

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

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Ian Couchman's 2 inch scale Ransomes straw bale elevator reaches the stage of final assembly on page 249 (photo: Ian Couchman).



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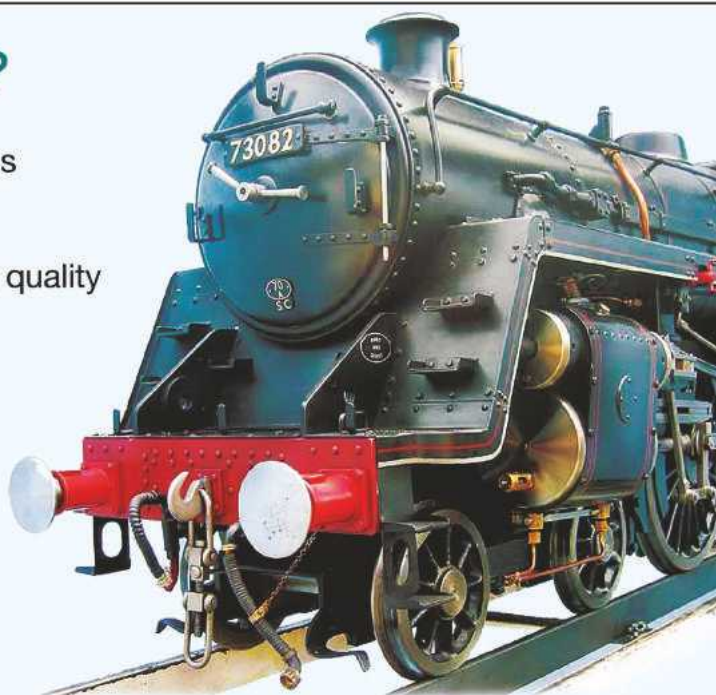
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Pennsylvania

Matt Jeffery, from Pennsylvania, USA, writes to me with tragic news of his club.

The Pennsylvania Live Steamers experienced a devastating flood as Hurricane IDA stormed up the East Coast and dumped many inches of rain in just 24 hours in September. As a result, the track and the clubhouse were flooded up to the clubhouse doorknobs and several of the buildings that house the locomotives and coaches were underwater. The river, Perkiomen Creek, crested at 28 feet, the highest ever recorded. The damage to locomotives that were on the lower levels is heartbreaking. The main clubhouse has sustained the terrible loss of all of its manuscripts and archives, photographs and books - nothing could be salvaged. The only good thing (if you can say that) is that the inner walls were cement block painted, and most were not sheet rocked (drywall), so were spared even greater damage. The members have already stripped the building and are in the process of replacing shelves, toilets, kitchen equipment, water heaters and central heating. The club hopes to be ready for the spring run in May.

Such determination and resilience in the face of disaster is greatly to be admired. I hope the spring run will be a great success and represent a new beginning for the club.

LittleLEC 2022

The Reading Society of Model Engineers is delighted to be hosting this year's LittleLEC competition following on from the successful Federation Rally last year. Founded in 1910 by a small group of enthusiastic model engineers, the Reading SME club has undergone several transformations to become the club we see today.

The competition is open to locomotives 50lb or under dry

weight (no coal or water). It will be held on the 18th-19th June 2022 at the society's track at Prospect Park, Reading, just off junction 12 of the M4. For the competition a 2½, 3½ and 5 inch raised track will be used with an approximate length of 1000ft, constructed of steel section rail. There is also a ground level track of 1112ft in length. These are managed by an automatic signalling system and a controlled vehicle crossing on the ground level by the entrance to the site.

There are several features that make the ride for passengers a little more interesting, such as footbridges, a cutting on the raised track and a main station that serves both ground and raised tracks. There is an additional station opposite the clubhouse which is used for birthday parties, visits from local schools, scouting and special needs groups. The raised track steaming bays have 12V and 24V supplies available and a rain water supply, provided the tank is full at the time. If rain water is not available they have the ability to use mains water. A refurbished clubhouse with tea and coffee facilities is provided for the comfort of its members and guests, along with an extensive OO gauge layout.

The event will start at 9.30am each day with light refreshments i.e. tea and coffee. Plenty of biscuits will be available through the day – spectators welcome. We have plenty of onsite parking for competitors and guests. Anyone wishing to camp overnight will be welcome; camping will be available for Friday and Saturday evenings.

If you wish to attend the weekend there are numerous places to stay with a few hotels close by. It is recommended you make a booking or reservation as soon as you have decided to compete or spectate to avoid disappointment.

If you wish to take part in this year's competition the

entry form can be downloaded from either the RSME's website (www.readingsme.co.uk) or the LittleLEC website (www.littlelec.co.uk) where you can find the competition guidelines etc. Applications must be submitted before the closing date of 30th April 2022 either by email or post. For those unable to access online you can either phone or write to the society and arrangements can be made to post an application form out to you.

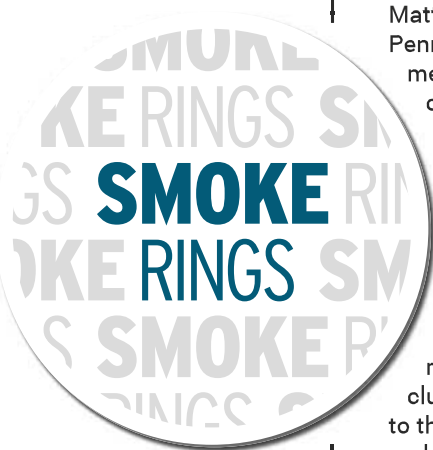
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Doncaster Exhibition

It has been confirmed that the National Model Engineering and Modelling Exhibition due to be held at Doncaster Racecourse in May will, because of the ongoing situation with covid, no longer be taking place. This will be a great disappointment to a great many of us but we can look forward instead to next year's show.

Bradford Cup

Although the Doncaster exhibition will not be taking place this year, I can confirm that the Bradford Cup competition will go ahead. More information about the competition can be found in issue 4680 (17th December) and a copy of the rules is available in issue 4681 (31st December). Given the recent uncertainty about the competition the organisers have agreed to extend the deadline for nominations until the end of February. So – many thanks to those who have sent in their nomination already and, to those who have not yet got around to it, you have less than three weeks left!



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Ian Couchman constructs an elevator to keep his Ransomes threshing drum company.



Continued from p.195
M.E. 4683, 28 January 2022



A Ransomes Elevator PART 5

Floor

Now I need a floor for the trough. The first section is a short length of sheet steel in the area that the tines pick up the straw. The next section

consists of a short length of slats, which allow any chaff to drop through to the ground. **Photograph 56** shows these two sections. The rest of the floor is more interesting. This is made from corrugated iron so off to the local builders' merchants.

"Four sheets of quarter scale galvanised corrugated iron please. ... Go where? ... I'll take that as a no, then".

Okay. Back to the drawing board ...

Many years ago, I bought something called a rotary machine; it consists of a pair of roughly parallel shafts, each having a former mounted on the end, which are adjustable horizontally and vertically. It is another of those tools only used once every other blue moon, but really earn their keep when you do need them. Amongst the formers which came with the machine was a pair which, with some modification, could produce corrugations. And so into production (**photos 57 and 58**)! And here are a couple of pictures of the finished floor (**photos 59 and 60**).



Floor, in two sections.



Rolling corrugated sheet.



58 Sheets rolled.



59 The rest of the floor fitted.



60 Underside of the floor.



61 Broaching the keyways in the chain wheels.



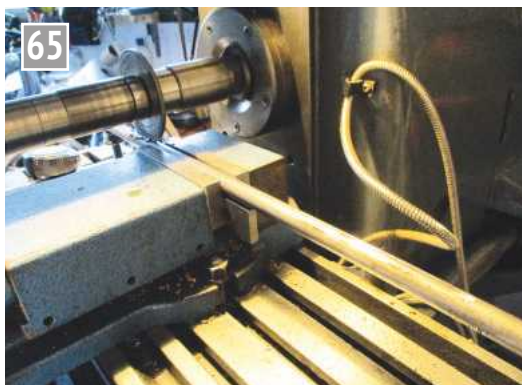
62 Making the chains.



63 A set of slats – these will carry the tines.



64 Tines fitted to the slats.



65 A quick way of forming the keyways in the chain wheel axles.



66 A pair of hopper sides.

The last things required to complete this part of the elevator are the chains and chain wheels. The chain wheels are as cast, with just the bore being machined. The chain is carried on the eight flats. In **photo 61**, a pair of chain wheels are clamped together across flats (to keep them in line) while the keyways are broached. The chains are formed from links riveted together (**photo 62**) with a single link drilled for the slats, followed by a pair of undrilled links (one each side). This can be seen in photo 52. I found that lightly peening the rivet then, after supporting the link either side of the rivet head in the vice, giving the rivet a sharp tap loosened the joint to allow free movement of the links.

The slats which carry the tines are shown in **photo 63** - with pilot holes in the end for the screws which will attach them to the chain - and holes for the tines ready drilled. In **photo 64** we can see some slats with tines fitted. Note the taper on the tines and the small bend about one-third of the way down to catch the straw.

Finally, for this section, we need the axles for the chain wheels. These are simple round bars with keyways for the chain wheels and drive gear. I use a saw on the horizontal mill wherever possible as it's so much quicker than a slot drill (**photo 65**).



Hopper side fitted to the elevator frame.



The complete hopper.



Various elevator parts in Very Pink primer.



Other parts going through the painting process.



Final assembly in progress.

Hopper

I didn't take too many pictures of this bit but you will see it better in later pictures. The hopper is the area where the straw from the threshing drum drops in to the elevator and is picked up by the tines. **Photograph 66** shows the two side assemblies, produced from home-made tongue and groove boards, with **photo 67** showing one of these sides in place on the frame. By this time, I'd run out of room in the

workshop and had moved to the trailer! In **photo 68** you can see the finished hopper.

Finishing off

All I've got to do now is take it all apart, paint it and put it back together ...

I used the same colour scheme as the threshing drum, alfa red on wheels and frame and salmon pink on the bodywork. I use a matt finish; gloss looks wrong to me on

something like this. The trailer was very useful storage for painted parts while they dried!

Photograph 69 shows various wooden parts in primer. They call it Very Pink primer. I can't argue with that. In **photo 70** we see a clutch of parts drying after spraying.

Now it all goes back together: undercarriage (**photo 71**), wheels, raising gear, hopper, trough and chains. The top photo shows the end result.

One part that I didn't mention can be seen at the left-hand end of the hopper in the top photo. This is a pair of pulleys which can be adjusted for position. They are used to guide the drive belt (from a pulley on the drum) so that the elevator can run at an angle to the drum.

That's it. I'm off to finish last year's harvest!

ME

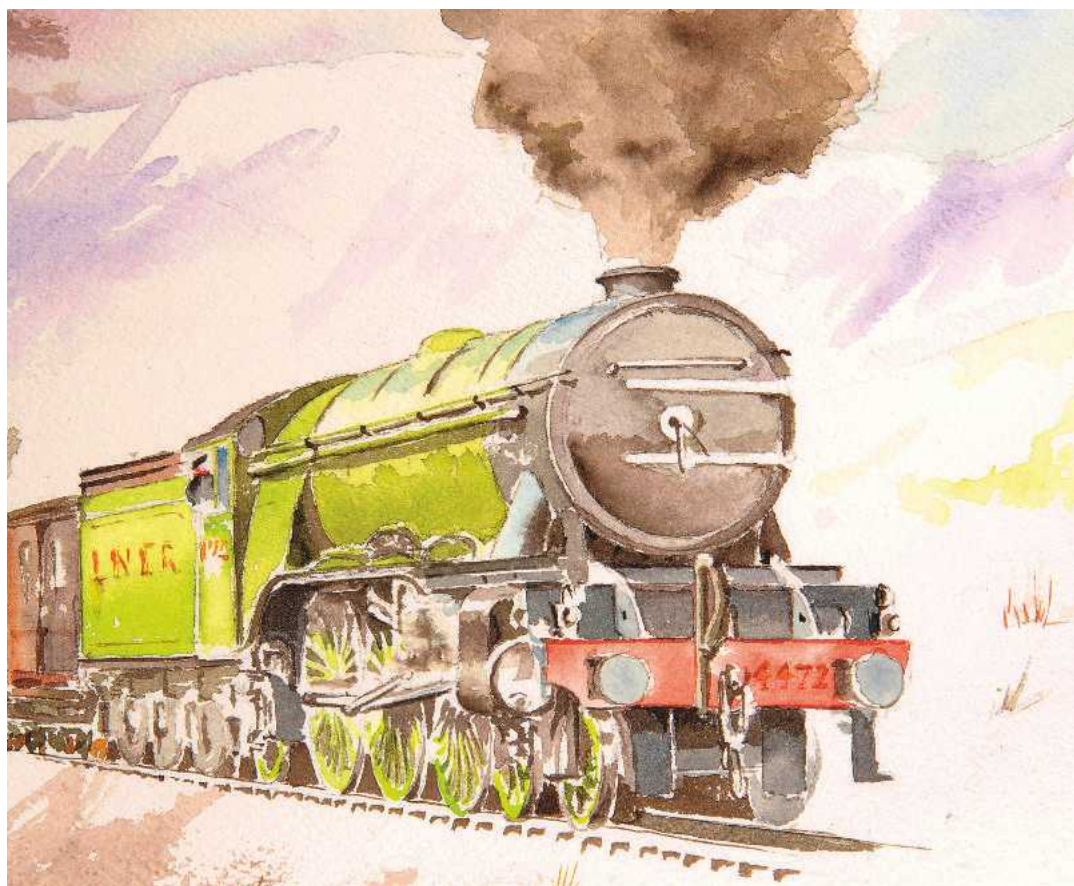
Peter Seymour-Howell

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



Continued from p.193
M.E. 4683, 28 January 2022

PART 28 - SMOKEBOX FITTINGS



Painting by Diane Carney.

Flying Scotsman in 5 Inch Gauge



Hinges

On 4472 for my era the door hinges etc were burnished steel. I planned to use stainless steel to represent this look and also to remain looking this way with no corrosion but that plan changed when it came to

tapping some holes. Tapping was a problem even after opening out the tapping holes by approximately 65%, the problem being that I don't own a 10BA spiral point fluted tap and they aren't cheap! So, I changed to BMS to which I

FAR LEFT: 1. First, I made the hinge pin. It's made from two parts, the first being the stem with a taper on its end and the top cap which started life as a section parted off from some stainless steel bar, centre drilled to fit the stem. Once silver soldered together the stem was put back into the three-jaw chuck and the cap was shaped as a flat dish. Currently, the pin is a little over length but I'll trim it once the door is finished.

LEFT: 2. The top hinge block hole needed a $\frac{3}{16}$ inch diameter counterbore machined into the flange to clear the block and you can see here how close the lower hole is to the edge. I used photographs as a guide for where to place these holes and they seem different to what they were before preservation.

shall give a burnished finish to help stop any corrosion issues.

After cutting some lengths of square BMS, I needed to drill the holes for the rivets to secure the hinge to the door. These will be for $\frac{1}{16}$ inch steel rivets but initially I drilled them 1.4 mm to take a 10BA tap - the reason why will become clear soon. Don stated to give these a $\frac{1}{2}$ inch pitch but on scaling from photographs this

didn't add up and so I reduced the pitch to 10 mm.

On to the hinge blocks. I cut off two lengths slightly oversize, clocked them in the machine vice for centre drilling one end 2.85 mm ready for the 6BA spigot/thread to be turned up and silver soldered into the block. The next job was to cross drill the hole for the pin and the last job was to round off the end which I did by hand

using a button. I then silver soldered the parts together to complete the hinge blocks.

On to the door ring that needed four holes drilled, two for the hinge blocks and

two for handrail stanchions. I clocked the door ring to find the centre and first drilled the two hinge block holes and then the two stanchion holes.



3. I now needed to temporary fit the hinge blocks using the pin to square them up and then check that the hinge was looking right. I first marked up the door from the centre to the left then, laying the hinge roughly in its position, I checked that it looks right for the mounting holes and to decide where I need to machine it down to a thickness of $\frac{1}{16}$, which is where the black line is drawn between the last hole and the hinge block.



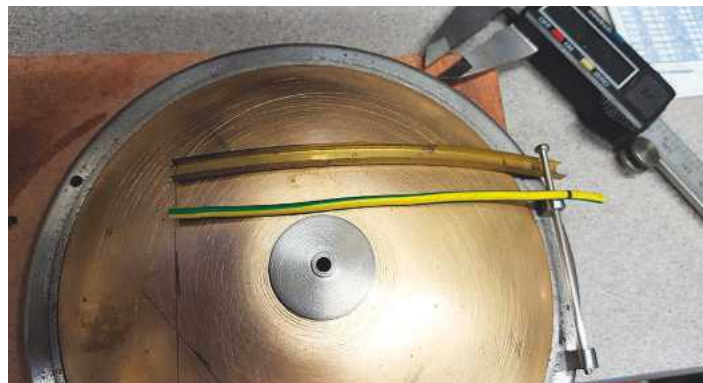
4. I tapped 5 holes in each hinge plate 10BA for securing to the jig plate and here we see the two hinges fixed to the jig.



5. Here is the jig held in the machine vice ready for machining (before the spacers were removed). I used small dabs of Loctite 638 as extra security in holding the hinges to the mounting jig.



6. The first job was to machine the hinge straps to their required thickness of $\frac{1}{16}$ inch. I stopped a little short of the 4 inches stated by Don as I wasn't sure how this would work out, as I was trying to follow the full-size profile. Here, the two hinges are still attached to their jig after machining.



7. Before cross drilling the holes for the securing pin I needed to ascertain the exact length of the hinge strap and the position for the hole. Using some brass channel, I carefully bent it to follow the shape of the door and marked where the pin was in relation to it. Then, using an off cut of wire, I marked out the length around the curve so that I could transfer the distance onto the straight hinge strap.



8. The holes for the securing pin have now been drilled and the outline of the ends of the strap drawn onto the strap.

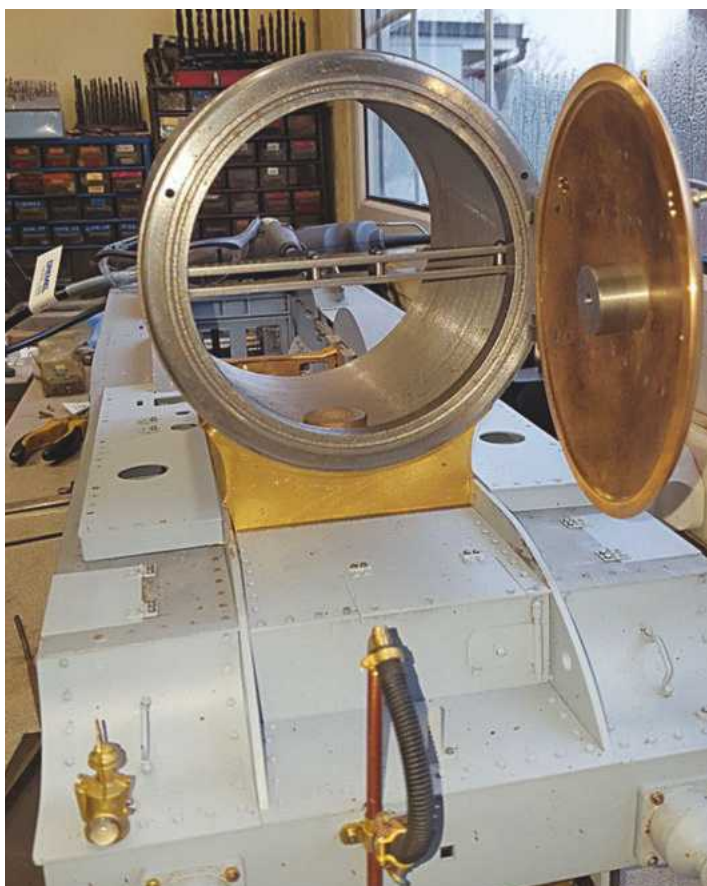
9. After finishing the hinges I attached them to the door. This involved first shaping the hinge pin end which was done with a sanding drum and some hand filing and then drilling through the 10BA tapped holes to open them out ready for $\frac{1}{16}$ inch rivets and, finally, a small countersink to seat the steel rivets. This picture shows how far the hinges open with their end lugs (slightly different lengths) touching the door ring. From what I've read the lugs were added as a safety feature to stop the door from swinging fully open.



10. Next the hinge strap was shaped by hand to match the door. This takes a little time as it's a compound curve but it's only a gentle curve so no real problem and the rivets will hold them tightly in place.



LEFT: 11. Once the hinges were shaped I re-locked the door ring on the milling table sitting on some parallel bars, taped under the hinges to stop any slip on the $\frac{1}{16}$ drill bit, lined up with the centre of the hinge strap near the hinge block and then, once happy that all was square, I moved over to one of the centre holes in the hinge strap and drilled the first hole through the hinge into the door. I then placed a rivet to hold it in place and moved along a few holes and drilled another. Doing it like this helps keep the hinge straps running at 90 degrees to the hinge pin, or at least that's how I tackled this particular job. Also of note is that the door sealing ring has been put in its groove so that the hinge is in its correct position for sealing the door properly. Once the central hinge holes had been drilled (the outer holes have to be done by hand off the table due to the angle) I then moved to plot, using a centre drill, the door handle point, two stanchion points and the lower central rivet hole for the door lamp bracket. RIGHT: 12. Here is the door in place, with the door closed.



13. I then tackled the crosspiece and its support brackets. The brackets are simple joggled shapes that were screwed to the back of the door ring with 5BA stainless screws. Here is the crosspiece in position.



14. This picture shows the lamp iron riveted to the door and the door handrail fitted although not tightened up yet. I had to counterbore the rear of the door to get the 7BA nuts to reach the handrail knob threads. Once painted I will return to the handrail and solder the parts together and round off the ends so that they are enclosed as in the prototype.



FAR LEFT: 15. The dart is a simple turning and silver soldering job with a 7BA thread on the end for the handle. LEFT: 16. The two handles are made the same way with a short length of bar silver soldered into a short central boss. The outer handle is drilled and tapped 7BA with the bar angled at 5 degrees. The inner boss is drilled and then has the hole squared to match the dart. Both bars are rounded off on their ends. For the square centre hole, I used a square section screwdriver insert bit that was filed down to the size required and tapped in through the hole while still in the chuck and then parted off to size. The picture shows the inner handle (square hole) checked for fit before silver soldering.



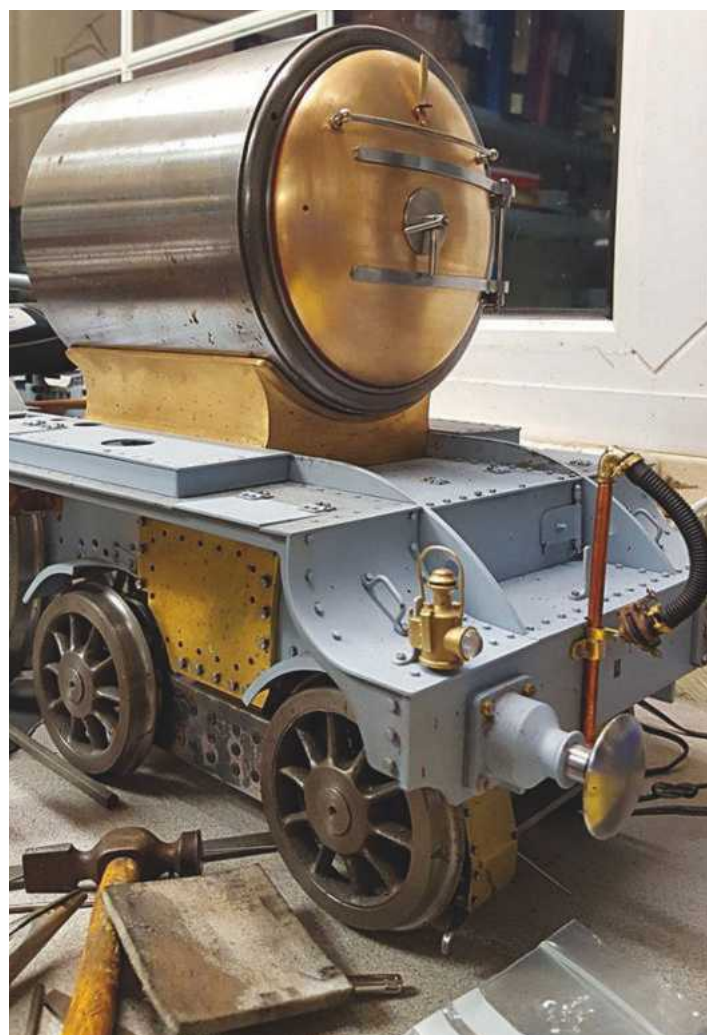
17. A view with the door open, showing the dart in position and also the door seal temporary fitted into its groove to check that all tightens up properly.

Lamp iron, crosspiece and dart

Continuing with the door I now fabricated some of the 'ornaments', as Don calls them. First was the lamp iron. Don gives two drawings and I needed to use the early pattern for my era. This was

straightforward and similar to the other lamp irons.

Next, I tackled the dart itself, I did this in two parts as it's in stainless and I didn't fancy machining the whole thing from solid. First part was the stem itself which involves a 7BA thread at the tip, a $\frac{3}{16}$



18. Here we have the door closed showing the handles in their normal closed position. Having said that, I have many photographs where the position varies a little but think this is the most seen position.

long square section and then a longer than drawing $\frac{5}{64}$ section that goes through the centre boss, I have extended this due to the bush as it was increased in length to give me a mounting point for the dust shield to be fabricated later. Then a short $\frac{3}{16}$ bush and then

narrowed again to fit through the crosspiece. The tongue itself is a piece of $\frac{7}{32}$ square stainless that has been drilled ready to be silver soldered to the stem. Once that's done the tongue was shaped to size.

●To be continued.

An Engineer's Day Out **King Cotton** PART 2 **Weaving at Queen Street Mill**

Roger Backhouse

visits
an authentic, and still
operating, weaving mill in
Burnley.



Continued from p.229
M.E. 4683, 28 January 2022

Queen Street Mill's engine featured in *Model Engineer* No. 4541 (5th August 2016) when it faced closure by Lancashire County Council due to a massive cut in Government grants.

Thankfully the Mill reopened for summer operation and will open again on 30th March 2022. As the last mill where steam still operates power looms this is a most evocative place and a 'must see' for anyone interested in engineering or textile history. Also in the area, Helmsore Textile Museum (*Model Engineer* 4535) is another fascinating place demonstrating mule spinning for cottons.

Specialist looms

Amongst the looms at Queen Street is a Terry towelling loom. This uses two weavers' beams, one holding thread for the loosely tensioned



Terry towelling loom with two weaver's beams so that loops can be created.



Detail of Terry towelling loom - this one made by Northrop features a dobby mechanism to programme weaving simple patterns.



This loom has several shuttles, each for a different colour, to weave a striped fabric.

towelling loops and the other for the ground warp which has to be kept taut. The weft weaves with the ground warp to provide a base for the loops (photos 22 and 23).

Different coloured cross stripes could be made with different shuttles, each holding a coloured thread. Multi shuttle looms were developed to make this easier (photo 24).

Dobby looms weave simple designs such as coloured stripes. A device above the loom carries a chain of little pegs in wooden lags (or a chain of hole punched cards) in a programmed order (photos 25 and 26). Lags move around a barrel, controlling levers which are lifting harnesses holding healds. A peg sits in a hole on the lag and this relates



25 A Northrop dobby loom still used to weave glass cloths. Note the string of punched cards top right. Holes controlled operation to weave simple patterns or lettering. (Mill made glass cloths are highly recommended.)



27 The most complex loom in the museum, this Jacquard loom uses punched cards to control lifts of numerous harnesses holding healds to make elaborate designs. The card principle was later used by Hollerith for early computers.

to the shaft of healds. When it detects a peg it lifts the heald and the shuttle goes through the *shed* created between. Complexity is limited by the number of healds.

Dobby is a corruption of 'draw boy' - the weaver's helper who controlled the warp thread

by pulling on draw threads. Previously weavers had used treadle looms where multiple healds were controlled by foot treadles - one for each heald.

The Hattersley Jacquard loom is the most complex at the mill (**photos 27, 28 and 29**). The principle was



26 A dobby loom used a heald shaft to lift the warp threads. Instead of punched cards here wooden lags with pegs in holes control operation and it can be programmed to create simple patterns.



28 Copy of a picture 'Bolton Abbey in the Olden Time' created on a similar Jacquard loom in the 1908 Franco-British exhibition.

developed around 1804 by Joseph Jacquard. By using punched cards he controlled the weave making around 60cms of a complex design in a day, compared to 2.5cms on drawlooms used previously.

Loom developments

Northrop looms, developed in Lancashire from the late 19th

Century, featured automatic shuttle replenishment. They were highly successful but did not completely replace older looms. Whereas up to six Lancashire looms could be managed by one weaver, advances in loom design meant that more looms could run almost unattended.



Jacquard card cutter

Rapier loom

More modern looms such as those made by Sulzer use air jets and operate at speeds of up to 1500 picks per minute. Others use spring powered projectiles instead of a shuttle. The museum has a telescopic Rapier loom made around 1975 by Adolf Saurer in France using a projectile - in this case a long rod - to put weft through the shed (**photo 30**). Unfortunately it was placed the wrong way round in the mill.

Shutting down

My grandfather was the engineer at the Ashton Weaving Company. There, a device probably linked to the mill engine limited the gas supply dimming lights five minutes before the engine stopped for the day. This gave weavers enough warning to shut down looms correctly. Then the gas supply dimmed further giving just enough light for weavers to see their way out. This system was probably used in many Lancashire mills. Electric lighting wasn't used in the main weaving shed at Queen Street until 1947.

Other processes

Queen Street Mill produced mostly plain grey cloth either sold directly or more usually sent elsewhere for dyeing or bleaching. Dye houses, bleaching works and fabric printers were major employers across Lancashire. Engineering firms such as Mather and

Platt made a variety of textile machines, particularly fabric printing machinery.

Problems at work

Noise levels in weaving mills were usually 100-130 decibels, similar to modern road drills. Weavers learned to lip read and developed a sign language known as MeeMaw. Deafness was common among mill workers (**photo 31**). Even now with only a few looms working, visitors are advised to use ear defenders if staying more than a short time in the weaving shed.

Many mills closed during the 1920s and 1930s. Demand slumped and tariffs and foreign competition led to mass unemployment across Lancashire. Yet after the Second World War mills suffered labour shortages, leading to Government efforts to make weaving more attractive as a career, but overseas competition and historic underinvestment led to more closures (**photo 32**). Lancashire textile manufacturing is now but a shadow of what it once was.

Although many mill buildings were demolished, others have been converted to different uses or even to apartments. Several mill engines are preserved but Queen Street remains the only place where weaving by steam power can still be seen.

Even this was under threat when Government spending cuts hit Council budgets though, fortunately, Lancashire



Telescopic Rapier loom made by Adolf Saurer in France around 1975. One end of a rapier (a rod or steel tape) carries weft yarn and moves across the fabric's width, carrying the weft yarn through the shed to the opposite side. The rapier is then retracted, leaving the new pick in place. Unfortunately, this loom was placed the wrong way round in the museum - the beam would normally be behind.



Former staff member, Renee Flynn inserts a pirn into a shuttle for use in one of the mill's Lancashire looms.



Post war poster recruiting women to work in mills. After the war fewer wanted cotton mill work and labour shortages were partly addressed through recruitment in Pakistan.

County Council eventually found money to reopen the mill; they also repaired the mill chimney and the whole complex is listed and a World Heritage site. The mill engine has been repaired recently.

This unique piece of Lancashire's industrial and working class heritage is not as well known as it deserves to be. Sadly, Council marketing budgets are insufficient to properly promote this amazing

place and the associated Helmshore Textile Museum.

I strongly recommend visiting. You won't be disappointed.

Thanks to

Alwyn Rogers -
Engine Tenter (Engineer)
Kary Backhouse (no relation)
and to former staff:-

Michael Schofield -
Fire Beater (Boilerman)
Jennifer Ingham -
Museum Manager
Renee Flynn -
Technical Assistant

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Street Mill.

ME

Queen Street Mill Textile Museum Reopening 30th March 2022 (check before visit)

Queen Street, Harle Syke, BURNLEY BB10 2HX

Bus No. 5 from town bus station. Regular services.

3 miles from town centre.

3 miles from J12 on M65.

Tel. 01282 459996

Wheelchair accessible. Admission charge.

Website

www.lancashire.gov.uk/leisure-and-culture/museums/queen-street-mill-textile-museum/#section1

Other places of interest in the area

Burnley has the historic 'Weaver's Triangle' near Manchester Road station. Nearby, Gawthorpe Hall (National Trust) has the Kay-Shuttleworth textile collection and Towneley Hall has local history displays.

Other Lancashire stationary and mill engines on public display include:

Ellenroad Engines at Milnrow, Rochdale, in steam the first Sunday in the month -

www.ellenroad.org.uk

Bancroft Mill at Barnoldswick

www.bancroftmill.org.uk

Trencherfield Mill, Wigan

(operated by Wigan Council but thought to be closed at present).

Manchester Museum of Science and Industry -

www.scienceandindustrymuseum.org.uk

Bolton Steam Museum where engines are in steam periodically

www.nmes.org

It's hoped to feature some in future articles.

Also well worth a visit - reopening Friday 1st April 2022

Classic spinning mill which includes working spinning mules and water powered fulling stocks.

Helmshore Mills Textile Museum

Holcombe Road, Helmshore, Rossendale BB4 4NP

Bus X41, Manchester to Accrington, to Gregory Road/ Helmshore Road bus stop, then a short walk.

Tel. 01706 226459.

Admission charge

Website

www.lancashire.gov.uk/leisure-and-culture/museums/helmshore-mills-textile-museum/#section4



Braiding maker - weaving wasn't the only technique used. Knitting machines and this braiding maker were also important.



Time clock - every mill would have had one or more.



Shuttle making workshop. Shuttles were bought in from outside firms such as Kirk and Co. of Blackburn.

Adventures with Injectors PART 3

Roger Froud studies the theory and practice of making injectors.

Continued from p.197
M.E. 4683, 28 January 2022

Let the fun begin...

For the moment let's skip the details on making the cones and concentrate on their designs and consequences. The experimental cones are for 16 fl oz/min delivery which is just under half a litre per minute. I've created a 3D model of the cone that uses the relationships teased from Bob Bramson's book because, ideally, I'd like to be able to create any size injector I fancy. I won't go into that now but I cross checked the model results with known good designs and it comes up with similar dimensions. It won't be exactly like a conventional set of cones because the choice of end regulation means the condensing cone will necessarily be different.

Annular regulation has the nose of the steam cone sitting inside the entry to the condensing cone, so the effective length will be different if the steam cone doesn't do that.

I've used a gap of 0.76mm between the condensing and mixing cones, using the two books mentioned as a guide for what's necessary. Some questions immediately come to mind when considering this type of design:

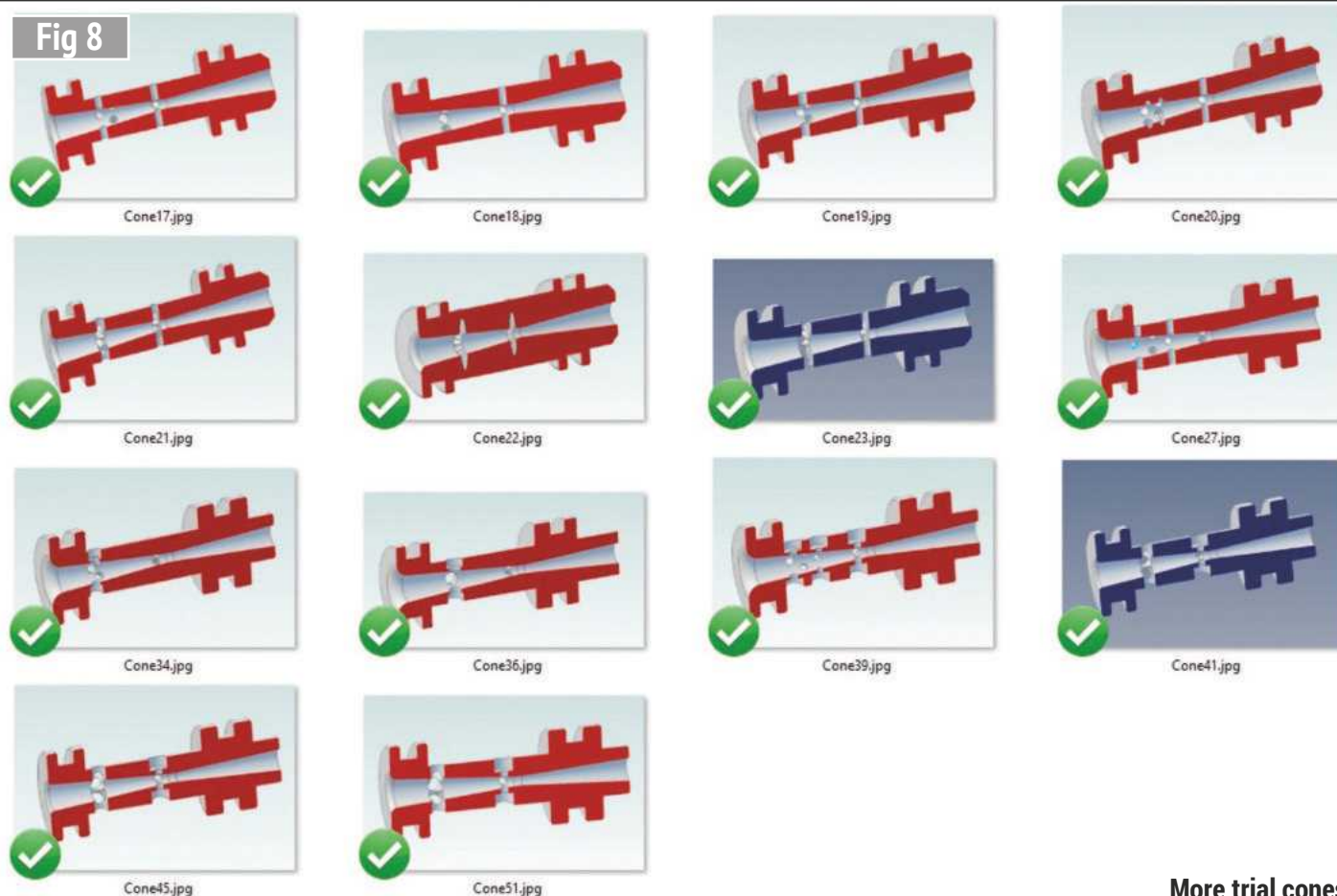
- What happens to the flow when it crosses a hole and what happens to the flow if the holes overlap?
- You need bigger holes to get the same area if they don't overlap, so how big can you go?

- How many holes can you get round a given diameter before you end up with separate pieces?
- If you can't get enough area in one row, how about two or more rows of smaller holes?
- How does the decreasing diameter of the tapered cone affect how many and what size of holes you can use?
- How does the number and size of the holes affect the resistance to the flow of water and steam?
- How does all this impact on the ability to lift water or the overall performance when running?
- What effect does the sprung overflow valve have on the ability to lift water?
- What effect does a radius of any given size at the entry to

Fig 7



Fig 8



More trial cones.

the condensing cone have, if any?

- What effect does changing the regulation gap have on any of the characteristics?

Maybe now you can see why it took so many experiments to tease out the answers to these questions. If you change more than one thing at a time, you can't attribute any changes in performance to one thing. Unfortunately, there are a virtually infinite number of permutations and combinations of hole configurations!

For your amusement, here are some of the designs I tried (figs 7 and 8). You can see that I quickly abandoned the centre O-ring arrangement, even though the performance of the cones was far from satisfactory at that point.

You can also see that the nose design changes and I also altered the middle neck dimensions. The cone was designed to fit in the scale 8X body, and that has its own

problems which I'll discuss later. The idea was that I would be able to switch over to the scale body at any point and try the current cone to see if it would work. The bigger nose was to contain an O-ring to help deal with variations in the overall length.

Rather than describe the tortuous and twisting tale of how each of these performed and the reasoning behind them, let's cut to the chase and see what was discovered.

Conclusions

As I've already alluded to, it soon became pretty clear that having separate or combined overflows made no measurable difference to the performance. Just stop for a moment and let that sink in, because this has huge implications for scale injectors. To be honest, I shouldn't have been surprised because both overflow gaps have similar requirements, albeit with different volumes. They both will surely overflow

for the same reason at the same time whether that's when starting or when overflowing with too much water. You almost certainly won't have one gap sucking while the other is overflowing. Even if it did, so what? As soon as the flow settles down, both will be sucking.

With that discovery out of the way, what was learned from the myriad of different hole arrangements?

Well, firstly, they all work after a fashion, and that was a big surprise. The biggest single issue, however, is getting enough suction to overcome the tiny spring on the overflow. Most of the arrangements could be coaxed to work but very few willingly picked up when the body was hot or the steam was turned on first. Even if they did pick up well, they usually dropped out at a disappointingly high pressure during the 'dropping pressure' test.

We've all had times when the injector has become

scalding hot when it won't pick up. Steam serves to heat the body even more as we try unsuccessfully to get it to work. The issue is that a hot body conducts heat to the water inlet pipe and the water partially turns into steam as it enters the body. That increase in volume has to escape through the overflow or else the excess simply expands into the water inlet. What's needed is enough suction and overflow volume to accommodate this excess volume so that water can enter and cool the body to start the injector.

The amount of suction is decided by the ratio of the steam cone throat area to the throat area at the condensing cone exit. To increase the suction, the overflow has to be moved upstream to make the area bigger. All of this is well known and simple to do if you have a nice straight edge to the cone, but I've got holes there instead. Experiments showed that a gap of 0.75mm

could be simulated much better by 8 x 0.9mm individual holes than say 12 x 0.8mm overlapping holes. Who would have suspected that? Not me. All I can put that down to are the slight scallops along the edges where overlapping holes meet, possibly disturbing the flow. Another possibility is that the volume created above the holes isn't sufficient, so there's resistance there. Drilled holes don't give as much volume as the traditional design of separate cones where there's generally a large relief above the gap.

I did find that I needed to move the row of holes upstream from the position where the cone would usually end. That's not entirely surprising.

Delivery end overflow

So what about the holes at the delivery end then? Well, basically you can get away with almost anything, it's not at all sensitive. There's no point in adding lots of overlapping holes, or making them huge; four small ones work just as well and it's simpler to make.

Blending the cone inlet..

Most of the tests were performed with and without some form of blend on the entry to the condensing cone. To be honest, it doesn't make as much difference as you might expect, although it does help. You can definitely hear that the flow is quieter with a radius, and it does allow the injector to run to lower pressures before dropping out. However, the original 0.8mm radius proved to be too large and counterproductive and I settled on 0.4mm. One problem with making the radius too large is that it effectively reduces the length of the condensing part of the cone.

Obviously, it's not possible to blend the inlets to what would normally be the second and third cones in a row, since they're one piece. The fact that this clearly doesn't matter provides a clue as to why they're needed on

conventional, separate cone, designs. Clearly the only reason it matters for those is that you can't guarantee the alignment of the cones accurately enough.

The overflow valve

Although a silicon nitride ball worked reasonably well, I found that the design in **photo 2** with a 0.5mm thick silicone washer was more reliable. I wanted them to be accurate so I made the little punch. There's no point in blaming a poorly made valve for not working properly, it has to be a fair test.

The silicone washer is stretched over the head on the valve stem. The idea is that it doesn't matter if it leaks a bit in one direction, in fact it's highly desirable so that water can flow through the injector when it's turned on. The thin section means it's flexible enough to be drawn onto the valve face when it needs to seal, and that's when it does matter.

I found the stainless steel springs on eBay from China. There was only one place that made them light and small enough. These are 0.2mm wire and 5mm long (**photo 3**). If they were any lighter, I don't think the valve would be reliable. Any stronger and you wouldn't be able to create enough suction to overcome the back pressure.

The regulation gap

Here's a quick reminder of what we're talking about: it's the gap between the steam cone and the condensing cone. The diagram with all the names is shown in fig 1 (part 1 – issue 4682, 14 January).

First of all, what is the gap and what is it for? Injectors are generally designed to draw water from the inlet, rather than relying on a gravity feed. If the injector is going to start, water must be present and ready to flow at the end of the steam cone. Whether that's by means of its own suction or fed from a header tank is immaterial.

Please note that for the purposes of this explanation, I'm assuming that the steam is being supplied at the



Overflow valve.



Overflow valve assembly.

rated maximum pressure it's required to work at.

Once the water merges with the steam, it will most certainly be pulled into the injector. If there is no limit on how much can flow, the volume of water will soon overwhelm the overflows and the injector won't start. The purpose of the regulation gap is to set the top limit on the amount of water that can be drawn into the injector to stop this from happening. As far as I can tell, this doesn't need to be done with a gap at all, it could probably be achieved just as well by adding restriction in the waterway somewhere in the body. It makes me wonder why nobody has experimented with deliberately designing the gap to be larger than necessary, and then tuning the flow with a simple screw valve rather than having to experiment with different shims to get it right. Setting the regulation when the injector is running is a trivial matter and takes seconds if you can adjust it.

You could probably avoid having any form of regulation at all but it would mean having to throttle the water supply

using the main valve for it to work at any pressure and that's just plain inconvenient.

Anyway, in my case, that restriction is the axial clearance between the end of the steam cone and the one piece cone.

Regardless of that, what actually happens when you change it? Well, with the water and steam both turned on, if you start with zero gap, clearly nothing is going to happen as no water will get in. As you slowly increase the gap, more and more water is drawn in but it all comes out of the overflow. That's because there isn't enough yet to condense all of the steam. Eventually that point is reached, and now there's finally enough energy in the flow and it's a solid column of water. At this point, provided the proportions of the cones and throats are correct, the injector will start feeding.

However, this will be on the ragged edge of working and as the gap is further increased, the flow settles down and the pressure available at the output rises to a maximum. If you keep increasing the gap, the pressure begins to fall again because

there's simply too much water getting into the cones and it starts to spill out of the overflow. Further increasing the gap results in the injector stalling completely, with the delivery dropping to zero.

So, what should the correct regulation gap be? Well, that depends on one other factor I haven't mentioned - water temperature. Clearly cold water will condense steam much more quickly than hot water. It's also clear that there must come a point after which it's not possible for the injector to work at all. A tiny amount of steam might just be able to make it all of the way to the delivery cone and enter the boiler, but we're relying both on transferring the kinetic energy of the steam, and for the column of water to be inelastic. In practice, the limit for feed water is in the region of 35 degrees C.

What we find is that hot water, unsurprisingly, requires a slightly larger regulation gap. This is because more of it is required to condense the same volume of steam and some of it may also be lost to the overflow in the process so, for practical reasons, it's not sensible to set the gap so it's

just big enough to allow the injector to pick up with water at 20 degrees C. because as soon as the water gets much hotter than that, it's going to fail. My experiments lead me to believe that the most sensible thing to do is to set up the injector so that the gap is the smallest that allows it to pick up cleanly with water at the highest temperature you want it to work at. With that setting, it will easily pick up at lower water temperatures.

There's one little twist to this tale and that's about what happens as the pressure drops? Unfortunately, the larger the gap, the sooner the injector will stop feeding as the pressure drops. That's because the amount of water flowing through the gap isn't in direct proportion to the amount needed to condense all of the steam at lower pressure. It's remarkable that a well-designed injector performs as well as it does in this regard. However, at some point, as the pressure drops, the amount of water drawn is more than can be delivered and it spills out of the overflow, usually causing the injector to stall. At this point, we have to manually intervene and reduce the flow

of water. Doing this should enable the injector to pick up again but as the pressure drops further, more water restriction will prove necessary until eventually we reach the limit of the design.

As with most things, it's a compromise. The higher the water temperature we want the injector to work with, the sooner the injector will need regulating manually as the pressure drops. In my experiments, which are for a working pressure of 90 psi, the injector will drop out at just under 50 psi if the regulation gap is opened up enough to work with 35 degree C. feed water. That can drop to about 35 psi if the top temperature of the feed water is 25 degrees C. Since most locomotives have two injectors, there's nothing to stop you setting one for higher temperatures and the other for lower.

Taking things to extremes, the injector can be adjusted to work with water in excess of 45 degrees C., simply by increasing the regulation gap. Further optimisation of the relative throat diameters is probably in order for this extreme though, because the overflow isn't completely dry. If you were

designing a backhead mounted Injector where it was always hot, this could be very useful. For regular use, this is probably academic and the need for regulating the water for more usual operating temperatures is likely to be annoying. I make no special claims for this injector's performance. Any injector that prevents air being drawn into both cones ought to have these characteristics. I mention it only to demonstrate that this design performs at least as well as any other.

Ideally the injector would have a temperature compensating mechanism to automatically adjust the regulation, based on the water temperature. Maybe some sort of bi-metallic helical piece that moves a sleeve on the outside of the steam cone?

Being able to optimise the regulation gap while in steam is so useful that I decided to incorporate that feature into the scale 8X injector too.

●To be continued.

NEXT TIME

We actually make an injector.

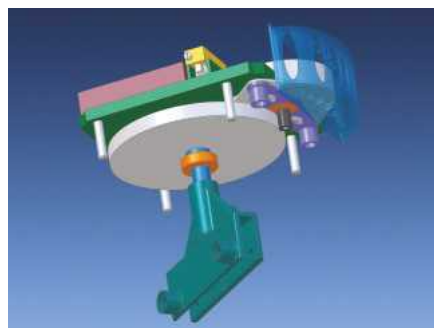
No.313

Look out for the March issue,
helping you get even more out of your workshop:

MODEL ENGINEERS'
WORKSHOP



Laurie Leonard shows how to improve the cross-slide lead screw on Myford Lathes.



Mark Noel explains the ingenious engineering behind kite-borne aerial photography.



John Purdy describes a neatly made milling machine depth stop.

On Sale 18th February

Puma

A Four Cylinder, Twin Camshaft, 30cc I/C Engine PART 4

Pete Targett builds his own version of Malcolm Stride's twin cam internal combustion engine.



Cylinder assembly/ piston rings

Now is probably the time to mention the cylinders. There is nothing different here from Malcom's design though. On one of the forums, a member has built a version the single cylinder *Jaguar* and it started just about first time.

The secret appeared to be that he had used 'O' rings rather than make the cast iron piston rings. As this engine was only going to be a demonstrator, I decided that this was something I was going to try. Rather than make new pistons with larger grooves for the 'O' rings, I sourced some 1 x 20mm Viton rings. This also means I can go back to the cast iron rings

if I wish (photo 22). Of course, using 'O' rings needs extra work on the bores to get them smooth (photo 23).

As I was working through the various stages of making the cylinder heads, I had got to the point of drilling the passages for the inlet and exhaust ports. They are angled at 15 degrees. I was messing about with protractors and digital angle gauges when I had an inspiration that the valve guides would be a ready-made sine bar. They are 12mm apart so the offset needs to be $12\text{mm} \times \sin(15 \text{ degrees}) = 3.105\text{mm}$. I used a slip gauge but a 3.1mm drill shank would do it (photo 24).

The bags (photo 25) contain various other parts that I had

made on the way. I find that doing a few small parts, here and there, helps reduce the tension that occurs when doing the more complicated stuff. It also means that, over time, everything gets done before it is required. Despite opting for 'O' rings, I had made the piston rings when I did the *Bobcat* six years ago. I had never made piston rings before and had expected problems so I made a few. My concerns were unfounded and I only used four of them, so I ended up with a few spares.

Valves

I also cheated a bit with the valves. I had made them to Malcolm's method for both the *Bobcat* and *Lynx* but thought I



Pistons with Viton 'O' rings.



Honing the bores.



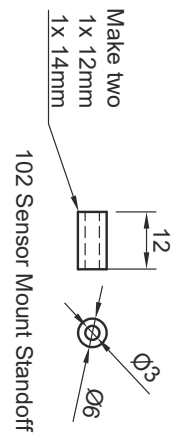
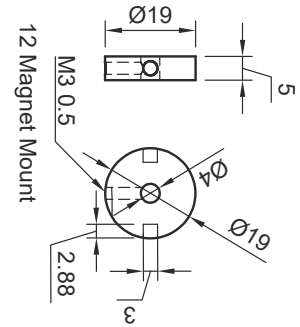
Using the valve guides as a sine bar.



Bags of small components made as a break between the more complicated parts.



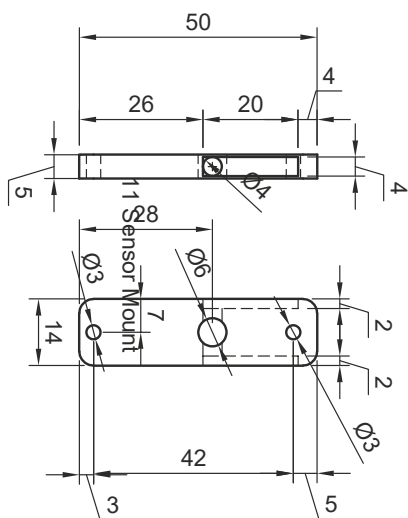
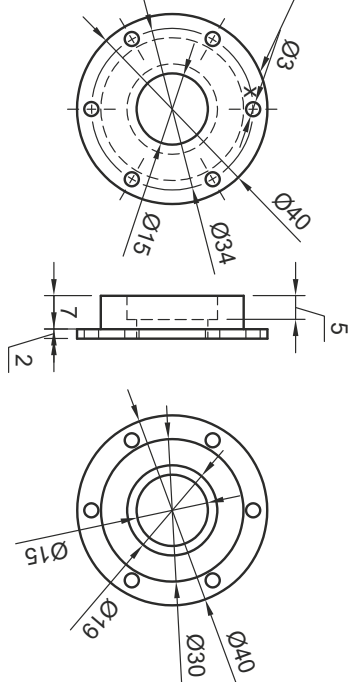
Fig 6



104 Timing Belt Tensioner
3x MR63-ZZ bearing
1x 3mm low profile cap screw
3mm nut and washer

'x' location of tensioner mount. Determine from job drill and tap M3
(It may be possible to use the top mounting hole of the timing base)

9 Timing Base/Rear Bearing Mount



Ignition and timing.

Dept.	Technical reference	Created by	Approved by
		Pete Targett	27/12/2020
All dims mm	Document type	Title	Document status
		Ignition and Timing	
		DWG No.	
		Rev.	Date of issue
		1/1	Sheet

Parts 9,11,12,102,104

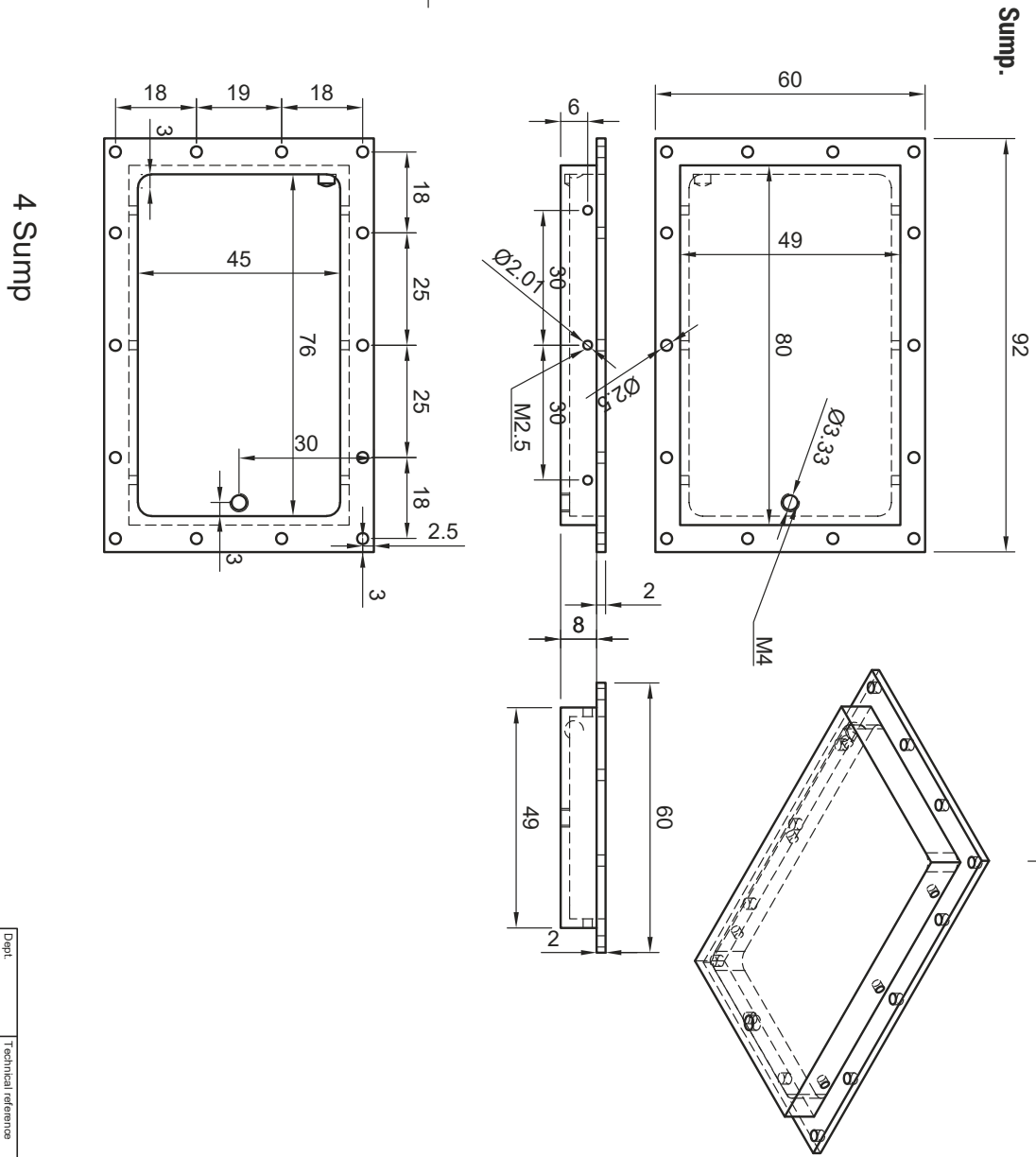


Fig 7

Dept.	Technical reference	Created by	Approved by
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		12/02/2021	
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Fabricated valves.



Grinding valve bevel on tool and cutter grinder.



Valve testing jig.



Lapping valves under pressure.

would try something different. I fabricated valves (**photo 26**) with separate stems and the heads silver soldered on. After facing off the ends of the valve heads, I used my tool and cutter grinder, with a diamond disc, to bevel the seat on the valve head (**photo 27**). This ensured the bevel was square and concentric with the shaft. Alternatively, the valves can be made the way Malcolm described.

The improved compression with the Viton 'O' rings was noticeable from the outset but to improve things further getting the valves to seat properly was another area to improve on. I devised this simple jig (**photo 28**). Mounting the head and applying pressure from the airline allowed me to lap the valves under pressure. It became obvious which valve was leaking and the point when the leak was resolved. The brass plug seals the sparkplug hole. With a pin vice on the end of the valve stem and some 1200 grit used for polishing

gem stones, it proved to be successful without having to re-assemble the engine to see if it worked (**photo 29**). (Note: those in the know use 600 or 800 grit but I couldn't source any.)

Here are the finished valves (**photo 30**).

●To be continued.

NEXT TIME

It's time to assemble the engine.



Finished valves.

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Book Review

The Leader Locomotive Bulleid's Great Experiment

Kevin Robertson

If ever there was a glorious locomotive failure it was Bulleid's *Leader*. Incorporating several radical ideas, the designer presented it as a replacement for the M7 0-4-4 tank engines but surely intended the engine to have a wider role.

The first edition of this book appeared in 1988 and sold out rapidly, showing interest in Bulleid's oddity had not waned since its introduction in 1949. This edition incorporates fresh research and it's probable that little can now be added to this locomotive's history.

O.V.S. Bulleid was the Chief Mechanical Engineer of the Southern Railway who had worked with Sir Nigel Gresley. Always innovative, he produced the Merchant Navy class for the Southern and the Q1 freight engine. This book covers the genesis of Bulleid's thinking with ideas that were sketched out but never fully designed. Much content is drawn from John Click, an engineer who worked on the Leader class and left reminiscences. He was on several trial runs, so well placed to observe failings and successes.

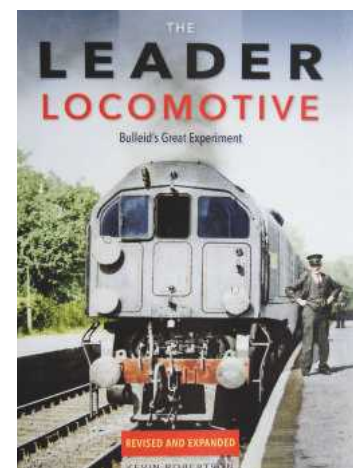
The Leader class design included several new ideas. Cabs at each end gave the driver a clear view not always possible in other engines due to drifting steam. No turning would be required at termini. The boiler was a brand new

design with four thermic syphons. Though that proved successful at raising steam, it was offset in the frames, giving weight problems. All was mounted on two pivotless bogies carrying three cylinders, each fitted with sleeve valves, probably Britain's only six cylinder locomotive design. Using bogies meant all the weight was available for adhesion.

In reality there were many problems. It was awkward to coal and water. Photographs show bags of coal being hauled on to the engine and few water cranes could reach the filler. Taking water could take up to an hour, unsuitable for an engine on busy routes.

It is amazing that Bulleid got away with so much. He used sleeve valves apparently to save space in the bogies, yet when these valves were tried on Southern 2039 *Hartland Point* they were a disaster. Why repeat the experience on a new design? With a new locomotive, teething problems would surely be ironed out before it went into production? Yet Bulleid had four more locomotives started and the second was days from completion when R.A. Riddles ordered work to stop.

Test operation revealed other difficulties. On a first outing the engine seized. A crank axle broke. The fireman's cab reached high temperatures - though Bulleid Pacific cabs



could be very hot too. Water and coal consumption were far too high. Worse, the offset boiler meant weights had to be added to compensate on the other side, making the engine well over weight and the projected universal route availability impossible.

The author makes it clear that British Railways' new CME R.A. Riddles gave *Leader* a fair trial even after Bulleid had left the Southern. Repeated failures meant he had little choice but to scrap the engines. Yet Bulleid's similar ideas used in Ireland on a turf burner worked. Perhaps the concept was right but the execution failed.

Although the locomotive was under test for a relatively short time it is surprising how many photographs the author has managed to track down. This book gives some engineering details often missed from similar books, including useful photographs of the bogies, but I'd have liked more information on how those sleeve valves were supposed to work.

Overall, a fair summary of this strange locomotive and one unlikely to be bettered.

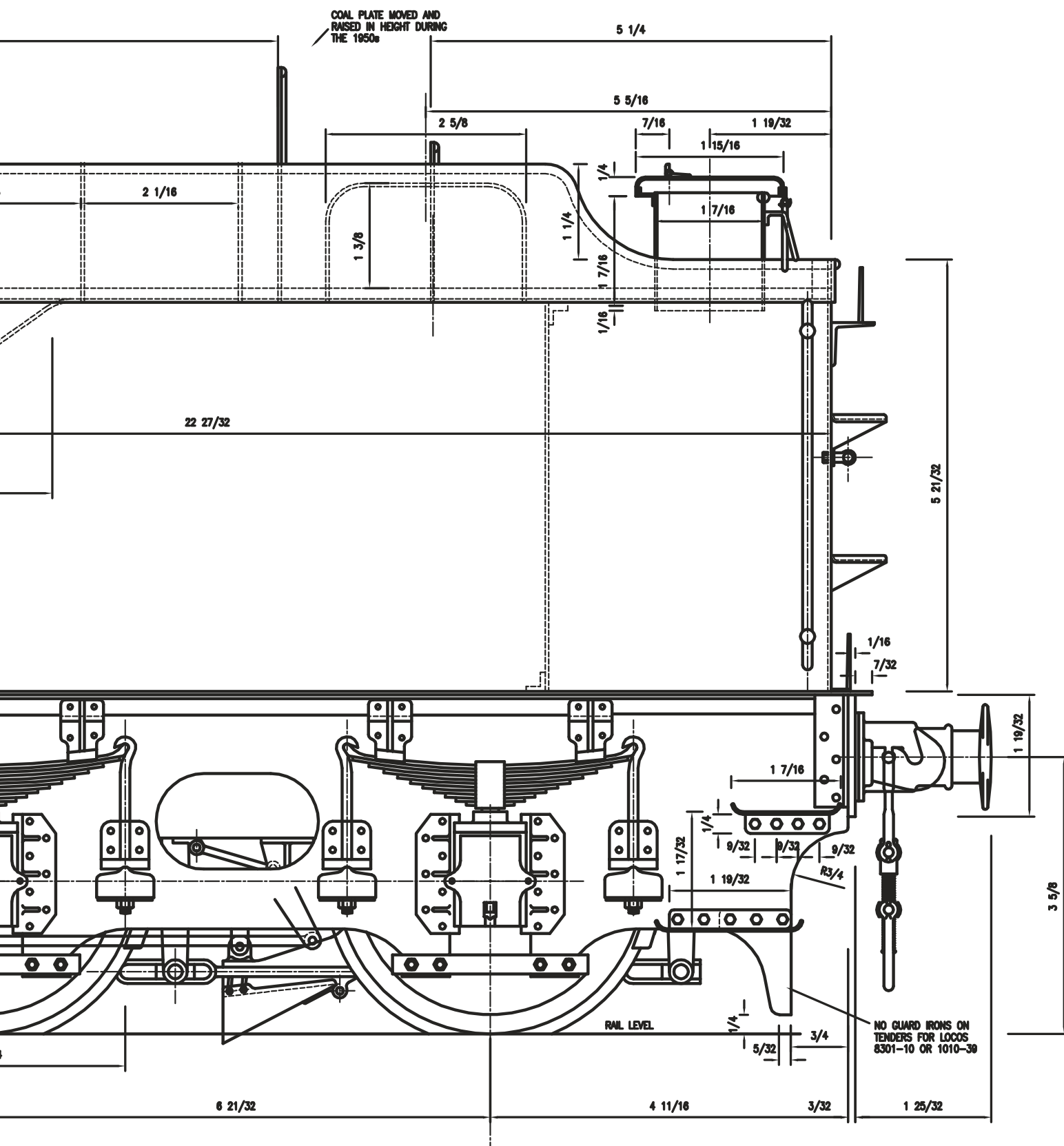
Roger Backhouse

Published by Crecy, 2021
ISBN 978-1-91080-9853
£30, 304pp, hardback

FIG 2 - TENDER GENERAL ARRANGEMENT



LOCOMOTIVES 61105 & 61165 HAD SECOND HAND TENDERS
DISPLACED FROM A2/1s WHEN THEY RECEIVED NEW
EIGHT WHEELED TENDERS



Measuring Threads

Jacques Maurel looks at variations of the 'three wire method' for measuring threads.

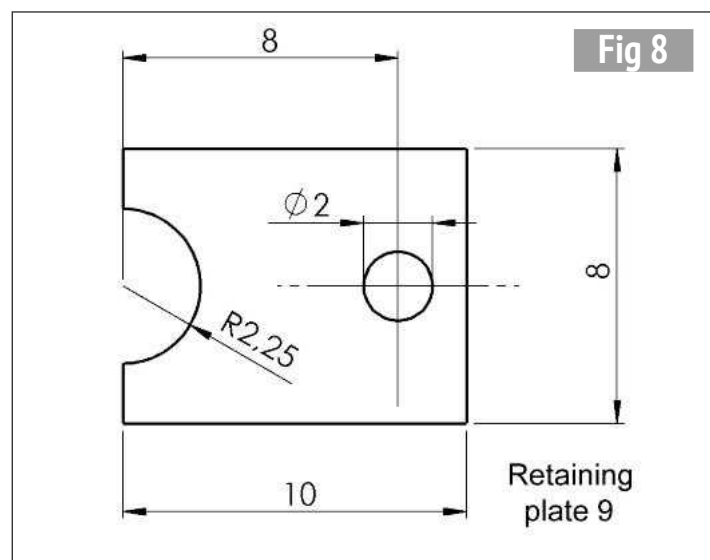


Continued from p.218
M.E. 4683, 28 January 2022

Internal threads

Curiously, almost nothing seems to exist for measuring an internal thread during machining (to know how far you are from the final dimension), so we have to rely on the successive trials with the male threaded part after each pass when the thread seems to be near completion and this is really a boring job. Here is my approach to solving this problem.

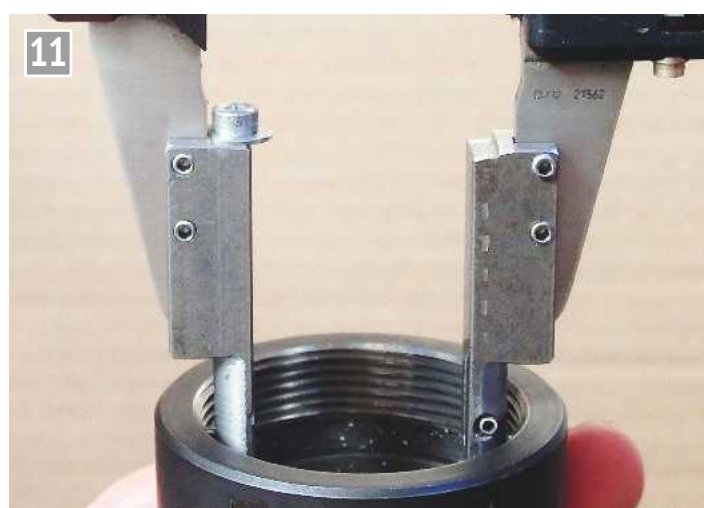
The 'two wires' method can be tried, using a plain iron wire or piano wire wrapped inside the thread (photo 9). This works but the wire must fit the thread. Piano wire is often quite stiff (not convenient for a wire diameter above 1mm) and iron wire can be scored by the hard caliper's jaws. Of course, you have to make a wire loop for each dimension and it's not very easy to fit the wire exactly in the thread furrow. For large wire diameters, it's worth using two sections of a loop (the wrapping diameter of which is smaller than the female thread diameter) held in the thread with grease - see photo 10 showing a M37.6 x 3mm pitch (lathe backplate) with two lengths of 1.69mm wire held inside by grease.



The 'two wire' method for measuring an internal thread.



Using grease to hold the measuring wires.



Using special jaws with a caliper to measure an internal thread.

The 'on wires' dimension is of course different from the external case and the formula for ISO threads (60 degree angle) is:

$$Di = D - (3d - 0.2165p) \quad (2)$$

where

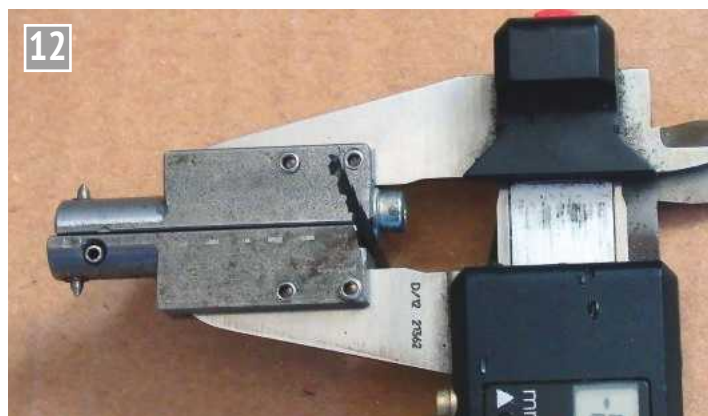
Di = diameter within the wires

D = external thread diameter;

d = wire diameter

p = pitch of the thread.

I also use a caliper equipped with special jaws holding truncated conical tips 6a for comparison with a reference internal thread (fig 9 and photo 11).



Setting the jaws to half the pitch using a drill.

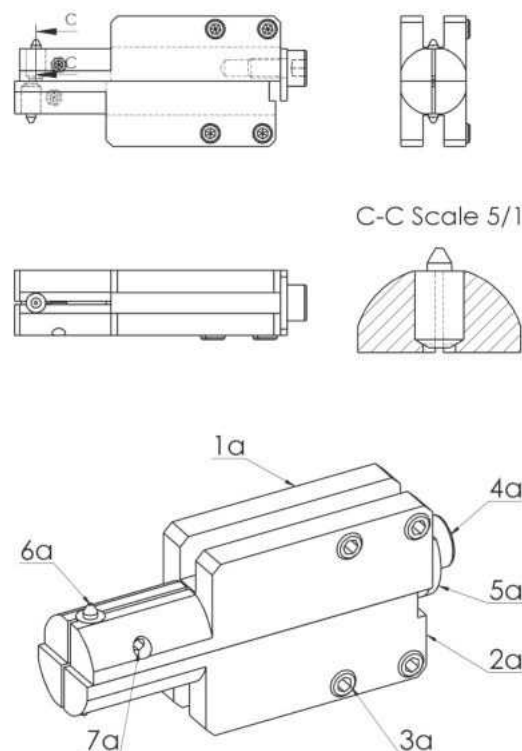
The tip holders **1a** and **2a** are fixed on the caliper's jaws and locked by two grub screws **3a**. The tips can be changed and they are pinched in the tip holders. To allow this the tip holders ends are split and the split slightly closed with the bench vice. A small grub screw **7a** is used for opening the split for changing the tips. The smallest diameter of the tip cone must not be too great. One tip holder is shifted (along the jaw direction) from the other by half the pitch - a drill of the appropriate diameter can be used to give a $p/2$ shift (see **photo 12**). A 1 mm shoulder is machined on one jaw so, for example, a 1.5mm drill should be used to give a 0.5mm shift for a 1mm pitch.

The minimum possible bore diameter is 14mm.

This system is used to compare an internal thread to another (reference gauge) but can't be used to control a geometrical dimension as wires could do. I use a plain nut as a reference gauge: M16 for 2mm pitch, M18 for 2.5mm pitch, M30 for 3mm pitch.

I use also roller bearing nuts for 1mm and 1.5mm pitches. ER socket caps can be used, all being 1.5mm pitch. I use my ER32 collet holder as a reference gauge for the diameter M40 fine pitch of 1.5mm. This is a very common pitch as the fine one for ISO threads above 10mm in diameter.

Fig 9



Special caliper jaws for internal thread measurement.

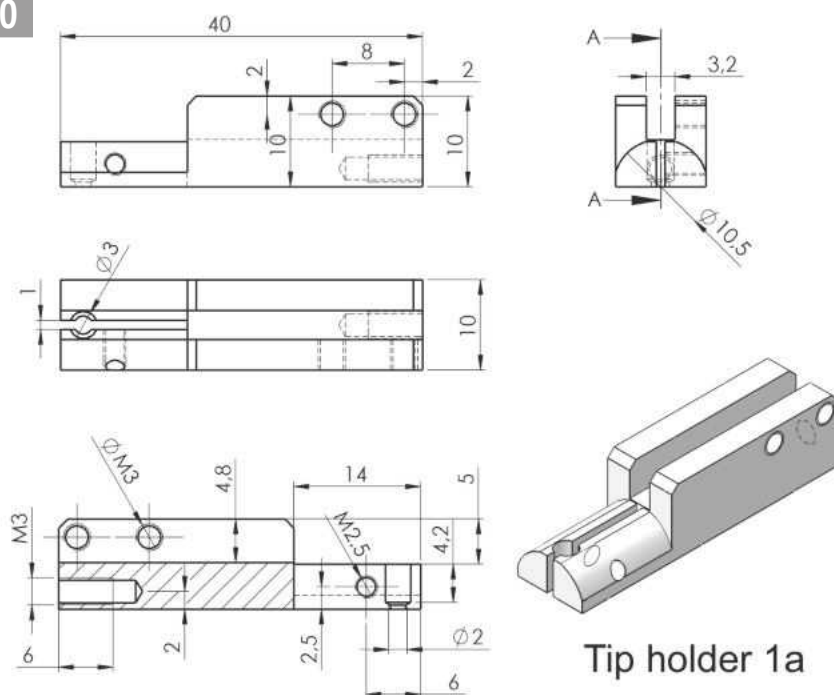
Measurement

The measurement is taken in the following way:

* Zero your tip equipped caliper on the reference nut.

* Any measurement can now be taken on a 1.5mm ISO pitch nut, for example, for a 32mm nut, machine your nut until -8mm is read on the caliper (for the same play conditions).

Fig 10

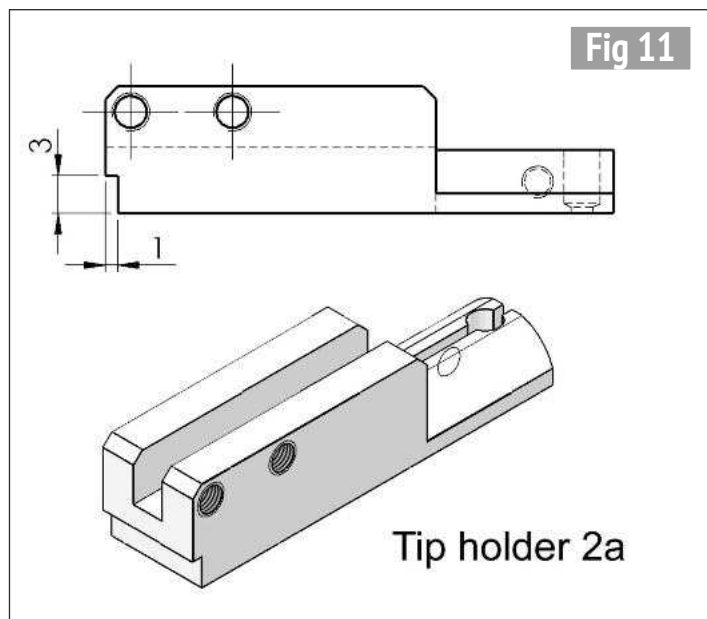


It's also possible to close your caliper by 8mm and to zero it in this position for machining until this reaches zero.

If you want to know the exact dimension (to compare with the standards) take the measurement in the following way:

- * A three wires measurement is taken with a micrometer on the male thread.
- * The nut is then set on this male thread, the socket holder body is locked in the milling machine vice and the nut radial play measured with a DTI.
- * By comparison to the ISO standard, you can find the error on this nut.

Fig 11



Tip holder 2a

Machining

Tip holders 1a and 2a

(figs 10 and 11)

Be careful as the M3 holes position is not the same for these two parts. The end rounding must be made on the two assembled parts (finished unless the split) set in a four jaw chuck. The split can be then made with a plain hacksaw.

Measuring tips 6a (fig 12)

Diameters are: $d_e = p$ (pitch), $d_i = 0.4p$. The bottom is made by parting off with a threading tool to get the 120 degrees angle.

Washer 5a

This must be sawn to clear the caliper's jaw.

Table 2 shows the parts list for the two tips holder.

Thread machining situations

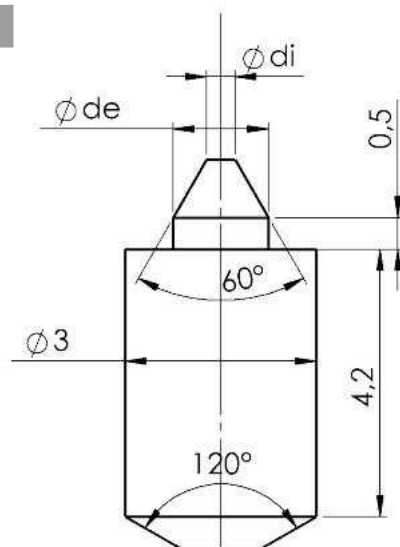
1 – Machining a male thread (male model to hand, no mating female thread available): Try to identify the thread (pitch and diameter). All the 'wires' methods are possible. The easiest is to use the 'two wires' method and the most accurate is the 'three wires' method. 'Zero' your caliper when the wires are on the model and machine the thread until you reach zero on the same wires.

2 – Machining a male thread from a drawing (no mating female thread available): The one and three wires method should be used for accuracy (after calculation), but the two wires is good enough most of the time (also after calculation).

3 – Machining a male thread from a nut or a threaded hole: Try to identify the thread (pitch and diameter) - the plain wire loop can provide some help to get the dimensions, then you are in the previous situation. **Note:** It's always worth checking the play with the mating female thread, when available; easy to do with a nut, but with a threaded hole in a big part, it's necessary to hold the screw between centres, so the screw can be taken out for checking and returned back on the lathe for further machining.

4 – Machining a female thread (female model in hand, no mating male thread available): Try to identify the thread (pitch and diameter). Use the plain wire loop to get the dimensions and use the conical tips for checking during machining. Zero the caliper on the model and machine until this is zero.

Fig 12



Measuring tip 6a



Using a dowel to get an imprint of a thread.

5 – Machining a female thread from a drawing (no mating male thread available): Use the plain wire loop after calculation.

6 – Machining a female thread from a screw: Try to identify the thread (pitch and diameter) and then you are in the previous situation.

Note: Here again, it's worth checking the play with the mating screw, when available; easy to do with a small screw, but not with a heavy and/or cumbersome screw. In this case, it's often necessary to make a dummy screw, just for checking. For example, machining a thread on a lathe backplate.

Table 2. Parts list for the two clip holder

Part No.	Quantity	Name	Material
1a	1	First tip holder	FCMS
2a	1	Second tip holder	FCMS
3a	8	Screw Hc M3-5	8-8 min
4a	1	Screw CHc M3-6	8-8min
5a	1	Washer diam 3, diam 10	
6a	2	Measuring tip	Silver steel
7a	2	Screw Hc M2.5-5	8-8min

Practical examples

1 – Machining fixing screws for a backplate on an ASA 4 spindle (**photo 13**):

The tapped hole diameter was 7.85mm, the pitch (1.25mm) was measured with the help of an 8mm diameter wood dowel (see **photo 14**), so the screw thread was certainly M9. The first screw was machined between centres (for checking in the tapped hole) and checking during machining used the 'three wires' method.

2 – Machining a special cap for a laser pointer (seen in photo 4 – issue 4683, 28 January):

External diameter is 12.3mm, 6mm long, pitch 0.75mm. The control used

was the 'two wires' method with a 0.5mm diameter wire, as seen on the photo - the clips couldn't be used for such a short thread.

3 – Machining a lathe backplate:

The spindle thread was M37.6 external diameter, 3mm pitch (from the lathe technical data). This backplate was made, many years ago, in the traditional way - a dummy spindle thread (photo 6) was made using the 3 wires method, to check the female thread. I've made a measurement on the backplate thread using the two wires method to check if this method could be used to avoid making a dummy spindle. A 1.69mm



Measuring the pitch from the imprint on the dowel.

diameter iron wire coil was made by wrapping around a 27mm diameter rod and two quarters of circles cut from this coil and set in the thread with sticking grease as seen in photo 10. The calculation from formula (2) gave $D_i = 33.18\text{mm}$ and the 'on wire'

measure $D_i = 33.16\text{mm}$, so it worked very well. A test using tipped jaws was also made. The caliper's 'zero' was set in a M30 nut and the measurement was 7.5mm in the backplate thread (should be 7.6) so the nut thread was just 0.1mm too big. **ME**

NEXT ISSUE

Triple Oscillator

Hotspur builds a three-cylinder oscillating steam engine capable of running in either direction.

Driving Truck

Tim Coles presents a 7¼ inch gauge driving truck, designed to carry two people and conforming to a prototypical outline.

Gearbox

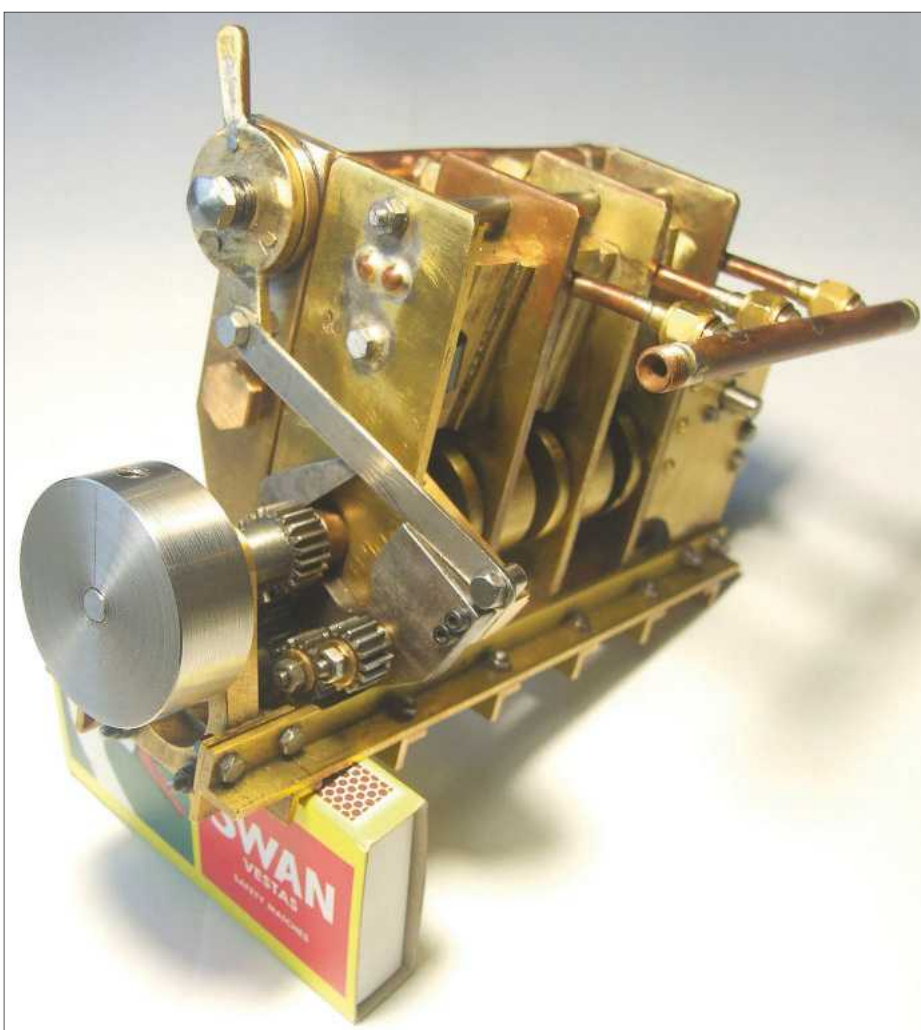
Ted Hansen decides to replace the transmission in Westbury's Aveling road roller with something a bit closer to the prototype.

Astronomical Clock

Adrian Garner completes the case for his astronomical bracket clock.

Bike

Patrick Hendra describes his lockdown project – the restoration of a 1947 *Vincent Rapide* motorbike.



Content may be subject to change.

ON SALE 25 FEBRUARY 2022

A Double Acting Engine for *Ellie* PART 2

Tony Bird decides to upgrade steam tram *Ellie's* engine.



Continued from p.203
M.E. 4683, 28 January 2022

Reversing valve

The reversing valve is a bit different from the original and doesn't need a rotary

table and milling machine to make it. This design has the advantage that because there is no slot for the steam to

act on, it doesn't need such a strong spring to hold it steam tight, which also helps as it shares the spring with the



A square of 5mm was marked out to the same dimensions as used on the cylinder frame for the ports.



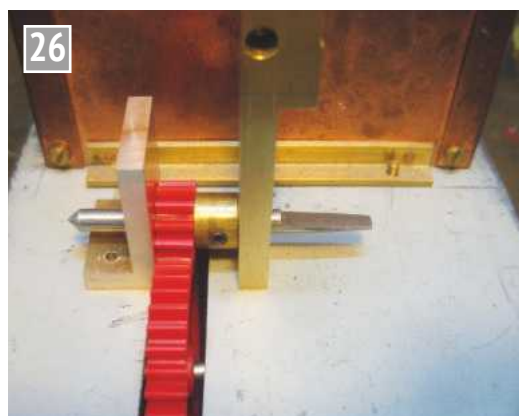
The ports are drilled a bit more than half way through the valve and then the passageways are drilled. This photograph shows the valve that has had the ends of its passageways plugged along with how the valve was stopped oscillating with the cylinder. Instead of being mounted on the cylinder trunnion it has its own brass tube bearing.



The valve was turned into a round shape and the position of one of its ports indicated with a pop mark.



The valve is positioned on the engine stand.



Holding the engine frame to the footplate was achieved by using some 4mm thick angle machined to the same width as the engine frame.



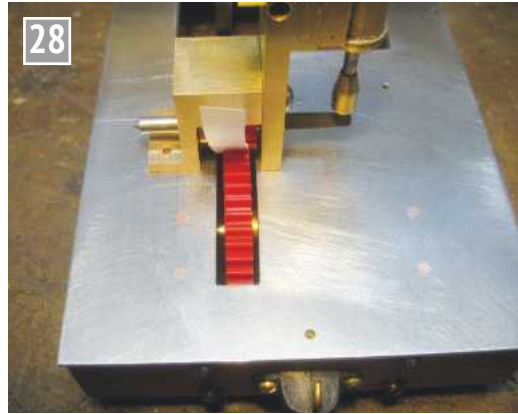
A block of brass was soldered to the angle so it could be attached by screws to the engine frame.

This design has the advantage that because there is no slot for the steam to act on, it doesn't need such a strong spring to hold it steam tight...

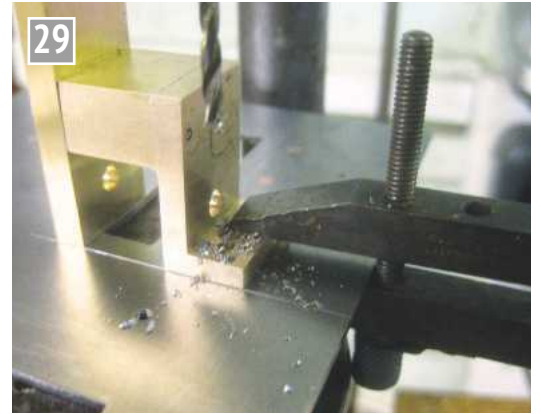
cylinder. The 'down side' is that it has to be accurately placed and it needs a full 90 degree movement to operate.

Flywheel

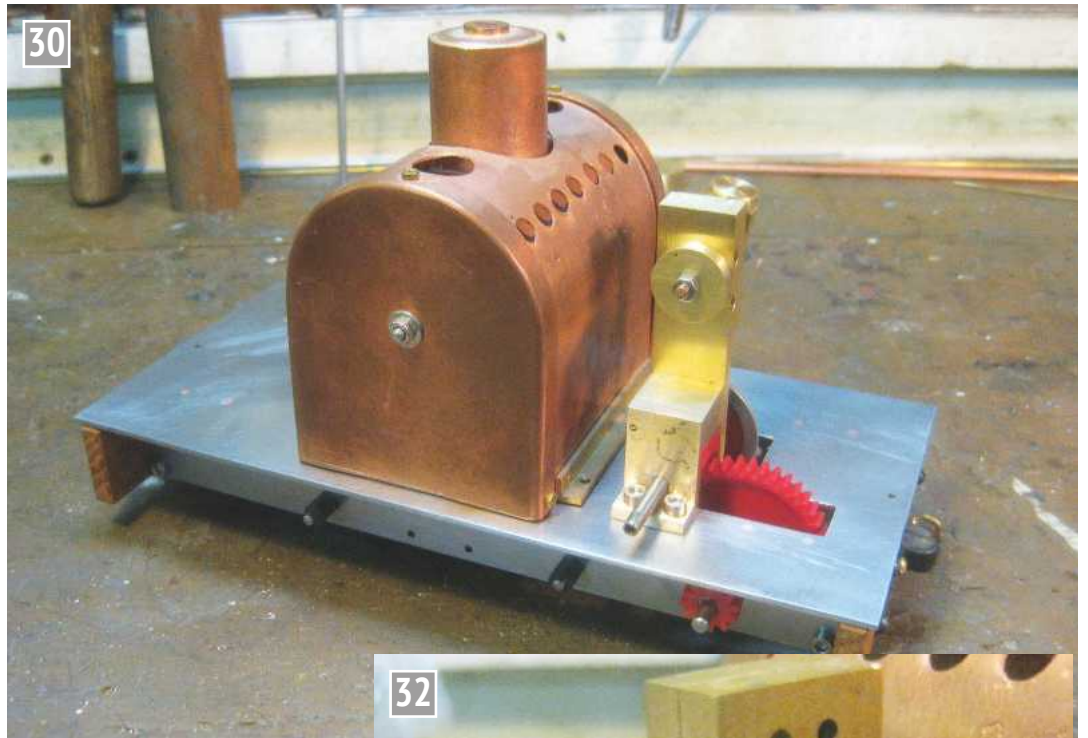
The flywheel was straightforward being 30mm in diameter and 10mm wide at its boss and these dimensions are by no means critical. The flywheel was balanced with the crank and grub screw fitted. This was done by fitting it to a short axle and resting it on knife edges (Stanley knife blades). Balancing holes were then drilled until it nearly balanced - it is better that the crankpin is on the lighter side of the wheel. This is not perfect but better than the crankpin and the grub screw hole making one side of the flywheel a lot heavier than the other and does make for a smoother and slower running engine.



The deepthing of the gears was done with the aid of a piece of paper introduced between the gears.



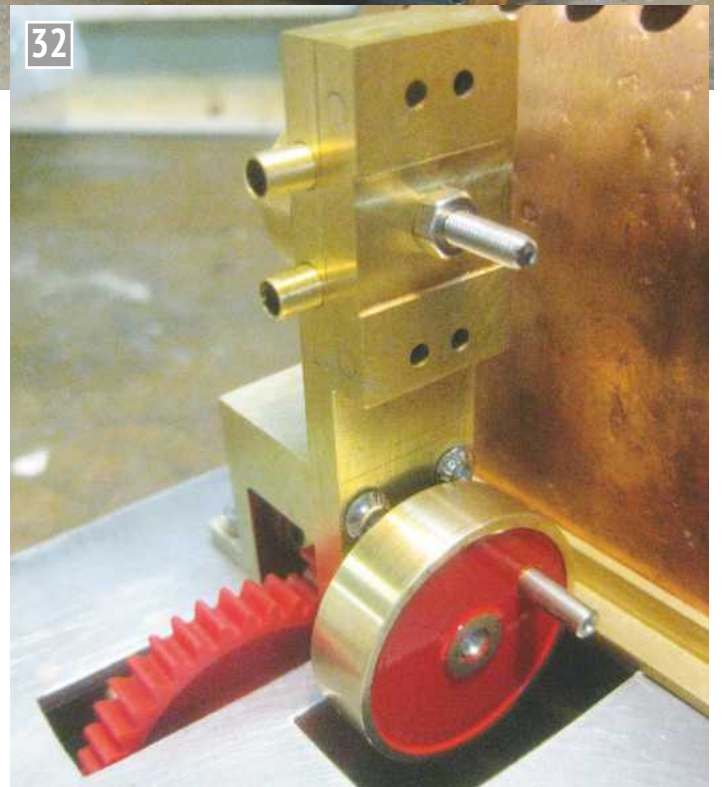
This allowing the positioning of the bracket, which was held to the footplate with screws.



The engine in position on the footplate.



Flywheel with mounting hole for the crankpin and balancing holes.



Flywheel in position.



The hexagonal rod is turned to 32mm long and then drilled to accommodate the brass tube.



The lathe is used to make the hexagonal rod into a rectangle 32 x 13mm, which is then split to make two port blocks.



A shellac chuck was used to finish the port blocks.

Port block

The cylinder's port block is made from some 21mm AF hexagonal rod and the cylinder itself from K&S brass tube with an internal diameter of $\frac{5}{16}$ inch, an 'O' ring of the same size

being used. The same jig used for the port block is used to spot the steam passageways in the cylinder port block after which it is drilled to size. A piercing saw is used to cut the rectangle in half so creating

two cylinder port blocks (this is the reason that two engine frames were made).

Cylinder

The K&S brass tube was cut to length and soft soldered

to the cylinder port block. A piece of wood was screwed into the trunnion hole while the soldering took place. It of course burned but stopped the solder getting into the thread.



The cylinder was soldered to the port block and then holes were drilled for the steam passageways into the cylinders.



The cylinder bore was lapped using a wooden lap charged with Brasso metal polish.



The wall thickness of the cylinder was made up by gluing strips of mahogany to it.



Some hardened filing buttons were made.



The wood was filed away to these buttons.



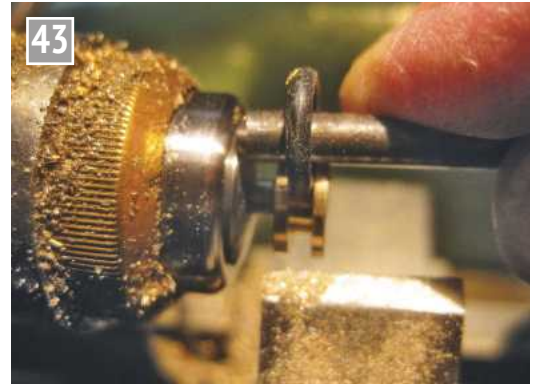
The cylinder end covers which would be glued in place were made. The piston rod end cover has no seal, just a long reamed hole.

Piston

The piston was made from brass and screwed onto a stainless steel rod. The Mamod style big end was made from ¼ inch hexagonal brass rod. Before gluing the top cylinder cover on it was checked to ensure that the piston didn't cover the steam port at top dead centre.



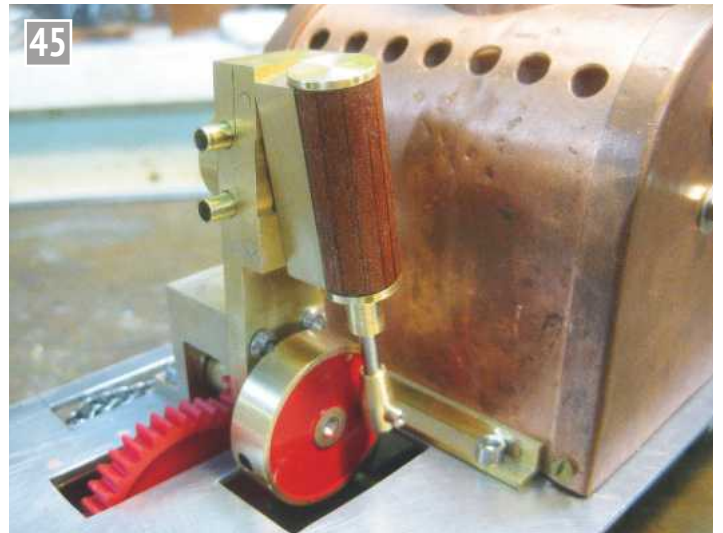
A pair of pistons.



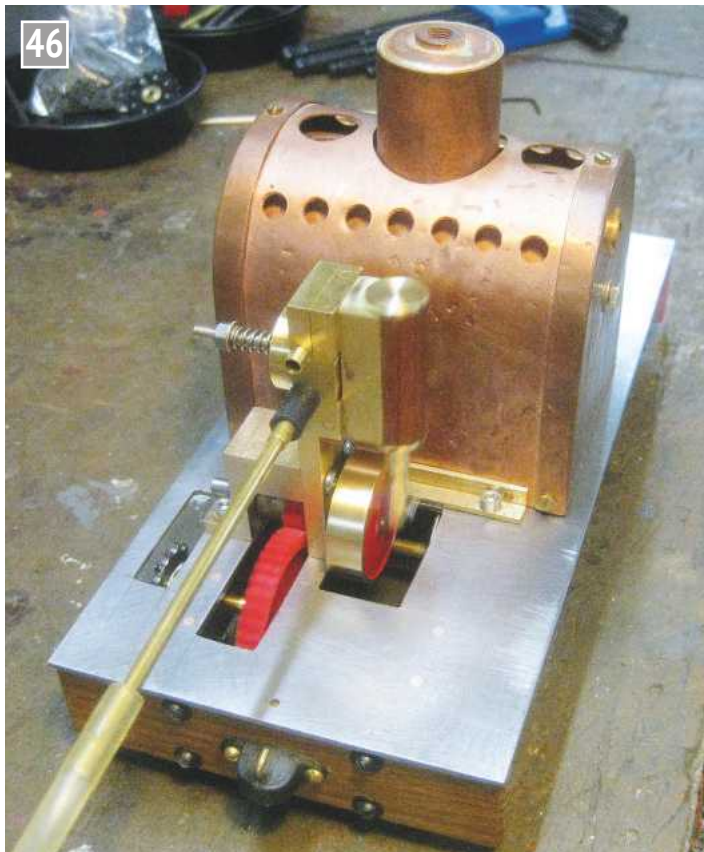
The groove in the piston for the 'O' ring was turned by hand.



The length of the piston rod was checked using the engine frame as a jig.



The finished engine with the cylinder covers and big end glued in place and fitted to the footplate.



The engine was first tested using air.



It was then connected to an auxiliary boiler.

Completion

The completed engine was then fitted to the footplate for testing.

The building of the engine and its first test run on a track can be seen on YouTube at: youtu.be/ZlInA09hBco



Stops for the reversing valve were fitted to the engine frame which completed the work on the engine.

ME



Draughting

Dear Martin,
I read John Hill's work on the subject of Locomotive Draughting with interest (M.E.4674, 24th September 2021). To state its importance to the efficient running of locomotives large or small is very true! That many skilled CMEs designed countless locomotives but sometimes overlooked what one would have thought was obvious I find quite hard to understand! André Chapelon went part way to adopting a scientific approach to building steam locomotives and in steam's twilight years L. Dante Porta did important work on making a steam locomotive work efficiently, in one case doubling the power, reducing the water consumption and using no more coal, and all with local labour and machinery in Cuba. A few stalwarts continued to develop the steam locomotive notably David Wardale and Phil Girdelstone, both building on the work of Giesl, Kylala and Porta amongst others.

Having read some of Porta's work and had experience of tuning internal combustion engines I would respectfully suggest that Mr Hill's work should perhaps have had a part 3. For efficient use of the steam it needs to flow from the boiler to the cylinders and then back to the blast nozzle with as little restriction as possible other than that required for the generation of a suitable vacuum in the smoke box. Pipes from the steam dome to the regulator and beyond should be large enough to carry the volume of steam needed when running wide open, with smooth bends and smooth passages in castings. The regulator and port ways in the valve chest should also be of sufficient area to pass the steam required for the speed or load. If super heaters are used then they need to be treated as the rest of the pipe work. One could start with the cylinder

3D CAD

Dear Martin,
In recent years, I have noted an increasing number of very fine, 3D CAD renderings of parts and assemblies in *Model Engineer*. Some of these renderings are good enough to be inspirational. I would like to be able to produce such renderings myself, so I would like to know what 3D CAD tools were used to make them. Sometimes the author of the article mentions the CAD tool that he used, and sometimes he does not. I wonder if *Model Engineer* could establish a policy of encouraging authors who submit 3D CAD renderings to at least mention the tool they used.

In connection with this, I wonder if *Model Engineer* could put together an article or series of articles on the 3D CAD tools available to the hobbyist. I know that *Model Engineer* has a fair number of authors who regularly submit articles to the magazine and at least some of them do use 3D CAD tools. Could the authors with 3D CAD experience possibly be persuaded to collaborate on such an article or series of articles?

Sincerely, John Hannum (Cherry Hill, NJ. USA)

(Well – how about it? – Ed.)

Write to us

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bore and a notional speed/load and therefore steam requirement, work backwards to the boiler and finally the fire and its needs. What have we then done? Gas flowed the steam locomotive - the appliance of science! Then there is the poor thermal efficiency to deal with! Look out, IMLEC here I come!

Maybe a better mathematician than I would like come forward and do some working examples to illustrate these points. Or better still design and build a locomotive based on the above principles.

Noel Shelley (Kings Lynn)

Jodrell Bank

Dear Martin,
I would just like to fill in one or two totally unrelated details about Jodrell Bank Telescope which Geoff Theasby mentioned in Club News (M.E. 4681, 31st December 2021).

I just happen to know quite a bit about this project as my uncle Phil Hewson was the head of the Erection Department at United Steel Structural Co. in Scunthorpe at the time. The job had just been completed when I joined

the company in 1960 and it was Uncle Phil (Dad's brother) who was the engineer who saw that it was all built to our specification. He was over there once a week and it was a bit of a trek to get there and back in a day. One day my dad went with him and they looked at the telescope and thought that it was massive. Phil said to him did he want to come up top, and of course my dad said 'yes'. The dish was horizontal at the time but had been cleared of all the scaffolding. My dad decided that he wanted his usual pipe of tobacco but he accidentally dropped the tin and it rolled into the middle of the bowl and then, apparently, they could hear it dropping through all the scaffolding under the dish with the usual tink tonk tink until it must have reached the bottom.

Anyway, now to the small details that have little relevance to the story! Did you know that the rollers in the bogies on the turntable are all BR Standard tender wheels and the gears which are used to tilt the dish are from scrapped World War Two battleship gun turrets?

Doug Hewson

Modern Times

Dear Martin,
I found your article in *Smoke Rings* entitled 'Modern Times' in issue 4678 (19th November 2021) quite interesting. It is amazing how modern technology helps things today; take for instance this covid epidemic and the speed at which effective vaccines have been developed - about a year. OK - the scientists who worked round the clock to do this had a good idea as to what they needed to do as this was apparently an offshoot of another illness for which they had samples to work from.

As you quite rightly say, with the advances we have made in home computers for instance and the power they have now, I often wonder if people like Isambard Brunel for instance when he designed and built the Tamar bridge would he have got the same

result if he had had CAD at his disposal? The same with the designer of the Forth Railway bridge in Scotland; I doubt if it was designed today that it would look the same. In both cases they were vastly over engineered as they didn't have the computer programmes we have today. Even on this Acorn 5000 computer I have a program which I can use to draw out a printed circuit called *Fastrax* and this computer is ancient compared to what we can buy today. Even then, when we buy the latest computer, in a way it is obsolete as once it is signed off to go into production they are working on the next generation.

Yes, modern technology is a godsend especially in engineering where we can build things, for instance cars, with robots and ensure that each car is as perfect as we can make

it. The robots can work 24/7 without a tea, toilet, or even a lunch break. I do however feel that we do need to control it rather than it controlling us.

I don't doubt that modern technology has helped a lot in manufacturing. I even read in our magazine where people are using CAD/CAM to help make their models, of whatever they are making, and even now using simple (compared to industry) CNC machining. No doubt it also helps you and the editorial team to put our magazine together every 2 weeks or so and makes it a lot easier to do page layout etc. than by the old-fashioned methods used more than a few years ago. Take for example the humble wrist watch that we wear today - yes, you can still get a windup mechanical one today but if you look at what we can buy they have a battery and also a small chip

inside along with a quartz crystal, which I understand vibrates at a certain frequency and the chip steps this down till it reaches a multiple of 60, which then controls the time keeping and for a moderate price you have a watch which is more accurate than a good quality mechanical one due to having fewer moving parts.

Even the mobile phone, when they first came out, were the size of a house brick and weighed the same; now the simplest ones are about the size of an average hand and can do a lot more. The last one I bought new cost me £5 plus another £10 for the SIM card and that was brand new. Okay, it is a fairly simple one but it does what I need and the £5 cost included the mains charger as well.

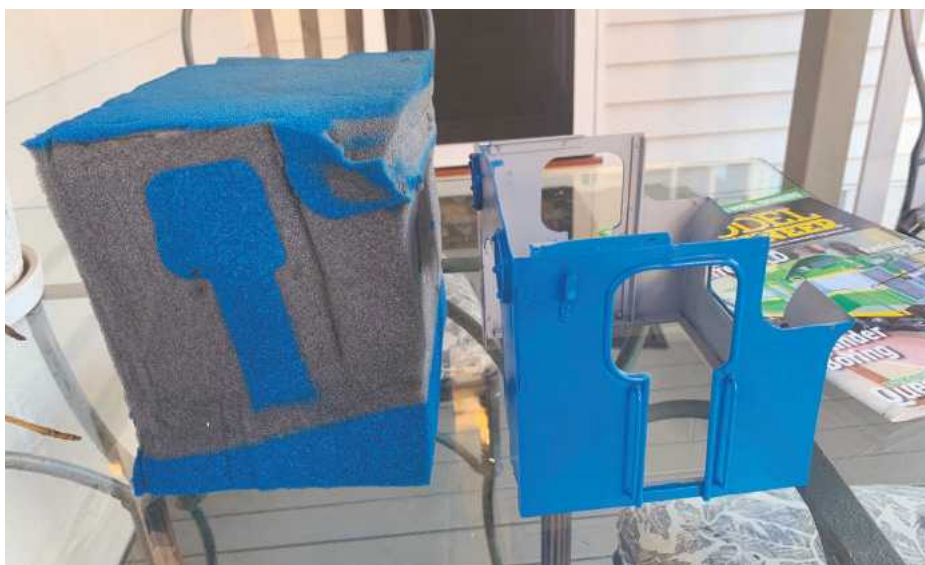
Yours sincerely,
J.E. Kirby (London)

Masking Up

Dear Martin,
During this recent period of disrupted routines I decided to renovate a 3 ½ inch gauge *Rob Roy* tank engine I bought on a visit to the UK a few years ago. It had signs of being left in the shed and then quickly tarted up for sale. The cab had been painted poorly with a brush and there were numerous other things that needed attention on the backhead so it was dismantled in this area and the jobs attended to one by one.

When it came to painting the cab, which I had removed, with its various angles and internal supports it appeared to be a tedious masking up job which unless done meticulously always disappoints so I decided to try something else. I haven't seen this done before but perhaps it has. I had a large piece of packaging foam that I use with moving delicate items in the car. My idea was to cut a block of the foam out, just a little bigger than the inside space of the cab, and squeeze this into that space so that the internal walls were protected from overspray.

The cab shape is roughly 7 x 7 x 6 inches but as you can see from the photograph there is a curve cut out to accommodate the coal bunker so some slight shaping of the 'cube' of foam was appropriate. The Minister for War and Finance had left the building



so I borrowed one of the long very sharp knives from her 'office' to do the job. Long continuous strokes in one direction worked perfectly and in five minutes I had my block of foam. The roof was removed as it is a different colour anyway. The foam was carefully persuaded into the space and relieved with a scalpel blade in various places to allow the paint access to some areas. Ensuring there was no evidence of its use, the knife was put back.

As you can see from the photo the edges, in some places, have not received a coating of paint. This could have been

managed by careful trimming of the foam in those areas. Due to the snug fit I was able to manipulate the piece by holding the foam which did help me to get a nice even coat in probably less than a minute of spraying.

I left the foam in place for a couple of days so that I could grapple with its removal. There are some minor signs of the paint sticking the foam to the cab but it's hardly noticeable and maybe more careful trimming could obviate this.

Paul McGee
(Brisbane, Australia)

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An Astronomical Bracket Clock

PART 22

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



Continued from p.208
M.E. 4683, 28 January 2022

Assuming you have decided to veneer the case, it is now time to glue the veneer to the four sides and the door outer surfaces.

I used sheet glue used in marquetry which melts when heated with an iron. Cut each piece of veneer slightly over size with a comparable sheet of the glue. I used only one layer of glue, which gave rise to some problems with adhesion. If I was doing this job again I would use two layers of glue. Lay the sheet glue, glue side down, on the surface to be veneered and use a hot iron to tack in position at two or three places. With a knife separate the glue and backing paper at one corner and peel off the backing. (If using two layers, do this operation twice.) Place the veneer in position and 'iron' it on. The iron should be at a low setting as the glue melts at around 100 degrees C.

Immediately press the veneer into position with the veneer hammer and continue to move the hammer over



Smoothing the veneer with the veneer 'hammer'.



the veneer until cool. (Why it is called a hammer is beyond me - it is not used to hit anything.) If any bubbles form re-heat and repeat the use of the veneer hammer (**photo 100**). Some bubbles are persistent. Heating, peeling back the veneer and adding more sheet glue is usually the answer and it is for this reason that I would start off using two layers. Occasionally a small bubble may be very argumentative when using burr veneer which has an uneven

structure. In this event re-heat the bubble and the local area and immediately place a small piece of clean brass plate over the area. The brass absorbs the heat and speeds up the setting process.

Beading was often used to ornament the window edges and hold the glass in position. On this clock the latter is performed by beading that will be added inside the window frames. I therefore veneered the window edges. I used ordinary white glue to secure



Securing the veneer while the glue dries.

the veneer and held it in place whilst drying with small strips of masking tape (**photo 101**).

The slots on the rear door for the lock and for the catch plate of the front door lock can now be cut. There is a dodge to fitting the front door catch. Mount the lock in the door, place the latch on the bolt with the key turned to the lock position. Now stick a short piece of double-sided tape to the underside of the catch and peel off the backing. Close the door and undo the lock. Carefully open the door and the catch should have adhered itself to the frame in the exact position required. Mark around with a knife and using a $\frac{1}{4}$ inch chisel cut out to a depth of about $\frac{1}{16}$ inch – just enough to sink the surface of the catch plate into the door leaving it, if anything, a little proud. A little fine fettling of the hole in the catch plate may be needed to ensure a sweet fit to the lock.

It is now time to turn the carcass face down with the rear door and lock fitted to

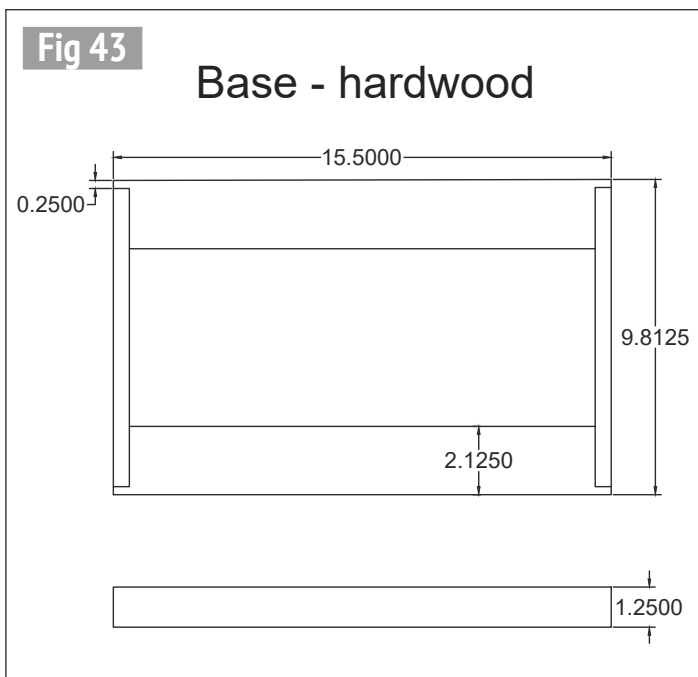
determine the width of the upper and lower rear case rails so that they leave a gap of about $\frac{1}{16}$ inch above and below the door. They should be a close fit to the carcass sides. Whilst they are not 'jointed' to the main carcass, glue will make them sufficiently secure and add to the structural rigidity of the carcass. If in any doubt small triangular cross sections of wood could be glued in the corners.

With the case veneered it is time to route the mouldings. The large ovolo shaped mouldings can be routed along the side edges of the appropriate thickness of wood and then parted to size on the circular saw table. Small mouldings can be difficult to hold and I find the easiest solution is to glue the wood to be shaped to a larger piece of wood and bring the whole to thickness on the planer. The extra wood makes handling easier and can be parted off later (**photo 102**).



Holding a small moulding for routing.

Gluing up the base, which will be veneered later.



The first moulding to apply is the wide, lower chamfered beading which is glued under the carcass and to which the base will be secured. As with all the mouldings, the corners need to be mitred to fit. I used the circular saw table with the slide set at 45 degrees. Cut the beading strips over length and then nibble away with small cuts. The beading can be held in place whilst the glue dries with $\frac{5}{16}$ inch long moulding pins as the holes will not be seen, being between the carcass and the base.

The base consists of a front and back made of hard wood $1\frac{1}{4}$ inches by about 2 inches. I again used White American Oak which was to hand but any seasoned hard wood would do. After cutting to length

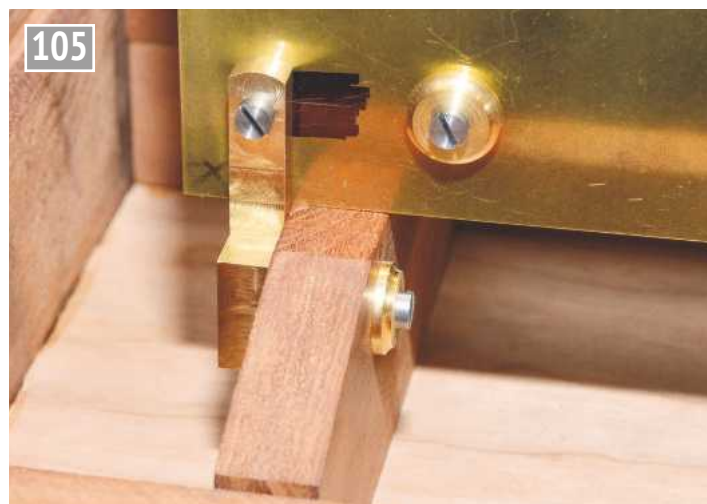
recesses were sawn in each end to support the $\frac{1}{2}$ inch thick side pieces. Glue the front and back in position and then cut the side pieces. The drawer holes, which double as hand holes to move the clock when the drawers are removed, were cut using the Hegner fret saw before gluing in place. The base will be veneered but it is best to leave this until later to avoid wear and tear on this area whilst working on the rest of the case (**photo 103**).

The lower ovolo mouldings between the base and carcass can now be cut and glued in place. As for the other mouldings, cut the sections about $\frac{1}{8}$ inch over length and take small cuts on the saw table until all the mitres fit. You may find that you need to bend





Relieving the back of a moulding for flexibility.



Locating the support beam accurately.



Former for bending the upper brackets.



Fixing the upper brackets.

one or more of the mouldings slightly to get a good fit. This is much easier if the back of the moulding is relieved with saw cuts, making it more flexible (**photo 104**).

With the main structure complete it is time to mount the clock. Secure one of the beams which the clock rests on into position with its two screws from underneath. Leave the other support beam loose but place in position. Place the frame of the clock with just the minute arbor in position. Using the whole clock will make positioning difficult due to its weight. Glue small wooden blocks to the front of the support beams so that the minute hand arbor which extends out of the front of the clock is in line with the front edge of the case carcass. It will then be safely behind the glass in the front door.

Remove the support beam screwed to the clock case and drill its hole for the brass mounting bracket. Remount the beam but leave the other loose. Place the clock frame in position and secure the bracket to the fixed beam and clock. Now screw on the other bracket to both the rear plate of the clock and the loose beam so that it takes up its natural position. If all is well, undo and place a little glue on the loose beam and remount as just described. When dry, the clock and brackets can be removed and screws added from underneath the case to the 'loose' beam knowing it is in the correct position (**photo 105**).

The upper brackets can now be made from $\frac{3}{4} \times \frac{1}{16}$ inch brass strip. These could be bent to shape in a vice but if you want to be certain of their shape cut a wooden former to

Beading was often used to ornament the window edges and hold the glass in position. On this clock the latter is performed by beading that will be added inside the window frames.

the shape needed (**photo 106**). Cut a recess along one side of the wooden former about $\frac{1}{32}$ inch deep and wide enough to fit the brass strip. This will ensure that it remains square whilst bending. The bend is formed by holding the strip against the wooden former in a vice and tapping the exposed brass tail to be bent with a hammer. Protect the brass from hammer marks with another scrap of wood.

The upper brackets are secured with 4BA screws and

washers to two tapped brass inserts in the case (**photo 107**). The brass inserts are glued with Araldite into the 7mm holes previously drilled in the case sides. This is rare case where a poor surface finish on the brass is an advantage as it will add to the grip of the glue. Very light knurling is an alternative. The related holes in the rear clock plate can now be drilled and tapped to match.

●To be continued.

We Visit the East Somerset Society of Model and Experimental Engineers

John Arrowsmith

goes west to Somerset to visit the first of a few West Country clubs.



My next visit took me westwards to meet the members at the East Somerset Society of Model & Experimental Engineers (ESSMEE) at their splendid site within the grounds of the Royal Bath and West showground near Shepton Mallet. I had been there before during a 7¼ Inch Gauge Society AGM but that was a very busy event so now I had time to talk to members and see what they have achieved since their formation in 2005.

Chairman, Robin Duijs met me and introduced me to the club by giving me a ride behind club locomotive, *Mendip* - basically a Tinkerbell 0-4-0 tender engine (**photo 1**) and my driver was Malcolm Mogford who drove the train around the circuit. The dual 5 and 7¼ inch gauge track is about half a mile in length, following the course of a small river and then around the lake before returning to the main station and club area.



Malcolm Mogford prepares Mendip for its journey round the railway.

There is quite an extensive area of track in front of the clubhouse which gives access to steaming bays, storage buildings and storage sidings and, of course, to the main line (**photo 2**). The locomotive storage area is serviced with a traverser (**photo 3**) which again provides flexibility to engine movements. On departure from the main

platform, passengers are taken around and behind the main club building and past the hydraulic unloading platform – something that makes the arrival and departure of larger locomotives much easier when visitors arrive (**photo 4**). The main line emerges to the side of the building and has a long, left hand turn out over the main road crossing (**photo**



The carriage shed and some of the trackwork in front of the main building.



The club's large diesel engine sits on the traverser outside the engine shed.



A useful hydraulic unloading platform.



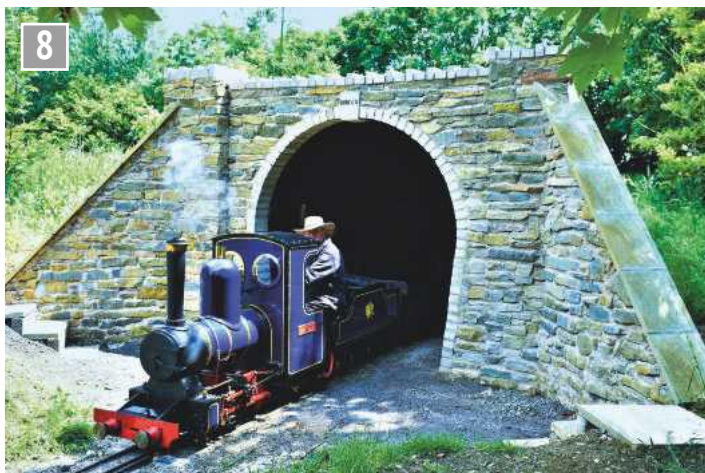
Approaching the station over the level crossing with the main departure track swinging off to the right.



Passing trains with the club's Garrett on the double span girder bridge.



Approaching the new tunnel.



Mendip emerges through the fine new tunnel portal.



The splendid new signal box at ESSMEE.

5) and out into the country. Crossing a double span girder bridge (**photo 6**) the line swings right and passes the extensive 5 inch gauge upper marshalling yard. It then continues around the bottom end of the site and curves towards the new tunnel. On approaching the tunnel, it appears to passengers that

you might be entering an old, rustic mine working or similar industrial installation (**photo 7**) but no, this is a modern, corrugated structure giving the impression of not being quite finished. The exit portal is something else! It has been built with local stone and is based on Brunel's Box Tunnel a few miles away (**photo 8**). It

really is a grand structure and Robin told me that most of the stone came from the ground they had excavated to build it. The right-hand wing wall even has an Ammonite fossil built into it.

The extensive 5 inch gauge marshalling yard runs parallel to the main line for some distance before terminating in

another small yard which also includes a useful turntable. It is connected to the main circuit and can operate completely independently of the main line. As there is no power or air supply to this area, the club have built a battery-operated linear motor to operate the points which provide access to the main



The impressive relay panel in the new signal box.



Richard Ashman admires the excellent 31 lever signal frame.



A very fine metalworking workshop.



Organisation on one of the workbenches.

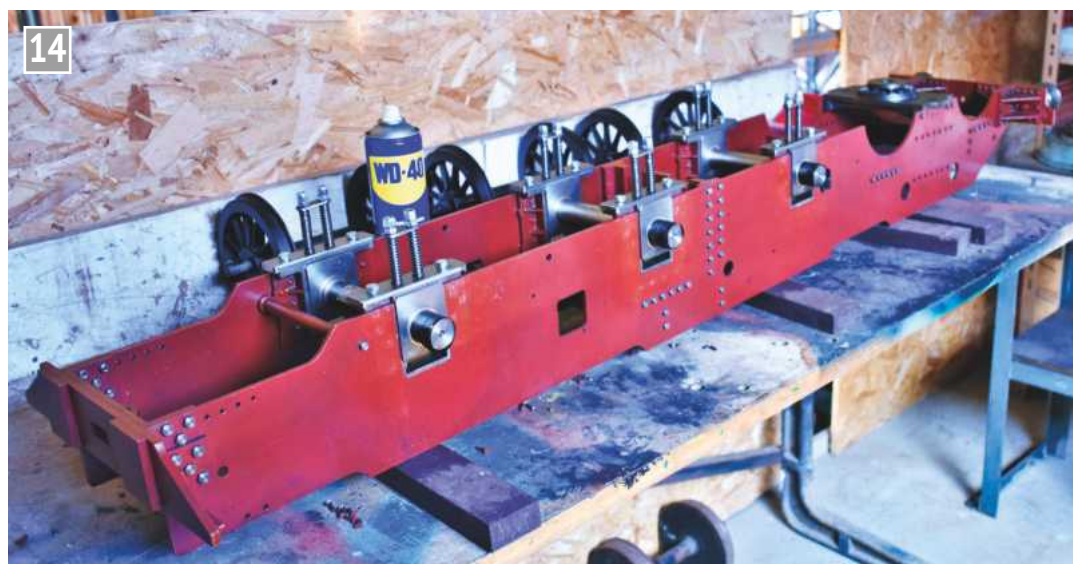
line. A useful single slip point is also built into this section of track. David Hale told me that it has been suggested that consideration might be given to forming a South Western centre for the GL5 group which could be worthy of further investigation. It could mean events similar to the main line rallies at Gilling being held at this track. Indeed, they were hosting one of these a couple of days after my visit

The signalling system is impressive using a block system which uses both electricity and compressed air for operations. The new signal box (**photo 9**) is another fine structure which houses a large, 31 lever frame and relay cabinet (**photos 10 and 11**). All this work has been managed by Richard Ashdown and his colleagues and an excellent job they have made of it! In a large and very well equipped workshop (**photos**

12 and 13) members have access to a large Cincinnati Vertical milling machine, a shaper, a Myford Super 7 lathe and a large Harrison 350 lathe. All this equipment and a host of tooling was all generously donated to the

club by a University who were re-equipping their workshop; if the ESSMEE had not taken it, would have all gone for scrap. I have to say it was one of the tidiest and best organised workshops I have seen in a long time. Set up on the

Harrison lathe were the steel tyre blanks for the club's latest locomotive project, an LMS Black 5, and this is coming along nicely (**photo 14**). On the other side of the building the club have a very nice clubroom which holds the almost



The new club locomotive; a 7 1/4 inch gauge Black 5 takes shape in the workshop.



Part of the well organised club room and Model Engineer library.



A disability carriage equipped to take a wheelchair and carer.



A novel support system for carriage storage.



A Tinkerbell style 0-4-2 locomotive on shed.



This time an 0-4-0 small side tank engine.



This very nice 5 inch gauge tank wagon on the sidings outside the main shed.

complete collection of *Model Engineer* magazines (**photo 15**) and provides the club with a good meeting room.

As a registered charity the club provides for the local community by allowing them access to the facilities, to enjoy educational visits and

provide for disadvantaged children. There is a large carriage available for use by disabled people so that they too can enjoy a ride on the trains (**photo 16**).

The need for carriage storage has produced a novel solution which involves

an overhead winch system supporting some of the light-weight stock on moving racks which, as the winch is lowered towards the ground, can fold flat to the floor, thereby allowing the stock to gently roll towards the track (**photo 17**). The locomotive shed housed

a good collection of engines from a splendid Britannia to a Swiss style crocodile under construction together with a variety of other prototypes (**photos 18 and 19**). Outside on one of the elevated bays a very nice tank wagon posed in the sunshine (**photo 20**).



The well-equipped maintenance shed.

It really is a grand structure and Robin told me that most of the stone came from the ground they had excavated to build it. The right-hand wing wall even has an Ammonite fossil built into it.

With such a large site area to maintain, there is a need for equipment to handle the many jobs that arise. The maintenance shed has a varied selection of tools and appliances including a forge, sand blast cabinet, welding equipment and an hydraulic press (**photo 21**). Grass cutting is another big undertaking and a suitable shed is available for mowers etc.

There was quite a lot of activity going on in the station yard area with a Midland 4-2-2 locomotive being prepared for its annual steam test (**photos 22 and 23**) and a 4 inch scale Burrell traction engine was being steamed for a potential buyer to witness (**photo 24**). The club Garratt locomotive, which was a Tim Marshall built engine, was also in steam and being given a test run with Stuart Bond at the regulator. With the new HS2020 document issued by the Federation of



Boiler testing the Midland Single.



After a successful steam test the Midland Single gets a trip round the track.

Model Engineering Clubs, David Hale has taken on the task of providing the club with a detailed appraisal of what these revised procedures mean for the club. He kindly gave me a copy and a very comprehensive document it is, which means that the club now has all the information they need to comply.

To conclude my notes as usual, I would like to thank Robin and David and all the other members for their time and excellent information. You have a superb organisation there and one that is progressing extremely well. Thank you all.



ME Steaming a Burrell traction engine for a potential buyer.

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



Evenin' all. It gives me great pleasure to declare this *Club News* open. I have a large number of items from clubs around the world, all the way down to the detritus in my head, or at least the coherent bits...

I have just had an idea for a simple driving truck, intended to be small and light enough to put in the car boot. More to come. It was inspired by an impractical locomotive of the 1930s, and/or a monorail.

Visiting the Danum gallery (The Latin name for what is now Doncaster) to see Green Arrow and GN 251, I found this model in an ill-lit display case. It doesn't resemble any known locomotive - was it a prototype that was never proceeded with, an apprentice piece, or a scratch built imagined example (**photo 1**)? Plus, in the Doncaster GS collection, two errors perpetuated in paint... (**photos 2 and 3**).

In this issue, horns, they also serve who stand and wait, lichen, a cake, a tour of Oxford, Fowler's Walschaerts valve gear, and a train set.

Steam Whistle, November, from **Sheffield Society of Model & Experimental Engineers** continues with 3D printing by Malcolm High, whilst Mike Peart discusses whistles, not just as a warning of approach, but communication. In the 1930s, the GWR introduced electric horns and, following confusion between them and other road users at crossings, or bridges, changed them for two, an octave apart, to be sounded alternately. In the Aire Valley, where I grew up, this soon



Mystery locomotive in Doncaster.

became 'On Ilkley Moor bah't 'at'. Murray is still thinking about CO₂ and the pressure it can impose on bottles and cans in carbonated drinks etc. Wishing his readers a Happy Christmas, he says, 'Raise a glass to the physics, chemistry, biology and engineering that brings its contents to you'. (Nothing dark about that glass - Geoff)

W. www.sheffieldmodelengineers.com

Worthing & District Society of Model Engineers welcomes the return of queues at their public running days. As well as the obvious and visible train and station crews, permanent way staff and signallers, spare a thought for the 'others', kitchen staff, a porter to help passengers, ticket dispensers, those who mow the grass, top up the coal bunker, tidy up after these events etc. There also appears to be a 'vacant committee member...' Kevan made a finisher. Noting the pressure needed on the belt for good running, he used a

gas strut, exerting about 27 lb/ft² or 120 Newtons, arrived at by an educated guess but seems to be okay. Editor, Dereck Langridge, spotted a photographer taking a close interest in the track. It transpired that he was studying lichen, as found on many track supports, including two varieties rarely found in urban areas as they require a very clean environment. A not entirely serious proposal to ban i/c engined vehicles, coal burning locomotives and requiring mowers to be hand operated. Furthermore, barbecues will not be allowed to use bottled gas, and only vegan food will be available. (Somehow... - Geoff) A facebook entry informs us that a miniature 'railway' fresh from carrying tourists fro and to on Worthing seafront, later Field Place, is for sale, having failed to succumb to the ministrations of various technicians. Offers in excess of £500?

W. www.worthingmodelengineers.co.uk



Spelling 2/1? at Danum.



The Gauge 3 Society
Newsletter for autumn celebrates 30 years of Gauge 3 in photographs, a quite excellent collection of pictures from the archives. I do like these: 5971, a Claughton, by Gordon Nightscales, (**photo 4**), Mike Mays' 'Kington Magna' diorama (**photo 5**), 20th Century old models (or models a century old...) and a fully functional Commonwealth bogie by Alan Marsden (**photo 6**). Super! Chris Partner built a GRS 4F kit, before starting which he read 'LMS Locomotive profiles' from Wild Swan. (Not relevant in this particular case, but I also recommend the book 'A defence of the Midland/LMS class 4 0-6-0', by Adrian Tester. It shows what these locomotives could have achieved, in the light of subsequent findings.) David White rescued a Carette 2½ inch gauge Stirling Single, which appeared belatedly in *Model Engineer* issue 4678, following up the mention in issue 4677, whilst the Mikes Palmer and Williams collaborated on the building of two 'Jubilees'. Later, they built a pair of LNWR 2500 gallon tenders. Chris (above) and Mrs P also built a row of terraced houses as a rear view, such as are seen all over the North of England. In the second lockdown, Graham Pearce built a BR 20 ton brake van from a kit and John Branch took another look and went out on a limb with his 1938 underground stock. Gary Dingle made a GWR water tower, new member Dennis Halstead and his 4MT are pictured at Mill Field, followed by Eric Sanders being instructed exactly on how to cut the Flitwick 30th anniversary cake by Ms Bea Huddart. Brian Torr details the 8 years of owning a Kingscale 'Britannia'.

W. www.gauge3.org.uk

I now have so many pictures that I have had to hold some over. Zounds!

Whistlestop, autumn, from **Hereford Society of Model Engineers**, reports that the



Gordon Nightscales' LNWR Claughton (photo courtesy of Trevor Goodman).

signals have been improved by providing a local 'top up' to the air pressure operating the points, by judicious use of a balance valve and air reservoir which detects pressure changes of a few psi, thus improving the speed of operation from 13 seconds to three. The 20th Sweet Pea rally in August was notable for a change of name for the top award, from the June Drake Award to the Jack Buckler Memorial Trophy, making Hereford the first club to present the 'new' award. Martin and Linda Gearing took their chain-driven locomotive. Twelve year old Ollie has only been a member for a few weeks, never having driven any sort of vehicle before, and was privileged to be shown how to drive a steam engine and then allowed out on his own. After a couple of laps he returned it in good order, meaning he had fired 'on the run' and kept the water level up. Well done, Ollie! An earlier steam-up had an electric locomotive referred to as 'two batteries on wheels'. Another new driver, Paul Pugh, also acquitted himself well, driving Fred Jenkins' engine. The boating pond was not neglected, with a nice coaster and D23, *HMS Bristol*, a one-off ship, looking very capable. Richard Donovan writes on Penarth 1959, when several



Mike Mays' diorama at Kington Magna (photo courtesy of Ian Turner).



Alan Marsden's Commonwealth bogie (photo courtesy of Ted Sadler).

ships were laid up in the ex-TVR docks. An Open Day at the Oxford Society proved rather a test, as not one but two destination addresses were out of date, Google's example showing an address from 15 years before. The services on the M5 were too busy to park the traction engine easily but after a circuit of the car park room was found. Wantage market was a trial,

involving missed signs, route reversals etc., then, reaching their destination, asking for the miniature railway to be told there wasn't one. On the 'phone to the organiser, they find they are 15 miles away. So, finding the A34 round Oxford, overshot, traffic gridlocked and a water main being replaced just to add interest. Finding a park but still no railway, enquiries met with "Oh, this

is Cutteslowe Park minor, you need Cutteslowe Park major...". Retrace steps again, told to take 3rd exit of a roundabout, which was wrong, and found themselves facing oncoming traffic. Off again, through a housing estate with large road humps and finally arrived, 5½ hours on the road. A cup of tea was never more welcome!

W. www.hsme.co.uk

BDSME News, November, from **Bournemouth & District Society of Model Engineers**, begins with the eagle-eyed editor noting the 2nd Class stamp bearing a picture of Henry Bessemer's famous converter, an example of which is displayed in all its tons of glory at Kelham Island museum here in Sheffield. I was due to attend Kelham Island this very evening to hear a talk on the Sheffield blitz of 1940. It was changed to online only, in view of covid, so it was viewed in splendid isolation, reclining on a chaise, with dry roasted peanuts and a glass of something. (Glue, Phyllosan, even Oxo...) Neil Horder inherited a lead mould from his father, who made soft-faced hammers for himself and others. When they got too misshapen he would melt them down and recast. Some years ago, the mould went missing, but has now resurfaced and doing this useful duty once again. New lamps for old??? All hands to the fire... This issue concludes with Raymond McMahon's diorama seen at the 2011 MEX. (I've seen 'it in the flesh' and the ancillary details are as good as the main feature, a fishing boat - Geoff)

W. www.littledownrailway.org.uk

The Times Rag, the newsletter from Geoff Stait, is from a new club of almost 30 members, about to start on building a track. Their motto, *Sursum Tua*, could be a little controversial, depending on how readers learned Latin... Anyway, moving swiftly on, the club visited David Hales' railway in deepest Somerset, a fine track, and in a pretty village. It was notable for Chloé and Tracy, who showed their



Andrew Allison's Perry No 9 (photo courtesy of Warwick Allison).

one inch scale vardo wagon, trailer and water bowser. Their vardo, built mostly of Plasticard and doll's house furniture, of the Burton style, circus type with small wheels, looks magnificent. Brean Live Steamers are a peripatetic group of modellers who travel the country in search of the Holy G... tracks to run on. In the SW, they descend on Pontins and 'cop' all the nearby tracks. (It keeps them off the streets, what? - Geoff) Geoff Stait went with Martin Parham and others, plus Mrs S with her 'bag loco', a 3½ inch gauge *Juliet* which travels in a shopping bag. Mick Bennett has taken to gaff racing, so much so that he is contemplating selling his locos and buying a sailing boat. Geoff requested a verdict from me on the newsletter. Specifically, I like the period pictures of early locomotives between items, and the green text, looks very stylish, showing that some thought has gone into it, and setting up a theme, which puts the reader in the right frame of mind to appreciate the contents. More please!

Centurion Smokebox, November, from **Centurion Model Engineers**, has Leon

visiting the Willem Prinsloo agricultural museum, finding lots of old vehicles, including horse drawn types. Secretary, Imogene Groothuizen, recalls how the society began, in 1961, then known as Pretoria Live Steam club, or *Stoomtrekkrakklub*. The work of the Tuesday and Saturday work gangs is recognised, including painting the town bridge red!

W. www.centuriontrains.com

Sydney Live Steam Locomotive Society, November *Newsletter*, features Andrew Allison's new, scratch-built, Gauge 1, 0-4-2 *Perry No 9*, coal fired, and the side tanks actually hold water, unusual in this gauge. Inspired by the Kiama Quarries 0-4-0, intriguingly, it has Fowler Walschaerts gear, which required reviewing and drawing out from another engine, but it works well. Seen here at the Cripple Creek Tramway, NSW (photo 7). John Lyons is constructing a 0-8-2T prototype locomotive, after one which worked at Newcastle, NSW (see: www.australiansteam.com/smr14.htm). John recalls an incident from his youth in 1959, working in the holidays,

on Christmas Eve at 5.10pm (closing at 5.30pm) when a customer arrived, having consumed the good cheer to excess, and wanting to buy a train set. No boxed sets were left, so between the staff a train was cobbled up and wrapped and the inebriate celebrant went on his way. John wonders how he got on... Chris Denton is making an 80hp Case TE, a 1916 version. In the catalogue, its then list price was less than the cost of the materials today. Warwick Allison goes a little 'off piste' and discusses firehole rings, a subject probably not figuring in most people's attention, I'll wager.

W. www.sls.asn.au

And finally, a tale of bear hunting reminds me that in modern aircraft, being all automatic, the cockpit needs only the pilot and a rottweiler. The purpose of the pilot is to feed the dog. The purpose of the dog is to stop the pilot from touching anything...

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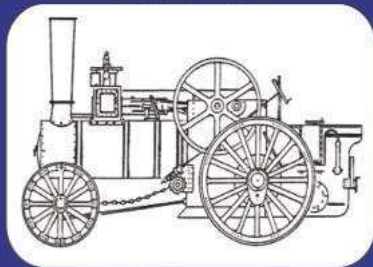
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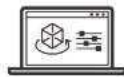
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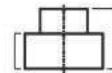
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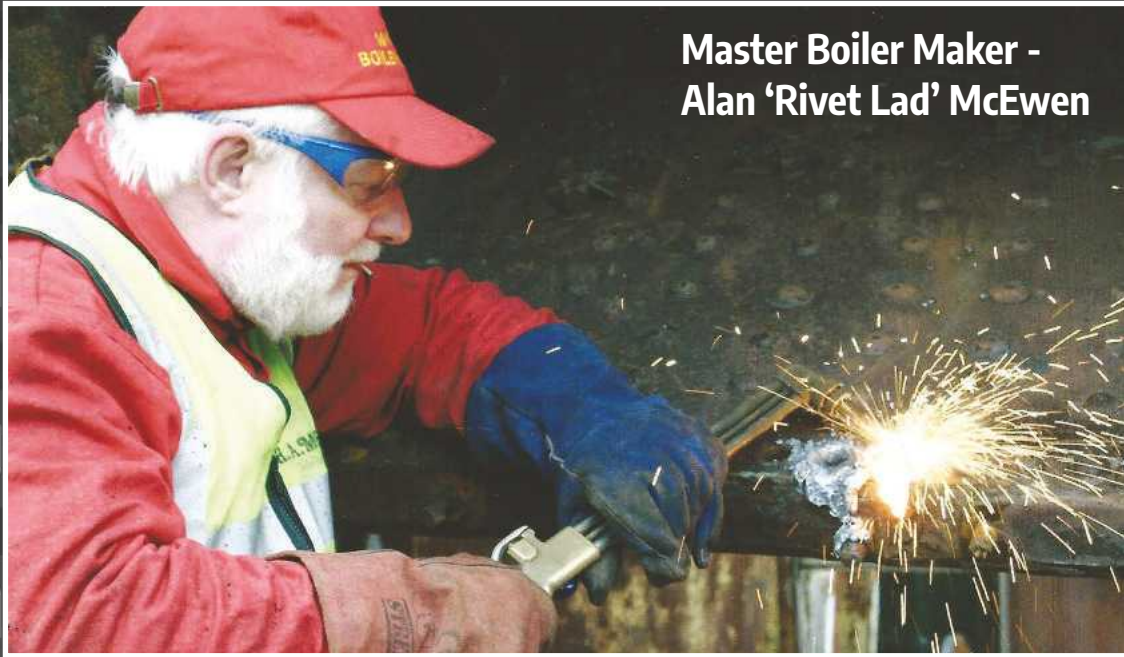


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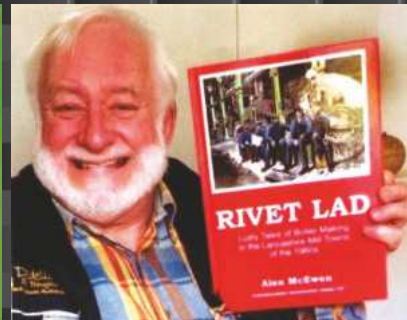
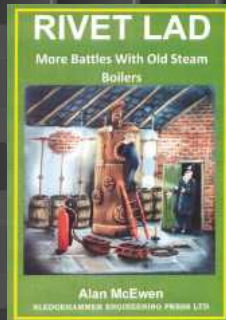


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