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IN THIS ISSUE

Vol. 227 No. 4675 8 - 21 October 2021

ON THE COVER...
Billy Stock wins the 2021 International Model Locomotive Efficiency Competition (photo: Tom Parham).

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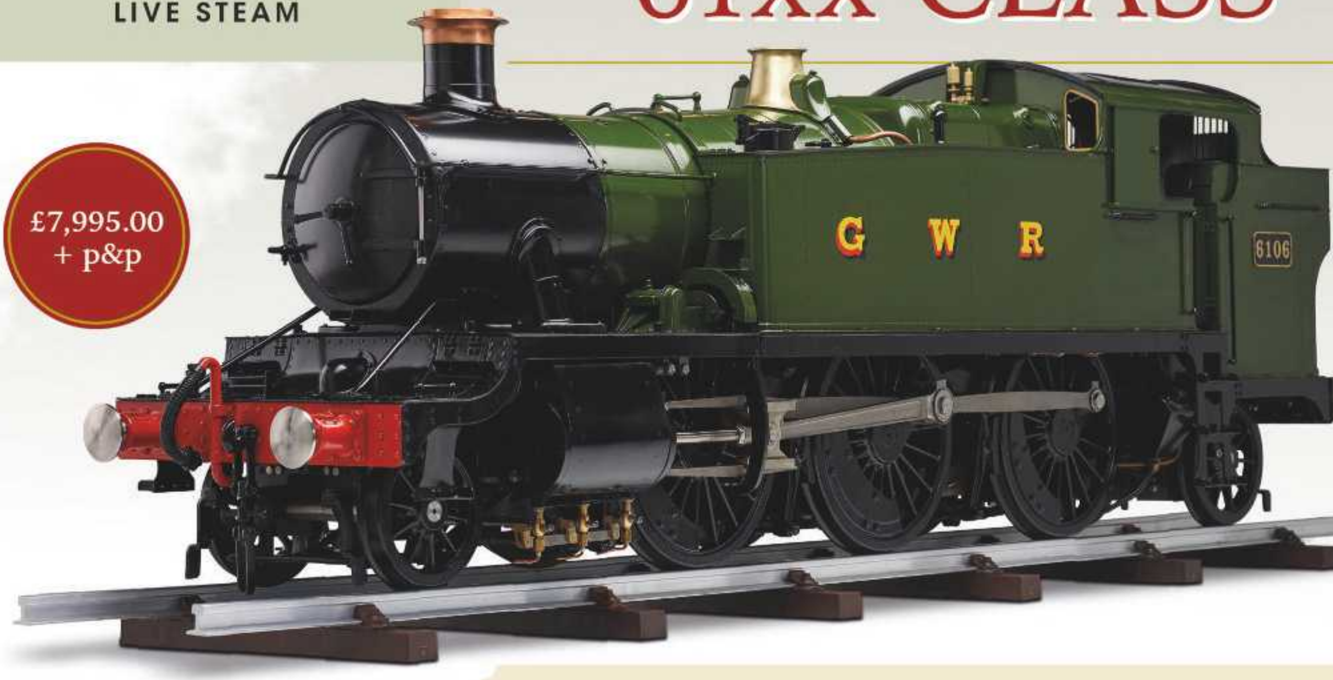

The GWR 61xx Class

The 61xx Class locomotives were, like many others, developed from earlier designs. The Class owes its beginnings to locomotive No.99 designed by Churchward in 1903.

The 61xx Class were almost identical to the earlier 51xx and later 81xx Class. They did however, have an increased boiler pressure which resulted in a greater tractive effort.

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Mike Pavie

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New Model Engineering Society for North Yorkshire

Just about every club and society over the last 18 months has been affected by the social restrictions placed upon us all during the Covid pandemic. So, it may come as a surprise that plans are being developed to establish a new model engineering society in North Yorkshire. with opportunities to have a working association with the Wensleydale Heritage Railway, that operates between Scruton in the Vale of Mowbray to Redmire, in the spectacular Yorkshire Dales.

Plans are currently at an early stage. However, these are already supported by access to land for the development of facilities, the ready availability of track to begin building a combined 5 and 7¼ inch gauge layout, access to meeting facilities and the logistical opportunities association with the Wensleydale Railway can bring.

Further potential opportunities for members will include options to become a Member of the Wensleydale Railway Association (Trust) Ltd. and the chance to volunteer at the Wensleydale Heritage Railway. Membership will also offer regular editions of the Wensleydale Railway's magazine *Relay* along with discounted travel on normal timetabled trains.

The society's founder, Cliff Almond, is no stranger to establishing new societies, having been the founding member of the very successful East Somerset Society of Model & Experimental Engineers and who was their first chairman. He has also held the honorary posts of secretary and committee member at two other societies.

The society will be known as the Wensleydale Model Engineering Society (WMES) and welcomes enquiries from anyone interested in any facet of model engineering.

Anyone interested in joining the society is invited to email Cliff Almond at **clifford.almond@gmail.com**

Can you identify this locomotive?

Another reader writes to say 'I live in Hobart, Tasmania and am trying to identify a 5 inch gauge 4-4-2 Atlantic live steam locomotive that is owned by the wife of a deceased friend. The locomotive was obtained sometime in the late 60's and has been stored unused in a dry environment since then; its prior history is unknown. It has been inaccessible from the mid-80s until recently as it was under a large model railway. It has not deteriorated and the motion readily moved when it was pushed on the carpeted floor.

'All round access and inspection is still difficult but it was recently viewed by a person who has some experience in these matters who suggested it may have been designed by Martin Evans.'

My first thought was that this could indeed be the Martin Evans *Waverley* design but this model differs in several details. Alternatively, I wondered if it could be a scaled up LBSC *Maisie*. Does anyone else have any thoughts?

Reawakening

Since the easing of covid restrictions in July I am pleased to observe that many events that we may have missed have managed to run this summer, often by being deferred from their usual 'slots' earlier in the year. We have had IMLEC, LittleLEC, the Sweet Pea Rally and the Rob Roy Rally. There have also been rallies at Andover, Reading and Gilling. We have already received reports from IMLEC and the Sweet Pea Rally and hope soon to bring you reports from some of the others. I think this shows that we are truly 'bouncing back' from the covid crisis and that the hobby is rapidly returning to normal, with 2022 promising to be a good year.

Speaking of which, the Northampton Society of Model Engineers are pleased to announce a new event for 2022. This will be the Bassett-Lowke Rally, to be held on Saturday 14th May 2022. As Bassett-Lowke were based in Northampton, the venue is an appropriate one to celebrate the products and designs of this famous company. If you are interested in Bassett-Lowke models you should put this into your diary now! I'll provide another reminder nearer the time. In the meantime, if you wish to register interest in bringing a model please contact the event organiser, Kevin West on **westkev58@gmail.com**

Pinnacle PCD 30 Mill

A reader has written to me as follows: 'Our Men's Club ('Mates') here in sunny Scarborough have been given a Pinnacle PCD 30 mill/drill and we would like an instruction manual/parts list for this machine. These machines were around in 1970/80 and might have been sold under a different name by sellers who might not be around now. Is anyone able to supply a copy of the instruction manual for this machine?'

Tom Parham reports from the first IMLEC since the start of the covid crisis, which was held at the Maidstone Model Engineering Society's track at Mote Park.

Continued from p.462
M.E. 4674, 24 September 2021

International Model Locomotive Efficiency Competition 2021 PART 2

Saturday Evening

Many more locomotives were seen to be running until late on Saturday - I believe 9 engines were steamed up for the evening play. So good to see and a great time was had by all. During this the degreasing wagon was still left behind one of the trains in order to maintain a consistent rail condition for the Sunday runners.

Run 19 – Dave Kerry

Dave Kerry opened up proceedings on Sunday with the early morning slot. He set off with his 9F which he built, with eight passengers. The locomotive handled this with ease and was soon lapping at a constant speed between 6 and 7mph. The first lap was a touch slower than the rest; it was noted by the observer that the boiler had initially been overfilled but subsequently there were no issues. The observer also noted that the driver finished extremely happy, really enjoying his run.

Run 20 – Paul Tomlinson

Paul Tomlinson followed with his 5-inch gauge Duchess which he has only recently completed re-building. Electing to take six passengers, Paul set off well until he had a couple of bogie derailments, which he quickly

Dave Kerry.

Paul Tomlinson.

Billy Stock.

David Mayall.

Judith Bellamy.

Ben Pavier.

rectified. It was otherwise an almost perfect run with little to comment on, until the 25-minute mark, at which point he was on his way back to the station to complete his turn... at which point the locomotive seized solid and had to retire, being lifted onto the trolley to be pushed back to the station.

Run 21 – Billy Stock

Slightly delayed in starting as a result of not knowing what was happening at the end of the previous run, Billy Stock followed with his highly modified Winson Britannia for only his second ever IMLEC entry. Billy quickly had his train consisting of seven passengers up to speed and stuck at the speed limit for the rest of the 32-minute run, receiving two speed warnings in the process. He managed the highest mileage of the weekend, in a rather impressive but uneventful run.

Run 22 – David Mayall

David Mayall set off next with his 15XX and six passengers. This locomotive has been run in IMLEC several times, with its best result being 2nd in 2017. Much like the preceding run, David was quickly up to the speed limit and stayed there, receiving two speed warnings during the run. David managed one fewer laps than Billy and made the run look easy with no issues to comment upon.

Run 23 – Judith Bellamy

Having had a few issues, and hence changing run slots with David, Judith Bellamy took to the track with the 5-inch gauge B1 built by her father over a 17-year period and recently renovated. She elected to take 3½ passengers and set off comfortably. Unfortunately, the rest of the lap did not go to plan, with a few stops and gradually unloading all passengers. Judith eventually retired at the end of her first lap.

Run 24 – Ben Pavier

Ben Pavier followed, causing a lot of interest and conversation over Kingscale, which is the basic origin of the Standard Class 4 tank that he was running. Ben stated for the programme that this example has seen a full strip down and considerable modification to suit the owners' preferences. He was quickly up to speed with his three passengers and, despite a speed warning as he started his second lap, the run was completed with nothing much more to note, other than a good solid performance.

Run 25 – John Cottam

John Cottam made the track look easy with his 5-inch gauge P2, pulling twelve passengers. A previous winner with this locomotive, John is well aware of what is required to perform well. John was quickly up to speed, sitting

John Cottam.

as close to the speed limit as he dared, exceeding it twice. Around half way through he had one slower lap but was soon back up to speed.

Run 26 – Alan Crossfield

Finishing off the weekend was Alan Crossfield with his stunning GWR Prairie. This impressive locomotive has been entered into the competition in the past when it achieved 3rd position. Alan was in steam early, almost at the same time as the previous run, and remained simmering on the steaming bays until ready to run. He set off rapidly with six passengers and was running well until a short pause at the top bend before continuing. Towards the end of the run another slightly longer stoppage at the top bend had a few of us worried that he may not finish in time but these thoughts proved to be a touch pessimistic as Alan finished in 32½ minutes.

Results (fig 1)

By Saturday evening we had already had all of the 3½ inch gauge locomotives run and so we were already aware of the best locomotive in this category. Unfortunately, the best 3½ was not in contention for any of the overall prizes. The best 3½ inch gauge prize went to Paul Tompkins with his Duchess *City of Chester* with an overall efficiency of 0.296%, 0.001% ahead of Danny's *Netta*. Paul was not able to attend on the Sunday, so his cheque for best 3½ inch gauge locomotive was posted to him.

There were a lot of strong locomotives running on the Sunday so the result was never certain until the final run. As it turned out, the top four finishing locomotives were all within the last six runs of the weekend, which kept the suspense until the end of the last run. Although it had been lovely to see Karl's *Apollo* at the top of the leader board at the close of play Friday, he was displaced half way through Saturday by Marcus's B1. This did not last long as Robert's 7F took the over-night lead into Sunday with an efficiency of 1.17%.

On Sunday much of the top of the table action took place, with Billy smashing Robert's previous best with an ultimately best figure of 2.24%, which gained him the trophy and top prize money. Not long after David put in the impressive performance with his 15XX which, although not really challenging Billy, was enough to take 2nd position. Not too long later David must have been nervous as John's performance with the P2 (which was always looking strong) ultimately proved enough for 3rd place, with an efficiency of 1.41%. When Alan finished off the day with his run, all eyes were on the scoreboard, as it did look like it could have mixed up the top three, although ultimately it proved enough for 4th place with an efficiency of 1.23%.

All competitors had been presented with a commemorative hat upon checking in and a certificate will be posted to all entrants once they have been printed.


Alan Crossfield.

The final prizes and the trophy were presented by Maidstone MES chairman Tom Parham.

Video

As many may have noticed throughout the weekend, there was a film crew on site. This was headed by a chap called Chris Eden-Green, who creates railway related films/DVD's. The recent content from him can be found on YouTube, if you search for 'Steam Locos In Profile'. Before long (at the time of writing) hopefully this video will have been edited and uploaded to YouTube and may be available to buy on DVD. Chris and his team could be seen chasing down any incidents with camera in

Fig 1 — **Results table.**

Run	Efficiency %	Driver	Locomotive	Club	Work Done ft.lbf	Time mins	Coal lb	Distance ft	Load
22	2.24	Billy Stock	BR Britannia	Urmston	420668	32.40	1.73	20576	7
24	1.61	David Mayall	GWR 1500/Speedy	Bracknell	277620	31.70	1.58	18738	6
26	1.41	John Cottam	LNER P2	Chesterfield	375551	32.56	2.45	18761	12
27	1.23	Alan Crossfield	GWR Prairie	Leyland	165307	32.30	1.23	11241	6
17	1.17	Robert Hurst	S&D 7F	Bracknell	232546	31.85	1.82	18526	6
14	1.13	Marcus Peel	B1 *Springbok*	Southport	191076	32.32	1.55	16605	7
3	1.00	Andy Healey	BR Britannia	Gravesend	284477	33.08	2.60	19059	8
20	0.86	Dave Kerry	BR 9F *Evening Star*	Chesterfield	242725	32.55	2.58	16732	8
10	0.77	Roger Holland	LNER A4	Chesterfield	246694	33.25	2.94	16685	8
15	0.73	Geoff Moore	LNER P1	South Holland	155108	34.38	1.95	9274	10
16	0.62	Nick Taylor	WD 2-10-0 Austerity	Maidstone	94580	31.56	1.39	5717	16
25	0.56	Ben Pavier	BR Std 4 Tank	Southport	138835	28.50	2.27	14984	3
4	0.45	Dave Shepheard	Polly V	Bracknell	87338	28.57	1.78	9564	3
2	0.45	Michael Porter	NBR *Waverley*	Beechurst	116529	30.50	2.40	16634	3
12	0.30	Paul Tompkins	3½" LMS Duchess	Tiverton	25814	26.90	0.80	8725	2
9	0.30	Danny Hayward	3½" *Netta*	Southport	29977	32.27	0.93	14831	0
6	0.26	John Williams	Southern U Class	Southport	39777	28.31	1.40	9347	4
19	0.08	Andy Pope	3½" Southern S15	Southport	11117	27.55	1.27	13156	0
7	0.06	Steve Harrison	3½" *Doris*	Birmingham	9521	26.18	1.45	9274	0

IMLEC 2021 prizegiving.

Billy Stock - IMLEC 2021 winner.

IMLEC film crew.

Karl Midgeley with Andy Healey and Apollo.

hand, as well as chatting to the drivers. I look forward to seeing this video appear.

Thanks

At the time, thanks were made to all who had attended to make the event a great success (I had been worried that it may flop with nobody coming along). There was no representative from the *Model Engineer* present at the prize giving, so I must thank them formally again here, for sponsoring the event. Unfortunately, we were not able to announce the next hosts and present the flag, as at the time (and still at the time of writing) nobody has volunteered to host for next year... Do please get in touch with the editor if you are thinking about hosting in future, I can testify that it was well worth being a part of! (I think we may have a candidate! – Ed.) I really am looking forward to taking part next year - I did miss entering and wished that I could have run my own locomotive. Maybe next year...

ME

NEXT ISSUE

Echills Wood Rally

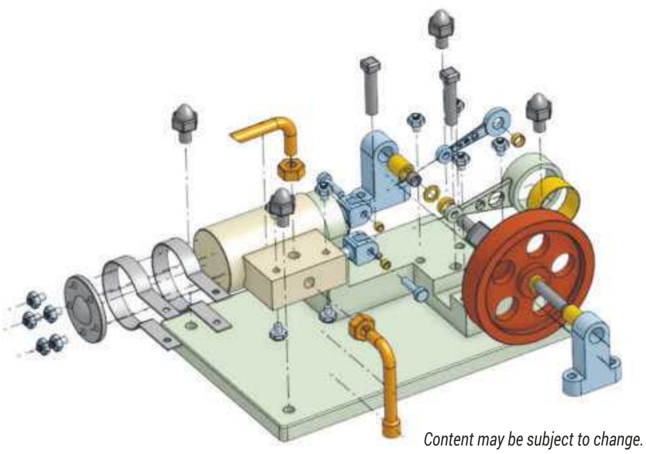
John Arrowsmith reports from this year's standard gauge rally at the Echills Wood Railway.

James Naysmyth

Roger Backhouse looks back at the life of the inventor of the steam hammer.

CAD

Luis Trinacao explains how Computer Aided Design and 3D printing make a powerful combination.



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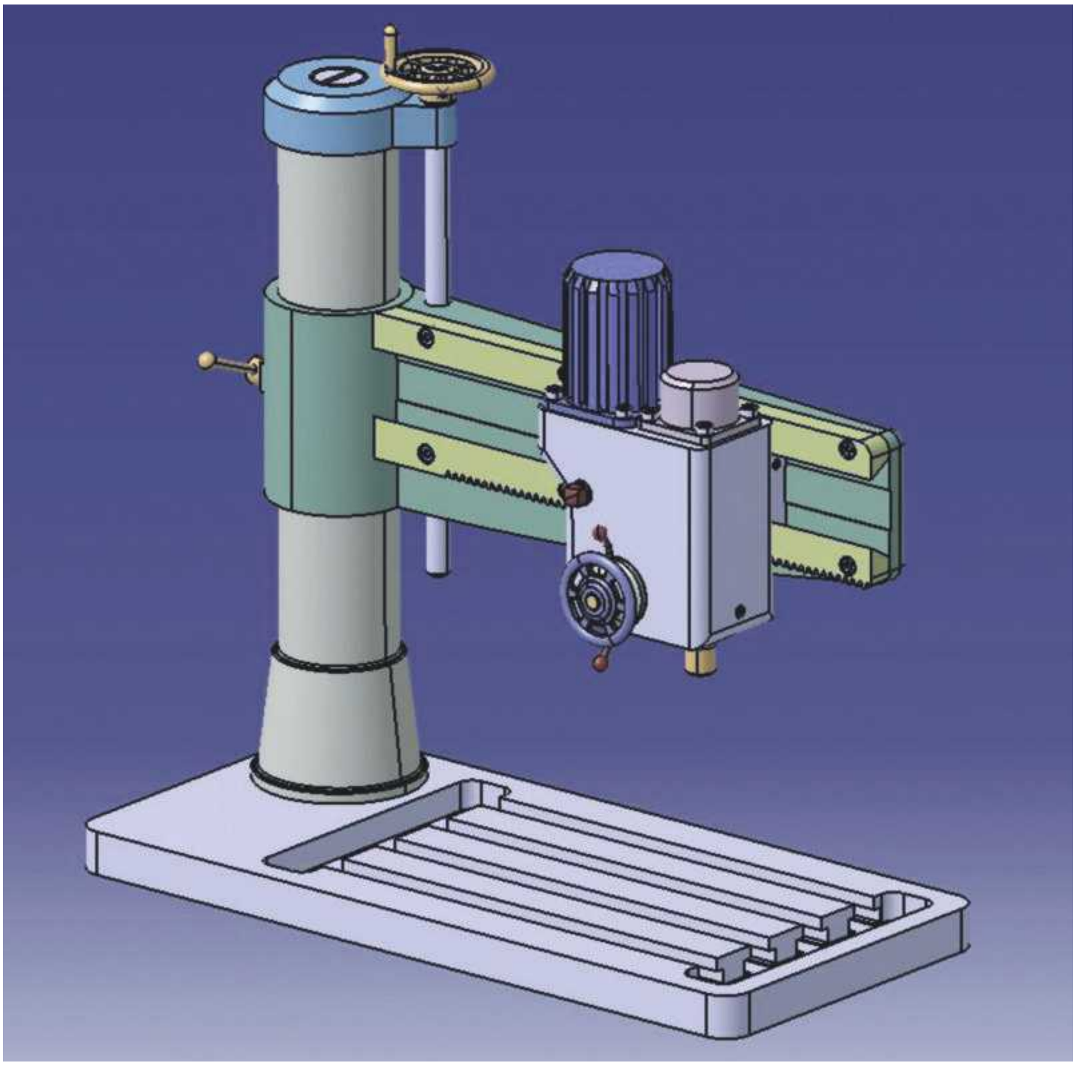
Philipp Bannik presents his own radial boring tool.

PART 6

A Radial Borer

Continued from p.437
M.E. 4674, 24 September 2021



Assembly

After machining all the parts, it was time to spend time on the finish and assembly of the machine.

First of all, I spent some time putting nice round edges on the parts, removing any machining marks, filing some chamfers and polishing the hand wheels (**photo 35**). To prepare the parts for painting and giving them a slightly rough surface, which should look like a casting, I sand

35

The parts were nicely finished before painting.

36

Parts masked up for sandblasting.

Fillets added using filler.

Boring head parts group photo.

Head assembly.

blasted them (**photo 36**). Filler was used to hide the ugly welds and gaps (**photo 37**).

Here are all the individual parts of the boring head (**photo 38**).

Here is the assembly of the boring head (**photo 39**).

The handles of the hand wheel for moving the head on the rail are made from 2mm drill bits. They were heated up and bent. After that I cut them to length and machined two knobs, which were glued to the handles (**photo 40**).

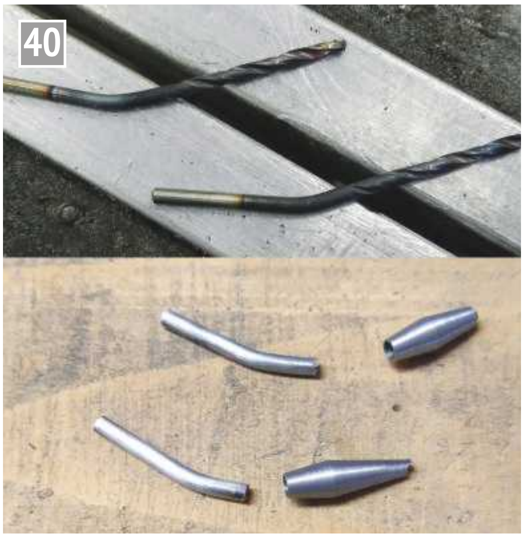
The dovetail of the boring head has an adjustment gib but there is not much space to place any adjustment screws. The dovetail was only reachable from the side, so I had to think around the corner. I used a set screw with a conical end, which pushes a pin with a cone on one end. This movement pushes the gib up and minimizes the clearance. There are slots in the gib to prevent it from falling out while the boring head is moving (**photo 41**).

Final assembly check (**photo 42**).

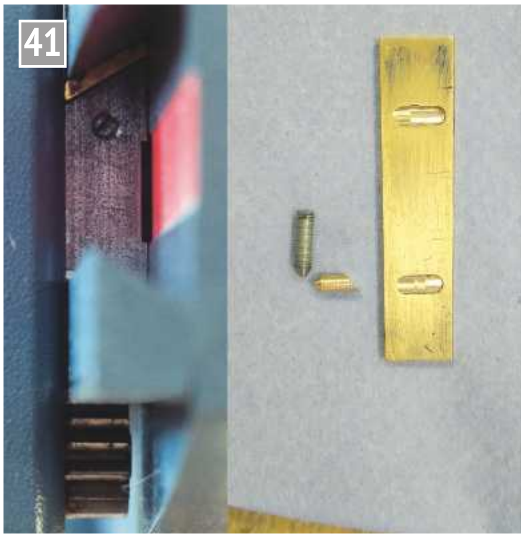
After I finished everything, it was time to check if everything works well. But wait - there is nothing to drill a hole in. I found a small piece of aluminium and milled two small steps to clamp it down. The clamps are made of steel and were given a black finish, which was achieved by immersion in a ferric chloride solution (**photo 43**).

The motor is powered by a 12V power supply. For testing purposes, I used a 3mm HSS drill. Power on - the drill is turning - let's go! Touching the surface of the aluminium block, the motor starts to moan but the drill bites into the material. It works surprisingly well (**photo 44**).

I am very pleased with my work and will find a nice decorative place in my home for the new machine. ME

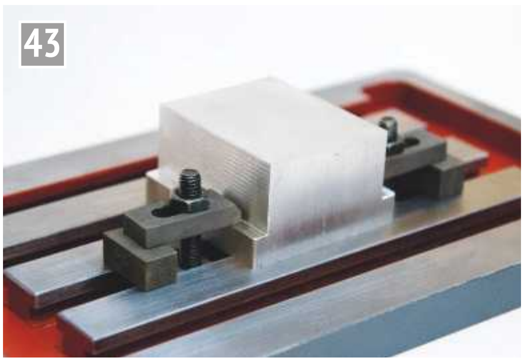


A novel way of making the handles.



Gib strip.

Final assembly.



Test piece held down with home-made clamps.

The acid test!

John Hill reminds us that the draughting on a locomotive can have a dramatic effect on performance.

Locomotive Draughting

PART 2

Continued from p.444
M.E. 4674, 24 September 2021

Grates

We have been looking at the locomotive's 'front' end of the boiler to make sure that the smokebox and contents are working as efficiently as we can make them, but what about the other end of the job - the grate? This is the place where the fire burns and the fuel's energy is turned into heat to boil the water to supply the steam to push the pistons that makes the wheels go round to give us our fun riding around behind our locomotive at the track. My little 3½ inch gauge 2-6-0 has a grate area about the size of a Swan Vesta matchbox yet is capable of generating sufficient heat from the small coal to make enough steam to pull me round any track, lap after lap and, to release that energy, the vital ingredient is oxygen. Next to smokebox deficiencies, inadequate oxygen to the fire will prevent it doing 'wot-it-orta' and the average grate casting supplied with so many sets of castings is likely to provide that inadequacy - too much bar, too little free air. The major industrial laundry where my dad was Engineer had a new 8000lb water/hour boiler installed in 1938, a big beast about 20 feet diameter (Danks of Netherton?); twin firehole, dry back, return flue which burned anthracite grain with forced draught. About four years of age at the time, I was taken to see the new boiler under steam holding very tightly on to dad's rough hand and have a distinct memory of him immediately looking up at the high gauge glass frame as we walked in the boiler house door. I had all the fittings explained - and their purpose including the three big Worthington feed pumps of which two worked at a time, slowly stroking away - to me, a four year old! But it was dad's life and he spoke to me of what he knew and loved and it didn't take too many days of watching before I understood. How fortunate I was, I lost my fear of fire and learned to deeply respect it and its power. From the age of seven, at annual boiler inspections, and for years after, I was put in the mudhole at the bottom of the boiler to clear sludge and residues, crawling more easily than a grown man 20 feet or more to the back end of the boiler, under the tubes which had been in steam the previous day *(phew!!)* - and earning a whole year's pocket money in one day! No wonder I could later enjoy pot-holing. Can you imagine a 7 to 14-year-old getting that sort of experience in today's 'Nanny' environment?

I didn't mean to go on about my childhood but it is how I came to comprehend the importance to the firebed of air/oxygen in the right volumes and direction for good combustion. To see the ex-RN Stoker, old Jack firing anthracite grains off a No. 12 shovel was to see an artist at work and the regular clearing of the ash tubes under the grate and lifting and breaking the sheets of glowing clinker off the grate with a paddle and sliding them neatly into a barrow a couple of times a day are memories which have stayed with me all my life. Dad converted her to oil-firing in the 1950s using Hamworthy Burners.

The 4F had the usual cast grate and I felt that this was restricting combustion, so I made a new deeper ashpan and fabricated a grate out of 1/16 inch plate cut into strips and made up with cross bars and

Parts for my new grate.

⅛ inch spacers - rollers from curtain track runners of which I had a jar-full, saves hours (**photos 3** and **4**). The deeper ashpan provided ample air to the underside of the grate as the ash built up and the thin bars gave something like 30% more free air through the grate. Poor steaming became a thing of the past; indeed I had to put a slightly larger cap on the blast pipe so releasing more power for the cylinders.

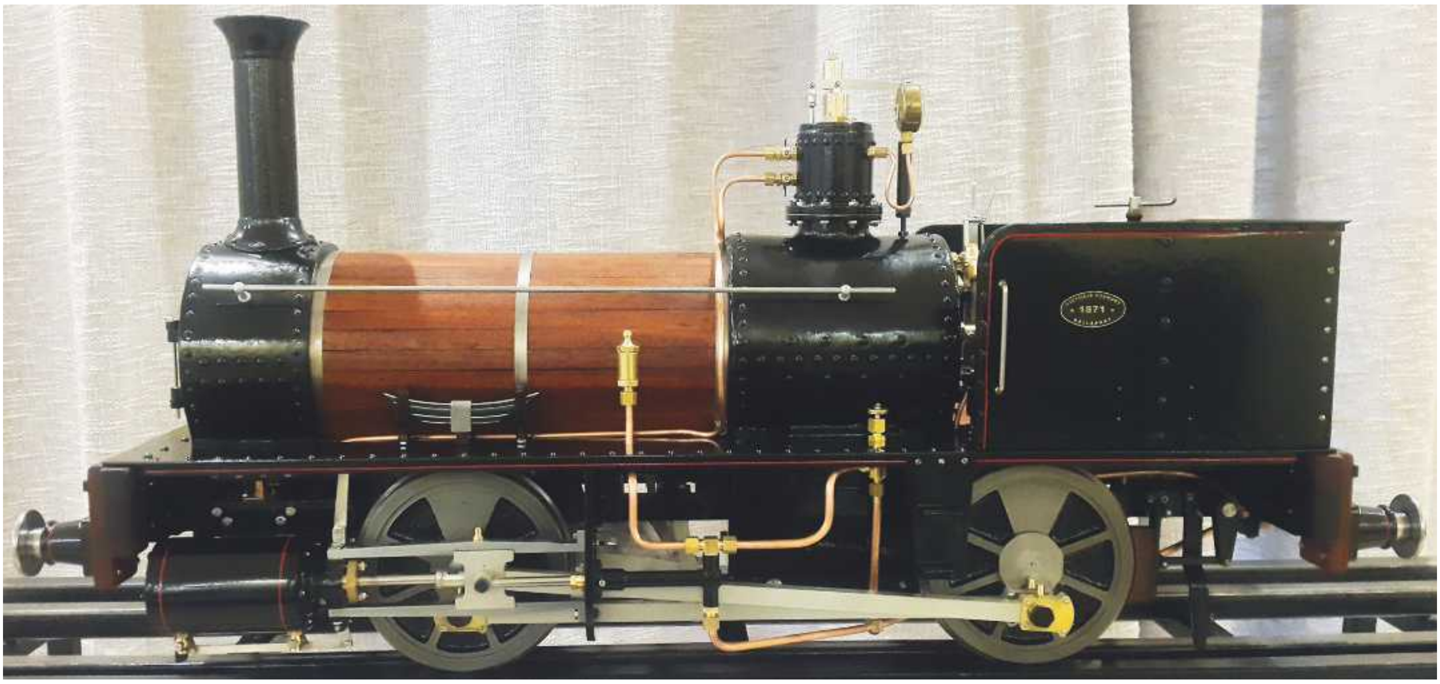
Ashpan volume and ash clearance are one of Martin Evans' regular design oversights, not recognising that ash will only move, on it's own, off very steep surfaces. Ash is usually harsh grain and locks together as track ballast does and it takes little running before a fair percentage of some of his grates become stifled. Fly-ash (PFA) was most popular for heavy road base formation construction as it does not move easily and allows good drainage. Good for them but not so for us. A shallow ashpan will soon fill up to the underside of the bars and cut off air to the grate so if you are having a long running day, raking out the ashpan will help to keep the pot boiling. The ashpan needs to be as deep as it can sensibly be made, avoiding horizontal areas close to the bars as far as possible (bearing in mind that you may need to drop a fire in a hurry some time). Ash with a drop of oil makes wonderful grinding paste if you think about it - poor trailing axleboxes! Protect them, if possible, when building. My thin bar grates roughly cut on a bandsaw from 1⁄16 inch sheet with ⅛ inch spacers have lasted three or more years of running as the free draught through the bars cools them and prevents them from burning away quickly. They cost almost nothing and take little time to remake. The increase of oxygen enables the fire to produce its maximum heat on the top of the firebed where it does most good. An expensive, stainless steel grate, like much modern medicine may make a grate last longer but does little to cure the cause of the problem of air restriction; ideally, a fire suspended on a force field with no bars at all might be a better answer, enabling the fire to burn freely all over the 'grate' instead of in hot-spots. When I was driving at Pecorama some years ago on their 7¼ inch gauge railway with narrow gauge type locomotives, their highly competent engineer, John MacDougal fitted one locomotive with a bleed from the exhaust steam manifold to the ashpan in an endeavour to reduce the decay of a batch of very poor quality, expensive firebars which were sometimes burning out after just a couple of days' work. This provided moisture and oxygen to the underside of the grate, reducing the temperature of the bars and significantly increasing their working life. As I left to go to the 10¼ inch gauge line at Trago Mills, I don't know if the idea was continued through the fleet or better quality bars solved the problem. It may have worked free on the bars, but damp may well shorten the life of the ashpan which is important in a commercial operation. There is little heat from a blacked-out fire and you need to keep it tight and bright - large lumps permit cold air past and take longer to ignite and to give off their heat energy. A bit of patience breaking up your coal to a size that the firebox of your locomotive enjoys is time well spent. Firing should ensure that you have no holes in grate corners that are not easily seen, it takes very little cold air to reduce your firebox temperature significantly, particularly if you have a wide firebox as in 9F, V2 or Pacifics. As a boy/chap I used to ride the West Countries up to Ilfracombe of a Saturday morning on the 'down Newspapers' (about 5.00am off Exeter Central - *ugh*) and the fireman didn't have much to do on the way there from Exeter until Braunton, dozing with his feet up on the oil-box having put a couple of ton of coal in the firebox at Exmouth Junction. The coming back up out of Ilfracombe with the first part of the up 'ACE' was quite a different story from the three or four newspaper GUV's down. A box full of well burnt through fire, 250psi. on the clock and plugging them in all the way up to Morthoe with the shovel and both hands inside the firebox doors for the back corner shots to keep them packed to avoid cold air holes, no wonder they wore heavy leather gloves to fire a Bulleid in a hurry. I passed the medical for the mainline footplate but failed the eye test with colour defect. I thought it was the end of the world at the time – but I got round it by building my own! - and it wasn't the end either, as it turns out. Perhaps some of you readers with practical experience might like to add their two-pennyworth. I have learnt a bit about the subject over the years and have also learnt that I don't know it all by a very long way! I should confess that as a known worshipper at the shrine of G. J. Churchward and despite being a Devonian-Janner-Swedebasher whatever by birth, I have also a fondness for the L & NWR (in the DNA code from dad, a Bellis and Morcombe man, I guess). By the way, the set of unused 4F castings were bought second hand for the mediocre-in-full-size Derby 4F as they were at a price I could manage at that time with two young children and a young mortgage, certainly not because they were for a 4F! It was a matter of cutting one's cloth to suit one's pocket as we did in times past - although I have never managed to live it down with those who know my loyalties; a Collett 2251 is nearer my fancy for an 0-6-0. Anyway, the 4F turned out to be a cracker, probably the best, most useful, easiest 'first build' locomotive ever offered to our hobby by the trade but I dare say the recent 3½ inch gauge Charlie Q1 will do just as well and the platework isn't much trouble to make!

ME

4

Old and new-ish grates.

From the age of seven, at annual boiler inspections, and for years after, I was put in the mudhole at the bottom of the boiler to clear sludge and residues.



Ballaarat PART 4

A 5 Inch Gauge 0-4-0 Aussie Locomotive

Luker describes a simple but authentic small locomotive.

Continued from p.393
M.E. 4673, 10 September 2021

The wheels

The wheels for any beginner are a source of great apprehension but if you start by thinking the job is easy and just another turning operation you've already passed the first hurdle. Worst case is you make a mistake and you will need to cut the flange and rim completely back and shrink fit a tyre on - which will last longer and is how the prototype was made anyway. The drawings actually call for a shrink fit tyre but I made the wheels from a single casting to simplify the build. This little locomoive doesn't weigh too much so the wheels will last as a machined casting.

There are a few ways of machining the wheel profile and a number of fine articles have been scribed on the subject. This is how I tackle the job...

Most of my castings are good enough to machine directly in the three-jaw chuck. If the wheel is clamped and turned at around 400RPM you'll spot any misalignment by eye, in which case the four-jaw chuck is used. If the four-jaw chuck is used you need to true up the inner rim (as cast surface) using the same **touch and en-gauge centring method** described previously but instead touching the inner face with a boring bar, set to centre height. The back of the wheel is then faced and the centre bore is drilled and finished using a boring tool. I don't like using reamers on any wheels because a reamer tends to follow the drilled hole. If anything in the casting causes the hole to drift the reamer will follow suit and you'll end up with a wobble.

The outer surfaces are machined with the wheel on a mandrel (one of the more accurate machining methods provided the mandrel is machined and kept in place until all wheels have been

18

Wheel profile being rough machined.

completed) using a securing bolt (**photo 18**). The eccentric boss is faced without the securing bolt in place so the TLC (take light cuts) principle applies. A simple trick to get the boss height right is, after facing the outside of the rim, to turn the carriage dial to 0.4mm, move the carriage away from the job, past zero and advance back to zero;

Drilling the crank holes with a drilling jig.

Machined shaft ready for press fit.

this will be the position of the final cut. You can then take as many cuts as you want and when you get to zero on the dial you're on size.

The outer profile is rough cut to within 0.2-0.5mm and I generally don't bother with the 2 degrees taper at this point. I have a tipped tool which I brazed to a square piece of mild steel and ground to the included angle of the flange and profile with the correct corner radius. Each wheel can be tightened on the mandrel and the tool can be plunged, cutting the 20 degrees then using the taper slide the rest of the profile is cut at 2 degrees. If you zero the gauges on the cross slide and taper slide when the first wheel is cut correctly, all the remaining wheels can be cut to the exact same size.

The normal drilling jig for making sure each crank hole has the same offset is critical to prevent the coupling rods from binding (**photo 19**). You also need to make sure the shaft hole and crank pin hole are perfectly parallel otherwise the relative distance between the two will change as the wheel goes round and, as the coupling doesn't change length, physics will solve that indiscretion very quickly. Provided the wheel is clamped parallel to the drill spindle the holes will end up parallel. I normally line up the crank hole with a pointer in the drill chuck and drill a pilot hole using a centre drill and a 6mm drill. The hole is finally opened up to size incrementally to make sure the hole is relatively round and not clover.

The crank shafts are a simple turning operation with a press fit to the wheel casting. Place a piece of soft copper or brass when pressing the crank home to prevent any damage to the ends.

A trick with any **press fit** is to machine a slight **lead-in**. I normally set my taper slide to 1 degree, touch the tool roughly a quarter of the wheel thickness from the edge of the shaft and machine the lead-in away from the chuck. With this method you're always sure to have 25% lead-in regardless of the fraction of angle set on the taper slide.

The wheel shafts

The wheel shaft bearing surface is the outside diameter of the bright mild steel bar so there is little advantage in machining the shaft between centres with a dog clamp. In a case like this I normally draw a line from one side of the bar to the other. This line is kept under the no. 1 chuck jaw when machining both sides. Even if the bar is a little out it shouldn't make much difference. Bright bar is adequate for most model engineering shafts provided the manufacturers stick to the mill tolerances. The shaft is then machined with the necessary oversize for press fit or undersize for retaining compound depending on your preference.

The shaft has an oil well in the centre to aid with lubrication and a plug pressed into place to hide this well. A 1mm hole is used to fill the well and is standardized for all oiling points on the locomotive. The bigger well makes drilling the radial holes to the oil groove much easier and you're far less likely to break the small drill when reaching the centre hole.

The bearing surfaces are cleaned up using fine (600 grit) sandpaper on the lathe, making sure you keep fingers and knuckles away from the turning chuck (**photo 20**). You will need to use a little cooling fluid to keep the shaft cool and under NO CIRCUMSTANCES should you use gloves anywhere near a lathe. The oil groove is for ease of oiling when starting the day's run to make sure the sides of the axle boxes get a little oil regardless of whether the holes line up.

At this point it is prudent to check the shafts turn freely in the axle boxes and the end to end distance between the left and right-hand sides are identical. Before the wheels can be fitted the eccentrics need to be machined - and don't forget to file the radii on the axle boxes!

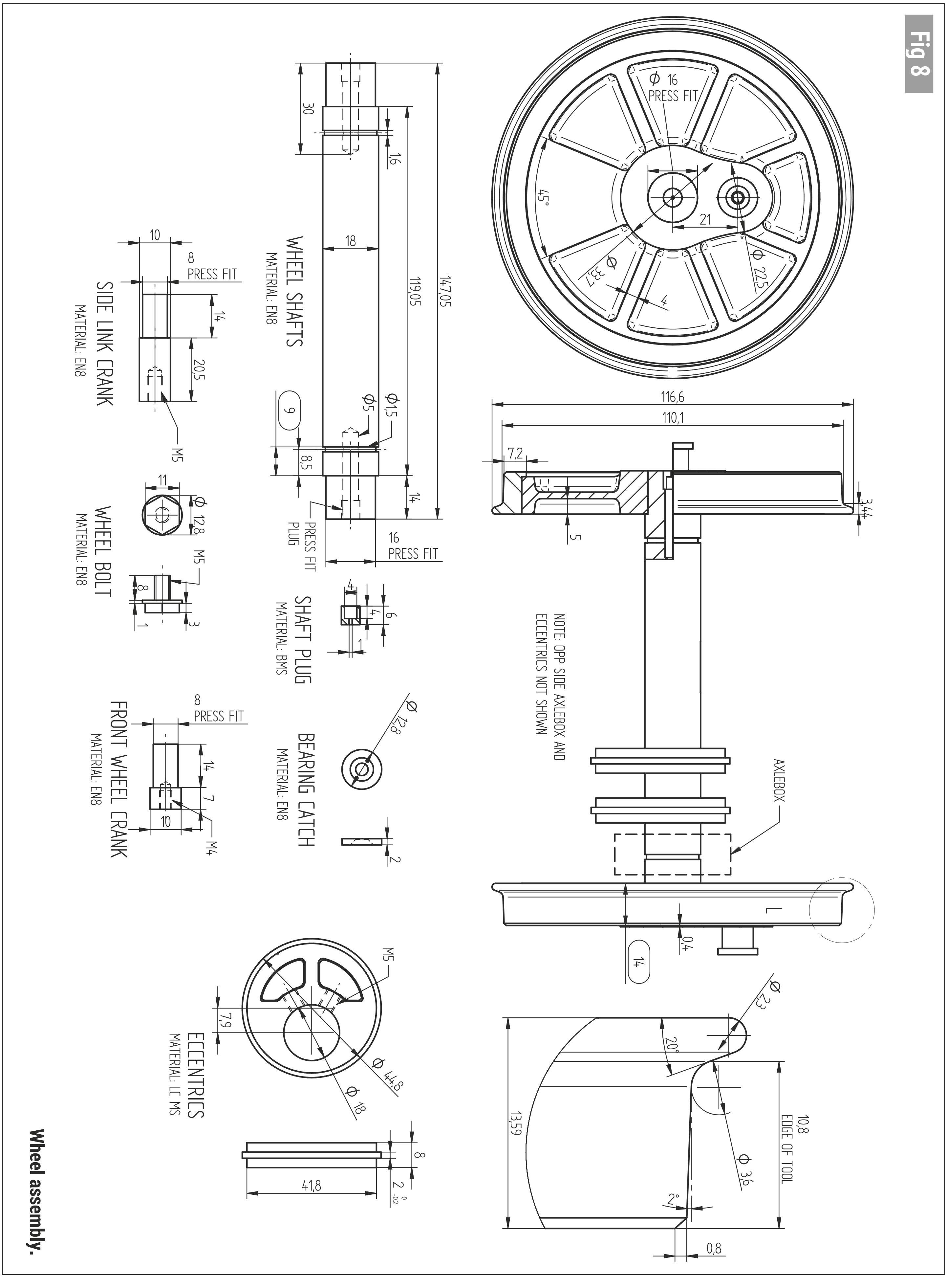
The eccentrics

I went all out with the detail of the eccentrics, including the cut-outs and proper set screws like the original locomotives. Luckily, these eccentrics can be laser cut decreasing the machine time considerably. The eccentric will then be the mild steel supplied by the laser cutters and the strap will be gunmetal or bearing bronze castings.

All the eccentric shaft holes were machined to a very light interference fit to the shaft, i.e. I could just rotate the eccentrics on the shaft by hand with a little oil. This was done using the four-jaw chuck and I wasn't too worried about perfect alignment; pushing the laser blank using a dead centre onto parallels and tightening the jaws is good enough. Subsequent machining operations will sort out alignment issues (**photo 21**).

An off-centre turning jig is priceless and can be made using an offcut of the wheel shaft material. All subsequent operations for all the eccentrics were completed using the jig. First the holes for the set screws were drilled and tapped while held in a vice or using a 'V'-block. The holes should be as close to the centre line of the shaft

Eccentric shaft hole alignment in the four-jaw chuck.



Wheel assembly.

Eccentric machining jig.

Machining the set screws in a 'V'-block.

Eccentrics and spanner.

Assembling the front wheel assembly.

as possible to avoid the eccentrics from moving when the set screws are tightened, a very annoying predicament when setting the valves.

The outer tapped hole can be closed using some threaded bar and deforming the ends with a round bar resting on the vice and a peening hammer; a couple of good blows will fix the plug good and proper. The set screws can be fashioned from standard grub screws with pieces of Allen keys brazed (silver soldered) in place. The set screws are then assembled to the eccentrics by screwing from the eccentric cut-outs.

The outer diameter and step are machined all in one go using the jig, clamped in place with a securing bolt (**photos 22** and **23**). A left-hand tool is used to cut the back leaving the required step in the middle. I found it handy to make my jig with the back the same diameter as the working diameter of the eccentrics. My cutting tool was then repeatedly zeroed on the jig for the surfaces to the side of the step. A little marking blue will show very quickly when the tool starts touching the jig - this is of course with the lathe turning. This method ensures all eccentrics are very close, tolerance wise. I managed to keep all the eccentrics and straps interchangeable but this required a keen eye on the dial gauge and constant measurements. Touching the cutting tool on the body of the jig helped immensely in this regard. Once machining has started on the outside diameter do not to remove it from the jig.

A simple box spanner can be made up using the head of a cap screw with a hole spotted on the outer diameter and a stiff piece of welding rod or broken drill brazed in the hole (**photo 24**). The side of the box spanner can be filed away to make a scale spanner to add to the loco toolbox; and it's fully functional.

The wheel assemblies

With the eccentrics and axle boxes finished the wheels and shafts can be assembled. >>

There are a number of different ways to assemble and quarter the wheels. I have personally tried a few different methods and regardless of how the wheels are quartered I prefer to press fit all the wheels to the shafts. For this locomotive I decided to go the quartering jig route (**photo 25**). The oil well for the shafts was left open with a loose shaft fitted to align the quartering jig. The quartering jig is very simply two drilled plates with the eccentric holes for the wheels drilled at 90 degrees (right hand side leading) and four holes at the corners for 10mm guide bars. None of these holes need to be reamed as long as the drilling is done carefully with a pilot hole drilled at least 0.5mm smaller than the final diameter to get the hole as true as possible. One wheel is pressed home before assembling the whole shebang. The assembly should be pressed slowly with the outer guide bars checked as you go to make sure they're still free to move and haven't bound up, pulling everything skew. If your press fit tolerances (30-40µm) are in the ball park the press pressure should be in the region of 2 tons; good enough for any Kentucky shuffle on the track.

If press fit seems like a mission then using a retaining compound is the second option and will work just fine for this light locomotive. Just make sure you leave the correct gap for the retaining compound (given in the data sheet) and both surfaces are properly clean. The assembly will need to be left in the jig overnight for the retaining compound to set properly. Pragmatically I would aim for a press fit first and if you miss the mark on the shaft tolerance just skim a little off for the retaining compound. There is absolutely no problem in press fitting some of the wheels and using the retaining compound on others, just make a note which wheels have which just in case they need to be removed.

Before the little oil caps can be pressed into the shafts the wheels and coupling rods should be assembled to the frame and checked for binding. If all is good the wheel assemblies can be removed and the oil caps can be lightly pressed into the shaft (15-20µm oversize). If the wheels need to be removed at a later stage a spacer that reacts on the shaft, and not the oil cap, will need to be turned. This is for the builders that use bearing pullers to remove wheels...

● To be continued.

The young lad mentioned in the beginning of the Ballaarat series is moving along nicely with his build. Bearing in mind he never went to a technical school, nor has he decided to follow a career in engineering, his model engineering skills are moving along incredibly fast. I asked him to write a piece for our little club newsletter and one of his statements struck home and I thought it was rather inspirational: 'This hobby sucks when you do things wrong the first time or two but it's amazing when you finally get it right'. He sent me a picture of one of the wheels, machined according to the instructions in the articles. The picture shows him checking the profile with a gauge I designed to make life a little easier. Looks pretty good to me (in fact spot on!). Well done, young man!

A damp start to proceedings.

The unique chain driven version by Martin and Linda Gearing.

The outside Stephenson valve gear on the chain driven engine.

Malcolm High was first on the track with his tender engine.

Sweet Pea Rally 2021

John Arrowsmith reports from familiar territory on this year's Sweet Pea rally.

This annual event was the 28th and was held at the Broomy Hill track of the Hereford SME. Held over from 2020 by Covid and moved to August to comply with the restrictions, it turned out to be a very enjoyable weekend. It is always difficult to know exactly what the program will be and the success or otherwise depends on the weather and sufficient visitors to make the organisation worthwhile. Happily everything went to plan and after a wet start on Saturday there was plenty of track activity to keep everyone on their toes (**photo 1**). There were also a couple of new details to the rally which assisted in providing additional interest.

The first was the new rally trophy, The Jack Buckler Memorial Trophy. The rally was the original idea of Ron and June Drake, the owners of Blackgates Engineering, who promoted this event to commemorate the fine new model designed and built by Jack Buckler. When June passed away Ron dedicated the rally to her and the June Drake Memorial Trophy was initiated. This has lasted for 28 years and Ron, now in his 80's, thought that it was time for a change as he does not feel like travelling long distances to rallies anymore. Phil and Jacquie Owen, the present owners of Blackgates, thought that it would be appropriate to change the name to the Jack Buckler Memorial Trophy in recognition of the tremendous number of this particular model which have been built to Jack's design. Hereford SME was proud to have been the first hosts for the awarding of this new trophy. The second detail that was totally new at this rally was a chain driven 0-6-0 Metre Maid variant. Built by Martin and Linda Gearing, this fine locomotive also sports outside Stephenson valve gear, which makes for a very unusual looking locomotive. It also proved itself to be a first-class performer on the track (**photos 2** and **3**). Hopefully Martin will produce some notes on this build in a future *Model Engineer*.

Onto the rally itself. After all the fine weather we have had, the Saturday turned out to be wet and miserable for the first few hours before the sun began to shine. However, this did not prevent the regular model engineers who attend from donning their wet gear and getting locomotives on the track. First out on the ground level track on Saturday was Malcolm High from Doncaster with his tender version of the engine, *Adele Marie* (**photo 4**). Malcolm was quickly followed »

Tony Phillips from Bristol enjoying his track time.

Jim Alderman from Worthing swings onto the river loop on Sunday.

I'm following you - Jonathon Mead crosses Dave Dick as they both head back to the station.

Phil Owen from Blackgates looks a picture of contentment as he coasts round the river loop with Jacquie O.

Another locomotive going well was that of Peter Harrison from Reading.

The lovely little 'Slate Wagon Train' of Rob Davidge from Leicester.

by Dave Dick from Stockport with his familiar *Millclose*. Dave and Malcolm always seem to have a little competition to see who can get running first; this time it was Malcolm but it is all good fun and banter. Over on the elevated track similar preparations were in hand with some good 5 inch gauge engines being steamed. Martin Everett from the Isle of Wight club was soon getting his engine going well and the damp atmosphere made for some good effects. Tony Phillips from Bristol came over and had an enjoyable time with his locomotive (**photo 5**). Next on the track here was Linda Gearing with the new chain driven 0-6-0 version of Metre Maid which she and Martin have built. This locomotive created a lot of interest amongst many of the visitors.

Back on the ground level track Peter Harrison from Reading was enjoying his track time with a good-looking tender version of the locomotive (**photo 9**). Following Peter, Rob Davidge from Leicester was also driving a tender version of the locomotive coupled to a very nice train of slate wagons along with a traditional guards van (**photo 10**). This was a typical use of this type of engine and added to the overall atmosphere. Later in the weekend Rob also added a passenger coach and took his family for a spin (**photo 11**). The Hereford SME's Sweet Pea was prepared and steamed by a couple of their young engineers and 12-year old Ollie Powell experienced his first ever drive of a steam locomotive. He did very well, covering two laps of the ground level track and arriving back at the station with a good fire, water in the boiler and the safety valves just lifting, so his engine management for a first timer was excellent (**photo 12**).

Rob Davidge takes his family for a spin on Sunday morning.

A first-time steam locomotive driver, Ollie Powell, from Hereford SME.

Another of the Hereford SME's young engineers James Knight with his recently purchased Sweet Pea.

Twelve-year old Tommy Morris and his Metre Maid version of Sweet Pea.

Idris*, an 0-6-0 Sweet William driven by 16-year old Matthew Kenington.*

Bob Danton from Bristol starts his visit to the rally with Baloo*.*

By this time the larger locomotives were beginning to join the track parade, with Bob Danton from Bristol the first to make an appearance, with his very nice 7¼ inch gauge *Baloo* (**photo 16**). Bob was quickly followed by Brian Holland with his version of the Sweet William 0-4-2 design *Susan Elizabeth* (**photo 17**). Brian Remnant from the Romney Marsh club is a regular patron of these events and if his Sweet Pea is ever unavailable, as was the case this year, he builds a moving machine just to take part. His motorised slate wagon was a real eye catcher and went like a rocket if you were a bit heavy on the throttle (**photo 19**). A number of visitors and members tried it out and thoroughly enjoyed the experience.

The rally continued to enjoy the fine weather on Sunday and two members of the Hereford club had the unenviable task of choosing

Brian Holland from Oxford is going well with his locomotive on a damp morning.

>>

All the way from the Isle of Wight, Martin Everett is going well on the elevated track.

Brain Remnant's flying slate wagon in action.

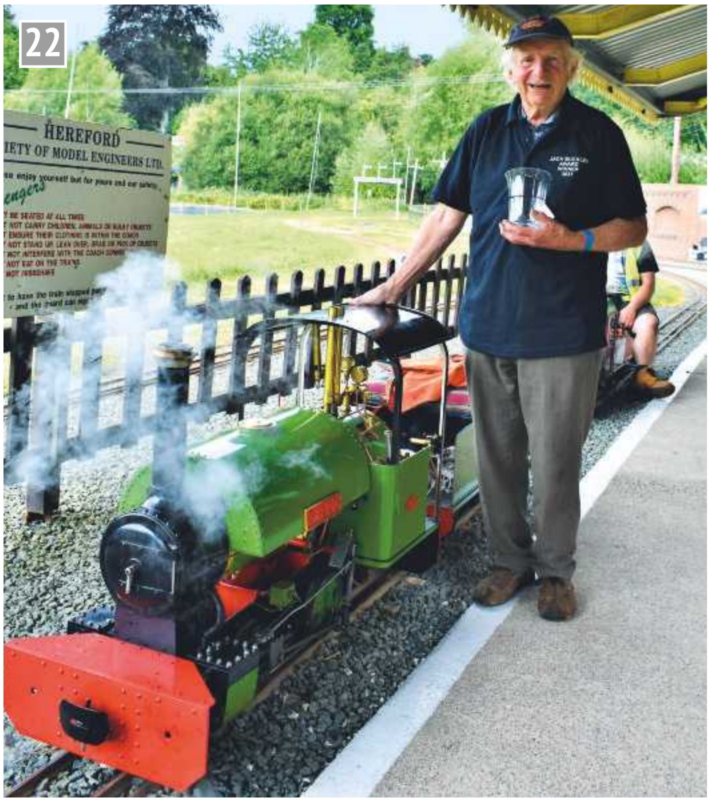
Jacquie Owen shows off the new polo shirt to be awarded to the winner of the Jack Buckler Trophy.

Bob Danton receives the Jack Buckler Trophy from Jacquie Owen.

winning locomotive to receive the new Jack Buckler Trophy. The station was the appropriate place to announce the winner and, following a short address to the assembled crowd by Phil Owen, Bob Danton and his locomotive *Baloo* was declared the winner. A very surprised and somewhat emotional Bob was presented with the trophy by Jacquie Owen (**photo 21**) together with a new polo shirt suitably embossed with the trophy name. Having got over his shock, a proud Bob soon donned the shirt and posed for photos with his locomotive (**photo 22**).

This little ceremony wound up the rally proceedings and it only remains for me to thank everyone concerned for a most enjoyable weekend, to the hosts Hereford SME and its members for organising the event and particularly the ladies of the catering team who worked very hard to keep everyone fed and watered over the weekend. To the visitors and their families who attended and joined in the spirit of the event, thank you all very much.

ME



A proud Bob Danton and his award-winning locomotive.

Zen and the Art of Model Painting and Lining PART 4

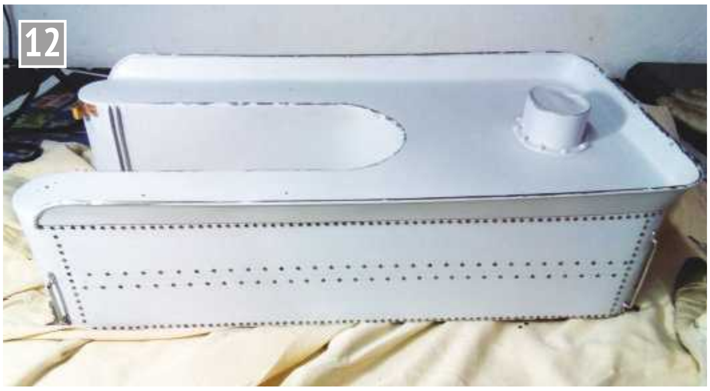
Luker tackles the task from first principles.

Continued from p.431
M.E. 4674, 24 September 2021

Dealing (cheating) with detailing

The biggest problem with using the automotive paints for models is the loss of detail due to paint build-up. The easiest way to get around this is either not to paint the detailed components on the sub-assembly and fit them afterwards with a thinner paint system (thinning out the paint and applying multiple thin coats) or just apply fewer layers on the assembly. The picture of the *Wahya* tender (**photo 12**) is a good example of cheating by adding the detailing after the filler and high build primer have been applied. This makes flattening and shaping much easier.

The rivets in the picture are of course fake. I had no intention of drilling hundreds of tiny holes into the stainless steel tank. They can be bought from a sewing or bead store and are heat fastened copper sequins. I did some experimentation with these and I found if they were applied to the filler primer they stick really well. If another layer of filler primer (which has been reduced to the upper end of the recommended range) is coated over all the detail parts, all the sharp corners are blended nicely without losing the actual detail. Covering the fake rivets with primer makes the system rather strong; you'll break a nail and bruise a finger before they come off, but a screwdriver and hammer will remove them. I fasten the rivets using a soldering iron (60W) and a scriber. The soldering iron heats up the heat glue and the scriber holds it down for a second or two while the glue sets. I have found a 5-count with the soldering iron is about right. After all the rivets are set I take some 320 grit sandpaper (dry) and rough up the tops of all the rivets to give the primer something to bond to. It's likely one or two will come loose because they never took properly; any more than 5% and I would take them all off and start again because something went wrong.



12

Detailing on a tender.

The little handles are screwed to the tank with retaining compound to prevent any leaks. The top of the screw is machined to look like a rivet and the slot is filled in before priming making it look like a proper rivet.

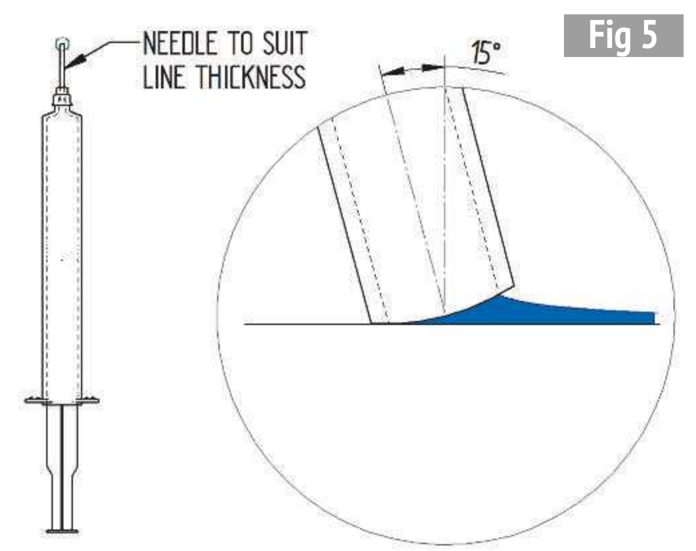
The round edging at the top of the tender is tack welded in place. The filler primer does a good job in hiding the welds, with the view showing the edging sanded to metal. This tank will have one more coat of primer (thinned) before moving to the colour coat.

For the small brazed or silver soldered components that require a lick of paint to fit the model there are a couple options. The first option is to use an aerosol 1K primer; these paints are generally very thin so they have very little build. If the specific colour isn't available this is a good time to push the limits with the 2k and thin it to the upper end of the recommended amounts. You would then use the touch up spray gun with the smaller nozzle that sprays much finer, with multiple thin coats. For particularly difficult parts that have all sorts of nooks and crannies a small paint brush is the best route to get an even coat. Incidentally if you want to use the aerosol paints with a brush you can spray a little in a small container covering the top with a rag. You may need to let it stand a little to flash off the solvents for a slightly thicker consistency.

Applying stickers

I was very disappointed with the stickers I got for the Stirling. They were only slightly bigger than they should be (a few percent) but enough to annoy me. When I picked them up I noticed they weren't to size and I pointed it out to the printers. They said it was the best they could do which I had to have a little giggle at. The absurdity of battling with stickers for a locomotive that was scratch built from a few pictures and a GA is laughable, »

Sticker application.



Syringe lining pen.

but such is the curse of the model engineer. In the end I just took the stickers and used them; it doesn't bug me too much now and I think it actually suits the engine (I also doubt Mr Stirling would mind).

The surface needs to be clean, which it should be for new paint. I normally apply the stickers (vinyl) dry which requires some planning. I've found aligning the sticker with marked masking tape makes life a little easier (**photo 13**). The other method is to wet the paint and slide the sticker to where you want it and squeeze the water out with a straight edge. I don't particularly like that method especially for printed vinyl but both work. All the vinyl stickers are sealed using 2K clear coat. This is to prevent the edges from lifting and helps protect them on the track. No thinners is added to the clear coat; this may negatively affect the printing on the vinyl.

The dreaded lining of locomotives

Lining is avoided by most modellers, and everyone I have spoken to thinks it's one of the most difficult things to do on a model. We have very few locomotives at the RSME that have been lined, other than a few of Uncle Nick's, of course. Some people recommend buying special art pens and all the latest fancies to get the job done. Personally, I couldn't be bothered shopping around for finicky and normally expensive stuff like art pens, etc. I just make mine.

My 'super sophisticated' lining pen is made from a humble syringe and needle (**fig 5**). It works on the same principle as a normal art pen or bow pen like those they used to use in technical drawing. The needle can be cut to the length given in the table as a first guess (these are the sizes I use). Using some 600 grit water paper the tip is rounded as shown in the sketch. I normally round the tip by holding it parallel to the syringe or needle ears so that I have a point of reference when doing the lining. Different needle gauges will give different line thicknesses and if something in-between is needed you can squash the end of the needle to the size that suits the job. The paint thickness (actually viscosity but let's not split hairs) will determine the end length of the tube, with thinner paints requiring a longer tube or a smaller gauge (needle size). Some experimentation is needed for the paint to be used and those test pieces that were done while painting the rest of the locomotive will come in very handy here (**table 3**).

The lining pen is used as follows: suck a little paint into the syringe (small amount, I barely pull a drop into the syringe). Pull the plunger out completely and blow a little paint out the tip to prime the tube. The paint is fed through the gap that was created by rounding the tip. By drawing the lining pen along the surface, the paint will auto feed and hopefully a clean line will be drawn. If the paint is too thick or you draw the line too quickly it won't feed properly and will most likely be staggered. If the paint is too thin the line won't be crisp but opaque.

For most of my lining I use enamel-type paints. If I'm not happy with a line I wipe it off with a little turps and start again. The normal small enamel paints used for the plastic kit models tend to work nicely but most enamels will do the job (the white lining on the Stirling is door frame enamel). Recently, I have used a water-based acrylic paint for the golden lining on my American type locomotive, which worked very well.

In between drawing the lines, the paint at the end of the needle tends to harden and stall. To prevent this I leave the pen resting in a container with the point on a turps-soaked rag (water for acrylic). Typically, drawing the lines requires some sort of guide; this can be a stencil or ruler depending on the geometry. The line should always be started on the guide and pulled onto the job; this avoids that horrible starting blob that is bound to happen if the line is started from mid-air. Any guide for the lining pen needs to be lifted off the job to prevent the paint from being pulled in between the two surfaces by capillary forces. A couple of strips of masking tape off-set by 2mm from the edge will work; in fact, I have a ruler especially for the straight lines that has permanently got the masking tape on the underside. Being the proud owner of a 3D printer, I can print my own stencils for the odd lining job (**photos 14** and **15**). Remember those rivets on the tender? They worked very nicely to lift the stencil above the job to avoid the paint going under the stencil and spoiling the job. The odd rivet will be in the way but the pen will slide over it without any issues, so a light hand is advisable.

The lining on the Stirling wheel (**photo 16**) was done using a normal ruler with the 'hook ends' free hand. A little

Table 3. Some approximate lining pen needle lengths.

Needle	Gauge	First guess length (enamel paint)
0.6mm	23G (Blue)	5mm
0.8mm	21G (Green)	8mm
1.2mm	18G (Pink)	20mm

Lining stencil.

American 4-4-0 tender lining.

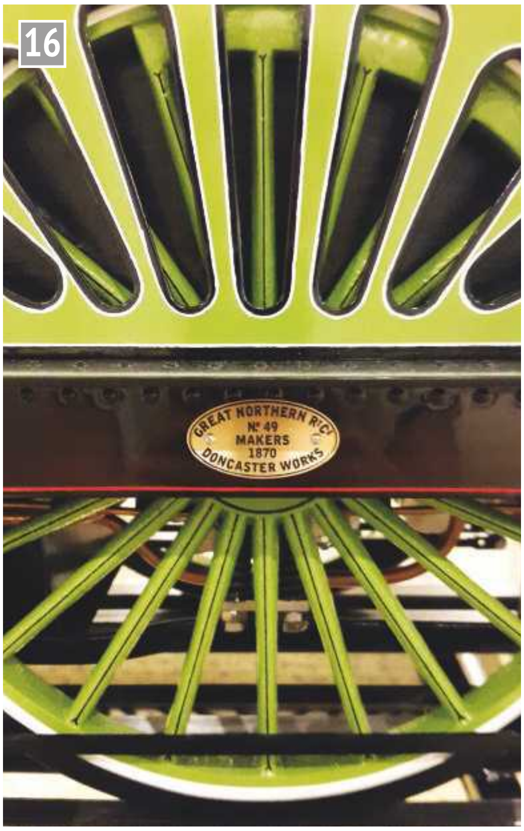
practice helps get over the shakes when lining the model and after a couple of lines it becomes easy.

Lining the Stirling

The Stirling single is a ridiculous example of lining, different paint colours and edging, and I think it requires a special mention. The sketch from Leeche's book, *The Stirling Singles* (**fig 6**) gives an idea of the painting scheme and lining with the colour chips found in Carters' book, *Britain's Railway Liveries*. In essence there are two distinct green colours, the frames on the inside are vermilion and on the outside Lake (dark maroon). The smokebox, running boards and backhead are black, with a black edge on almost everything broken by either a white or vermilion line. The greens are also broken by a broad black line with a white line on the edging; most sane people will run for the hills at this point! Even the inside of the cab is lined but with a darker green as the base colour.

The insides of the frames were painted vermilion first. All the upper edges were masked off and the inside of the frames covered with newspaper, to prevent the inevitable overspray, using masking tape to hold everything in place. I decided black should be the first colour on the outside. Only the edges were sprayed, with no specific masking of the inner areas. A product called a 'fine line tape' was used to cover all the black edging (**photo 17**). It's a plastic tape that comes in various widths typically used in the automotive paint industry. The paint can dry on this tape before it is removed, 'cutting' the paint, creating a clean line (**photo 18**).

The sequence of painting was the black base, then lake for the frames or light green and finally dark green for the tender and cab, with each previous layer taped up and covered. Once all the lining tape and masking tape was removed the ridge left by the fine lining tape was used as a guide for the syringe lining pen. Finally, when the enamel had dried properly the whole lot was sealed with 2K clear



Stirling wheel lining.

Fine line tape applied for black edging.

Fine line tape removed for white line.

Painted tender.

Fig 6

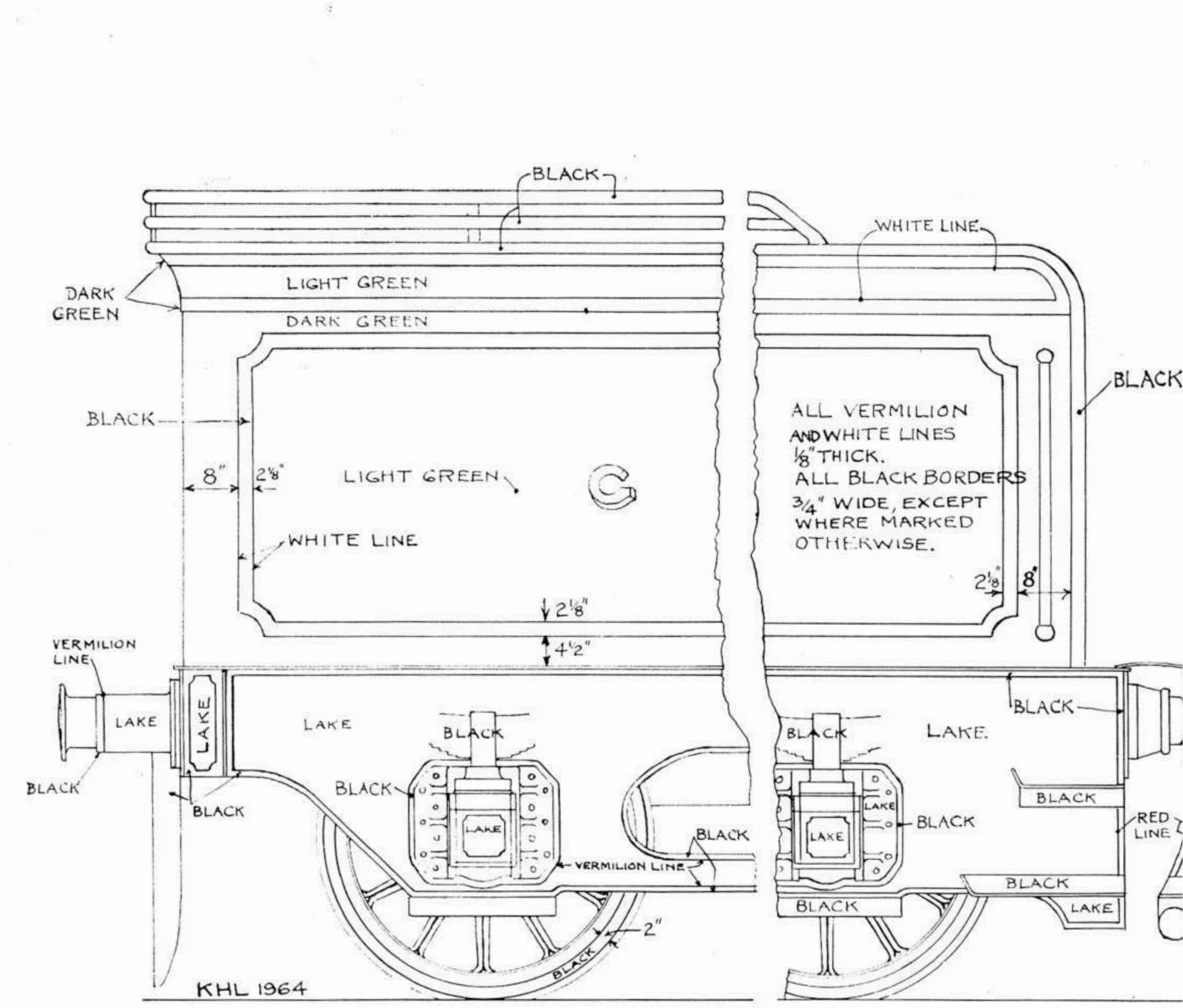
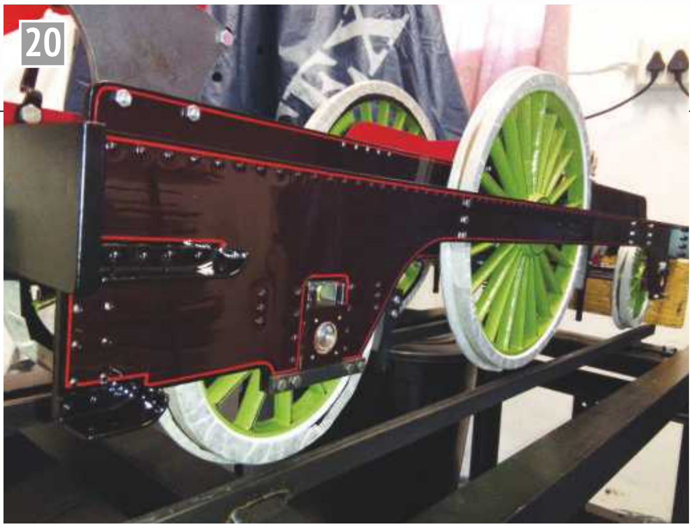


Diagram of painting and lining, G

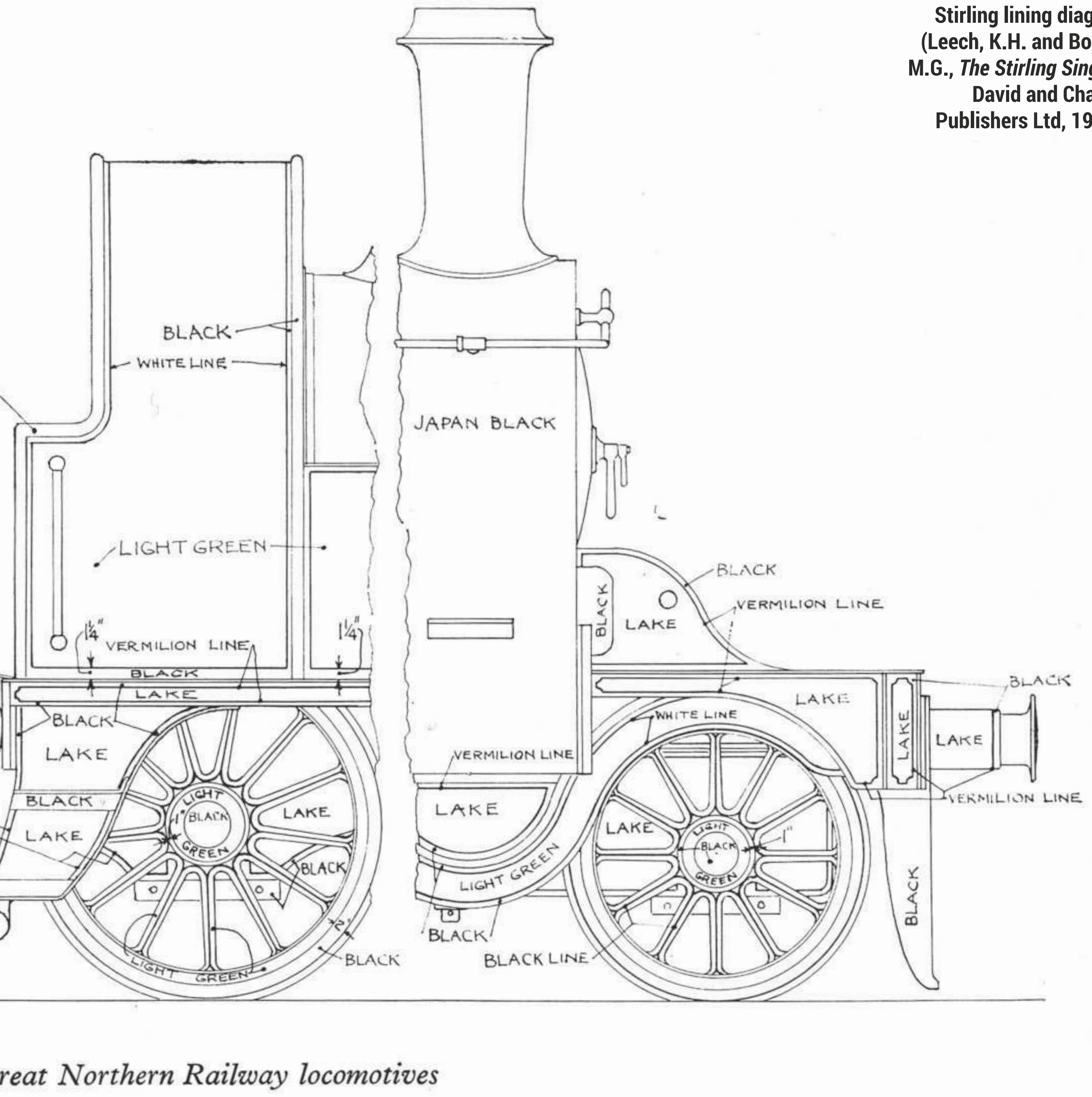


Stirling frame lining (the masking tape on the wheels is for assembly).

to hide the ridge from the fine lining tape (**photos 19** and **20**).

Fixing up a blemish

Paint is essentially a plastic, and plastics can be built up, sanded and polished to hide a chip or a scratch. The first thing you need to do is make sure the area to be fixed is clean of oils and moisture otherwise any repair will look worse than the offending blemish. A chip for example can be built up layer by layer by filling the chip till just past the ridge. No thinners should be added to the touch-up paint or the sides might pull up, and it is a good idea to leave the mixed paint you intend using in the fridge for a couple of hours to get it a little thicker and to flash off the worst of the solvents. Once you've filled the chip, and it has dried **properly**, tape the immediate area using Sellotape (not



Stirling lining diagram (Leech, K.H. and Boddy, M.G., *The Stirling Singles*, David and Charles Publishers Ltd, 1965).

masking tape; it's too thick) and sand the chip down using (at least) 1000 grit water paper with soap and water. The tape helps to prevent the areas immediately adjacent to the repair from being sanded. Remove the tape and polish using a good automotive polishing cream; the area will look as good as new.

For the most part scratches can be sanded and polished provided they aren't deeper than the top colour coat. If it's all the way down to the primer you'll have to sand back further and use a touch-up gun to recover the area. You'll need to spray thin coats blending the outer areas by feathering the trigger. Don't spray up against masking tape; the ridge left will be unsightly. The sprayed area can then be polished to further blend the touch-up and get rid of the overspray.

You're likely to get the odd meddlesome particle in-between the gun and job, ending up on the wet paint and it's always the final coat. Some things like small bugs and hairs that aren't too thick and dark can be lightly sanded and polished as above. If you're lucky you won't even notice there was a problem, other than a few tiny bug-paw prints.

Conclusion

I hope the article was of interest and the information useful. At the very least if, after reading the series, you think painting can be done to a high standard without all the bells and whistles then I've achieved what I set out to do. That, and it gave me something to do while watching residuals tick away on a thermal analysis!

●To be continued.

The Stationary Steam Engine

PART 26 - THE OLD ORDER OF THINGS

Ron Fitzgerald takes a look at the history and development of the stationary steam engine.

Continued from p.409
M.E. 4673, 10 September 2021

Various attempts have been made to estimate the number of atmospheric engines operating in Britain by the end of the eighteenth century. Recently Kanefsky assembled information for a total of 737 by 1780 and, with other authors, he has suggested that by 1800 the number may have exceeded 2,000. This suggests a substantial increase over the fourth quarter of the century (**ref 137**).

The engineers responsible for building these engines are, in the main, shadowy figures but what is known indicates that the procedure which they followed was largely similar to that which had prevailed since Newcomen's day. After preparing the design, it was usually the case that they, personally or by deputy, superintended the manufacture of the components and oversaw the erection on site. The artisans involved in building the engine were all recruited by direct contract with the end user and each was independent with his own craft specialism rather than being part of a permanently unified group with a specific engineering identity. Thus, the parts of the engine did not come from a single source and one of the main tasks of the engineer responsible for building the engine was the organisation and coordination of the suppliers of components.

The most demanding of these components was the cylinder and up until the mid-eighteenth century Coalbrookdale had an effective monopoly of cylinder casting and boring. After 1760 the spread of coke smelting encouraged the formation of new ironworks which began to reduce the Dale's dominant position. Carron Ironworks' role in bringing coke smelting to Scotland after 1760 has already been discussed, as has the Wilkinsons work. They were the pioneers but a new generation of coke ironworks was assuming importance in North Derbyshire, South and West Yorkshire and North-western England.

Amongst the earliest of these was the works started by Samuel Walker and his brothers. In the seventeen-thirties the Walkers had a nail forge at Grenoside near Sheffield at which, in 1741, they made experiments in casting domestic cast-iron goods using a reverberatory furnace. Five years later they moved from Sheffield to Masborough in Rotherham where a charcoal-iron smelting furnace was built in 1758. The first coke-smelted iron was made in 1769 by modifying this furnace (**ref 138**). On the opposite side of Sheffield, John Smith II and his sons, Ebenezer and John III, established a linked group of three works at Brampton near Chesterfield in 1775, with coke furnaces and foundries (**ref 139**). Booth, Binks and Hartop began casting at the Park Furnace on the Duke of Norfolk's Sheffield estate in 1784. North of Sheffield, the high quality coking coal of the Halifax Black and Better Beds with its interbedded, low phosphorus ironstone gave rise to a cluster of ironworks in the Wakefield and Bradford area. The first was Emmet's Birkenshaw Ironworks, three miles south of Bradford, which grew from a partnership formed between John Emmet, Thomas Holden and William Bolland. The partners also owned a foundry in Halifax. In December 1780 they were advertising a range of domestic and industrial cast-iron products (**ref 140**). Both the Birkenshaw blast furnace and the Halifax foundry were in the sole possession of Emmet and his two sons by 1785.

John Sturges senior, who had started a foundry in Wakefield at Fall Ings in the early seventeen-eighties, played a major part in launching the Bowling Ironworks nearer to the centre of Bradford in 1788 with his sons John and William and with Richard Paley and John Elwell. The beginnings of Bowling's traditional rival, Low Moor Ironworks, followed in 1789, the partners being Joseph Dawson, Richard Hird, John Jarrett and John Hardy. Dawson, a dissenting minister, was the technical partner with scientific interests mainly in minerology but assistance was provided by his fellow minister Joseph Priestley. Priestley, also an enthusiastic mineralogist, was, most famously, the discoverer of oxygen. He married Mary Wilkinson, the sister of John Wilkinson. In 1794, John Elwell left Bowling Ironworks and joined with John Crawshaw (possibly formerly a partner of the Walkers) and Samuel Aydon to launch the Shelf Ironworks.

A common thread linking these ironworks was the production of ordnance. Most had started by casting domestic ironmongery but the frequent wars of the second half of the century and the virtually continuous naval piracy, sponsored by rival nations, gave rise to a lucrative market for cannon and shot. Cannon were first made at Coalbrookdale after the reorganisation of the firm in 1738 reduced the shareholding of the Quaker Darby brothers to a 3/16 interest and with it, any religious scruples about engaging in the production of armaments. Cannon casting probably started in 1740 and by 1748 over 2,000 had been made. The Carron Ironworks in Scotland had envisaged ordnance making as a major part of its production from the beginning and subsequently cannon and shot became the icon of the firm. Wilkinson's interest in this direction has already been explored. The Yorkshire iron masters also became major suppliers of munitions. Samuel Walker's accounts feature cannon after the first coke-iron began to be produced. A new casting house was built for the gun trade in 1773-74 and payments in debentures for guns were first received in that year. The Smiths' Griffin Ironworks in Chesterfield included a converted corn mill that became known as the Cannon Mill. The three Bradford ironworks - Bowling, Low Moor and Shelf - all included cast-iron ordnance as a major part of their output from the earliest days.

It is not coincidental that these gunfounding ironworks also became the most significant suppliers of cylinders for the atmospheric steam engine. The possession of a facility for iron casting and foundry expertise was one element of this, but of equal importance, the production of cannon called for machining capacity, particularly boring machines. To some extent this demand for boring equipment had been anticipated by the production of pumps but interest in boring mills grew with the demands of cannon making. A new boring mill was completed at Coalbrookdale in April 1740. Samuel Walker with his partners had added boring mills and turning shops to their plants in 1760 but in 1774, at their Holmes works, a substantial investment included:

… a new casting house; 2 boring houses, with pit, cranes, stove room, 3 air furnaces &c., for carrying on the gun trade … …

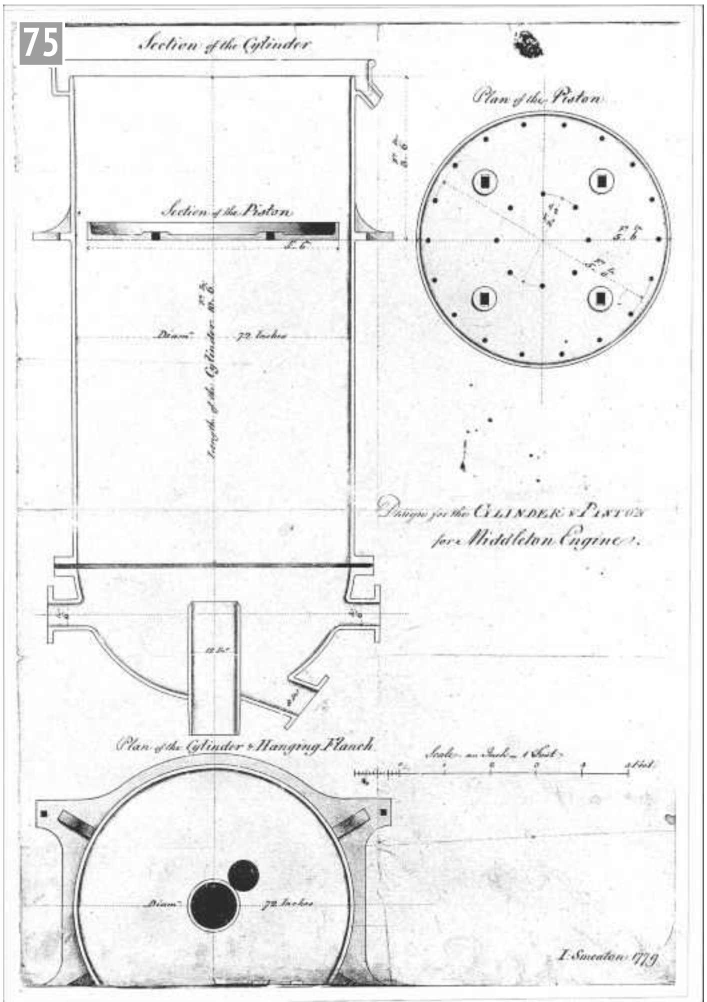
At the Griffin Foundry, John Smith II had purchased a group of forge buildings at the confluence of the Holme Brook and the Somersall Brook at the same time that the corn mill further up the Somersall Brook was acquired. This site had a substantial supply of water and by 1791, or possibly three years earlier, a boring mill house had been built onto the older forge building.

Doubtless, some of these cannon boring machines would have been pressed into machining atmospheric engine cylinders. The experience of Carron Ironworks shows that with a degree of tortured ingenuity they could be adapted but as cylinders grew in size the difficulties increased. For this reason Wilkinson's boring bar, unprotected by patent, was rapidly taken up by his competitors. In May 1780, William Reynolds of Coalbrookdale wrote to James Watt that:

… we are now putting up a mill at the Dale to bore cylinders in the manner of J. Wilkinson bore his (sic) … … (**ref 141**)

Banks and Onions of Benthall may have been experimenting with a boring machine similar to Wilkinson's for they too had erected an improved machine by September 1781 (**ref 142**). Writing to Boulton and Watt on 29 May 1781 Samuel Walker, in trying to solicit foundry work, says:

… We have not one of those Boring Mills you wd. have the Cylinder done by; but have had, & still have thoughts of erecting one … … (**ref 143**)



John Smeaton's drawing for the Middleton Colliery engine cylinder 1770. John Smeaton drawings preserved in the Library of the Royal Society.

Philip Robinson in his book on the Griffin Foundry assumes that the new boring mill house built by the Smiths contained a Wilkinson type machine although this statement is not supported by any evidence. The Hornblower brothers were reputed to be building a Wilkinson type machine at about this time and ten years later the Eagle Foundry in Birmingham, near neighbours of Boulton and Watt, were operating one.

Improved manufacturing competence encouraged these firms to extend their activities beyond the supply of cylinders and engage in steam engine building more comprehensively. As the supplier of cast-iron cylinders, Coalbrookdale might have been expected to be a leader in this direction. A pumping engine was being used to return water over wheel within their works by 1742 which, it can be safely assumed, was wholly built by Coalbrookdale itself. The degree to which the company subsequently undertook to build engines to this level of completeness remains to be explored. The Coalbrookdale cylinder dated 1776 previously illustrated in connection with the picklepot condenser may have been part of an engine fully built by Coalbrookdale as the author of the article says but his statement is speculative and it may well be that it remained a matter of supplying the cylinder only.

In the same year, 1776, the earliest engine that can be credited to the Walker brothers' Rotherham works was supplied to John Barnes of Ashgate, Chesterfield for his Engine Hollow pit near Barlow. A year later the firm built a pumping engine for use at coal pits which they operated near to the Holmes works but it was not a great success. A second engine for internal use may have represented an improvement. Whatever the case, according to Samuel Walker writing to Boulton and Watt in May 1781:

… We do a great deal of heavy Iron Work in the Engine way …

The firm must have had some credibility as they made the 72 inch cylinder for the Middleton Colliery in Leeds, an engine designed by John Smeaton in 1779 (**photo 75** and **ref 144**).

Of the forty-two atmospheric engines listed by Frank Nixon as being built in Derbyshire between 1775 and 1800, apart from ten definitely attributed to Thompson, only three can be identified with a specific builder. Two were by Boulton and Watt and the Foolow engine at Watergrove lead mine was by Booth, Binks and Hartop of Sheffield. Of the remaining unknowns, although firm evidence is lacking, it may be reasonable to conclude that all of Francis Thompson's engines were built by the Griffin Foundry and on this basis amongst the earliest engines built by the firm must have been the Staveley Company's Norbiggs Colliery engine of 1777. As, prior to the two-cylinder engine patent, Thompson's engines were single-cylinder machines, the Norbiggs engine and all of those built in association with Thompson up to 1792 can be assumed to have been of the conventional atmospheric kind. The Pentrich engine of 1791, which is now preserved, is a single cylinder atmospheric; the cylinder rim carries an inscription recording that it was made by *Smith & Co., Chesterfield, 1791* and *F. Thompson Engineer, 1791*.

The earliest works in the Bradford group of ironworks known to have supplied cylinders is Emmet's Birkenshaw Ironworks. Their *Leeds Mercury* advertisement of 5 December 1780 includes in a long list of domestic and industrial ironmongery … *boilers, cylinders, pipes, etc., for fire engines…* . A price list of 1782 for the same firm (**ref 145**) which is considerably longer again details:

… Cylendars, Bottoms, Receivers, Sinking Pipes, working Barrels, Wind Bores, Elbow Pipes etc., …

Amongst domestic goods and ironwork for pressers, dyers, mills and forges. Birkenshaw may have built the pumping engine that was erected for the future partners of the Low Moor Ironworks when they were jointly working coal on the Low Moor or Wibsey estates around 1781 but ten years later they are definitely known to have supplied the furnace blowing engine for their new Low Moor Ironworks. At about the same time, 1789 or 1790, Charles Hudson of Jumples Mill near Halifax had an engine installed at his mill which had been supplied by the Emmets (**ref 146**). Other engines of this period believed to have been constructed by Birkenshaw Ironworks were the Morley Crank Mill engine and engines for two woollen mills at Birkenshaw (**ref 147**).

The new generation of iron-smelting works capable of producing engine parts strengthened the relationship with the designers of the engines. This was mutually beneficial inasmuch as the ironworks secured the casting and machining work and the engine designer could collaborate more intimately with the foundry to improve the product and experiment with new ideas. At present, only in a limited number of cases are sufficient details known to show whether the arrangements that subsisted between the ironworks and the engineer were those of partner, consultant, engineer or employee and whether the engineering responsibilities extended beyond an interest in steam engines. If the evidence is inconclusive, in a few instances greater detail is available.

Francis Thompson's close connection with the Griffin Ironworks has already been noted but nothing has so far come to light showing the exact nature this relationship. It has been stated on several occasions that a formal agreement existed between Thompson and the Smiths. This was first referred to by Nixon who says that Thompson had … *a business arrangement with Ebenezer Smith* … in his *Derbyshire Steam Engines* (**ref 148**) but provides no details of any contract. Nixon suggests that Philip Robinson in his then forthcoming book, *The Smiths of Chesterfield* (**ref 149**) would provide further evidence. Unfortunately, Robinson's book fails to provide documentation and he falls back upon speculation. David Hulse made extensive use of both of these sources in his recent book, *Two Engineers, Francis Thompson and Richard Trevithick* (**ref 150**) saying definitively that:

In 1784 Thompson entered into a business agreement with Ebenezer Smith to have his engine castings made at the Griffin Foundry. This proved to be a successful partnership and worked for many years.

Again, Hulse fails to produce any evidence beyond that cited in Nixon and Robinson.

Thompson's work extended outside steam engines; he was a respected authority on mine pumping, he played some part in building the hydraulic pumping engine in the Aberystwyth lead mines and provided the pumps for the Norwood Canal tunnel in 1792. He also, unsuccessfully, attempted to build an air pressure engine. In all of this, the degree to which he was allied to the Griffin Foundry remains uncertain. He clearly made extensive and repeated use of their facilities and tenuous evidence points to a more fundamental relationship but confirmation of the position would benefit from further research.

The same obscurity almost invariably surrounds the career of other known eighteenth-century engine builders. Adam Heslop had some kind of association with both Reynolds at Ketley and with the Seaton Ironworks after he moved back to the North-West but again the extent and form remains unclear. Of the practical aspects of the practice of John Curr, the Sheffield mining engineer and steam engine builder and of James Brindley who was a steam engine builder in addition to his better known exploits as a canal engineer, again little is known.

Occasionally surviving documentation provides more complete information. The initial technical skill at the Birkenshaw Ironworks was probably John Emmet, the senior partner who came from a merchantile family but had an iron foundry in Halifax in the late seventeen-sixties although by the time that the Birkenshaw concern was started, Emmet was describing himself as *Gentleman*. Of the other two partners, Thomas Holden was a whitesmith and William Bolland was an ironmonger. Neither were partners after 1785. Later the active engineer was Michael Billingsley who was joined by the Cole brothers. When Birkenshaw ceased trading in 1802 Billingsley and the Coles all went to the Bowling Ironworks. In 1791 Emmet's foundry supplied the cast-iron water wheels and massive cast-iron tilt hammers for Kirkstall forge which survive today.

The Low Moor Ironworks' engineer, Edward Smalley, has the most complete biography. He was recruited because partners lacked practical engineering experience whereas Smalley had been previously employed in building Lord Balcarres' Haigh Ironworks in Lancashire. His *Articles of Agreement* with the Low Moor Company were reproduced by an early twentieth century local historian (**ref 151**). The Articles were agreed on 21 December 1791, between the partners Hird, Jarratt, Dawson and Hardy and Edward Smalley, who was then lodged at the Low Moor estate. Smalley undertook to:

*… faithfully serve Richard Hird, John Jarratt, Joseph Dawson and John Hardy as their principal Engineer, Superintendent, and Overlooker of the Foundry, Furnaces, Buildings, and Works now built and erected or to be built and erected by them on the said Low Moor …… during the term of ten years for the smelting of iron ore and casting boring and making of iron into saleable goods and merchandise and also all and singular the Trade, Business and Concern which is now carrying on by Richard Hird, John Jarratt, Joseph Dawson and John Hardy … Edward Smalley will faithfully fulfil the lawful orders and instructions and directions of … (*the partners*) … he shall not … absent or withdraw himself from … (*their*) … service without their leave in writing … shall not maliciously waste or destroy … Buildings, works, etc … to give true and perfect accounts….*

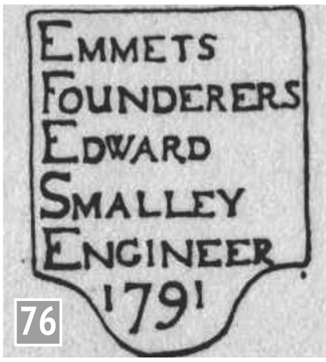
(The partners) *… will find and provide a good and sufficient Messuage or Dwelling house … for the said Edward Smalley and his family near to the said works … of equal goodness to the house now occupied by him belonging to Mrs. Judith Mortimer and also six days work of land near to the said messuage … also coals … they … will pay … unto Edward Smalley yearly … One hundred and fifty pounds in four equal payments in the year as a salary and stipend … and reimburse for all sums expended on travelling.*

Smalley brought with him from Wigan, Thomas Woodcock, a stone mason and builder (**ref 152**), who designed and built the first two furnaces at Low Moor but the blowing engine was designed by Smalley, an atmospheric engine with a cast-iron steam cylinder, 60 inches in diameter and a blast cylinder 101 inches in diameter. The bottom of the blast cylinder was open. As the piston descended four valves opened allowing air to pass from the underside of the piston to the top side which formed an air chamber. Further valves in a transfer box bolted to the upper cylinder cover discharged the air as it was compressed by the rising piston. The compressed air passed by a pipe into a stone reservoir which ironed out the engine's pulsations prior to delivery to the furnace blast main. The castings for the engine bore the legend *Emmetts Founderers. Edward Smalley Engineer 1791* (**photo 76**). The engine survived into the twentieth century, much rebuilt but retaining its original cylinders.

Smalley was responsible for the design and manufacture of all of the ironworks plant and machinery used at Low Moor over the following ten years and doubtless also for the engineering products sold to external customers. When his contract expired he moved to Bolton, taking over an existing rolling mill which became the Union Foundry of Smalley, Thwaites & Co.

Robert Fourness, who is mainly remembered today for his steam carriage patent of 1788, was extensively involved in building atmospheric engines and possibly engines with condensers. In 1793 Fourness, with his partner James Ashworth, leased workshop space at Booth, Binks and Hartop's Park Ironworks in Sheffield. Fourness's skills extended to patternmaking, the Park furnace making his castings. The Foolow engine referred to above may have been his but a rotative engine built by Fourness and Ashworth for a textile mill at Boulderclough near Sowerby Bridge met with considerable trouble as did Fourness and Ashworth's landlord, Mr. Booth who struggled to obtain his rent from the partners (**ref 153**).

●To be continued.



Facsimile of the builder's name plate cast into the blowing cylinder of the Low Moor furnace blowing engine. The Progress of Engineering in Bradford. J. W. Banks. Bradford Engineering Society.

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148. op. cit., p. 12

149. op. cit

150. op. cit., p. 32

151. *Illustrated History from Hipperholme to Tong*. James Parker. Pub. Percy Lund, Humphries & Co Ltd. September 1904 P. 37

152. Woodcock's father was apparently the foreman moulder at Emmet's Foundry. Presidential Address of J. W. Banks: *The Progress of Engineering in Bradford*. Bradford Engineering Society.

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My Favoured and Favourite Tools PART 2

Mike Joseph talks about a few of his favourite tools.

Continued from p.457
M.E. 4674, 24 September 2021

Tool ownership – owner's marks on tools

This is the second of the two articles and my personal feeling is that even though I never knew the previous owners of these tools (with possibly one exception), I would like to think that they would be happy that I treasure them and sometimes use them – though usually without their skill …

The marks are either the initials and surname or just initials. There are (in my collection, anyway) no tools with what might be called an 'illiterates mark' simply because these were skilled men and could not have done the job otherwise.

The marks vary between, at the basic level, scratched on marks to solidly punched names. Some have full stops, others not and some only partially. I don't think that any have been done on an engraving machine.

ME

H. DUCKWORTH *on the large square with the K upside down – an easy mistake to make.* **R.V.K** *and* **WM.C.** *on the scribing block.*

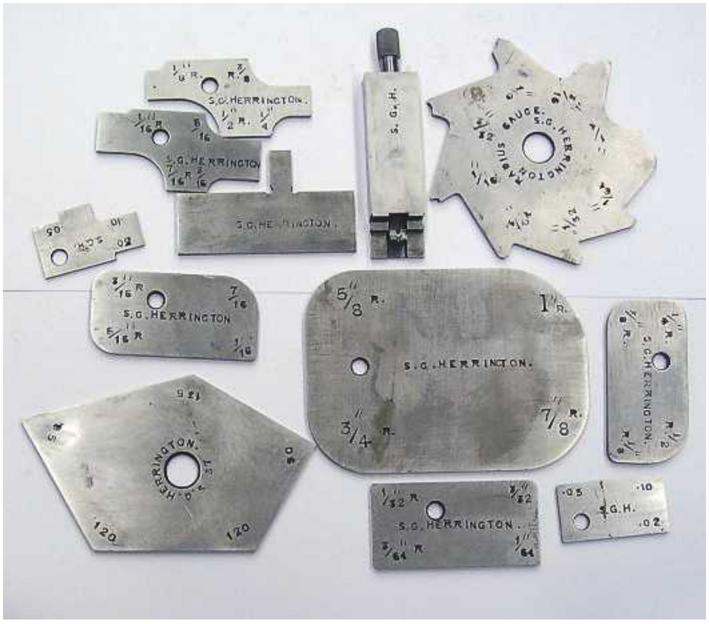
In the close-up of the scribing block there is a row of dots visible indicating a change of ownership.

GEJB *on the locking pliers.* **W.R.J** *stamped into the surface of one square and* **A.J** *into the other (possibly belonging to my paternal grandfather).*

S.G.H. *stamped into one of two small and unusually proportioned squares and the other appears to be neatly engraved in script.*

AW York *scratched into the surface of the square.*

On an engineer's clamp is **A KINDER** *on the upper jaw and* **A K** *on the lower jaw.*

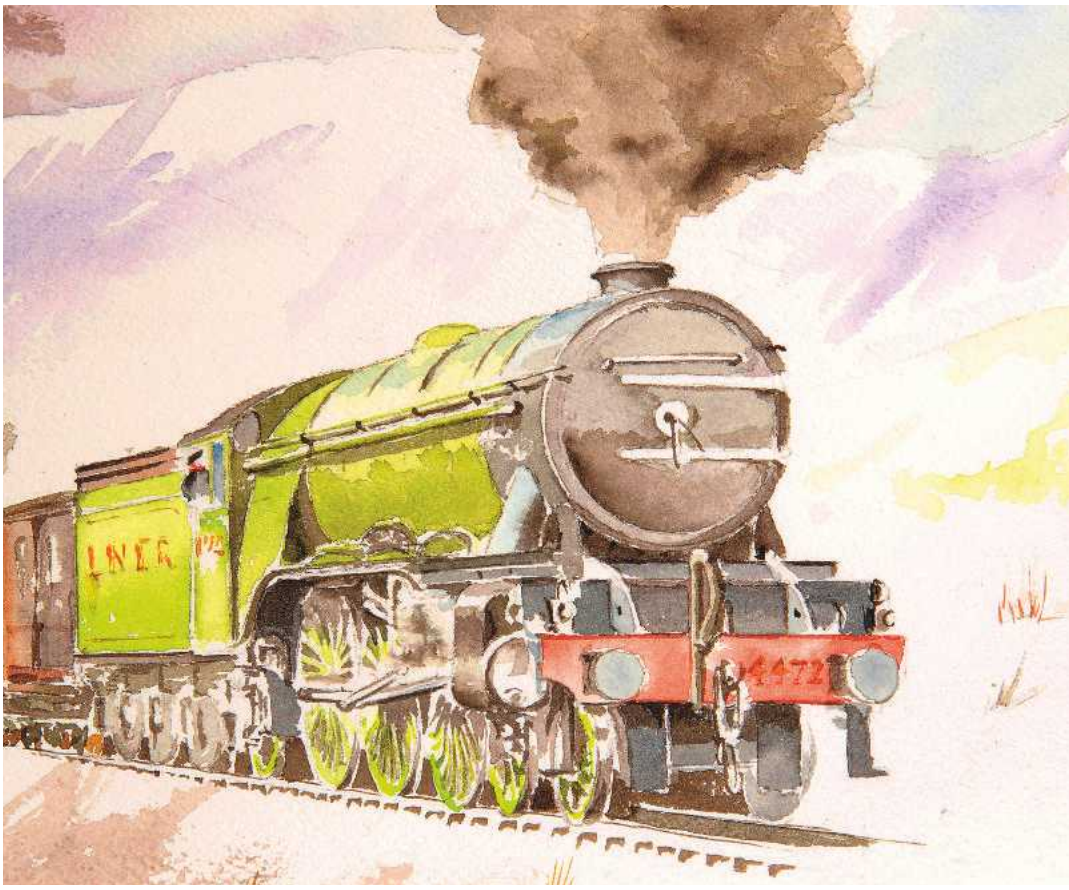


A remarkable collection of gauges all stamped with **S.G.HERRINGTON** *or* **S.G.H.** *Also, there is a small tool, the purpose of which I am unsure of except that it looks as though it was designed to grip something – the finish is excellent as are all the gauges.*

Finally, a note to let you know what is unusual about this combination square: I had not spotted what made it that little extra special because the 45 degree piece was stuck in the box. I only managed to remove it a short while ago (after having possessed it for over 20 years!). Beautifully engraved in script on the combination square's rule is **H J Fox***. So far, so normal - but then, on the underside of the 45 degree angle piece (photo 11) is* **H J Fox** *again and below it was the surprise: it is marked* **1917***. This set is over 100 years old! I can only surmise that this was part of the war effort because few consumer goods were being manufactured at that point in the war. It has survived intact in what I believe is the owner's own home-made box. It was this discovery that prompted these two articles. A very special tool.*

Peter Seymour-Howell builds a fine, fully detailed model of Gresley's iconic locomotive to Don Young's drawings.

Continued from p.402
M.E. 4673, 10 September 2021



Painting by Diane Carney.

PART 19 - CARTAZZI AXLE: SPRING PLATES, SPRINGS AND OIL BOXES

Flying Scotsman in 5 Inch Gauge

1. RIGHT: Progress so far, with a trial assembly of the Cartazzi axle.

2. FAR RIGHT: I first tackled the axle box covers, made from some $^3/_{32}$ brass flat bar. The covers were then lined up over their respective boxes, the hole positions transferred and the slot for the oil tray oiling lug cut out.

Spring plates and wedge control

All that remained was to turn a couple of wheels and the Cartazzi axle could all be brought together for a trial fit. It was nice to see things coming together and it was especially nice to note that with suitably sized pieces of steel to represent the sliding control mechanism placed between the axle boxes and the trailing frames the chassis is sitting close to its correct height and lining up nicely with the tender.

Now we have more work to do on the axleboxes.

3. Here is the side control mechanism. It consists of an angled wedge with a stud in the middle and a tapered channel cut down the centre to match the taper already machined on top of the axle boxes. The wedges slide nicely in and out although when assembled the wedge will be fixed in position via the spring plate and the axlebox, wheels and axles will be the items that do the sliding to and fro.

4. The first job was to machine up the basic angled shapes and then I needed to tackle the slot for the wedges to sit in. Here's the two plates held upside down in the machine vice while the slot was machined. I do these stages in pairs to both speed things up but also so that both are exactly the same.

5. Next I held the plates back to back for machining the oil reservoir seats which stick out from the plate outside edges. The corners still need rounding off, which I will do at the end. I then placed the plates their correct way up in the machine vice for drilling the hole that the wedge spigot pushes into. These were centered, step drilled and then reamed to size.

6. I then tackled the slots. I decided to do these separately. The slots were machined undersized as seen in the picture and they then needed fettling with a file to fit as I did not have a suitable cutter that could machine the return angles, and even if I did I'd still have to file one side by hand.

7. Here I have fitted the wedge and tried to angle the plate upside down so you can see what's going on. I have also filed the said return angles in the slots and begun the rounding off of the corners although not those on the oil reservoir seat yet. To finish these particular parts I needed to turn up two spigots for holding the spring buckle and braze them on and then finish filing to the drawing for the shape. I then needed to drill angled oil-way holes through the oil reservoir tank when built, through the spring plate and then through the taper wedge so that the one reservoir oils all surfaces and I also needed to drill and tap the mounting holes for the oil reservoir.

8. I then took a step back to catch up on finishing some parts that were still very much in the roughing out stage. One such part was the spring plate, seen here, which needs the spigot brazed to the top for accepting the spring buckle.

9. Finally, we have the Cartazzi axle main components assembled, now that they have all been filed smooth, especially along the sliding surfaces. You can also see the two 10BA hex head bolts fitted to the front edge of the oil reservoir seat. I did a little more research and although I have yet to see an image of 4472 with the shield fitted that these two bolts hold, the bolts themselves could be seen.

>>

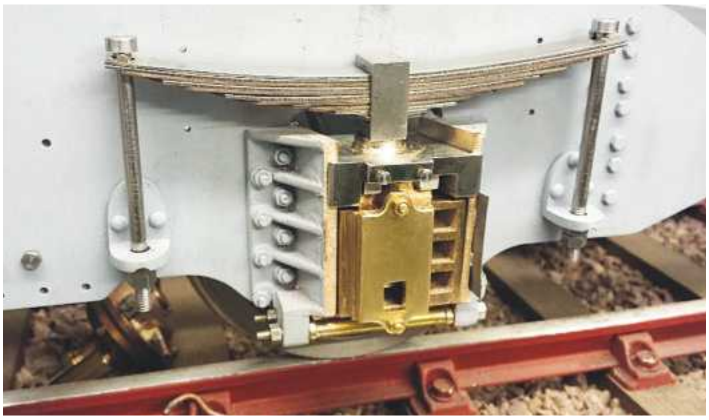
Springs, spring washers and oil boxes

Now we need a pair of springs. I shan't go into too much detail as these are mostly a repeat of the tender springs. The main difference between the tender and Cartazzi spring sets is that the tender spring hangers are hooked and slot over the end of the spring and latch onto the gripper (lovely design) that is brazed to the end of the top spring, whereas the Cartazzi spring hangers are a simple design in comparison, consisting of a straight length of steel which a collar at the top and threaded at the end.

10. FAR LEFT: Whereas the spring hangers are simpler than the tender's, the spring leaves require a little more work. The top two springs are drilled no.12 at each end and a steel gripper needs to be brazed across the centreline of the hole. I drilled the no.12 holes first as seen here, each upper set being drilled together.

11. LEFT: I then chamfered all of the leaf ends except the first three. The top two steel leaves have straight ends and the third leaf has a small semi circle filed out of each end for it to fit up against the spring hanger. Next, I dug out the hardwood profile tool that I had made for the tender springs to shape the leaves to their required deflection, followed by a good polish ready for the hardening treatment.

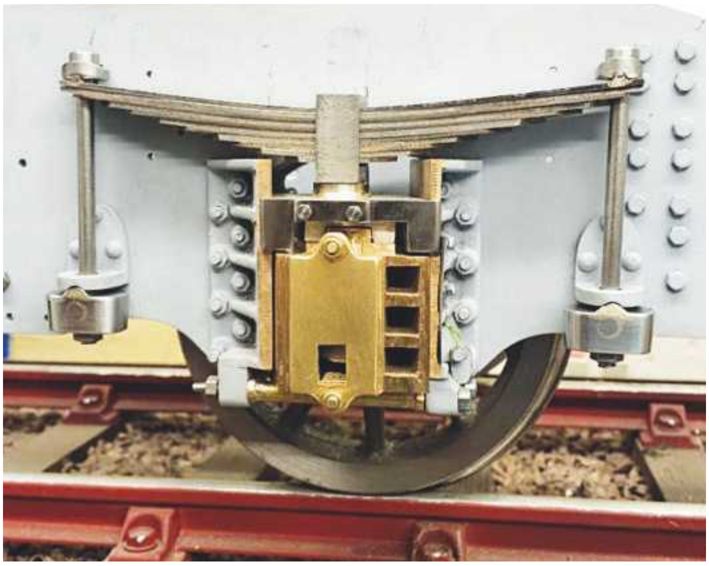
12. Here we have the components so far. The next job was to do the spring buckles which again are the same as for the tender.



13. And this is where I have got to so far. It was nice to discover that the springs not only worked well but the deflection looks like it's correct, currently sitting a little higher than normal, which will settle once the boiler is fitted. I will of course have to test the spring settings when fully loaded, either adding or removing Tufnol for steel and vice versa.

14. For small items the spring washers took a surprising amount of work. However, a combination of turning, milling and use of the belt sander resulted eventually in the required shape. These parts are pretty small so I held each part with a suitable nut and bolt - got a little hot on the belt sander though.

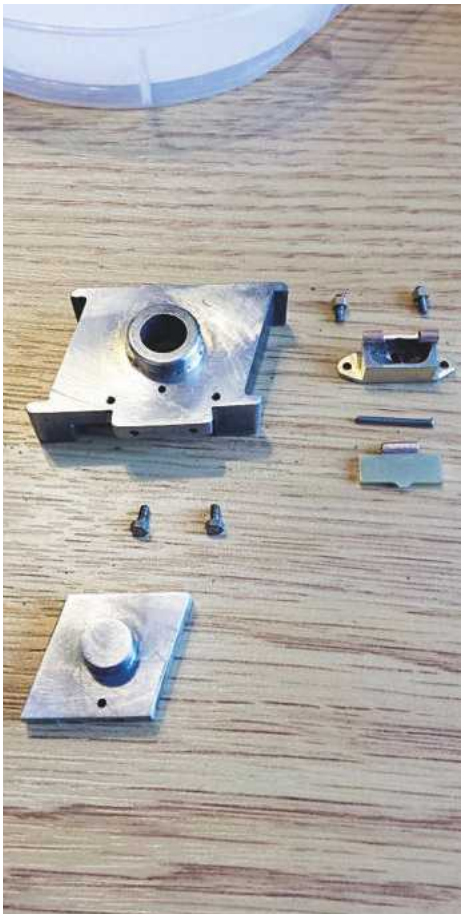
15. To finish off the spring washers here's a close up of one of them fitted. I have to say that I'm pretty pleased with how these turned out. When compared to the prototype pictures they look pretty close and certainly a lot more prototypical than those drawn by Don – certainly worth the 3 to 4 hours they took to make.



16. The shock absorbers are the same as those on the tender so no need to go over those again here. Here is a picture just to show this stage completed.

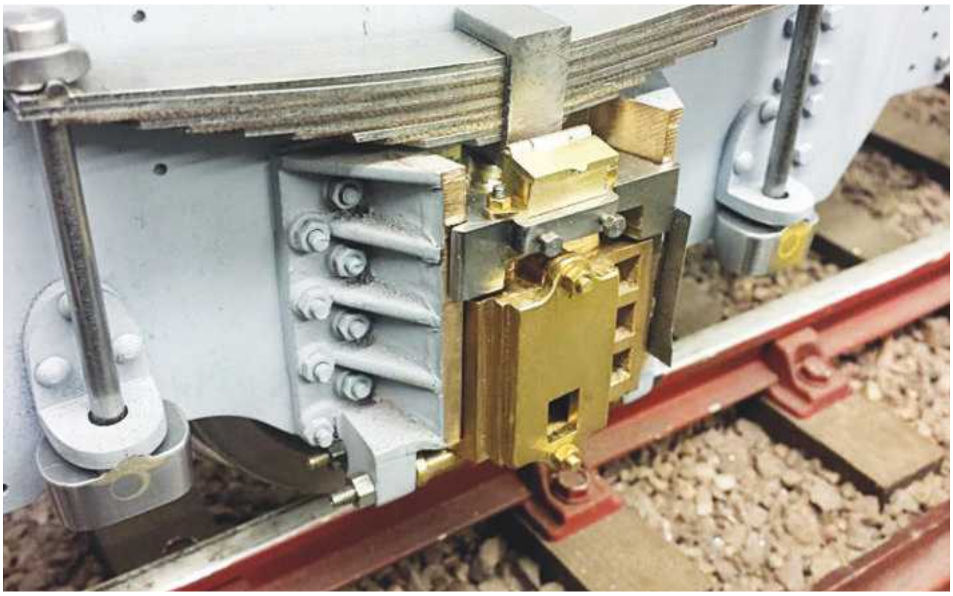
17. Now we come to the oil boxes. The first job was to make the reservoir tanks from ¼ inch brass section. Once I had two rectangles of the correct length I machined the end steps that have the holes for the bolts to secure them to the spring plate, as seen here.

18. After some machining, shaping and silver soldering on the hinge we arrive at the nearly finished tank. The top is sloped 10 degrees, the hinge has been added and the end tabs have been profiled to shape although not quite there yet. I also needed to do a little more draw filing to get the case nice as this isn't a painted item when finished so needs to be good. The small oil hole has been drilled into the bottom of the tank at an angle - this hole will continue through the spring plate and the wedge so that all of those parts get oiled from the one tank This I did once the tank had been fitted to the spring plate.



19. Here is a view of the various parts that make up the springplate assembly for the Cartazzi axle. The lower item is the wedge - you can clearly see the oilway hole, which is off centre - above is the two 10BA bolts that would hold on the dust shield if fitted - this seems to be a later item and I haven't seen the shield itself on pictures from the era I'm modelling, although the bolts are seen. Next up was to bolt the tank to the spring plate and then drill the oilway hole, this being drilled at an angle through from the oil tank, through the spring plate and then also through the sideways control wedge.

20. Here is a close-up of the finished assembly. I spent a bit of time filing these parts, which shows when compared to the other Cartazzi parts that still need a lot of work doing to them.



21. And now here is the assembly shown back together - this really shows how much more tidying up I needed to do on the rest of the Cartazzi parts, but that was for another day...

●To be continued.

Darlington's Narrow Gauge Dream Factory

PART 2

Mark Smithers explains how Scarborough's North Bay locomotive works found itself relocated to Darlington.

Continued from p.433
M.E. 4674, 24 September 2021

The next major step in the progression of steam locomotive design for N.B.R.E.S.L. was movement from the use of a cylindrical firebox to one of conventional locomotive pattern. Early in 2017, the opportunity to make this progression presented itself in the form of an order for a new-build replica of the Type One 3-Tonne Decauville 0-4-0T. Although a very small number of Decauville locomotives did work in England during the pre-preservation era, and others have since been imported for preservation purposes (including an 1885-vintage Couillet ancestor of the 'Type One', *Chuquitanta*, now on the Richmond Light Railway in Kent), this class was not generally indigenous to English locomotive practice. The inspiration behind the new-build locomotive was the 600mm gauge W/N 302 of 1899 *Bathala*, which was built for the Dombe Grande Sugar Estates in Angola and paid a visit to our shores in relatively recent years.

Whilst the new-build Decauville, *Edgar*, was in the process of construction, however, the shortcomings of the Scarborough area as a location for the company's activities were making their effects ever more felt and it was decided to relocate to the present site in Darlington. The rationale for this measure was explained by David Humphreys at the time:

"Mark and Steve Watson (another N.B.R.E.S.L. employee) live in Middlesbrough - 50 miles from Scarborough - and were travelling daily. We could not get staff and parts for manufacturing and re-making things were all coming from Teesside. Darlington is the centre of the new build and restoration scene, with the A1 and the G5 at Shildon as 'new builds', along with Darlington R.P.S. and N.E.L.P.G. At Stockton, nine miles away is Northern Boiler, with whom we work closely. Darlington is a convenient site as it is only 15 miles from Middlesbrough'.

The compressed-air test is an important part of the procedures necessary to get a new locomotive ready for operation and this is Edgar *undergoing the test in Darlington on May 30th 2018.*

During the remainder of 2017 and the first half of 2018, work proceeded steadily on *Edgar* and on 30 May 2018 a compressed air test was carried out in the presence of the locomotive's purchaser, bookshop owner John Sutton. Following the satisfactory conclusion of this procedure, the next hurdles to be overcome were the visit of the boiler inspector and the final running tests in steam. In order to complete these, it was decided to move the locomotive temporarily to Beamish Museum's 2 ft. gauge line, where the necessary tests were completed during the final week of June and early July. Following its spell at Beamish, *Edgar* moved on to its permanent base at Apedale where it played a prominent part in the line's September 2018 Golden Jubilee Gala.

With *Edgar* now completed, thoughts turned to what to do with the embryonic two foot

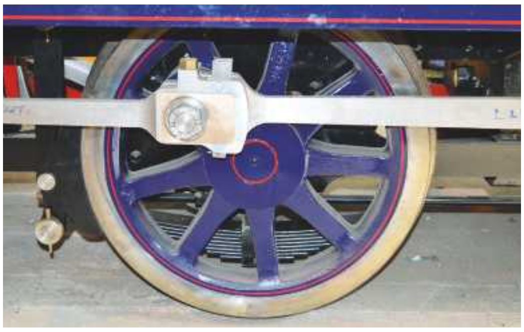
As the project progressed, it was realised that the process of manufacturing a replica passenger steam locomotive is a more onerous one than was originally envisaged, involving not only the certification of most components as 'fit for purpose' but also the production of metric CAD drawings of the locomotive's components.

When completed, Edgar *had its trials on the 2 foot gauge line at Beamish Museum before going to its present home on the Apedale Railway. It is seen here at Beamish posing with resident locomotive* Samson *on July 1st 2019.*

Much of the work undertaken today by N.B.R.E.S.L. is on boilers and not all for railway locomotives. This is a three-quarter (9 inch) scale boiler for a miniature compound Foden steam lorry for a customer in the Republic of Ireland.

A view of Blyth's *weighshaft balance weight and right-hand eccentrics.*

A view looking into the leading left hand area between Blyth's *mainframes showing the left hand drop link and overhung leading spring, along with part of the right hand expansion link.*



Blyth's *leading left-hand coupled wheel showing similar detail to the previous view, but this time also showing the rear of the connecting rod.*

The left-hand leading wheel area of Blyth *showing the lower part of the motion bracket, crosshead and slide bars, leading forked end of the connecting rod, securing cotter for the piston rod, gland and rear cylinder cover.*

A close-up of the left hand leading area of Blyth's *boiler barrel, showing the clack valve and handrail. This view shows well the fact that the smokebox is lagged (hence the cladding) and the fact that the steam pipes have yet to be fitted.*

gauge Bagnall locomotive. The lack of a designated customer was turning out to be a major headache and by April 2018, thoughts were even turning to utilising the engine's components in a 15 inch gauge project. Realistically, there were only three potential venues likely to be interested in the locomotive, namely the Groudle Glen Railway, the Amberley Chalk Pits Museum and the Amerton Railway. In the event it was the G.G.R. that was able to come up with the necessary funds to complete the engine in the form intended. Final trials were undertaken on a suitable stretch of track adjacent to Castleton Moor Station on the Middlesbrough-Whitby (Esk Valley) main line on 21/22 April 2019. The locomotive – which it had originally intended to name *Wendy* – was formally commissioned as *Otter* on the G.G.R. alongside 2-4-0T *Brown Bear* on July 24th 2019.

At the time of the move to Darlington, David was asked how much of the company's production was in the railway sphere and how much is taken up with other work. David explained: "80% is railway. The rest is traction engine and new build boilers and steam plant for boats". He was further asked what he felt the limitations of the company's production capacity were: "Currently, we can build/restore locomotives up to the small standard gauge size. Whilst working for a previous company, Mark built the N.E.R. »

Blyth's *left-hand steam chest cover showing the entry point for the steam pipe.*

Blyth's *backhead area showing the water gauge glasses, firehole door, rear coupling mounting and steam brake cylinder.*

A view of Blyth's *brake cross-shaft and the lower part of the rear ashpan damper.*

A leading left-hand three-quarter view of Blyth *in the workshop. Shortly afterwards the tanks were constructed, sufficient funding having been received.*

The rear of Blyth's *steam brake cylinder and its mounting on the inside of the left-hand mainframe.*

replica G5 boiler along with the frames. More realistically, a large narrow-gauge locomotive could be built here, up to 6 metres long. New boilers can be made up to 1 metre in diameter too." Certainly, this vision of the time has been borne out by more recent events as evidenced by two of the most recent narrow-gauge 'new-builds'. These will have the effect of raising the profile of N.B.R.E.S.L. in the steam railway fraternity generally as both of the locomotives concerned are well-known domestically-based designs.

The larger of the two latest 'new-builds' is a replica of *Blyth*, one of the three original 3 foot gauge 2-4-0T's completed in 1879 for the 3 foot gauge Southwold Railway. This is being constructed for the Southwold Railway Trust, which officially launched the project on 16 March 2010. Originally, it was funded solely by the '2-4-0 Club', a separate scheme under which the replica's components can be sponsored in units of £240. Some components were completed during the early pre-N.B.R.E.S.L. phase of construction and these included the mainframes - with associated footplate valences and motion brackets; buffer beams; pony wheel centres; smokebox door and chimney.

As the project progressed, however, it was realised that the process of manufacturing a replica passenger steam locomotive is a more onerous one than was originally envisaged, involving not only the certification of most components as 'fit for purpose' - a process that involves the compilation of comprehensive records relating to steel type, provenance and construction methods - but also the production of metric CAD drawings of the locomotive's components. In consequence, it was found to be necessary to almost totally redesign the new-build *Blyth* from first principles using the original Sharp Stewart General Arrangement drawing as a guide. The work included a redesign of the boiler and the preparation of a 3-D Solidworks CAD graphic of the entire locomotive.

The source of funding for the project has also been widened and simplified. In 2018, a £300,000 contract was finally placed with N.B.R.E.S.L. for the construction of *Blyth* and this commenced with the boiler, which was constructed in Darlington during the course of 2019. Mainframe and stretcher assembly has been facilitated by the use of a special hoist, which allows for the lifting or lowering of the inverted chassis as each individual manufacturing process requires. At the time of writing, work on *Blyth* is almost complete, with the components for most of the chassis, boiler, smokebox and side tanks (stainless steel in accordance with company practice) present in the workshop.

As an example of redesign requirements for *Blyth*, close examination of the original makers' general arrangement drawing shows that the leading axle was fitted with Adams radial bearings. Operational experience with the original locomotives indicated that they were prone to derailment on occasions. This would appear to be the consequence of two design features, namely their relatively long coupled wheelbase of 4 foot 3 inches – still not sufficiently long to prevent the need for a 'puckered' foundation ring – and the lack of effective side control for the leading axle. As Mark explained the new-build *Blyth* will therefore have Cartazzi-pattern inclined plane side control incorporated into the radial axleboxes. In this context, it should be noted that the two larger 3 foot gauge 'Sharpie' 2-4-0T's built in 1879 for the Manx Northern Railway incorporated similar pony trucks to *Blyth* as built and were found to need the subsequent addition of side control springs. Completion of the locomotive is currently envisaged for the middle part of 2021.

When *Blyth* is finally completed, it is envisaged that it will run on a stretch of track associated with the S.R. Trust's Steamworks project adjacent to Blyth Road in Southwold. Any operative restoration of all or a major part of the Southwold system will of necessity be years into the future, however. The arrival of this locomotive on the heritage railway scene could, however present another opportunity which could follow the precedent set by Isle of Man Railway 2-4-0T *Loch* in 1993, namely a visit to the Isle of Man that could see a 'Sharpie' 2-4-0T in Ramsey for the first time since the departure of the last-surviving Manx Northern Railway example – probably for scrap – in the latter part of 1923, even if this could only be accomplished by means of road transport.

●To be continued.

A close-up view of Blyth's *steam brake cylinder from between the mainframes.*

Another close-up view, this time of Blyth's *firehole door. Welded construction is once again very much in evidence.*

Blyth's *smokebox tubeplate is seen in this view. The steam pipe header has yet to be fitted.*

The non-ferrous castings for Blyth's *Stroudley-pattern regulator are seen here. Most of the machining work has yet to be carried out although a start has been made.*

Blyth's *handbrake column is seen here, along with a side view of the left-hand water gauge.*

Blyth's *steam and handbrake bellcranks are both visible in this view.*

Another boiler job – this time for a 15 in gauge loco of Kerr, Stuart 'Wren' inspiration on the Sherwood Forest Railway. Welding work on this boiler was in progress during my visit.

An Astronomical Bracket Clock PART 13

Adrian Garner makes a bracket clock showing both mean and sidereal time.

Continued from p.448
M.E. 4674, 24 September 2021

The remontoire release mechanism

Whilst this is a critical part of the clock the planting of the two cocks and pivots is no different to those in the time train. The position of the 6t pinion arbor is at the intersection of the arc scribed by the depthing tool from the intermediate wheel arbor hole, again using the brass disc mentioned above, and a horizontal line 0.6875 inch below the intermediate wheel pivot hole. The position of the release arms pivot is the intersection of this horizontal line with a vertical line 0.375 inch from the line through the centre wheel pivot hole.

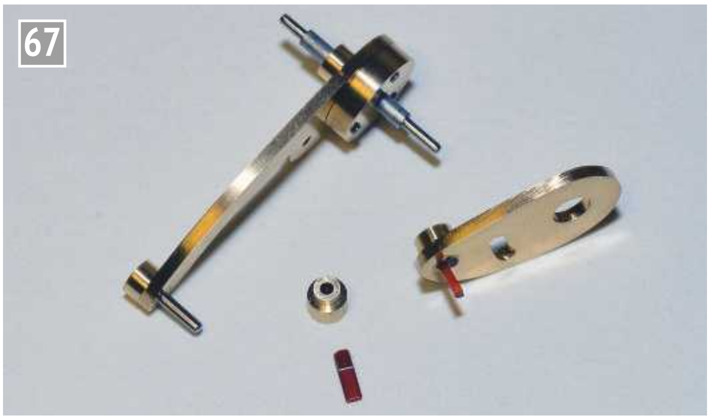
The two-armed remontoire release wheel is made from 1/32 inch gauge plate. After coating the gauge plate with layout blue, mark out the shape. The 10BA clearance holes are best made a little over size (I used a No. 48 drill rather than the usual No. 50) and the central hole should be reamed 3/16 inch after centre drilling and drilling with a No. 15 drill. The shape was cut out with a piercing saw and then filed. Use filing buttons to form the central shape. Take care not to bend the arms, as gauge plate is tough to saw and file and it is easy to slip (**photo 66**).

66

The remontoire release wheel.

The associated brass collet which is Loctited to the 6t pinion has nine holes. Three are tapped 10BA to secure the 2t release arm. The other six are 1/8 inch diameter on the same pitch circle as the 10BA holes and are there purely to reduce the weight.

The release arms are pierced from 1/16 inch brass plate. Before picking up the piercing



The remontoire release arms.

saw, however, the various holes need to be drilled/tapped. These could be marked out and then drilled but are easier to coordinate drill. The shapes of the arms are not critical. The small slot for the 10BA cheese head screw which locks the two arms together needs to be a clear but good fit to the screw. I drilled two 10BA clearance holes, one radially spaced 24 degrees from the other around the pivot axis. The material between these holes was then pierced out and the curved slot brought to size with a needle file.

Either hardened and tempered to blue, 1⁄16 inch diameter silver steel or 'blue' steel can be used for the peg at the end of the arm which meets the brass swing arm. A steel against steel combination for the pin that stops the two-armed release wheel is less satisfactory as it will encourage wear due to the microscopic welding of similar materials. I therefore opted to use a 1.9mm diameter Brocot pallet stone for this pin. This stone is 6mm long and cylindrical for about 2mm and halfmoon shape for the remaining 4mm. To mount, a shouldered collar is needed, drilled to a depth of 2mm. To secure the stone use shellac, which can be purchased in flake form. A tiny piece should be cut from a flake with a modelling knife (the shellac is easily cut but brittle) and dropped with tweezers into the hole in the collar. Gently warm the collar over a small flame until the shellac melts and insert the jewel. After cooling the jewel will be secure (**photo 67**).

The collar is secured in the release arm using Loctite. If the jewel needs to be rotated so that its flat face meets the release wheel this is easily done by reheating. Shellac melts at about 75 degrees C (less than the temperature of boiling water and below that which harms the Loctite joint) so the key to success is to only apply little heat.

Pendulum and remontoire stop pins

It is essential that these four pins are fitted. The long two pins are fitted to prevent the pendulum/crutch swinging too far. Without these pins irreparable damage can be done to the escape wheel. These are made from ⅛ inch diameter mild steel rod threaded 5BA at one end. A 5⁄16 inch diameter steel collar about 0.135 inch thick is Loctited above the thread and, when set, its lower surface turned true. A small 0.015 inch slot sawn at the other end will allow the use of a screwdriver to tighten them in position. I cut these slots with a small circular saw in the mill before securing the collar so that it was easier to hold in my dividing head.

The positions on my clock are shown on the drawing but the precise positions should be determined from your clock so that they provide an equal swing to each side of the centre line (**photo 68**).

The upper right-hand pin of the above has a secondary purpose. It prevents the release arm from excess anti-clockwise rotation (looked at from the rear of the clock).

A third shorter stop pin prevents excess clockwise movement of the release arms. This pin is made from 5⁄16 inch mild steel rod. It is not totally trivial to make. I faced the end and then turned a rod to ⅛ inch diameter for about ⅜ inch. After parting off about 11⁄16 inch long it was held by the ⅛ inch diameter to turn and form the 6BA thread which will secure the pin to the rear plate. A short brass rod was then held in the chuck, drilled and tapped 6BA and the embryo pin screwed on to it. It was now easy to reduce the ⅛ inch diameter to 1⁄16 inch with a sharp tool and multiple cuts, kept to about 0.005 inch to avoid bending the pin.

The position of the stop pin will depend on the exact shape of the release arm as well as the precise position of the release pins in the release arms assembly. This is not easily possible to calculate so a trial and error system is best adopted. To do this take a short length of 5⁄16 inch mild steel and turn a spigot to 1⁄16 inch by 9⁄16 inch long to form a dummy stop pin. Part off leaving a shoulder just over 1⁄16 inch thick. Now reverse in the chuck and turn the shoulder to 1⁄16 inch thick and form a small recess at its centre (say about 0.010 inch deep by ⅛ inch diameter).

Stick the dummy stop pin to the rear plate with superglue at your best guess of the required position. You will be lucky if your first guess is correct. Once you are happy, measure or mark its position, remove all the wheels and cocks and release the dummy pin by momentarily heating with a gas torch. Drill and tap for the stop pin.

The fourth and last stop pin limits the anti-clockwise rotation of the swing arm (when looked at from the rear of the clock) and thus disengagement of its wheel from the double wheel assembly. This could happen in two ways – the jewel in the remontoire could break or the release arm could be swung the wrong way when the clock is being moved. In either event the mechanism would have free run to lift the swing arm up and 'out of gear'. The powerful spring would cause the mechanism to run at an excessive speed with resultant damage.

The required stop is a short length of ⅛ inch silver steel faced at each end and drilled for a 10BA screw. Its position is not critical provided it prevents the swing arm wheel from disengagement with the double wheel and allows sufficient movement for the arm to swing in during its normal cycle. For information, the 10BA tapped hole for this stop on my clock is 2¾ inches from the top of the clock plate and about 3 7⁄16 inches from the clock plate edge - but do check your clock.

●To be continued.

The pendulum stop pins.

A Small Steam Turbine from Castings

PART 2

Bob Hayter makes a small turbine from Luke Cringle's castings.

Continued from p.441
M.E. 4674, 24 September 2021

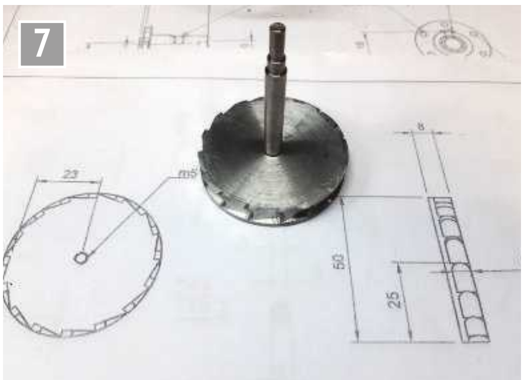
Main shaft and rotor

We now come to the moving parts. First, I machined the steel main shaft to size and threaded one end. I then tackled the rotor. The rotor casting has a smaller diameter extension on one side to hold in the lathe whilst drilling and tapping the centre. Before removing it from the lathe, I skimmed the full diameter of the face then reversed the rotor in the lathe, mounted on the main shaft to ensure concentricity. I machined off the extension, faced the rotor to 8mm width and reduced the diameter to 50mm.

Next, I transferred the assembly to the indexing system on the mill and lined it up with the 6mm cutter. The drawing shows a 6mm cut for the buckets with a space of 2mm on the side opposite the shaft, which would cause the cutter to break the surface on the inner side. Instead, I chose to move the rotor over slightly, reducing the 2mm to 1.8mm, leaving a thin wall along each bucket. Before cutting ensure that the direction of the buckets and direction of rotation match. The steam entering from the jet should enter the slope of the bucket to strike the curved end.

Machine 16 buckets equally sized and spaced (**photo 6**). Note that the end of each cut is on a radius from the centre. The balance of the rotor depends on getting the buckets cut evenly. I now completed the main shaft checking the bearing spacing and position of the rotor in the casing before finishing the shaft to length. Once complete I tried the assembly in the housing and fine adjusted the position of the rotor to run clear and free, screwing the rotor along the shaft to adjust if necessary. It may be necessary then to lock the rotor to the shaft - in my case it was screwed tightly to the face on the shaft (**photo 7**).

Starting to machine the first bucket.



Rotor with all buckets machined.

Steam jet

The steam jet is made from the brass material. Drilling the 1mm through requires a little care if the drill is not to be broken in the hole, backing the drill out frequently to clear the swarf. Ideally, such a jet would have a taper widening towards the outlet as described in the recent series on turbines in this magazine. However, it isn't practical in this case and probably would not make a significant difference in such a small turbine. The inlet flange is shown as having a 4mm hole and this should be adjusted to suit your application. I tapped mine ¼ inch x 40tpi to take a pipe union. Filing the flange to shape was an interesting exercise in the use of buttons and I had to file grooves in the central button to allow the outer two to share (**photo 8**).

Inlet flange.

Drain cock.

Drain cock

Many will prefer to buy a commercially available drain cock and tap the hole in the casing cover accordingly. I made the drain cock specified but extended the inner shaft length, cut the handle off and turned it 90 degrees as shown (**photo 9**). While I had the lathe set over to machine the taper on the inner I also made a taper on a piece of mild steel to match. This was turned into a reamer by cutting grooves along the length and then hardening (**photo 10**). It was then used to cut a taper inside the body to match the core.

Tapered cock inner and matching reamer.

Exhaust flange.

Exhaust pipe and flange

The exhaust pipe is a matter of choice and I used a short length of 15mm copper water pipe. The flange is marked for fixing holes but part of it is removed to allow a close fit to the casing. Check the orientation to prevent a clash between the flange screws and those attaching the rear casing (**photo 11**). As can be seen, I didn't quite get this right - not a serious problem as there is no pressure in the exhaust - but it just doesn't look good. I later disguised it with a dummy screw (now there's an admission!).

Assembly and testing

At this stage a trial assembly can be done, adjusting fits so that the turbine runs easily and freely (**photo 12**). I applied air to the inlet at 15psi and the turbine whirred into life - at 60psi it screamed. For final assembly a thin smear of sealing compound on mating surfaces is all that is required as the only pressure interface is the steam inlet. I put a small drop of cyano adhesive in the bearing seats to ensure they don't work loose.

Painting

Aluminium, like brass, needs some special treatment to get paint to adhere well. After cleaning a coat of etch primer should be applied and allowed to dry thoroughly. I saw that the instructions on my can of etch primer must be generic to that range of primers because it recommended several thin coats. With etch primer only the first coat is in contact with the metal and will do its etching; subsequent coats can be of any suitable paint. I used a brushing enamel for the final coats. I was pleased with the resulting model, which will be mounted on a base with a small gas fired boiler (**photo 13**). I will select the gas burner to supply the volume of steam required by the turbine.

The completed turbine before painting.

Turbine teamed up with its boiler.

ME

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.

The cruise…
Well, a curate's egg of a holiday. Documentation problems - fog, Scotland off the itinerary, impromptu non-stop tour of the Channel Islands. The reception centre, where our documents and vaccinations were checked before boarding, sported four clocks on the wall. They were labelled New York, Los Angeles, Dallas and San Francisco. The times they indicated bore absolutely no relationship to reality. For instance, New York is not 2 hours 15 minutes different from Los Angeles! However, a week away, hot and cold running drinks, whale spotting, Portsmouth dockyard, the Inner Hebrides and lots of friendly passengers and crew. Plus aspects of humour, beginning with Captain Rommel, appropriate music, aspects of ship design - and we won two quizzes and came second in another by 1 point only. My picture of the Belfast pilot boat is rather good, I think (**photo 1**). A modern version of dazzle paint is seen here on HMS *Spey*, P234 (**photo 2**) and I found that not only was our ship bigger than the *Titanic*, but also bigger than the Royal Navy's new aircraft carriers! Here is a helicopter pilot's view (**photo 3**). A police launch located itself between *Prince of Wales* and our ship *Borealis*, presumably to detect any skulduggery on our part, after which it wandered off to patrol the other denizens of the dockyard. Notably, all the crew are Authorised Firearms Officers. Our presence was also observed from the bridge of *PoW*. Our coach tour of Portsmouth met with a thunderstorm and, what with torrential rain and the fog, meant that the ship's musicians played 'I can see clearly now' and 'I can see for miles' although, when they began playing ragtime and the attendants started rearranging the deckchairs, I began to wonder. Later, the band were just beginning a slow, romantic number when we were joined by a virtuoso performance of 'Foghorn in the key of A' by Fred Olsen, which reduced the singer to fits of giggles. As the band were playing requests, I asked for some *Shadows* numbers, since most of their music was written in 'A'. Around the Isle of Wight were ships waiting to dock, or, 'Loitering within t' Solent'. We noted that the coast looks very different from seaward, there being no signposts. So, approaching a coast at night meant lighthouse spotting or - crunch! - "Land ho…". We learned fog recognition too, sea frets, Scotch Mist, etc, although we could have been off Namibia or Newfoundland for all we knew. We were informed that some whales grow up to a hundred feet, enabling them to walk about on the seabed. I resisted the temptation to shout "Periscope off the starboard bow!" (Or Klingons…) We were moved

Belfast pilot boat.

Dazzle paint updated, here on P234.

HMS Prince of Wales.

about the ship's facilities courtesy of Schindler's Lift, about which a film was made starring Liam Neeson and Ralph Fiennes. There were lots of maritime pictures in the corridors, mainly by the Dutch painter Peter J. Sterkenburg - look up the Peter Sterkenburg Foundation to see his work. Once roaming the corridors, emulating Capt. Van der Decken, I encountered some ship's officers, followed by a motley collection of disciples. I asked if this was 'Captain's Rounds', but no-one replied and they moved on.

I also visited the dentist again, following my remarks in M.E. 4670 and was relieved of a three figure sum for the privilege of looking less like Alfred E. Neuman.

In this issue, pilot boats, speed records, magnets, big drills, sundials, marine artistry, interlocking, the finest model engineer(?) and welding.

Let's get right on with it. *PEEMS*, May/June, from **Pickering Experimental Engineering & Model Society,** has a detailed article on the restoration of the stables clock at Upper Helmsley Hall, by Mel Doran, who participated. The clock was built by Thomas Cooke in York in 1874 and is probably good for another 1000 years… The Gem Turbine Streamliner motorcycle, created by Alex Mcfadzean and seen at Elvington, is to attempt the land speed record, powered by a Lynx helicopter engine and driven by Guy Martin.

W. bisarchtest.wordpress.com

The *Bristol Model Engineer*, summer, from **Bristol Society of Model & Experimental Engineers,** tells us that the new club locomotive is modelled on the GWR Class 800, and named *Isambard Kingdom Brunel*. The dummy nose and cab were 3D printed, in a second attempt after the first distorted in the hot sunshine. Locomotive *Duckling* was given some TLC, having been referred to as a 'flat-pack' vehicle due to someone driving over the curved roof as it was about to be fitted. Now with a new half-cab, repainted and renamed *Smallard*, it bears a plate announcing that it has reached a speed of 12.6 mph...

W. www.bristolmodel engineers.co.uk

St Albans & District Model Engineering Society's June newsletter *The Gazette* of 10 years ago carried an interesting item about TIG welding, with particular attention given to copper boilers. Mike Collins visited Bradford Industrial Museum (one of my favourite places – Geoff) whilst Rob Briancourt continues his tale of a pilot boat. Secretary Roy Verden explains how to revitalise tired old magnets. (Ferrosan?, blue pills?) Roy also explains that it is illegal to move large magnets by road or rail. The poles are moved to their destination before being energised, the equipment needed being brought to them. There's an attractive idea… In the case of model railways, a couple of neodymium magnets added to the pole pieces is all that is required.

W. stalbansmes.com

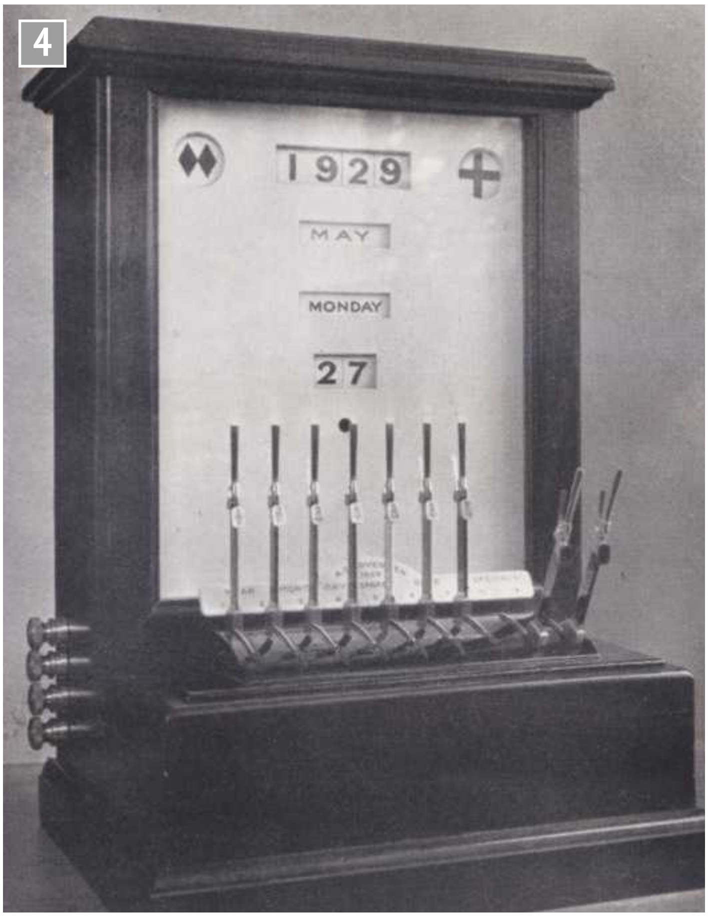
Goodwin Park News, summer, from **Plymouth Miniature Steam,** this time amounts to 32 pages, thanks to members' diligence and literary activities. Michael Malleson describes another of his lockdown projects, the resurrection of an old dental drill. This is the menacing arrangement of cords and pulleys that used to loom over us as the chair reclined, like an instrument of torture. (Who said, "Whaddya mean, 'like'?) Anyway, after freeing off bearings and replacing the motor with one from a sewing machine all was well and he now has a sort of Tonka-sized Dremel! Ian Jefferson made a press tool to make repeatable shapes for a model, the tool being used in a three-inch vice. And then, what do you have, given four men and a boy, and no railway for a year? says John Briggs. Answer? An opportunity! So, the bridge was raised at one end to compensate for a sinking foundation and 20 tons of rubble laid to match the track height on the approach. Eight other projects were also completed PLUS a new signboard and a refit of *Hernia.* A correction to the sundial project in the previous issue of GPN is that the dial as given is incorrect. The a.m. and p.m. positions should be reversed. This is easier than pushing the Sun backwards.

W. www.plymouthminiature steam.co.uk

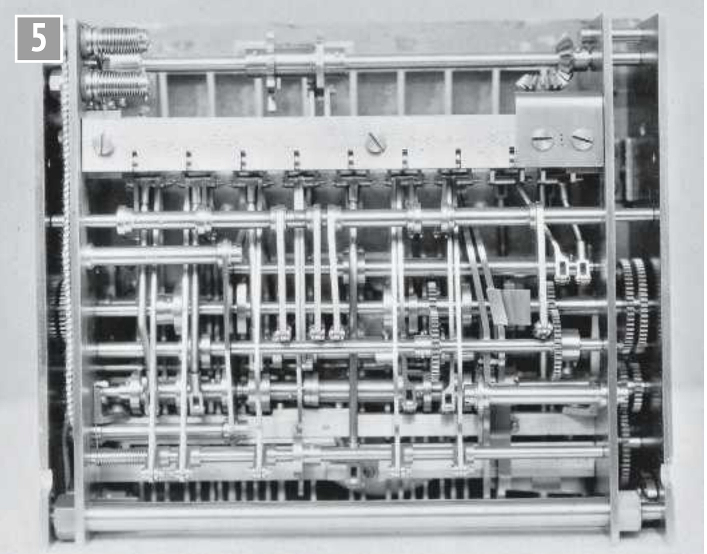
Stamford Model Engineering Society June *Newsletter* says that in the Bit & Pieces meeting, Pete Seamer showed an Appalachian dulcimer he had made, from tulip wood and other exotic materials laid about. (Chewing gum, Meccano…?) The sound holes were laser cut and the fret spacing found on the internet. (A dulcimer is a stringed instrument, like a psaltery, so that's OK then. Any questions? – Geoff. Often played by damsels – Ed.) Dr John Hennessey brought some mechanical artefacts, including two, four function, hand powered calculators. Editor Joe Dobson recommends 'modelengineeringwebsite. com' run by David Carpenter, a collection of items and free plans. The July issue opened with Keith's Harold Underhill motor fishing boat, which he is very pleased with, and even found a place to display it which met with his wife's approval. Editor Joe Dobson managed to repair a Bulle clock and subsequently several others. These electro-magnetically regulated clocks date from the early 20th century. The Scott/Wilding clock uses a similar principle but is engineered quite differently and is based on a design by Herbert Scott of Bradford.

The Lobby, summer, from **Brighton & Hove Society of Miniature Locomotive Engineers,** which is celebrating its 70th year in Hove Park, gave details of a very complex desk calendar using the same

4



Interlocking calendar from Brighton & Hove SMLE (photos thought to be by Dr John Bradbury Winter).


The calendar from below (as above).

principle as the Congreve clock and the interlocking system of a manual signal box. The concept was realised by Dr John Bradbury Winter in 1929 and four were built altogether. The location of one is known but the fate of the others is unknown (**photos 4** and **5**).

Harry Robinson claims that you could mount a shed on wheels and call it a locomotive. Well, they have! (I referred to this devilish machine in M.E. 4664 - *Laurie Goes Loco*, No 23) Mike Norfolk writes on his Russian Maxim machine gun. Finding a set of drawings from the late 1800's, he resolved to make it, although with no capacity to fire a bullet. It has no firing mechanism and the barrel is solid throughout.

W. www.hoveparkrailway.com

John Bryant found this remarkable video (www.youtube.com/watch?v=mJ1jWcHvs6Q) showing the LNWR 'Irish Mail' taking water at full speed (and overflowing). Really well done and dating from 1898.

Grimsby & Cleethorpes Model Engineering Society's *The Blower*, July, continues the discussion on the merits or otherwise of the Myford lathes. The gist of this is the claim that a Myford can make almost anything, using the various attachments and facilities, compared to, say, a Colchester Student. The Colchester can make heavier cuts, has a higher speed and greater rigidity, which makes parting off so much less of a problem, but it can't do much else. The co-sited Waltham Windmill is 140 years old and a free Open Day has been scheduled for 21st August.

W. www.gcmes.com

I tested my Bolide at the Sheffield SMEE track, having corrected the faults previously revealed. I abandoned the electronic controller in favour of a simple 12 or 24 volt supply to the motor, rigidly fixed the minimum 'between flanges' spacing, and reworked the footrests. It made a complete circuit of the track without problems. Huzzah! My objective has been achieved! Then the footrest broke, the front wheels derailed, and the abrupt stop moved a battery causing the spade connector to part company with its wire. Ho Hum. Next week I will beef up the footrests yet more and rethink the nature of the wheel spacing both inside and out of the gauge. Finally, I will remake the ¼ inch crimp connectors. I also think, as suggested by my namesake club member, Geoff, that using the footrests meant that I had been 'holding the front wheels down', so to speak. Then the absence of front loading meant that it tended to ride up the wheel flange on a track bend and the unsprung chassis allowed it to do so. Then, with nothing restraining it, derailment, my dear Watson. Elementary. I found that using 12 volts was insufficient to negotiate a bend with an adverse gradient so a simple 'on-off' 24 volt supply, with the batteries in series, works, *pro tem*, although it is rather too fast on the straight and level (**photo 6**).

Reading Society of Model Engineers' *The Prospectus,* July, begins with Stephen Millward making his first locomotive and deciding upon a 'Sweet Pea'. After nearly 1400 hours, he reckons it is an ideal beginner's model. Terry Wood repaired an old electric motor, learning in the process how it worked and what was needed for success.

W. www.rsme.org

Bournemouth & District Society of Model Engineers' *B&DSME News,* July, has Ron Barson musing on personal contacts. At an event he attended recently, the conversation turned to railways and he found that a deceased neighbour of their host was one James Beeson, who produced model locomotives from G1 to 7¼ gauge. In his undated catalogue, he quotes £220 for a Garratt suitable for a 10-foot radius curve. A previous editor of this newsletter (Dick Ganderton) wrote a 150-page book about Mr Beeson, who was said to be the finest model locomotive builder of the 20th Century.

W. www.littledown railway.org.uk

In **Model & Experimental Engineers' Auckland** July missive, Mike Jacks made a precision height gauge, calibrated with slip gauges and set by a camera remote shutter release cable. It is capable of measuring to 1 micron (1/1000 mm). A final item refers to one Craig, who, in editor Murray's words, is 'the finest welder in NZ', specialising in critical welding.

And finally, as I write, the 'A' level results are out. I was particularly interested in the Popular Music degree being offered – grades required are A,B,B and A.

CONTACT

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The beast with two Geoffs at Sheffield SMEE (photo courtesy of Deborah Theasby).

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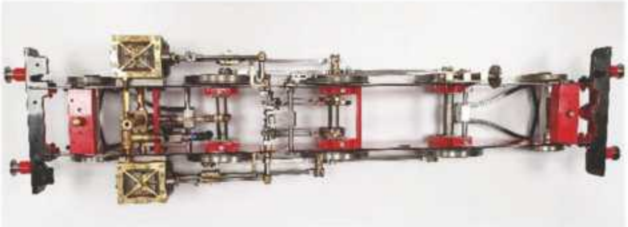

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