cynics go into print, the sealing faces still have to be dressed – I figure I have plenty of opportunity to butcher a finely finished face between now and final assembly so I will do it just before its assembled. The attached photo (Photo 2) shows the valve arrangement and the cover in the background. Note the finish on the cover – its done with a burr in a Dremel and is supposed to imitate a sand cast finish. It looks better when it is not so shiny. It’s a mindless job to do when you are waiting for materials or parts. And it does not cost anything. The finish looks good on the cylinder body and will improve on this element when it tarnishes.

Learning from this episode – I need to develop my skill drilling a hole of the intended size, shape and depth, at its exact location.



The Smallest Injector?

Andrew Allison

When there seemed to be a contagious desire to make injectors a year or so ago, I focused on the smaller sizes. The commercial injectors available are all too big for 2.5" and 3.5" gauge locos, with 5/16" x 32 fittings. They are not just huge in delivery but it can be impossible to find space to fit them.

After making a batch of 18oz injectors to Eric Rowbottom's #70 design (as described by Basil Palmer, *Miniature Live Steam Injectors*, Model Engineer, 7th -21st May 1976) I then went about designing and making my own smaller injectors.

These had a shorter body and 1/4" x 40 fittings, much more suitable for fitting to smaller locos.

I made a batch of 14oz, then some 12 oz, but while I was making a few 10oz it occurred to me I really didn't know



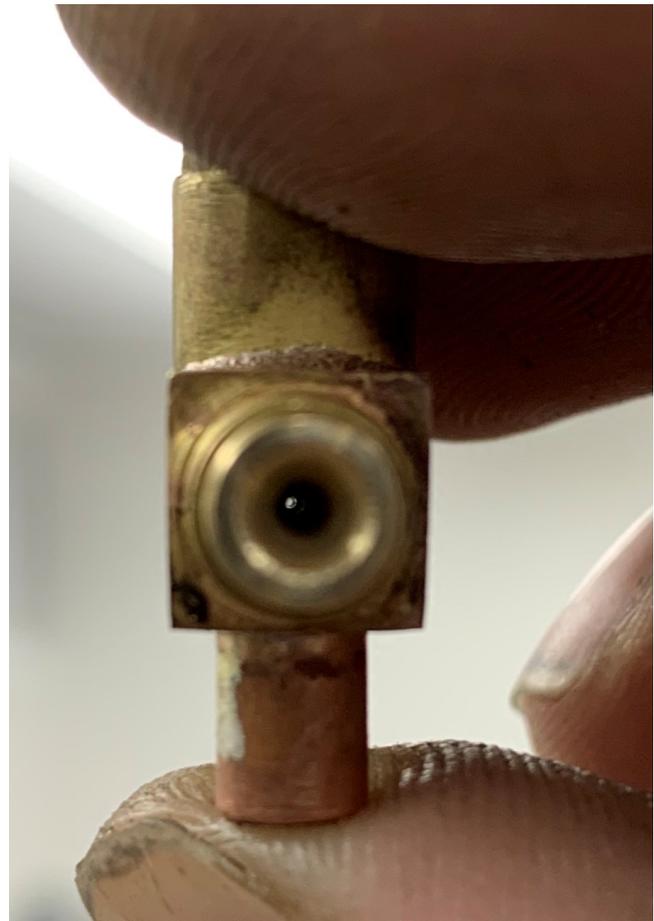
why I was doing this anymore! I had no particular use for these, and really, anything under 18oz is quite sensitive to scale, fur and grit and reliability in 'real world' operation is reduced. Instead I was enjoying the challenge of making these tiny devices and having them work. So I decided if I was going to make something that was of no practical use, why not go straight to the limit make an injector the smallest I could? One of the bodies I had made for the 10oz batch was set aside for this purpose.

Now C.M. Keiller had published an article called *The Mininjector* – (ME, 14th January 1943). In which he described the development and presented a design for a 4oz/min injector with a #80 delivery cone throat. A design was also given in D.A.G. Brown's book, *Miniature Injectors Inside and Out* – (Tee Publishing, 2011). So it seemed that the smallest injector with a published design was a 4oz/minute with a #80 delivery cone throat. This is understandable as #80 is typically the smallest size in the classic set of tiny drills.

When I started injector making I had found getting high quality small number drills for making injectors was a

challenge and eventually I stumbled onto some tungsten carbide metric drills sold as 'PCB drills'. These were relatively cheap, very, very delicate but drilled a beautiful accurate hole compared to the normal twist drills. Also to their advantage, they come with a 1/8" shank so easy to hold accurately in a chuck. They are sold in sets, and the smallest drill in the sets I had was 0.3mm, minutely under #83 drill size or 0.012". So this became the figure the rest of the injector would be designed around. This equates to a theoretical delivery of ~3.5oz/minute, smaller than any published design I was aware of!

Working back from this size the combining cone needed a throat of 0.35mm and the steam cone a throat of 0.45mm. The annular gap was just 0.002". Fitting into the body I had already made for the larger 10oz injector was something of a compromise. The location of the ball valve dictated the position of the combining cones, with the steam and delivery cones much longer than normal to fill the excess space. The overflow from the ball valve was halfway down the delivery cone, rather than usual at the junction of the combining cone and delivery cone, so the delivery cone was machined smaller in diameter than usual to provide a passage for the overflow around it. Really, I should have miniaturized the body as well. Fitting it to the existing body was challenging and making a smaller body would have been simple! On the positive side, the longer steam cone does mean more water contact area so maximum ability to condense the steam, and a standard length with my





other small injectors meant it fitted the existing test plumbing.

The main challenge in construction was that the long steam and delivery cones were longer than the tiny drills, meaning the cones had to be drilled from both sides and hope the tiny holes lined up in the middle! This is a good way of breaking these tiny drills.

But on this occasion it all went okay. Apart from that, construction was not really any more arduous or different than any other injector. One of the

methods I am a disciple of is taper reamers ground from old hacksaw blades and fed in by hand, as described in Ted Crawford's booklet the model injector published by AME. They take minutes to make and I think can provide a superior finish than other methods, once you get the feel for using them. I also hand scrape all bell mouths and radii by eye. However despite how good a finish you can achieve, surface finish does not scale. Would this be the limiting factor?

Fitted to the test boiler, with some trepidation I held a cup of water below the injector and opened the steam valve. Excitingly it lifted the water, picked up and started feeding. Interrupting the water flow showed the injector could automatically restart. Pretty good, but a constant dribble out the overflow though showed not everything was as efficient as it should be. Throttling the water did not reduce the overflow – meaning the annular gap was not excessive. The issue was elsewhere. After playing around with it and filling the boiler a few times, The usual checks were done and all okay, making sure it was clean, the cones were of debris and appeared concentric when held up to the light.

The next week was spent pondering what may be wrong. As the injector was lifting, starting, restarting, and feeding, and throttling the water did not reduce the overflow, it was clear that the first half of the injector was doing everything it needed to do. The vacuum was being formed, the ball valve opening and seating, the steam condensed, and the annular gap was not excessive. I came to the conclusion that the delivery cone was too far from the combining cone. The stream issuing from the combining cone was becoming divergent before it had reached the delivery cone throat, causing some of the stream to be lost out the overflow.

I machined a few thou off the inside flange of the delivery cone so it pushed in further and tried it out. The constant dribble had now reduced to a constant drip – we were heading in the right direction! With the loco in steam, the flange was reduced, thou at a time, tested... even better... maybe a little more... better still... until whoops! The delivery cone now was touching the combining cone! A ring of fine fuse wire packed the delivery cone out slightly to correct this - the injector tested, it was now just an occasional drip out. As it was getting dark, I called it a success and left in there, but I think a cut across the front of the delivery cone bell mouth to allow it to be inserted just another two thou would have made it completely drip free.

All in all, a practically useless item but quite a satisfying and amazing how well something so tiny could work. I have no doubt that smaller would be possible and it does not appear we are at the limits with respect to surface finish limiting the performance. These PCB drills seem to be available down to 0.1mm diameter... hmmm... now that would be a challenge! Maybe for someone else!

Firehole Rings

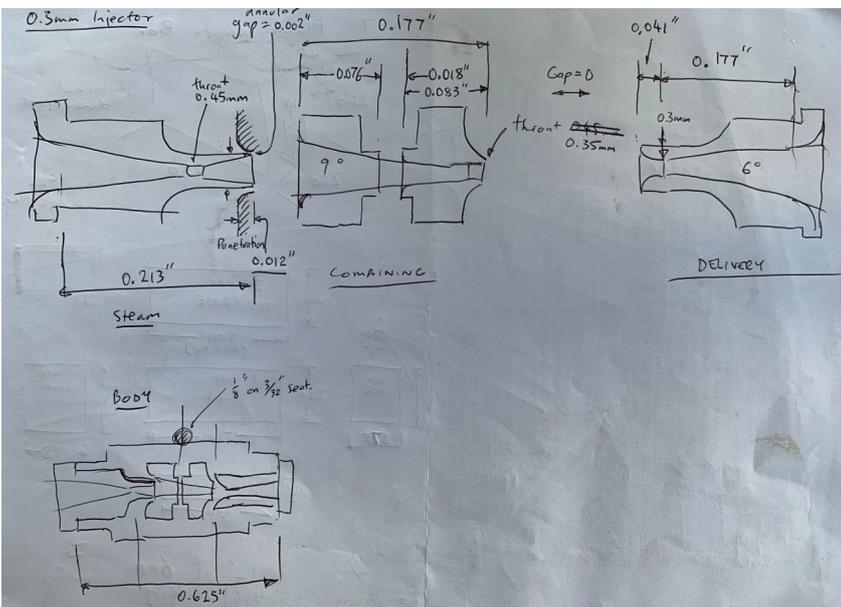
Warwick Allison

Very little has changed with the design for firehole rings over the years. Greenly usually showed a ring that was rivetted between the firebox backplate and backhead, a not especially simple task. If not that then the two plates were flanged inwards and rivetted.

Kozo uses a simple tube pushed through holes in the two plates and silver soldered. This would require a reasonably good fit between the tube and hole for silver brazing.

It was LBSC who advocated the 'Briggs' fire-hole ring.

This was a thick walled copper tube which had a step machined on both sides so that it fitted through the holes in the plates with a thicker section between the plates themselves and then slightly rivetted over to secure it before silver brazing. This arrangement met with favour and is universally applied in LBSC, Martin Evans, Don Young, and other designs. Its advantages being that it was sim-





ple to install, tolerant of some mismatch between the hole shape and the ring shape, and very strong. The strength

benefit is somewhat hard to quantify, but with a large lump of coal being virtually hammered to fit through a firehole that is too small, one can appreciate it is not an area to short change. It also ensures the two plates are held parallel during assembly. Interestingly the AMBSC code is silent on firehole rings, so they would appear to not be a problem area.

For 2½ and 3½ inch gauge locomotives, it was a good solution as the tube sizes were small. However the main difficulty with it is in acquiring some suitable thick walled tube (10g or thicker). Given that each boiler would only need less than an inch, it is not likely something one obtains in any quantity. As well it is likely that the next loco you build will want a different size! Thick wall tube is hard to come by in the larger diameters too.

Some builders have resorted to using rings turned from LG2 bronze bar. If the ring is round this is a reasonable solution, apart from the cost of large diameter bronze and the copious amount of expensive swarf it produces (unless you are lucky enough to get a hollow piece the correct size). Squeezing a LG2 ring into an oval shape can be difficult. Some have done it but the risk of cracking is high if carried too far. Its not like copper.

For many years now I have been making custom firehole rings out of two strips of copper. I don't know where the design came from, but I got it from John Campbell in SLSV. The inner ring is wide enough to go through both plates plus the gap between the plates. The outer ring fits between the plates. They are simple enough to make and often make use of copper offcuts from boiler making.

The inner ring can be virtually any thickness, but remember the thicker it is the smaller the ultimate firehole! 1.6mm to 2mm is fine. This piece is bent around suitable pipe etc to the required shape and the ends then bronze brazed together. The outer ring is made the same width as the water space. Again most plate widths are OK but I suggest 2.5 or 3 mm is

ideal. This is placed central to the inner ring and rivetted to it with a copper rivet. Wrap the ring around the inner, cutting to a suitable length to butt against the start, then rivet it to keep it in place. If the ends don't quite meet, I don't think it matters. It can be filled with bronze. If the outer ring can slip a bit sideways, put a copper rivet in the other side to teach it manners.

Now the whole assembly is tobin bronze brazed. I like tobin bronze because it flows very easily once a bright red temperature is reached, and being rather small, most brazing equipment will be able to do the job. It is also much (much!) cheaper than silver brazing! The use of tobin bronze in making assemblies guarantees that in future silver brazing of the assemblies, you will not have to suffer any risk of the joints softening or moving. However if you prefer silver brazing, I am sure it will work fine on this component. Don't overdue the brazing because you want it to fit well up against the plates. If you end up with significant fillets, you will have to file them back! After brazing you can file off the remains of the rivets that may be protruding inside and outside the ring. And there you have a fabricated ring. This construction offers another possibility too. If the inner plate is made to protrude out of the backhead, it can be used to mount the fire door. Providing you are after a functional door rather than a prototype one the plate can be sloped with the lower portion protruding and a hinge fitted for a fall down type door. The arrangement does not jam with coal because the door is closed against a ring. Anything trapped is simply pushed into the firehole.

As well if the door is fitted with a tail below the hinge, it can be completely operated with the shovel. The shovel can lift it up and because it is inclined to the boiler, it stays shut of its own accord. To open it, the tail is pushed and it drops down!



Duty Roster.

- December:** Ross Bishop/ Neal Bates, Tony Eyre, Jo-Anne Topp, Ray Lee, Peter Wagner, Paul Taffa, John Tulloch, John Simpson, David Judex
- January:** Mick Murray, Andrew Allison, Mark Gibbons, Wayne Fletcher, Graeme Kirkby, John Noller, Ian Tomlinson, Glen Scott, Chris Denton, Warwick Reinhardt.
- February:** Evan Lister, Simon Collier, Garry Buttell, Barry Millner, Scott Murray, Graham Tindale, Paul Brotchie, Mike Dumble, Deven Shirke, Craig Deacon.
- March:** David Thomas. Bernard Courtenay, Greg Croudace. Stuart Larkin. David Lee. Brad Wilkinson. Geoff Hague. Martin Dewhurst, Ken Baker, David Coulshed.
- April:** 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 Jacarandas make an impressive sight at his time of the year.

Below: The final steam train of the Small Gauge Festival double heads back to loco. B2 'Royal Sovereign' leads Brit 'Shooting Star'.



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

Public Running Day is the **THIRD** Saturday in each month from 1.30pm. Entry is \$5 adults, \$2.50 children. Rides are \$2.50 each.

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