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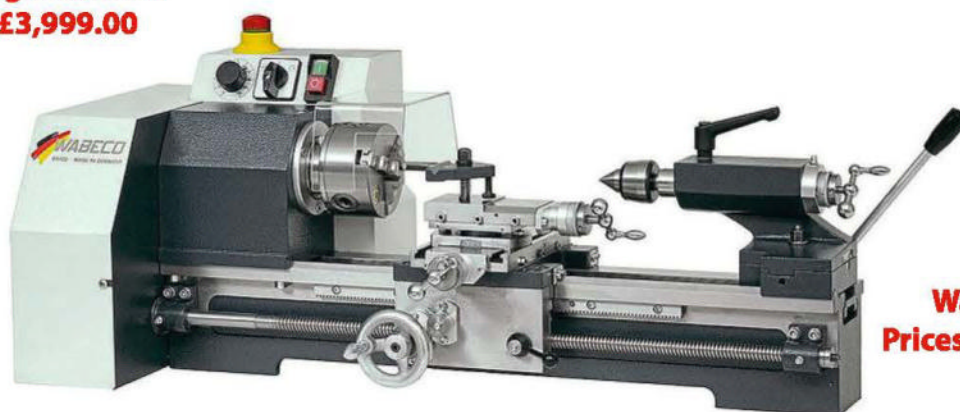
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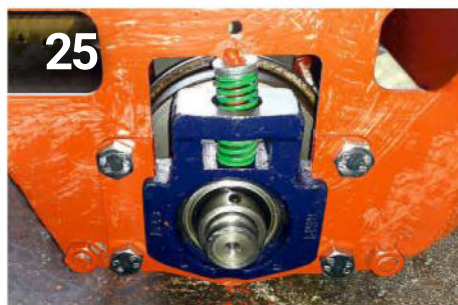
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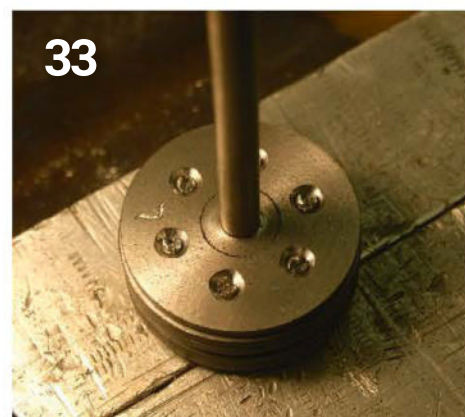
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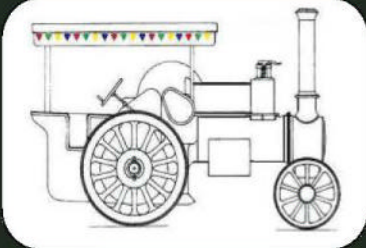
A view into the cab of Doug Hewson's 5 inch gauge 4MT locomotive (photo Doug Hewson).

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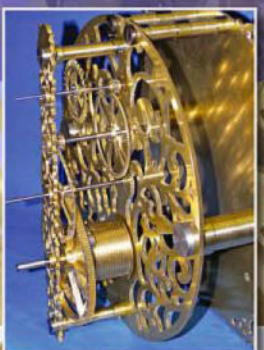


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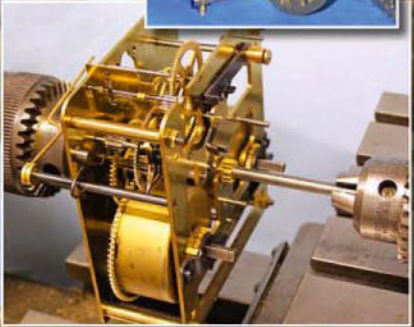
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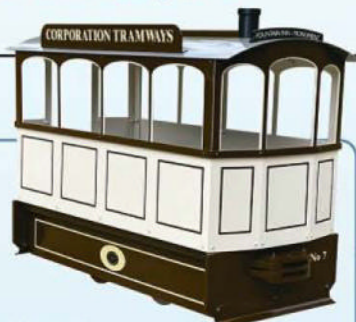
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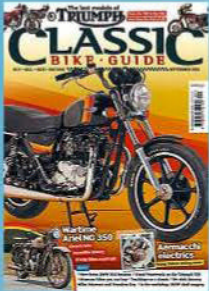
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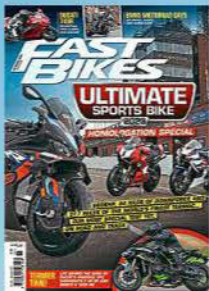
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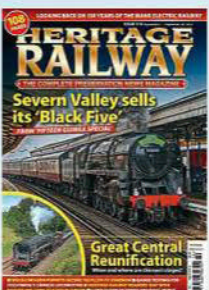
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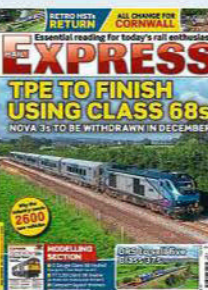
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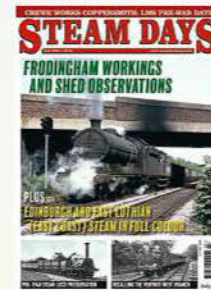
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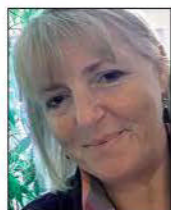
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Merry Christmas!

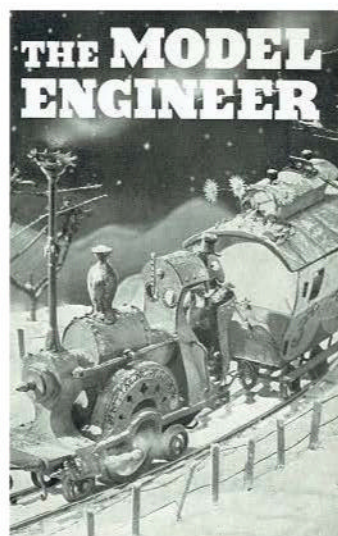
All of us at *Model Engineer* would like to wish all our readers a very Merry Christmas.

Many of us may feel that there is currently not very much to be merry about and there is no doubt that we are approaching the end of a year fraught with problems. Some of these problems seem to have little prospect of a resolution any time soon and, for most of us, we feel quite powerless to do very much about them. We can only observe events and hope that things will get better. Perhaps the best we can do is put these worries aside for a little while and enjoy the company of our friends and families.

Times were not much easier 75 years ago, towards the end of *Model Engineer's* 50th year. The world was still recovering from a devastating war and economic conditions were still rather straitened. The editorial staff at the time, though, did their best to cheer their readers up. Let's look back three quarters of a century...

'It was the custom of the late Mr. Percival Marshall, at this season of the year, to publish a Christmas Greeting to readers, for he was proud of the personal, friendly bond that existed between himself and model engineers everywhere. Those of us whose privilege it is to succeed Mr. Marshall in the task of editing and producing *THE MODEL ENGINEER* are no less proud of that mutual friendship which we hope and believe will continue to endure and mature; it is an ever-present inspiration to us, and we value it very highly. Therefore, we take this opportunity of extending to our readers our best wishes for Christmas and the New Year. Austerity conditions still continue to harass us in many ways, but not, perhaps, quite so severely as in recent years; but at

Christmas-time we endeavour to forget our worries for a little while and turn to more pleasant thoughts. In this issue will be found some items which, we hope, will help to add a little pleasure and amusement to the leisure which most readers will be enjoying during the next day or two; in short, have included something 'in lighter vein' that we may not all become too serious in our hobby. A little fun occasionally does no harm, but it almost always does some good, provided that it does not take the form of reckless practical joking. We hope that readers will find the lighter contents of this issue interesting and even useful. Model engineering everywhere continues to attract new adherents, which is a good sign; for it means, above all, that it appeals to the natural craftsman as a ready method of indulging his creative instincts. Our advertisement pages show clearly that our friends in the trade are doing everything possible to meet the ever growing need for tools and materials which the model engineer must have if he is to make anything; the demand for drawings and practical books is always increasing, while descriptions and illustrations of models of all kinds, together with explanations of how



Model Engineer cover – December 23rd 1948.

the models were, or can be, made, are a never-ending source of inspiration, interest and encouragement to other people. *THE MODEL ENGINEER* has its rightful place in the general development of our hobby, a place which it has occupied for more than fifty years, and a place which those of us whose duty it is to conduct it intend that it shall continue to occupy in the future, and we trust that we may enjoy that friendly co-operation from readers, so potent a force in the past and so essential for the success of our plans.'

Sleeping car

The Golden Gate Live Steamers in San Francisco have introduced a new service on their ground level railway. For longer journeys they now offer a sleeping car service. The photograph shows the new service being tested by Charlie. It's not known whether breakfast is included.



Charlie tests the new Golden Gate sleeping car (photo Lisa Kimberland).

Martin Evans can be contacted on the mobile number or email below and would be delighted to receive your contributions, in the form of items of correspondence, comment or articles.
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LOWMEX 2023

Julie Williams

reports from this year's Lowestoft Model Engineering Exhibition.



LOWMEX

Diversity – no, not the street dance troupe that won BGT in 2009 (was it really that long ago?) – the noun diversity, which begs to have so many adjectives like considerable, remarkable, or talented (to name but a few) attached to it - especially applicable when visiting the eighth LOWMEX exhibition, held for the second year running at the Energy Skills Centre at Lowestoft's East Coast College, on the last weekend in October.

The exhibition was sectioned into four zones, along with an outside area (dependent on weather) and a large working Fun Fair layout in the separate 6th Form building. In addition, there was also the large main hall, which was the exhibition focal point for, what might be

called, traditional mechanical model engineering – with all its variations. It formed the mechanical/model heart of the exhibition and, I suspect, where most model engineers and visitors lingered the longest and returned to.

Halesworth and District MES (HDMES) members provided the largest and most diverse display – let me give you a soupçon.

Under construction was a 4 inch Foster traction engine (**photo 1**); father and son David and Glenn Doddington are building two 4 inch Fosters, one each, but only had room to display one. Also under construction was a Union Pacific 4-8-8-4 Big Boy locomotive, displayed with its plans (**photo 2**), belonging to

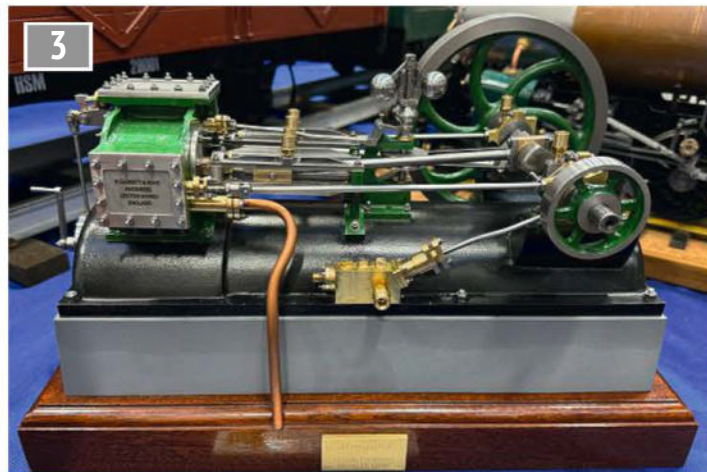
brothers Neal and Nigel Davis. The brothers also displayed some of their other large to scale models, a traction engine driving a thresher and a baler to name but three.

Peter Joyce displayed four scale stationary engines from his collection. Each of the engines Peter built are named after the ladies in his life – his wife, daughter, mother and mother-in-law - and there are other stationary engines under construction. The Garrett 'Royal Show Compound' engine of 1881 is named *Margaret* after his mother (**photo 3**).

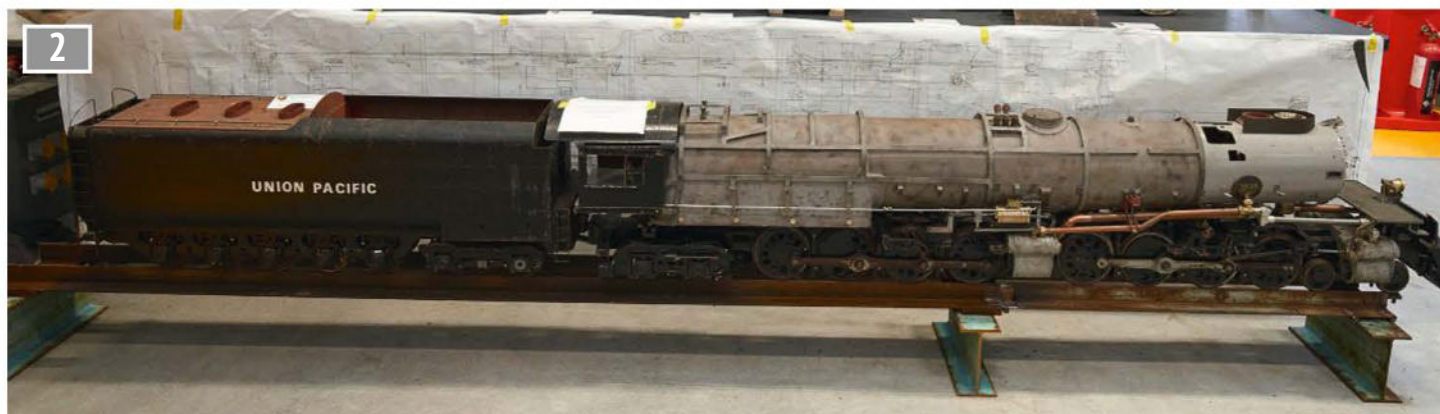
Modellers don't always keep their talents to one discipline either. Take recently retired tower clock renovator/restorer Colin Walton, who displayed a small selection of his models.



Parts for a 4 inch Foster traction engine (photo by John Wilkins).



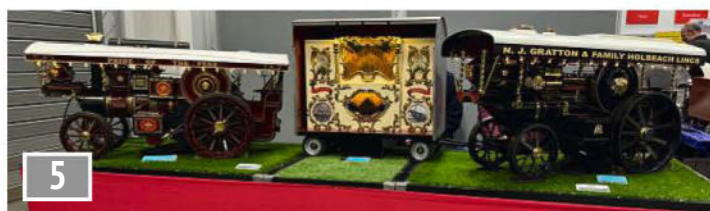
Garrett 'Royal Show Compound' engine Margaret.



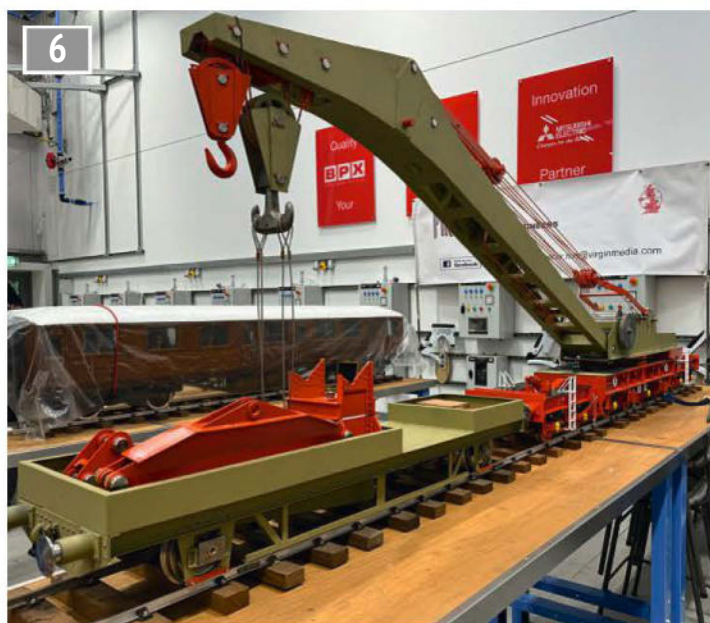
Union Pacific 'Big Boy' locomotive (photo by John Wilkins).



A collection of clocks by Colin Walton (photo by John Wilkins).



Nick Gratton's collection of showman's engines and organs.



Charlie Lovett's Cowens and Sheldon 75 ton crane.



John Luscott's prize winning BSA DBD34 Gold Star motor cycle.



A gang of menacing figures by Gary Edwards (photo by John Wilkins).



The movies come to Halesworth (photo by Jamie Haywood).

At the back is his latest finished project, a renovated 5 inch 4-4-2 Jersey Lily, and at the front are five clocks from his collection that he has made over the years (**photo 4**). Talking with Colin you will also learn about his experience with renovations, restorations, and maintenance of classic cars.

HDMES filled about half of the main hall with their various models, both finished and under construction, and Ipswich MES (IMES) also had an excellent display of their members' models. There were also several individual, and non-affiliated, model makers also displaying their splendid models here. Nick Gratton displayed his beautiful collection of showman's engines and organs (**photo 5**) and wherever you were in the main hall you could see Charlie Lovett's enormous Cowens and Sheldon 1962 75 ton looming crane, which he has added to since last year – he has put in over 4,000 rivets so far (**photo 6**).

LOWMEX does not award prizes but that doesn't mean that prizewinning models aren't displayed. John Luscott's

BSA DBD34 Gold Star, a 1:3.5 scale model, won first prize in last year's (2022) Midlands Model Engineering Exhibition (**photo 7**). The only things that John didn't make were the springs and the chain (he even made the tyres!) – it was the scaling from the chain that determined the 1:3.5 scale.

Stepping into the small hall, part of Zone 1, the first models you saw were some of (HDMES member) Gary Edwards' model collection, large fantasy figures all made from scrap - these ones were the most portable



Choose your weapon! A pair of lightsabers (photo by Clive Randlesham).



Prepare to be exterminated!

as Gary likes 'big' projects (**photo 8**)!

Turning round you met the droids and Daleks (**photo 9**) along with other Dr Who and Star Wars memorabilia, but not everyone saw the two different, wonderful lightsabers being wielded by its creator, HDMES member Clive Randlesome (**photo 10**). The Daleks and droids made regular sorties

around the building, interacting with members of the public and exciting (and frightening) children of all ages (**photo 11**). They were probably the most photographed models of the whole exhibition and were certainly the most entertaining with their interactions and banter.

Elsewhere in this zone was Professor Baz (Barry Lain)



A Victorian pumping engine by John Child.



A fine model of cruiser HMS Tiger.



A Wimshurst machine by Professor Baz.

with a couple of his whacky 'steam punkish' models (**photo 12**) as well as his home-created enigma machine. Several people asked about the 'Steam Punk' room which had been so popular in past years. Unfortunately, some of the modellers had passed away and another, Dr Chillo (John Child), decided to do 'proper' modelling instead – his impressive Victorian pump, along with some of his other models, (**photo 13**) was in the HDMES display in the main hall.

Zone 2 had several rooms with small gauge trains

and train layouts, both on display and for sale; medium sized boats that were radio controlled, and some that were not; and superb planes and helicopters. Chris Bullock displayed his navy warships, including a very impressive 8 foot long model of cruiser class HMS Tiger (**photo 14**). The original warship was commissioned in 1959.

The upper floor, Zone 3, had a large area devoted to dioramas and scale models between 1:16 – 1:72 scale, all meticulously painted in authentic colours and portraying realistic scenes (**photo 15**). And in Zone 4 there were more rooms filled with smaller R/C boats, trucks, and off roaders. The R/C trucks and tanks (**photo 16**) were taken for regular trundles around the exhibition with their handlers, showing great skill in reversing and manoeuvring. There was also the College's bridge simulator for the public to try, where you manoeuvre and try to berth a ship into one of many world harbours. Although your head knew you were standing on firm ground, the effects were so good you could actually 'feel' the motion of



One of the dioramas in Zone 3 (photo by Jamie Haywood).



Radio controlled tanks maintaining order outside (photo by Jamie Haywood).



Lego City.

the ship, so much so that your stomach decided to become very queasy! Several people had to leave the room early.

The favourite room for the children in Zone 4 had to be the Lego display. It was amazing. A whole town, futuristic Stud Vale, with a railway and canal layout, fascinated adults and children alike (**photo 17**).

Situated between Zones 3 and 4 was our beneficiary's stall, S.O.L.D. (Special Objectives for Local Disabled). Each year LOWMEX has been honoured to be able to donate

its profits to this locally based charity, helping locally disabled people to get back into the workplace.

Outside, HDMES member John Wilkins, (**photo 18**) steamed his 4 inch Burrell. He and his father have had the engine for about ten years now and have overhauled and renovated it – but they still haven't got round to putting the nameplate *Burler* on it, so the engine is referred to as 'It'.

The last area for models was in the 6th Form building, where food could be eaten. It was an



John Wilkins with his 4 inch Burrell traction engine (photo by Jamie Haywood).

intricate, extensive working floor layout of K'Nex funfair (**photo 19**) built and displayed by Malcolm Barker. Malcolm also had collecting buckets for GOSH (Great Ormond Street Hospital).

I doubt if the architects who designed the Energy Skills Centre Building envisaged their creation having such a diverse use - from scale replica steam engines first created in the early 19th century to futuristic beings trundling through corridors to exterminate visitors; from depictions of First World War

transport to fun fairs; LOWMEX had it all. A parting comment from one well known visitor was, "what a shame this isn't in the middle of the country, everyone would come".

Visit www.lowmex.co.uk for more information and/or go to YouTube and enter '2023 lowmex' to watch Ken Kinsey's video of the show.

See you next year?

Photographs are by the author unless otherwise stated.

ME



The K'Nex funfair (photo by Jamie Haywood).

Buckeye Coupling for 5 Inch Gauge PART 4

Jon Buck equips a 5 inch gauge A4 locomotive with prototypical couplings.



Continued from p.761
M.E.4731 December 1

The intention was to build up the second coupler as a test bed for the torsion spring development, leaving the coupler on the A4 tender unmolested until I had a good spring worked out. While this was underway, Covid-19 intervened and access to my father's workshop disappeared for quite some time but with access later restored, I gradually got to making the remaining parts and eventually found myself back in the dreaded situation; I was going to have to make the torsion spring.

In my absence, the trusty ML7-R had been rather substantially upgraded by the addition of a screwcutting gearbox, which I anticipated would make winding springs considerably easier.

The idea was simple. I needed to wind a $5\frac{1}{2}$ turn torsion spring, with one straight leg and one under-and-over bent leg with a kink in the middle, as shown in **photo 11**. In the lathe I turned a blank of a radius corresponding to the straight leg length, with a small flat on one edge and a retaining screw to secure the tail, neatly bent over and around. A 1mm spigot protruded from the centre to provide the actual winding mandrel. The spring is a left-hand helix; winding away from the mandrel gives the correct helix without risking unscrewing the Myford threaded chuck attachment in reverse.

To control the wire, I had started on a couple of ill-formed ideas when I encountered the perfect lazy man's solution, courtesy of



Torsion spring as modelled.



Wire guide tool.

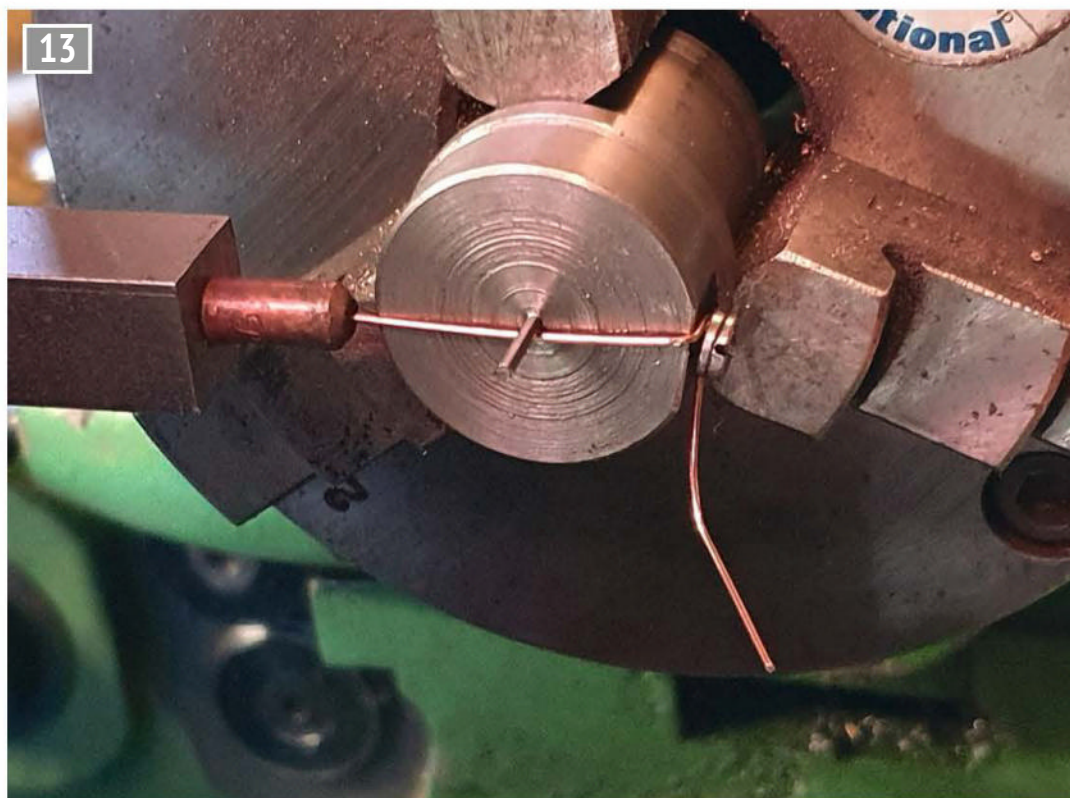
'This Old Tony' of YouTube fame (only famous if you watch all the wrong sort of videos like me).

I started with a blank of steel about 10mm square and milled out a $\frac{1}{4}$ inch slot over most of the length and most of the depth. I then drilled a $\frac{3}{16}$ inch clearance hole centrally through one end of the tool, followed by drilling and tapping to suit the tips of the MIG welder through the other. I drilled and tapped M3 through the top of the slot, and made a small brass block with a flat-bottom hole in the top (to match the M3 screw) and

a 90 degree Vee-groove in the bottom, large enough to guide the wire and small enough that it acts as a brake when clamped down by the screw.

I now had a just-as-imprecise-as-it-needs-to-be wire guide suitable for anything vaguely close to a MIG wire size, as shown in **photo 12**. Full size spring wire was $\frac{1}{4}$ inch, scaling to 0.56mm, which is conveniently close to 0.6mm MIG wire.

In model engineering we are conditioned to think that scale springs are inevitably over-stiff, mostly from locomotive suspension, since a model



Ready to start spring winding.

mass scales with the cube of the scale factor while spring stiffness scales with the square. I had accordingly acquired various sizes of bronze spring wire, aiming to sandbag the stiffness down with the lower Young's Modulus of bronze and smaller diameter, but the smaller sizes seemed impossibly flimsy. On the first attempt at winding, I'd misplaced the larger diameters anyway, so I tried it with some 0.3mm wire, which wound well but clearly wasn't stiff enough by a considerable margin.

It was around about then I realised that although the mass of the model may be scaling with the cube of the scale factor, the strength of

the operator is not. Even I am a veritable giant of the 5 inch gauge universe (at least in physical terms) and the buckeye spring has far more to do with the user's strength than the mass of the parts. I was resigned to sourcing some 0.5mm piano wire when the suggestion floated across the workshop that since I had cannibalised the MIG welder for its tip, I might as well try the MIG wire.

To jump to the end of the story before going back for the detail, the copper-clad steel MIG wire works so far. Despite its minimal carbon content, it has plenty of manganese and silicon, which seems to result in quite a springy wire as

drawn down to 0.6mm. There is no evidence of either of the springs I have completed taking a significant set as yet.

Anyway, back to spring winding (**photo 13**). The first couple of winds with the MIG wire looked good, but on checking them against the drawing I realised they were winding with almost no clearance between turns, making them much too short. The scale correct pitch is about 30 tpi, inconveniently between the 28 tpi and 32 tpi offered by the Myford gearbox, so I was winding with a 28 tpi feed as a first approximation. However, I was clearly not getting 28 tpi. I tried an increase to 26 tpi with no obvious change, leading to the realisation that because I had to have the wire guide well clear of the spike mandrel to clear the leg attachment, the wire was free to lag well behind the tip of the guide and was obviously much keener to perform a nice tight stacked wind.

I should note at this point that I was winding under power at minimum speed in back gear - 28 rpm - so I decided to try winding in the cross slide as soon as the wire guide tip

cleared the large diameter region of the mandrel. On the first attempt this led to a 6 turn spring, because frantically winding in the cross slide rather got in the way of counting. Not wanting to let a good test piece go to waste, I added another half turn by hand, plus 135 degrees that seemed to account for the spring back on cutting the wire free from the guide.

I found myself with a 6.5 turn spring of about the correct length, but with a variable rate wind like one might find on a set of car lowering springs. I'm not convinced the variable pitch makes any difference in the torsion spring application; in a compression spring the idea is that the closer-pitch turns close up sooner, effectively removing them from the spring and giving a progressively increasing spring rate, but a torsion spring shouldn't have any great tendency to close up axially, although the extra turn will make it a bit softer than a 5.5 turn constant pitch spring.

I decided to try forming the difficult second end anyway. During design I had entertained various ideas of jigs, 3D printed or otherwise, but for a first-off bending application the question is always how much spring back to allow for so, instead, I checked the required internal radii and clamped an assortment of drills in the vice soft jaws to manually bend the wire around the shanks.

After a few minutes at the vice and a lot of checking against a 1:1 scale drawing as I went, I had a spring that looked quite close to what I was after. I decided the folded over ends of the full-size design were a bridge too far, trying it on the straight leg (which already had a 90 degree bend where it had been secured to the mandrel) and breaking the end off for my troubles, leaving the item shown in **photo 14**.

Not expecting much, I dropped it in the coupler. I thought I was probably going to have to adjust it a bit and possibly bond the spring carrier pin in place to stop it waving around, but the metallic clack



Torsion spring forming complete, prior to de-burring.

of the lock snapping home as I pushed the knuckle closed suggested I was a bit closer than anticipated. On adding the unlocking lever, it just worked, the knuckle flying open. The deep slot in the top of the lock seems to do a good job of capturing the end of the torsion

spring, provided the initial shape brings it somewhere close.

A second spring was made for the first coupler, with similar success, and at that point the job was finished.

So, in conclusion we now have two complete drophead

buckeye couplings that work pretty much exactly as per the full-size version. One is in residence on the tender of 4497, the other is waiting for a suitable home, possibly on a driving truck or the tender of No. 10000, currently under construction. Neither has

yet been used to pull a load, but I see no reason to doubt their robustness should the opportunity arise.

I am aware that previous users of this type of coupling in miniature have found it necessary to make modifications to allow for the non-scale track irregularities of miniature railways. Elsewhere, Ben Lyons has been kind enough to write up his and Brent Hudson's experience with the Dave Noble couplers on their impressive rake of 5 inch gauge Pullman cars (*Turnout* – Issue 70, April 2019). The eagle-eyed may already have noticed from **photo 15** that the second coupler has the slot in the centre of the knuckle filled in, as he recommends for use on uneven track. If 4497 ever gets the opportunity to pull a rake of buckeye coupled stock we may also have to look at the freedom of the coupling hook to traverse sideways and lift vertically.

The stainless 3D prints were certainly an expensive way of getting the parts I wanted, but for a limited run casting equivalent, with superb detail and all the mechanical properties of a wrought stainless part, I have been very impressed. I had concerns over the 'machineability' prior to taking delivery, but for the limited clean-up work required they machined perfectly well. If I was ordering again, I would avoid the binder jet 'high detail' process, as used for the unlocking levers. These parts had mismatched surface colour and were prone to gross deformation which simply did not occur with the laser sintered items.

Despite the handy shortcut provided by the 3D printed parts, a reasonable amount of work and a considerable number of parts went into each coupler, as shown in **photo 16**, but the satisfaction from getting them to work properly with remarkably little hassle at the end was immense. A fun little project, all told.



The disassembled components of one complete coupler.



4497 Golden Plover and its 1935-pattern corridor tender (in miniature).

The Richmond Light Railway – A Kentish Treasure

PART 2

Mark Smithers visits a two foot gauge railway in Kent.

Continued from p.744
M.E.4731 December 1

The next steam locomotive due for consideration is very much a 'home grown' celebrity, namely the ex-Penrhyn Quarry 'Small Quarry' class 0-4-0ST *Elin* (Hunslet W/N 705 of 1899). After some four decades of work in the slate quarries, *Elin's* boiler was worn out and it was replaced by a boiler made by traction engine builders Marshall's of Gainsborough. This necessitated a new saddle tank of rounder profile than the original and an extended footplate at the rear, giving the locomotive a distinctive appearance, much of which it retains to this day. Withdrawn in 1954, *Elin* was sold eight years later to J. Burdett of Louth, who restored and re-gauged it from 1 foot 10¾ inches to 2 feet and took it to the original Lincolnshire Coast Light Railway in 1969. Sadly, the locomotive's 3-ton axle loading proved too much for the permanent way on the L.C.L.R. and it saw little use there, passing to Yaxham in 1986. Whilst at Yaxham, a new longer firebox was fitted, along with rear frame extensions.

Elin was acquired by the R.L.R. in September 2012 and its return to use was a very protracted affair. By the end of March 2018 dismantling of the locomotive prior to restoration had begun. During the following month work commenced on wheels and boiler and further stripping



Making its public debut on the railway in 2023 was Decauville 'Type 3' 0-4-0T Lily. Although a larger and more modern locomotive, the design's descent from Chuquitanta is very evident, and as stated in the text, the Couillet influence upon Decauville practice died hard. Note however how the tanks are supported by the motion brackets, a feature not found on Chuquitanta. Lily is seen here crossing the bridge on the branch line having just left New Barn Halt with enclosed passenger carriages 4 (leading) and 3.



Lily is seen here returning to New Barn Halt via the branch line.

and assessment was carried out in May, particularly on the motion. By the end of November 2018, *Elin's* frames were ready for their first coat of new paint, the wheels had been re-profiled, their first coats of paint applied, the axle boxes and brake gear were being cleaned and primed and

work was continuing in-house on the boiler.

Four months further down the line saw the first fitting of new firebox girder stays, the fitting of a new rear frame stretcher, new bolts in the rear buffer beam, along with further work on the rear end of the locomotive, and cleaning



A posed view of Lily with its crew at New Barn Halt during the early hours of the August 2023 Charity Gala. Baguley-Drewry Diesel W/N 3701 can be seen on a siding in the background.

and undercoating of various components. The latter part of March 2019 saw the first layer of primer and undercoat applied to the mainframes. April saw more paint applied to the frames and further work apace on the boiler shell, including the mudhole cover. May saw remedial work on various components, including cylinder and valve chest covers, the first layer of final colour paint applied to the wheels and axles and yet more frame painting.

By the end of June 2019, the cylinders had been trial fitted and painting was still proceeding on the chassis components, including the distinctive splashers fitted to Hunslet locomotives of this dynasty. December 2019 saw the gauge glass brasses returned from the nearby R.H. & D.R. after overhaul, more painting on various components, including the running boards and eccentric sheaves and rods, and the boiler shell made ready for the riveting in of the foundation ring and inner firebox. This latter task was accomplished in February 2020.

Three months later the new boiler tubes were delivered and by July the final stages of painting of most components were in progress, with the major work being carried out off-site. Welding-up work was being carried out on the smokebox, whilst preparation work was in progress on-site on the saddle tank for painting to commence. From the chassis

point of view, various worn-out pins and bushes on the motion had been replaced and a new pair of expansion links and die blocks made. Work was also progressing on the slide bars and relocation of the mechanical lubricator between the mainframes.

March 18th 2021 was a very significant day in the restoration process as the now fully assembled boiler underwent its hydraulic test, with November 18th seeing the first fire lit where a pressure of 100 p.s.i. was reached with only a few minor leaks present. All the hard work was duly rewarded in March 2022 when *Elin*, resplendent in its new lined-out paintwork, ran under its own steam on the R.L.R. for the first time – a fitting tribute to the diligence and professionalism of those involved in its restoration. The locomotive has since taken part in both the 2022 and 2023 Charity Galas for Riding for the Disabled.

Elin is not the only 'Quarry Hunslet' currently resident on the R.L.R. as in the summer of 2021, *Sybil* arrived from the Brecon Mountain Railway. A 'Britomart' class locomotive originally built for the Pen-Yr-Orsedd slate quarry, (W/N 827 of 1903), it differs from the mainstream 'Alice' pattern of Dinorwic Quarry evolution in that it was originally constructed as a 1 foot 11½ inch gauge entity whereas currently working ex-Dinorwic locomotives have been converted from 1 foot



Lily is seen here again on the branch line with a passenger working that shows off the 'Prince Philip' carriage to advantage. Note the livery that has much affinity to the Ashover Railway fully enclosed carriages and the relatively low loading gauge when compared to the four-wheel 'balcony' carriage behind.



By way of contrast to the previous view, this view of Lily on a passenger working well illustrates the bogie open carriage design using a Robert Hudson chassis acquired from Lydd Ranges married to a body manufactured in-house.



A study of 'Quarry Hunslet' 0-4-0ST Sybil seen just in front of the locomotive shed before commencing duties during the August 2023 Gala. The rear end of the Campagne 'Locotracteur' is visible in the background.

10¾ inches. The locomotive remained in use at Pen-Yr-Orsedd until 1959 and was sold to Tony Hills who rebuilt it over the ensuing nine years. After a period in use on the Llanberis Lake Railway and a sojourn on static display in the Welsh Slate Museum, *Sybil* was transferred to the Brecon Mountain Railway where it hauled the first trains. *Sybil* subsequently proved to be underpowered for day-to-day

services on the B.M.R. and saw little use afterwards but it was fully restored in 2011-12 with a reconditioned boiler and new inner firebox. On acquisition by the R.L.R., *Sybil* was close to the end of its 10-year boiler ticket but was able to take part in the 2021 Charity Gala and visit the Ffestiniog Railway for the A.G.M. Weekend of 30 April-2 May 2022 in company with *Elin*.



Sybil is about to depart from Richmond Station with the mixed working consisting of ex-R.A.F. Fauld ammunition wagon, and Decauville and Penrhyn carriages. The constructional details of the Fauld wagon are once again shown to advantage.

Sybil was on display, but not in steam, at the 2022 Charity Gala where a visiting locomotive was ex-Dinorwic 'Port' class Hunslet W/N 1429 of 1922 *Lady Joan* from the Bredgar & Wormshill Light Railway. In October 2022, *Sybil* was in the R.L.R. workshop for lifting of the cab and saddle tank in preparation for inspection and overhaul of the boiler and regulator and also necessary remedial work on the motion to improve its timing. By March 2023 the boiler had passed its out-of-frames hydraulic test and two months later, with some fittings re-attached and a fresh coat of heat-proofed paint applied, was re-attached to the mainframes. The smokebox pipework was also re-installed, and the lagging sheets fitted. The remaining work to complete the overhaul was finished in time for *Sybil* to play a full working role in the 2023 Charity Gala on 12 August.

Shortly before the 2023 Gala, it was announced that the R.L.R. had acquired a steam locomotive, in working order, from Germany. This locomotive is a Decauville 'Type 3' 0-4-0T, W/N 648 of 1912. It was built for the Thessaly Railway, Volos in Greece, where it remained in service until 1939 when it was sold to a Chrome mine in Lamia. Withdrawn from service in the 1960's, the locomotive stood derelict in the open until bought by the German Steam Locomotive Museum in Neuenmarkt Wisberg.

After two further changes of ownership, it was purchased by Frankfurter Feldbahnmuseum in 1993 where it was restored to working condition and given a 'Teutonic'-pattern cab. Since its arrival on the R.L.R., *Lily*, as the locomotive is now named, has received some more work to make it suitable for the line's operating conditions. It made its public debut during the 2023 Gala and made an interesting comparison with *Chuquitanta*. An interesting point to note is that even after Decauville had established its own design school with the 'Type 1' and succeeding types, the Paris concern continued to build specimens of the Couillet designs that it had once dealt in. Examples survive in New Caledonia (W/N 251 of 1897 *Nostalgie*) and Uruguay (W/N 1785 of 1906).

The last resident steam locomotive on the R.L.R. to be considered here is a narrow-gauge celebrity that has never been based away from England. It is a locomotive that Jeremy was very pleased to obtain. On 27 July 2019 the R.L.R. announced that it had acquired Bagnall 'Namchick' 0-4-0ST *Pixie*. A typical Bagnall 'Bullhead' (enlarged cylindrical) firebox narrow gauge product, it has Walschaerts valve gear rather than Baguley or Bagnall-Price as was more appropriate to its year of construction. This 5½ ton locomotive with 6 by 9 inch cylinders was originally supplied to Staveley Minerals for construction work



Leary and No. 7 (Motor Rail W/N 7403 of 1973) attract the attention of admirers in the vicinity of the locomotive shed.

on Pilton quarries in Rutland, subsequently moving between Pilton and Cranford.

The locomotive's celebrity status stems from the fact that in 1962 it was purchased by the Rev. Teddy Boston of *Thomas the Tank Engine* (The Railway Series) fame for use on a narrow-gauge railway that he was building at All Saints Church Rectory in Cadeby. Over the years Boston accumulated and operated a collection of narrow-gauge locomotives and rolling stock but the C.L.R. closed in 2005 and *Pixie* was sold to a private collector who commenced a 10-year overhaul. This was never completed and after protracted negotiations, *Pixie* arrived onsite in June 2019. By this stage, some work had been undertaken on the locomotive by external contractors including the replacement of a defective wheel centre, new tyres all round and new axlebox castings, which required machining. By the end of 2020, *Pixie's* boiler had been sent to David and Michelle Goddard's Road Steam Works where several tasks were undertaken including re-tubing, building up of wasted areas, new studs, fitting a new (riveted) smokebox, overhauling the regulator and carrying out a hydraulic test. The boiler was then returned to the R.L.R. allow the fitting of a new chimney and smokebox door. The boiler fittings were also being overhauled at this stage with the injectors being sent away for the fitting of new cones. Eventually, *Pixie's* wheelsets, frames, cylinders and motion

were moved to the Ffestiniog Railway's Boston Lodge for restoration to continue in Wales whilst boiler work progressed at the R.L.R. By June 2022 two new test cocks had been fitted to the right-hand side of the backhead and the blow down valve overhauled. A pattern for a new steam turret was also under construction.

Shortly afterwards the boiler joined the chassis components at Boston Lodge for the remainder of restoration work. By November 2022, the motion and wheelsets had been removed from the frame assembly there to enable the individual components to be painted. The saddle tank had also been shot-blasted to enable assessment of its condition. Painting work was well advanced by January 2023. Some two months later, the boiler, wheelsets and motion had been re-fitted to the frame and cylinder assembly at Boston Lodge, but much pipework remained to be fitted. It had also been decided at this stage to order a new saddle tank to be sent down to Wales when required. The original was sold (complete with cut inspection holes) to the Bala Lake Railway which is home to earlier Bagnall 'Bullhead' saddle tank *Dorothy* (W/N 1568 of 1899 and fitted with Baguley valve gear). Work on *Pixie* continues to make good progress at Boston Lodge and it is hoped that the locomotive will be in steam at the 2024 Charity Gala, where it will no doubt be the star attraction.

●To be continued.

LNER B1 Locomotive

PART 33 – YET MORE ON CAB FITTINGS

Doug Hewson

presents an authentic 5 inch gauge version of Thompson's B1 locomotive.



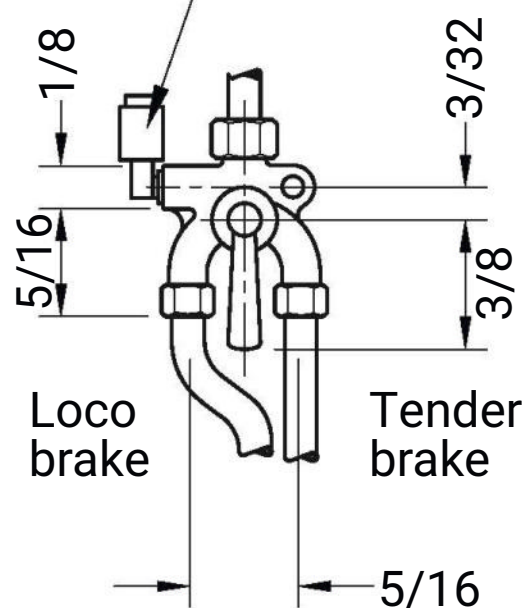
Continued from p.764,
M.E.4731, December 1



A view of the steam brake valve on B1 61264.

I have used the photographs of 61264 for the purposes of illustrating the B1 steam brake valve as it is much easier to make than the original one which is shown on 61306 *Mayflower*. The other thing is that Adam Cro makes just the correct steam brake valve. I think he still makes all the castings for it but doesn't provide the machined set of castings at present. **Photograph 241** shows a lot of detail but mainly the steam brake valve which takes centre stage at the top of the picture. Also, you can follow the black pipe down from it to the division valve which splits the steam to either that engine (on the left) or the tender (on the right) or both. I have drawn this fitting (**fig 126**) so that you can copy that but it is up to you if you want to connect the tender brake or not otherwise the fitting can be a dummy. However, to complete the detail you need to make decent job of it. In Adam's list of parts, you

Fig 126 Dummy lubricator



Distribution Valve For Steam Brake

Steam brake distribution valve.



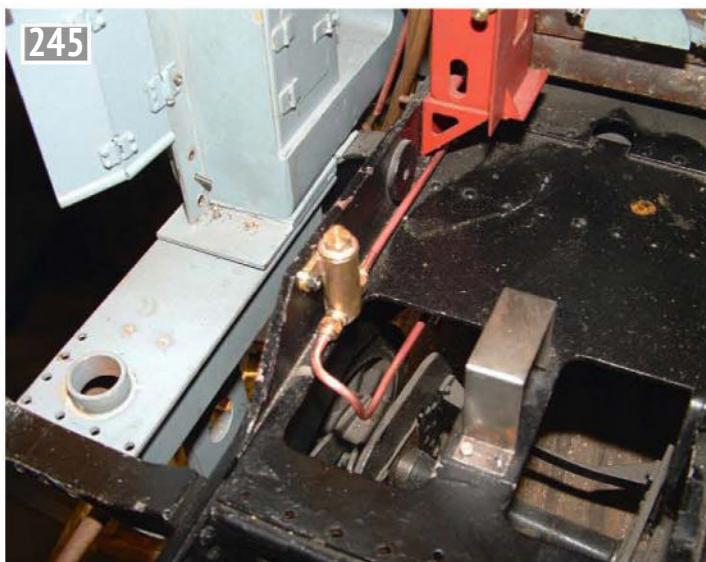
Five-inch gauge steam valve by Dave Noble.



Steam valve fitted in the cab of a five-inch gauge 4MT.



Steam brake displacement lubricator.



Steam brake lubricator installed under the cab floor.



Steam brake lubricator filler cap.

will need to look in the section under BR Standards as it is identical.

Photograph 242 shows the steam brake valve which I bought from Dave Noble and I think he also makes

the similar set of castings. **Photograph 243** is a peek inside the cab of my 4MT with the brake valve just inside the window. There are two dummy pipes made from 54 thou pipe which (if you want

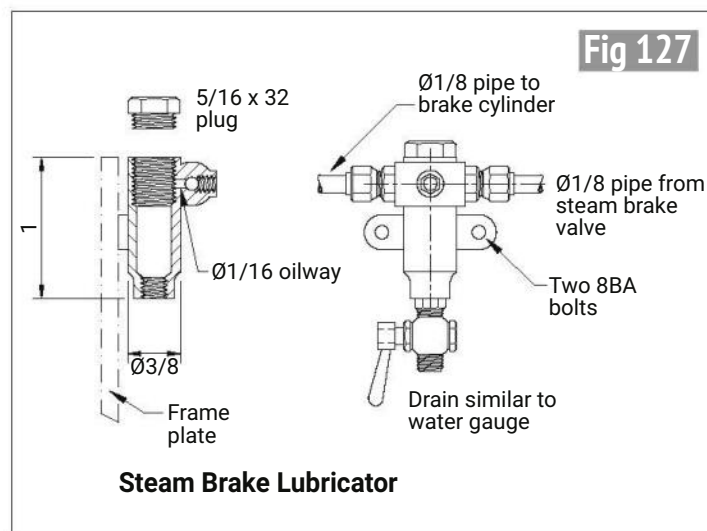
to fit them!), when using the vacuum brake, automatically put the locomotive steam brake on slightly before the vacuum braked train so that the train does not break away from the engine. They think of everything don't they!

Now, the other thing which you will need is a proper lubricator for the steam brake (**fig 127**). This was another thing which I made for my 4MT and I have to re-fill it twice a day with steam oil to ensure that everything works efficiently. **Photograph 244** shows the steam brake displacement lubricator for my 4MT ready for mounting under the cab floor. Please don't try to tell me that steam brakes are not needed on a 5 inch gauge locomotive as I use mine all the time, especially when coupling up to some wagons, even if it

means dabbing the brakes on and off. I was always taught to use them and I think they are brilliant. Try them and you will be amazed.

Photograph 245 shows the brake pipe all coupled up and **photo 246** shows the filler plug in the cab floor. I think I had fanciful ideas when I produced the drawing for the lubricator as it doesn't need all those other connections. I also bought a drain cock from Dave Noble. You also need to drain off the condensate of course.

We now come to the boiler feeds (**fig 128**). Once again Adam Cro does make a pair of boiler feeds supposedly for the B1, but I am afraid to say that they are not a bit like the ones on my photographs. The problem is that they are a 'pair' but in actual fact they should not be a pair as the right hand



Steam brake lubricator.

Radial Valve Gears Again

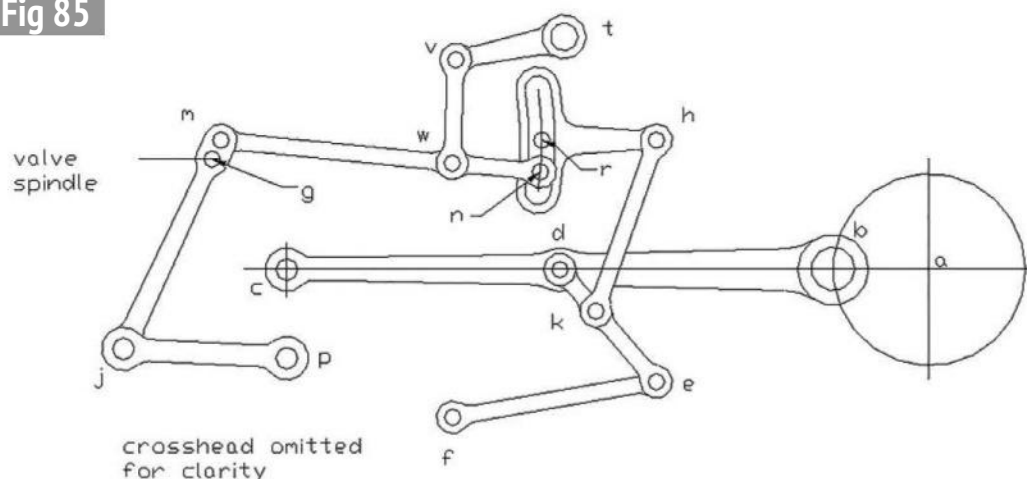
PART 15 – OUEST VALVE GEAR

Duncan Webster sheds light on what is often seen as a complex subject.



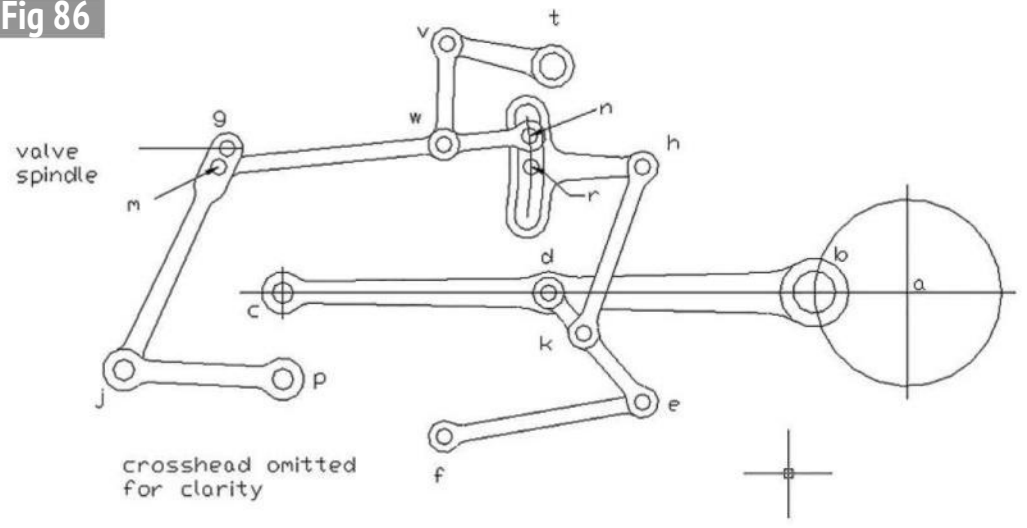
Continued from p.747
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Fig 85



Ouest valve gear – inside admission.

Fig 86



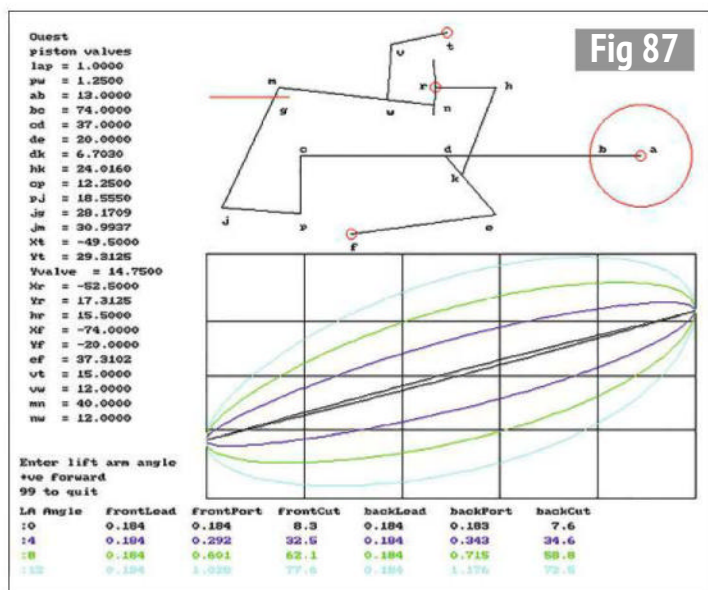
Ouest valve gear – outside admission.

This is the last one, honest. I wasn't going to model this one but it wouldn't go away and I needed a task to learn a new (to me) CAD package as Draftsight is no longer free.

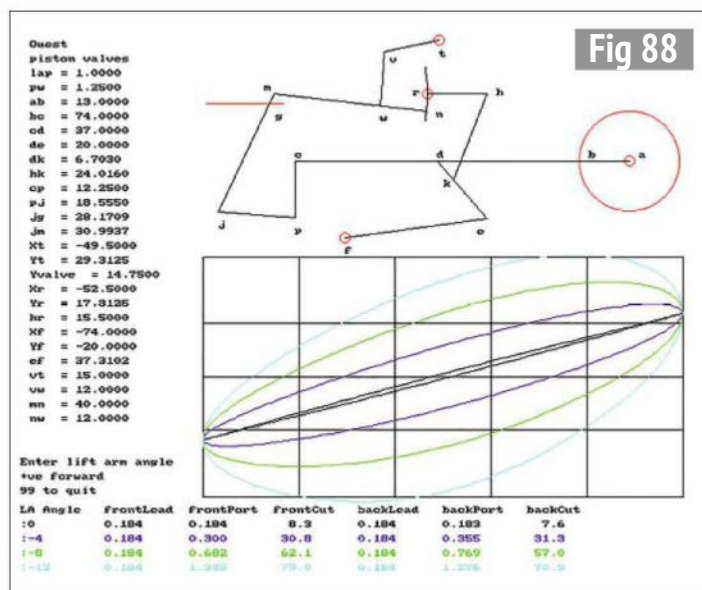
This gear (**figs 85 and 86**) was used by at least two French railways in the 1880's.

I have been unable to track down the designer, who must therefore remain anonymous. I would guess it was for use on inside cylinder locomotives. It belongs in the Walschaerts family because it has the combination lever driven directly by the cross head and an expansion link that rocks to

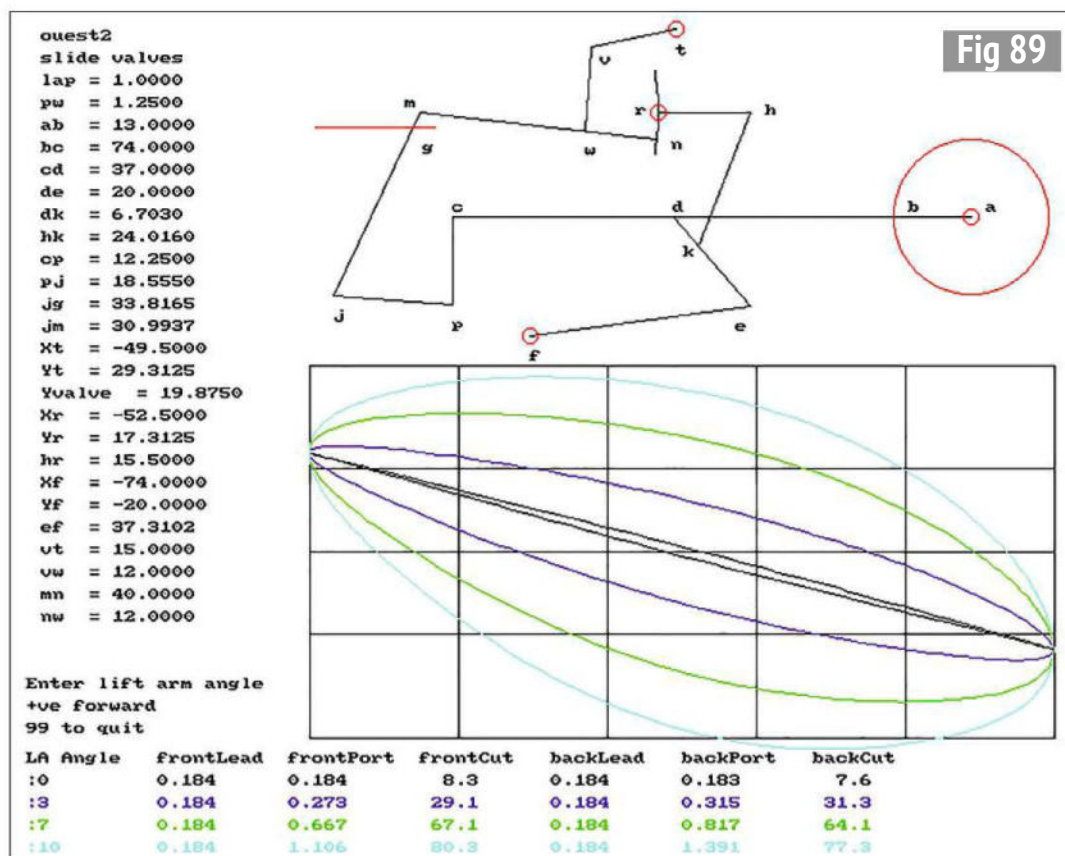
and fro out of phase with the piston, but instead of a return crank it has an expansion link pivotted at *r* driven by the rise and fall of point *d* on the connecting rod. If there were a link directly between points *d* and *h* it would sort of work but the motion of the expansion link would suffer severely from



Quest valve gear performance – piston valves, forward gear.



Quest valve gear performance – piston valves, backward gear.



Quest valve gear performance – slide valves, forward gear.

angularity of link *dh*. This is addressed by the Joy type correcting linkage *de, ef, kh*. So, what are the advantages?

- It eliminates the wear involved in a Joy type curved slide where the die block is sliding up and down full stroke all the time.
- It reduces the load on the connecting rod at point *d* as it only has to drive the outphase component.

- It has no need of eccentrics on the driving axle, leaving more room for axleboxes, cranks etc.

The disadvantage is obviously more pin joints to cause lost motion. Furthermore, eccentrics have to be large diameter, giving high surface speed, hence high wear. I fancy that the curved bit of the expansion link would be offset sideways from the

horizontal arm *hr* to line up with the combination lever/drop arm arrangement.

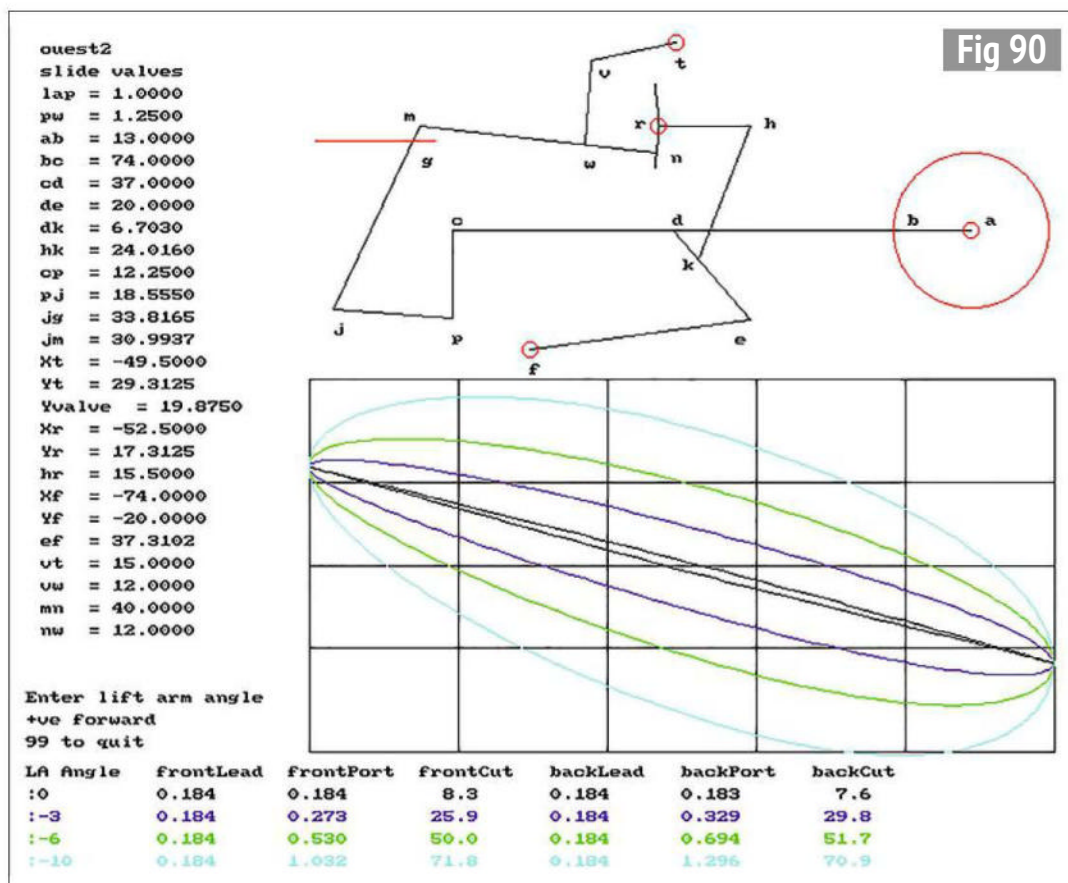
The dimensions I have used are based around the overall size of the LYR locomotive in the Joy gear episode (part 7, M.E.4724, August 25). The rest of the dimensions are reasonable but could probably be optimised. I have not included the maths for working out the lengths of the various

links as there has been enough sums in previous episodes and I doubt anyone will ever make it for real.

This gear is no more difficult to model than Walschaerts. It appears to be soundly based, so how well does it perform? Results are shown in **figs 87** and **88** (inside admission) and **figs 89** and **90** (outside admission), and are quite reasonable. Note that for piston valves in forwards gear the die is in the lower half of the expansion link and for slide valves it is in the upper half. With the die in the upper half there is more die slip, but still nothing like Joy.

Am I going to build a locomotive with this gear? Well I reckon inside cylinders are for masochists, so no, and I don't see many freelance locomotives with inside cylinders. Perhaps someone will use it on Don Young's LMS 0-6-0 which he designed with Joy gear - you can't get any odder than that! Perhaps some French model engineer will come along with a model but I'm not holding my breath.

I was quietly confident that this was as far as I was going on valve gears but then Mike Tilby of the SMEE found a reference in a *Model Engineer* magazine (**ref 26**) to a locomotive with a similar valve gear. This seems to be called Hawthorne Kitson gear - see **photo 6** (extracted from **ref 27**)



Quest valve gear performance – slide valves, backward gear.

by kind permission of Roger Smith).

The expansion link is driven from a connection to the connecting rod to the right of the big end by the rather slender vertical rod, and the correcting linkage *de* and *ef* is omitted. This means that the

expansion link pivot is higher but the designer arranged that the valve face slopes relative to the cylinder which would mitigate this. I expect the error due to angularity of the vertical rod would be quite large. It might be possible to have some backset compensation

like Walschaerts but the long horizontal member which drives the expansion link would make this difficult. Vertical movement of the axle would also disturb the events. It seems that this gear was a favourite of Kitsons (see **ref 28**). Its claimed advantage

was that it kept all the gubbins up away from the rails, which was considered important on small wheeled locomotives, especially I would imagine where derailments were not uncommon. I do not propose to model this gear (enough is enough) but if anyone wants to I can supply source code for the other gears which would be a good start.

I hope you all have enjoyed this journey down the odd ball valve gears. I leave Stephenson's and other link gears to Don Ashton (now sadly deceased). They are much more difficult to get right. The next virtual project is to examine die slip in Walschaerts but you'll have to wait for that, as I need to get some metal bashing done.

ME

REFERENCES

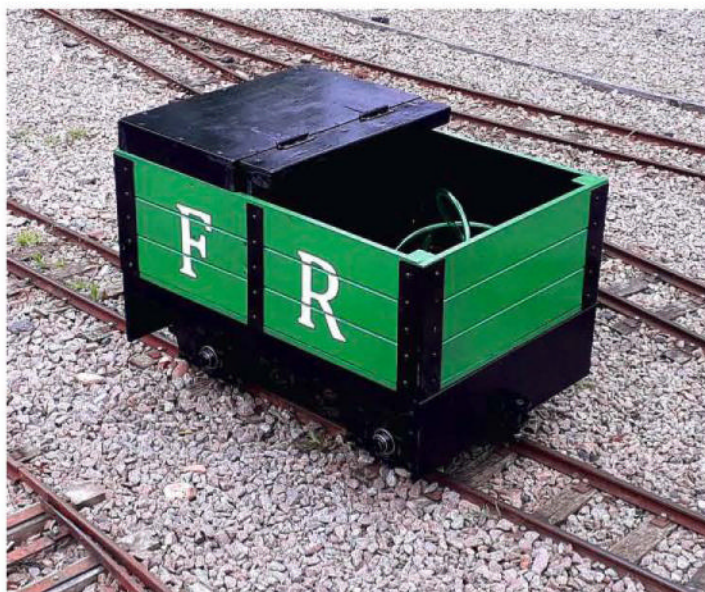
- Ref 26.** Model Engineer, M.E.3397 17 July 1970, *Walschaerts Extraordinary*, G.E.C. Webb
- Ref 27.** preservedbritishsteamlocomotives.com/1338-cardiff-railway-0-4-0st
- Ref 28.** en.wikipedia.org/wiki/Namaqualand_0-6-2_Scotia_Class



Locomotive with Hawthorne Kitson valve gear (extracted from ref 27 by kind permission of Roger Smith).

Driving Truck for 7¼ Inch Gauge

Cliff Almond describes the construction of his driving truck.



Completed driving truck coupled to Hunslet.

Several years ago, I was offered the makings of a driving truck, suitable for 7¼ inch gauge, which consisted of a substantial steel box section fabrication, forming a good base to work from, that someone had started but not completed. This also included wheels, axles and timber sides.

A quick review of the fabrication suggested that it would be more than substantial enough to be used to fix a set of frames to, as well as the associated hornplates, bearings and brake linkage. In addition, the box section fabrication had been constructed to include both front and rear buffer beams.

Around the same time the construction of my (now completed) 7¼ inch gauge Hunslet was well advanced. Therefore, my thoughts turned to completing a driving truck that would look in appropriate proportion behind it, whilst able to provide space for water, coal and tools (**photo 1**).

Provision of additional water was considered essential for the injector because the water in the saddle tank of these and similarly-designed locomotives very often gets too warm for injectors to be able to operate, once the locomotive has been running for a while. In addition, water from the saddle tank recirculates via the bypass on the crosshead pump, which, in turn, adds to the rise in water temperature, given the proximity of the supply and delivery pipes, not to mention the rise in temperature caused by operating in the summer.

Setting to work, by initially measuring the parts and



Underside of chassis.



Trial assembly of frame.

then drawing them, a general arrangement was quickly developed.

Reference to a full-sized narrow-gauge coal truck informed me that the overall length and width of the design offered a near scale version, with the exception of the timber sides, which appeared too high and out of scale to the length. This was quickly remedied by reducing them by around 6 inches, providing the opportunity to form a seat and somewhere to place one's feet inside.

Satisfied with the general proportions, I then turned my attention to the frames (photo 2). Those that have followed my other articles will now know that I am a keen user of laser-cutting. Therefore, it will come as no surprise that the development of the frames and bearing keeps, hornblocks and associated parts were all designed from mild steel sheet and plate (photo 3).

Without wishing to spend a disproportionate amount of time on the project, the brief I set myself called for commercially available axle bearings, with the ability to allow independent vertical

movement. Some research on the web soon provided a solution, in the form of bearing blocks which would also provide a form of hornblock, and the ability to support a springing arrangement. Fortunately, the axles had only been 'roughed out', meaning I could finish turn the journals to



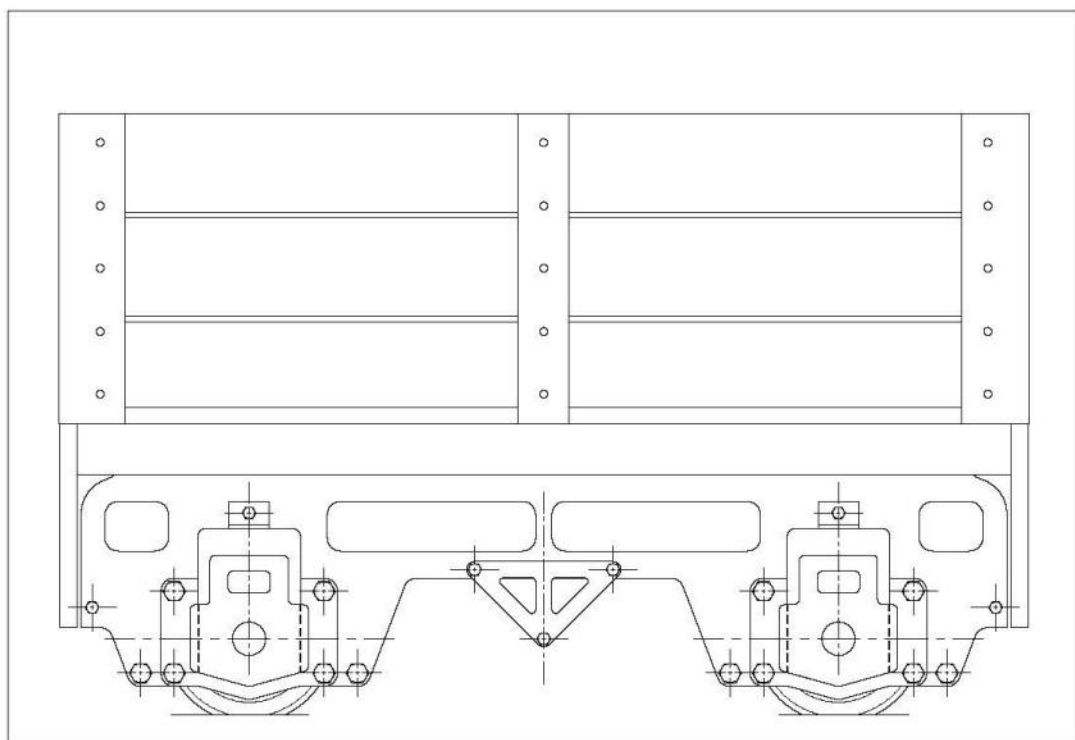
Driving truck bearing assembly.

suit the bearing diameter. I was able to download a CAD file of the bearings that enabled me to accurately design the frames and the associated bearing keeps before I placed my order.

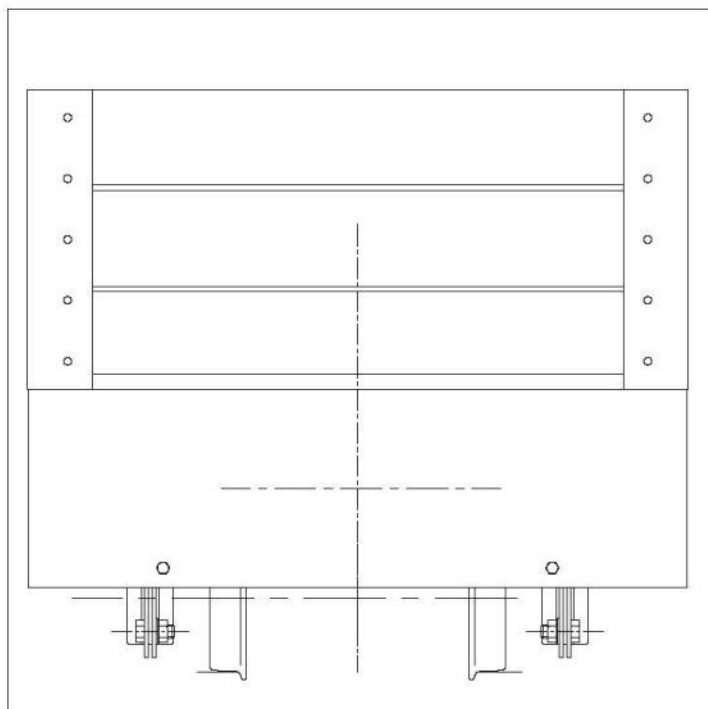
One of the key considerations was the allowances to be made for both accommodation of the vertical movement and the spring arrangement. Keeping with the simplicity theme, I decided to use a single coil compression spring per axle box. This enabled me to select a robust spring that would allow the length of compression I required, whilst

resting directly over the centre line of the bearing (photo 4). In order to be able to select the correct spring I worked out the combined weight of the completed truck and then added my own weight. This was then divided by four and used to find a spring that would achieve circa 50% compression with that weight. This allowed sufficient compression and extension allowance during normal running.

When selecting springs, many suppliers have useful tables on their web sites that can be used to select the most appropriate



Driving truck general arrangement – side elevation.



Driving truck general arrangement – end elevation.

one. Once you know the load or performance criteria, it's a simple matter to refer to the chart and select a spring which also gives the overall dimensions you require, taking out a lot of the guess work.

Each spring is kept in position and upright via a pin that is retained to the frame above the bearing block. With the spring passing through the bearing block casting, any tendency for the spring to deform laterally is removed. In practice, this has proven to work very well, and I am very satisfied with the result.

The wheels that came with the parts looked fine. However, after securing them to the now finish-turned axles, I decided to check the profile against those recommended in the 7¼ Inch Gauge Society standards. This proved to be a good move, as the angles were found to be slightly out. This also allowed me to ensure the wheels ran true between centres. Initially I 'loctited' the wheels in position. This seemed to be satisfactory but, to be sure, I tack-welded the back face of the wheels to the axles.

The bearings simply slip over the ends of the axles and are secured to them via the grub screws in the bearing housing with the provision for lateral

movement being provided by the width of the slot being wider than the frame thickness. This worked out at circa 3-4mm and has proven adequate, providing some 'free-float' whilst enabling the springs to work effectively. Lubrication of the mating faces is quite easy and the bearings themselves are 'sealed for life'.

An essential item of the design is the provision of a hand-brake. The parts I received included what appeared to be the handle from an old car hand brake, complete with the release button and ratchet assembly. My initial thoughts were to mount this externally on the truck, which is how many are fitted and operated. However, this means the linkage design would need to be more complex, as otherwise the force applied would tend to favour those wheels on the side the handle is fitted. Therefore, I decided to mount the handle in the middle of the footwell. This meant that the braking pressure would automatically be distributed across the four wheels and would be simpler and need less pressure to engage them.

A rummage through the odds and sods box in my workshop located four brake blocks sold

by various model engineering suppliers for the purpose. These are fitted to a linkage arrangement made from laser-cut parts and threaded M8 rod. One would probably ask why threaded rod instead of purpose-made bar with threads on the ends where required? The simple answer is that I had plenty of threaded rod lying around and this enabled me to put all the parts together and test things on the bench, in the first instance. In actual fact, the arrangement has, in service, proven to be very effective. However, the plan is to replace the rods with custom-made ones in due course, using the threaded rods as templates.

The couplings at both ends of the truck are commercially available laser-cut parts available from several model engineering suppliers. These are excellent and are made from three pieces of 10mm steel plate that fit together and can be bolted through the buffer beams with high tensile bolt sets. Further reference to the 7¼ Inch Gauge Society standards provided the correct height for them. However, a word of caution - when marking out the position of the fixing holes, take into account the mid-position riding height when the truck is loaded i.e. the driver in position and a small allowance for any water/coal being carried.

Whilst on the subject of couplings, it is worth mentioning the many methods used to couple locomotives and carriages together. Over

the years I have seen a wide variety of coupling and pin arrangements. Many are simply made from whatever is to hand or looks about right. Whilst this may be fine in many cases, it is worth remembering that a fully loaded 7¼ inch gauge locomotive with several loaded passenger carriages can amount to a considerable shear force on the pins. This is often witnessed by the fact that so often pins are bent or cannot be easily fitted or removed.

Another concern is the opportunity for pins to work themselves up and then cause the carriages or locomotive to de-couple, with obvious consequences. This risk is easily overcome by providing 'break-away' chains or cables. However, I always use ¼ inch or M6 high tensile bolts as pins, with either nyloc nuts or 'R' clips fitted into holes cross-drilled through the bolt ends.

With the chassis now complete, my attention turned to the body work. As I mentioned earlier, the timber sides supplied were considered to be out of scale for 7¼ inch gauge. The previous person had gone to the trouble of using 12mm plywood, which had been 'scored' to represent planks. The spacing of the 'scores', by chance, allowed me to cut off what would have been the top plank. With this done, it was then a simple matter of fixing the four sides together with internally placed timber corner uprights, with the bottom section being made of 12mm plywood (**photo 5**).



Completed driving truck body.

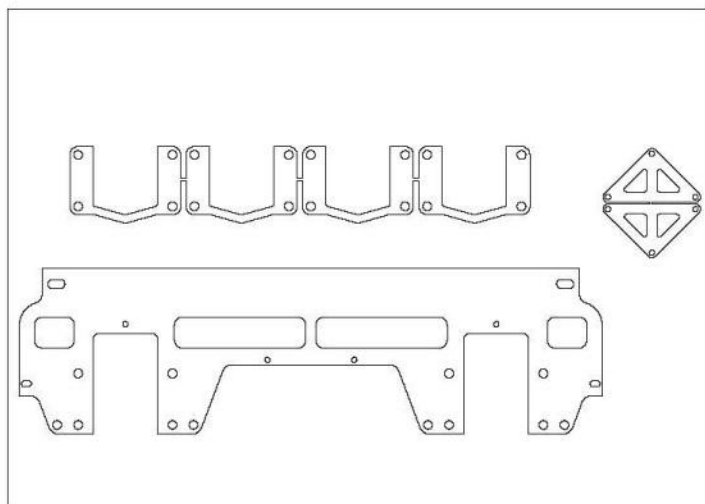


Driving truck water tank.

The assembly is held onto the chassis via connecting bolts, with the brake handle passing through a cut-out in the floor that allows it to be applied and released. In order to provide additional rigidity, I had four pieces of 1mm steel sheet laser-cut, complete with fixing holes. These were bent to 90

degrees in my brake press and then secured with roundhead screws right through the assembly with the excess being trimmed off with a small angle grinder and disc.

I was keen to ensure that a good supply of feed water would be available for the injector. I looked into various



Driving truck frame parts.

tank options, from making my own, through to containers readily available in various shops or garden centres, and then came across a company on line that made custom and off-the-shelf containers ranging from several litres capacity up to several thousand litres. These could be supplied with connections for inlets or outlets and well-fitting lids with holes in to allow air in as the fluids drain or are pumped in. A trawl through their website provided me with a container that would fit across the compartment under the seat and be the

correct height and width, by chance! Not only that - it could be supplied with a factory-fitted BSP threaded bush! Unfortunately, and relatively speaking for those on a limited budget, these containers are not 'cheap'. However, what they offer is a problem free and sealed solution that isn't going to be a source of trouble, meaning that, if the water being poured into the container can either pass through a strainer in the lid, or an in-line filter is fitted, the injector should be supplied with a good supply of clean and cool water (**photo 6**). With the water tank at the back of the truck, there remained enough space in front of it to put in a bulkhead and then form a toolbox that would all be contained under the hinged seat/lid and secured by a hasp and staple for security when unattended (**photo 7**).

At the time of writing, there are a few additions to add, including a padded seat and a rubber mat in the foot well. However, I have trialled the truck with an extensive day of use, on a public running day, with no issues, with one exception - the bearing keeps tended to rub on the slightly raised timbers on my club's turntable, occasionally. This I intend to rectify by milling off a few millimetres from the bearing keeps when I replace the temporary threaded brake rods with solid ones, in due course.



Driving truck tool storage.

ME

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A Method of Manufacturing Piston Rings of the Clupet Style PART 5

Martin Gearing discovers how to make these rings himself.



Continued from p.758
M.E.4731 December 1

Note: imperial dimensions follow metric dimensions and are in brackets. References are listed in part 1 (M.E.4728, October 20).



Cup for holding a ring.



Lapping a ring to width.

Testing

Having allowed a small amount extra on the width to deal with any variations that may have occurred I made up an aluminium cup bored to the finished cylinder diameter, 0.5 (0.020 inch) less than the finished width that also confirmed the gap was acceptable (**photo 31**). This was then used to lap the width of the ring on a sheet of

'wet and dry' laid on a small surface plate one side at a time until the width of the ring fitted the groove in the piston with the correct clearance (**photo 32**).

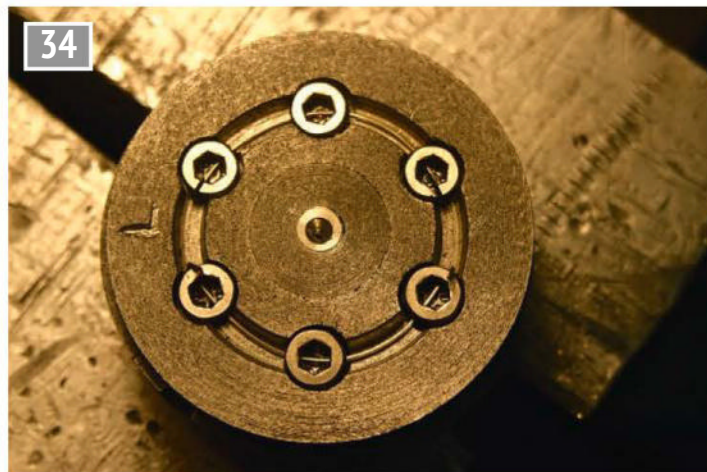
Initially, despite being astounded at the ability of the material to withstand being 'turned inside out' then back for the annealing process, I was too scared to subject them to the stress of being fitted over

a standard solid piston for installation into their operating groove. The only way of avoiding this was to make the piston as a built up assembly (**photo 33**).

This worked well, except I was uncomfortable with the thought of the securing bolts working loose with the cycling of the temperatures in use, so decided to drill the bolt heads and use locking wire (**photo 34**).



Built-up piston.



Locking wire securing the piston bolts.



Bolt head drilled for locking wire.

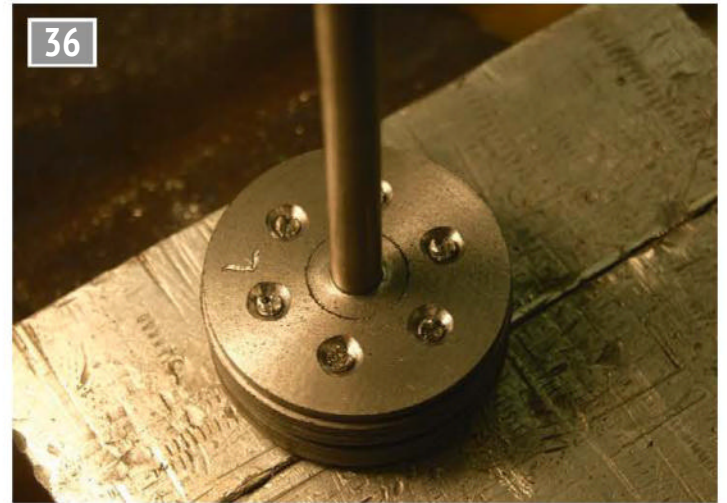
Due to the small bolt size used and having to drill the head through three times so as to be able to ensure access for the wire when the bolts were tightened (**photo 35**), I found the hexagon drive in the bolt heads was compromised. The only alternative I could come up with quickly, was to allow a short length of thread to protrude into a shallow countersink on the threaded side of the assembly, and split the threaded end so that, after tightening, the end of the bolt could be opened out (**photo 36**). Crude, but I could sleep easy!

When finally the locomotive was run the pain of the rings' creation was totally forgotten!

The engine ran very freely with no sign of leakage across the rings when stalled with the wheels locked and the regulator fully open. Time will tell as to whether or not this performance will be maintained but for the moment I'm more than happy.

In an effort to make sure that all the various amendments/alterations were correctly documented, I decided to make a further set of rings for another engine, built by following to the letter the instructions I'd created.

Doing this resulted in six out of seven blanks being successfully produced, without any issues. The failure



An alternative way of locking the bolts.

was down to my mistake in misreading my notes, resulting in the removal of 0.2 (0.008 inch) extra off the width of one ring (but still good in all other respects).

Feeling cocky, and goaded on by a picture at the top of Martin Wallis' article (ref 11 – M.E. 4093 7 May 1999) showing a large piston having four Clupet rings - the top one still in the process of being installed and the three lower rings already settled in their grooves - I decided to take a chance and see if it was actually possible to fit my rings into suitable grooves of a solid piston. I therefore made up a piston blank with two grooves

to the same overall dimensions as my built up piston and (holding my breath for each one) fitted a ring into each of the grooves without issue (**photo 37**).

Seeing that fitting my Clupet type rings to a standard solid piston was practically possible, I'll now try the suggestion made by Alan Beasley (ref 13 – M.E. 4352 22 May 2009) and make a set of solid grooved aluminium pistons to see if the reduction in reciprocating weight produces any noticeable improvement in the smoothness of running of our engine fitted with Clupet rings.

Conclusion

I hope the content of this series might provide the inspiration necessary for others to attempt making this fascinating type of piston ring. Some of the areas covered were out of my comfort zone, as more proficient engineers may have recognised, but it does at least complete a long journey of discovery on which I learnt a great many things.

I must thank unconditionally Simon and John of Steam Workshop (ref 1), who were the catalyst to my starting, and Simon for being very helpful in answering my questions. Also to John Parkin and David Fletcher-Jones (ref 19) for their time in providing a confirmation of the annealing process I chose to follow, in terms that I could understand.



Piston with rings successfully fitted.

ME



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Electrical Safety

Dear Martin,

The letter about electrical safety from John Baur, one of our Canadian readers (M.E.4727 October 6), is a timely warning about being careful when around or working on electrical appliances and power supplies.

I believe that Canada shares a common voltage of 110 volts for its domestic mains supply, the same as America. Even so, any mains voltage can be deadly if not treated with respect. I suppose we can all relate to happily non-fatal mistakes i.e. not switching off and disconnecting from the mains. Having said that you don't need a large voltage to get a wallop, so to speak - a 12 volt car battery can pack quite a punch if not treated with respect. I remember well that once I was fitting a new steady bar bracket on one of my cars and didn't take the battery off or take my wrist watch off either. The metal strap of the watch slid across the live terminal and the air turned blue with a few choice swear words. Lesson learnt - take your watch off and remove the battery. On a commercial vehicle, of course, the voltage is 24 volts as opposed to normally 12 volts on a car. A lot of pre and post WW2 cars had 6 volt systems. The post war MGA and early MGB sports cars had I believe two 6 volt batteries in series to give 12 volts.

Another electrical component we have to be careful with, of course, is the humble capacitor as I understand that, particularly on television sets, they can also pack quite a wallop as well so I understand that you need to leave them well alone and wait until they are discharged.

When I used to work as the workshop technician in my local secondary school one of the things the 5th formers used to make was a small mains powered desk lamp. We bought the plugs, lamp holders etc. in

but before they could take them home I had to PAT test them for electrical safety. I always said to the students "electricity is a nasty thing - you can't see it or hear it but you certainly feel it when it bites you".

Yours sincerely,

J.E. Kirby (London)

Boiler Testing

Dear Martin,

I have been a boiler inspector for as long as I care to remember. I am a Chartered Engineer and a Euro Engineer and if anyone is interested I am also an Associate Fellow of the Permanent Way Institution. However, I am becoming somewhat concerned about the testing of boilers for people who are wanting to change societies where their new boiler inspectors expect them to strip their engines to inspect the bare boiler! Why does it need to be a 'bare boiler'? You can test a boiler without going to all the trouble of stripping the boiler completely down to bare metal. I am sure there is a paragraph in the rules which says the boiler inspectors can use their 'common sense' about whether or not a boiler needs to be completely stripped when testing. If I have missed something, then there should be a line in the rules that says exactly that.

Surely when someone turns up at a new society, especially if the boiler has all the correct certification from a previous society, then why on earth can't this be accepted as is. I heard of one society not passing a boiler as the regulator was dripping very slightly. I am afraid that this is just not on. The regulator has nothing to do with the boiler. They should have given the gentleman a certificate and told him to get his regulator fixed and then bring it back for them to test it again. The regulator was fine when the engine was in steam. We had a boiler come to us once and it had a slide valve regulator made from a block of PTFE which floated when the boiler was cold. We

tried it under steam and the regulator was fine otherwise there were no leaks whatsoever so said gent was issued with a certificate. We did, of course give the boiler its usual steam test. We told him to fit a screw above the regulator so that next time it was tested he could screw the slide down before it was tested again. We also had a gentleman ring me to say that he had had a refusal from his boiler inspectors as he was building one of my 4MT's. All my engines that I have designed have rocking grates, and many people have copied them. The boiler inspectors had never heard of a rocking grate before as they said it was impossible to dump the fire in an emergency. He had fitted it with my rocking fire grate! I said to the gentleman, "do you know what happens when you stuff a rag in the chimney and turn the blower on hard". He admitted that he had not heard of that. The fire goes out in less time that it has taken me to write these few words. Had the boiler inspectors used any common sense? NO, I suggest not. That once again was nothing to do with the boiler. He could also have opened the ashpan doors and dumped the fire straight out. The poor chap went home and sadly made a conventional fire grate to satisfy their boiler inspectors! I just wonder how many boiler inspectors do use a bit of good old common gumption.

When a loco is presented to us the we have not had sight of before, the first thing we do it to pump it up to one and a half times the working pressure and that should address any problems. If it leaks it will not hold any pressure and then the needle on our 4 inch Budenberg gauge will drop immediately. If it passes that test then there is no need to investigate any further. If the pressure drops, now is the time to investigate further. Look inside the smokebox first of all to see if there are any superheater elements leaking or anything else untoward going on in there. If there is anything wrong with the regulator it will

manifest itself by dribbles from the drain cocks which need to be open of course and, as I have said before, this has nothing to do with the boiler! The next thing is to do with the superheaters. I have 126ft of superheater elements in my own 4MT but the whole lot can be removed by removing the petticoat and two 5BA nuts and I have used the same arrangement on my B1 which is being described presently in *Model Engineer*. If there is a leak from the superheaters this will also manifest itself at the drain cocks but, once again, this is nothing to do with the boiler so it is no reason for not giving a certificate. You just need to ask your client to see to the superheaters and then bring the engine back for a re-test. He can do whatever he likes by plugging the regulator or superheaters before he brings the loco back for a re-test but concentrate on what it needs to separate the boiler from all other things that may or may not leak. You should also look in the firebox to make sure that too is all dry and inspect the fusible plug too if it has one as that should also be dry. If that is weeping that is not a boiler problem either, it is something which can soon be fixed. Incidentally, I have never built a boiler which does not have a fusible plug! If the drawing doesn't show one we always put one in as it can save a boiler.

We were testing one boiler where there was a sudden drop in pressure so we pumped it up again and it held the test pressure. However, we then had a good look all around the boiler and found that one of the superheater flues had collapsed, so we suggested to the gent in question that he used the next thickness up. That was what the drawing suggested but he said that he had used 20swg tube rather than 18swg as he didn't happen to have any 18swg tube! Just goes to show doesn't it, read the drawing and stick to it and read what is specified.

In summary, test the boiler and not the fittings such as

regulators and superheaters and test the boiler on the engine first before you go looking for other problems - there may not be any!

Doug Hewson

Explosion Hazards

Dear Martin,

I found the article by Roger Backhouse, "going with a Bang" (M.E.4729, November 3) quite interesting, especially about the explosive qualities of dust. He is quite right about this. I worked at the Haringey College in Bounds Green North London as one of the technician team in the multi skill workshop. We had both woodworking and metalworking machinery there; the planer thicknesser and the circular saw had fitted dust extraction which fed into a large container outside the workshop. This container had blast panels on it so if the saw dust had detonated it would have blown the panels off instead of flashing back into the workshop.

Another example of dust being combustible was I believe a hazard in coal mining. From what I have heard the very early compression ignition engines (the forerunners of today's diesels) were fuelled by very finely ground coal dust - of course today they use diesel oil in its various forms.

As to his making a cannon on his father's lathe, as far as I can remember cannons, especially the early muzzle loaders, were smooth bore and relied on packing between the charge and cannon ball and another packing in front of the cannon ball to give some sort of seal to propel the cannon ball.

Yours sincerely,

J.E. Kirby (London)

Morton's Valve Gear

Dear Martin,

Thanks to Messrs Allison (Postbag, M.E.4730 November 17) and Collier (via ME forum) I now have a good photo of a

loco (*Valdora* in the Nambour Museum Australia) fitted with Morton's valve gear, which I described in issue M.E.4728 (October 20). It is actually an outside variant, so instead of the link *gf* connecting the bottom of the vibrating lever *ghm* (see fig 57 on page 565) to the crosshead drop arm, we have a return crank connected to the main crank pin driving point *e* direct, much as I described for outside Joy gear in issue (fig 36 on page 344, M.E.4724 August 25). I have annotated the photo supplied by Mr Collier to identify the pins. Unfortunately, the return crank is not shown on the photo.

Whilst searching for a photo of *Valdora*, I came across a photo of a loco *Bli Bli* fitted with outside Joy gear, so I've added

that for good value. It appears that Aussie sugar plantations are a good hunting ground for obscure valve gears.

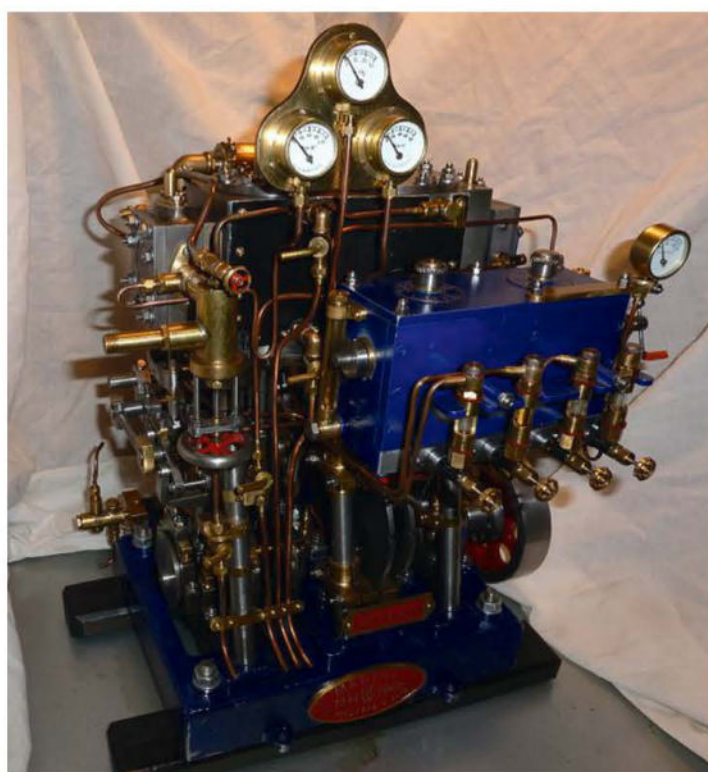
Valdora was built by Dick Kerr in Scotland 1893, *Bli Bli* by Fowlers in Leeds in 1914. Both locos are in the Nambour Museum. Dick Kerr only built 50 or so locos before moving to Preston (England) and concentrating on building electric trams, eventually becoming the English Electric Co. Fowlers of course built hundreds of locos (both narrow gauge and standard gauge), traction engines and ploughing engines before giving up the ghost in 1974. The company has been reborn on a much smaller scale in south Lakeland.

Duncan Webster



HERCULES

A twin cylinder compound condensing marine steam engine. PART 3



Finished cylinder block. Trial fitting of bottom covers and support plate.

Cylinder

I had a good look around for some decent cast iron for the cylinder block (**photo 43**) and eventually found a firm who could supply me with a 7 inch length of 3 x 3 inch square Meehanite. In addition, I ordered some other sizes for

the valve chests and cylinder covers.

Most of my supplies have to come by mail order and the postman was singularly unimpressed as he struggled up my long drive with the parcel containing these lumps of cast iron. I found the Meehanite to machine beautifully with just a very thin, easily removed hard skin.

I cleaned up all the faces using a fly cutter and then initially drilled the two bores. After opening out with larger drills I was able to start using a boring head. This was fine but the quill travel on my mill was just not long enough to machine right through in one pass. I was forced to do it in a series of stages, repositioning the mill head on its column at intervals. This wasn't too much of a problem as once I got near to the final sizes, I moved over to the lathe for the finishing cuts (**photo 44**).

Chris Walter

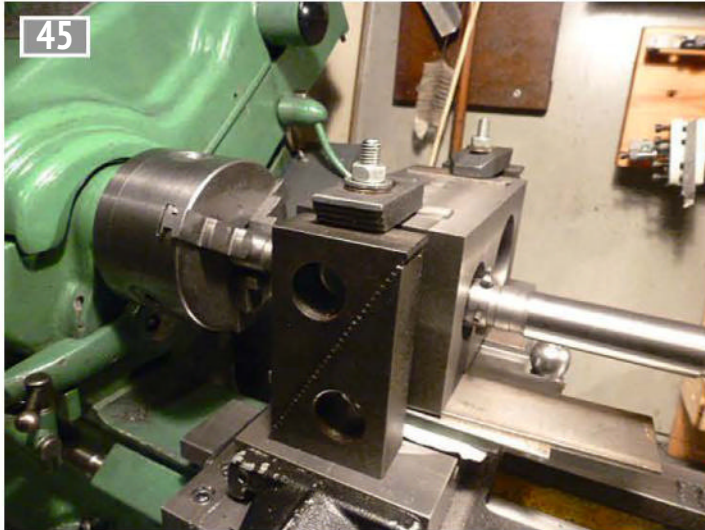
builds an engine described in *Model Engineer* 100 years ago.



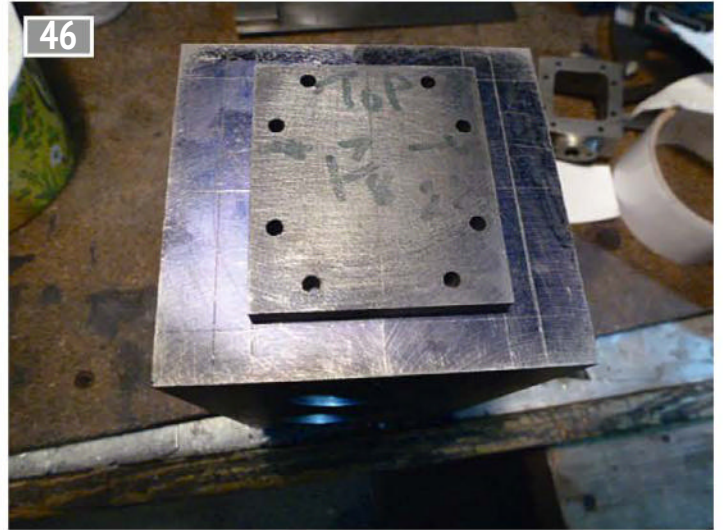
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M.E.4731 December 1



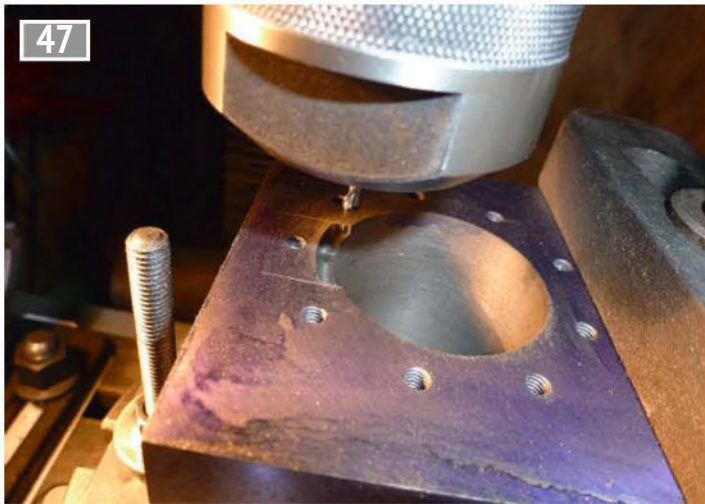
Opening out the bores with a boring head.



45
Cylinder block mounted on the lathe cross slide, using a boring bar between centres to take the bores to finish size minus a few thou to allow for honing.



46
Using a valve chest cover to spot through the fixing holes.



47
Close up of the rebate.

The block was held on the lathe cross slide packed up to the correct height, and using a boring bar between centres the final cuts were made using the self-act (**photo 45**).

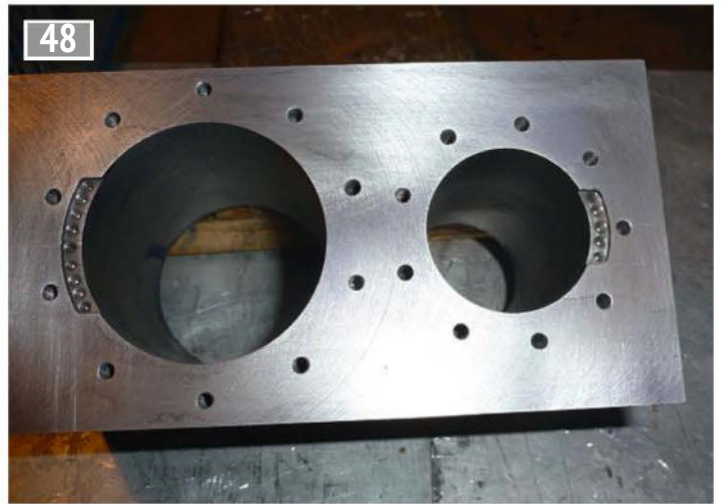
I thought it would be a good idea at this juncture to make the two valve chest covers so that the fixing holes could be easily spotted through onto the cylinder block and, at a later stage, onto the chests themselves. These were machined up from 1/4 inch thick pieces of cast iron. Once done the holes were drilled and tapped M4 and milling the ports could begin (**photo 46**).

All the ports were completed using the DRO on the milling machine, which certainly makes the job easier and more accurate. Before the steam passages could be tackled it was necessary to mill a curved

rebate at the top and bottom of each cylinder from which to start the drilling. This was done by securing the block on the rotary table and using a 1/8 inch slot drill (**photo 47**).

As the steam passages were 1/8 inch diameter the rebate was made 3/16 inch wide to leave 1/16 inch thickness of cylinder wall at the top edge. To work out the centres of each individual drilling I used a 1/8 inch length of silver steel rod in the drill chuck and then centre drilled all the passages that I could fit in (**photo 48**).

Once the block was set up in an angle vice on the mill, the same piece of silver steel could be used to position things so that the drill broke into the passages at the correct point. The passages were drilled (**photo 49**) leaving a minimum of material between each



48
Block now ready for drilling the steam passages.



49
Drilling the first of the passages.

one and once done they were carefully opened out into one passage, using needle files and small burs in a rotary tool. This all took a good deal of time and patience but the finished result was worth every minute.

Had castings been used, the cylinder block would have had suitable lugs to affix the front and rear support columns. I had, then, of necessity, to provide a separate support plate to fulfil this function. Try as I might, I



Very rough wooden mock-up of the cylinder block, to enable me to get my head around the shape and position of the various flanges and bosses. I think I'd best leave pattern making to the experts!



Rear support columns with the two crossheads.

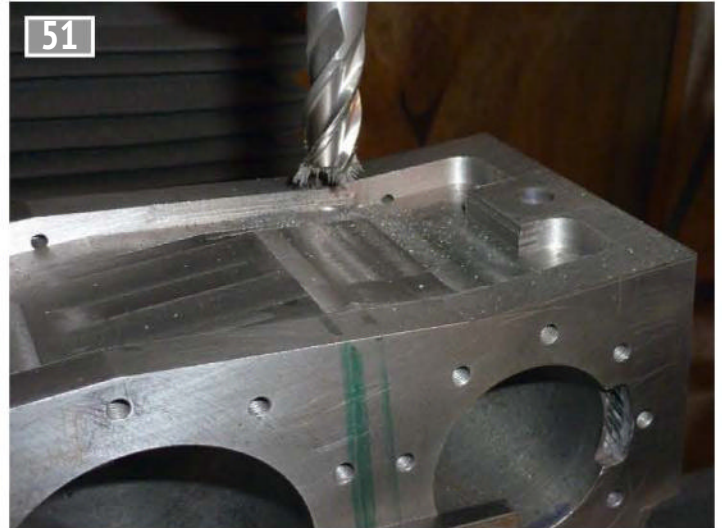
found it very difficult to form a complete mental image of the required positions of the top and bottom flanges. There were also the inlet and exhaust bosses and the drain cock bosses and their interactions, as well as the voids to contain insulation material.

In the end I dug up some balsa wood from a previous project and cobbled together a prototype cylinder block, layer by layer. Eventually this enabled me to get my head round it and it got to an acceptable shape that would fulfil all the needs required (**photo 50**). It was a bit rough but had the desired result and I was able to start milling out the insulation voids and defining the shape of the flanges (**photo 51**). (On reflection I don't think I shall be taking up a career as a pattern maker!)

One of the last things needed was to make up the brass sheet cladding to cover the insulation material, and to drill and tap the 8BA holes which retained it. Of course (and it had to happen) I eventually managed to break off a tap level with the surface of the block. There followed some serious mumbling, and teddy was forcibly thrown into the corner.

As in all these situations, nothing protruded from the hole capable of being gripped and not even the thinnest tool could penetrate down the side of the broken ends.

Luckily, many years ago, I had built - as an experiment, with the help of my father - a very small spark erosion machine. It was low powered and fast it certainly was not, but it was more than capable of removing a broken 8BA tap



Milling out more of the insulation void and forming the exhaust port boss.



Fly cutting the two columns as a pair.



Front face completed.

without ruining the sides of the hole. I eventually breathed a sigh of relief, and continued with the tapping.

Rear support columns

These are not only the two main supports for the cylinders (**photo 52**), but also the main guides for the crossheads and

motion. In the real world these would definitely be castings so I had to fabricate each one from four pieces of flat steel stock. The main sections were machined from steel bar and the rest from suitably sized flat stock (**photos 53 to 56**).

There were also the top and bottom flanges and rectangular



55 Truing up the base of the column.



56 Drilling the end of the column for the base screws.



57 Bases attached awaiting brazing.



58 Wired and fluxed in the brazing hearth.



59 Complete units with the crossheads. The flanges have been drilled and tapped for the crosshead keeps and oil channels milled across the bearing surface. The top oil channel is drilled through the column to end in a 3/16 x 40 3/32 inch pipe union on the back.

1/4 inch thick sections to form the front plates, which would eventually become the sides between which the crossheads would move (**photo 57**).

These were silver brazed together with everything well fluxed and held together with iron wire. They were fairly substantial so it took a fair amount of heat to get them up to temperature. It was very necessary to get good joints on all these components as they take a lot of weight (**photo 58**).

Once defluxed and cleaned up, the slot for the crosshead was milled out and then the face of the top and bottom flanges skimmed to ensure they were true to angle and within dimension.

I could have done with making the crosshead flanges 1/4 inch wider as it was very tight to squeeze in the 6BA retaining screws for the crosshead retaining plates. The tapped

holes were getting quite near the edge of the flange, but were just about acceptable.

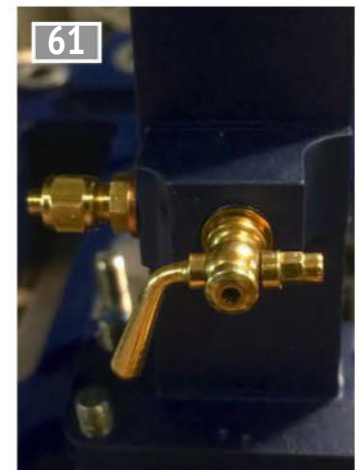
On the slide where the bronze crosshead shoes bear on the steel I machined three shallow grooves at right angles to the direction of travel to act as oil retainers. From the top one of these an oil hole is drilled through to the back of the column where it is plugged by a grub screw. A cross drilling was made from the inside top of each column to join up with this drilling and then tapped 3/16 inch x 40 to take unions for the oil feed pipes from the lubricator (**photo 59**).

The crosshead shoes are drilled and grooved to pick up a modest amount of oil from these slides, which should then pass into the wrist pin bearings.

At the bottom of each crosshead slide, a rectangular



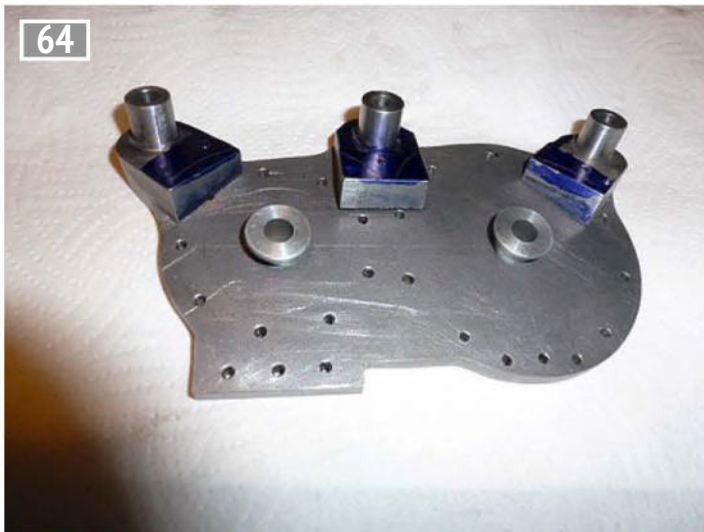
60 Column with the crosshead retainers in position and the brass oil catcher.



61 Tap and union for oil catcher drain.



Cylinder block support plate.



Positioning the brackets on the plate.

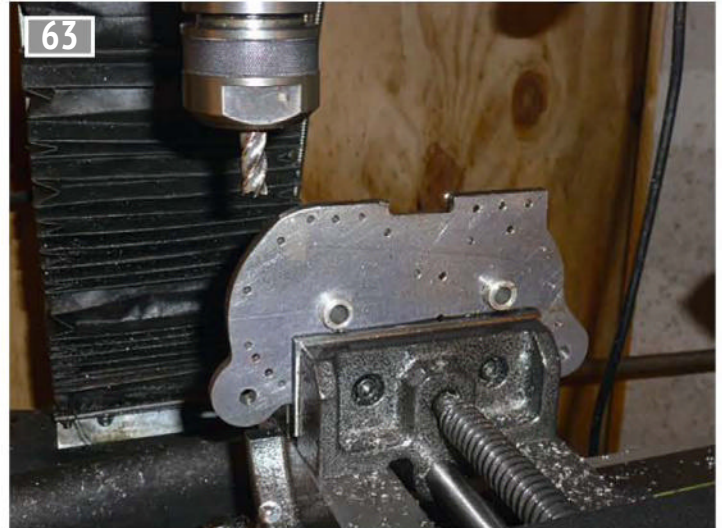


Milling the curved inside surface of the column brackets.

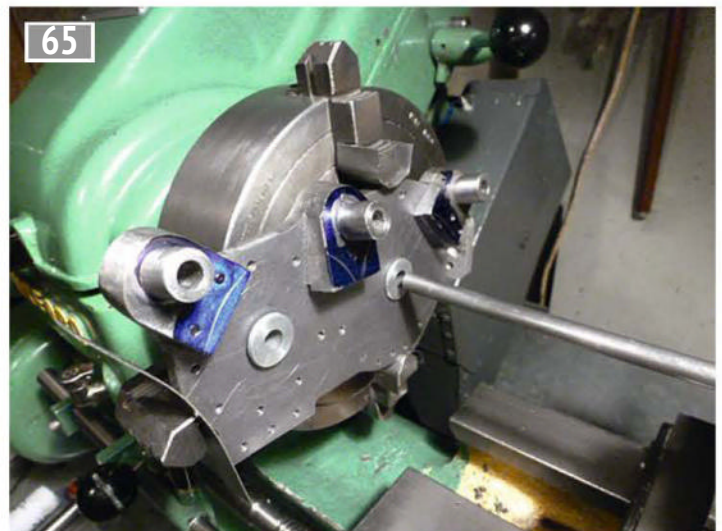
brass oil catcher is screwed to the column to catch any excess oil dripping from the slide. This is fabricated from brass sheet and is linked by a copper pipe to a small drain cock on the rear of the column (photos 60 and 61).

Cylinder block support plate

As has already been mentioned, without a cast cylinder block with its own support lugs, it was necessary to provide a separate cylinder support plate to join the cylinders and



Milling the outline.



Positioning the plate in the four jaw chuck on the lathe, before transfer to the rotary table on the milling machine.

columns (photo 62). This was not an easy item to make and a lot of huffing, puffing and scratching of heads took place before a reasonable solution was produced - and although having angled support columns is fairly prototypical and looks nice, it does make life a lot more difficult.

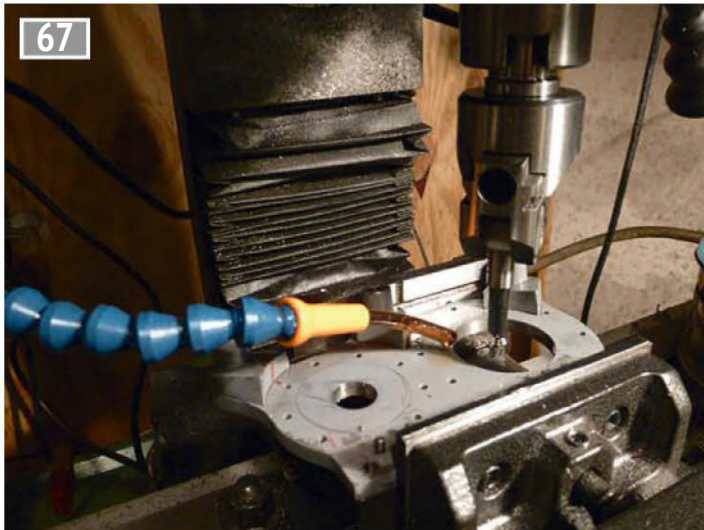
If you want to drill an angled hole in a ¼ inch thick steel plate, where do you mark the centre to start the drill? It all depends what the angle is, where you are looking from or how you are going to drill it. Think about it!

The plate was ¼ inch steel, marked out, chain drilled and machined to profile. Two temporary steel bushes were made having an inner diameter of 5/16 inch to fit the piston rods and these were made a push fit in the plate on the

cylinder centrelines. These were used to ensure the positioning of support fittings (photo 63).

To assist with locating the front columns, three brackets were made to form the front part of the plate. These were fabricated and brazed separately and then positioned on the plate, being secured with 4BA screws (photo 64). The whole plate could now be trial positioned using the piston rods to ensure the exact finished position of the plate and its brackets.

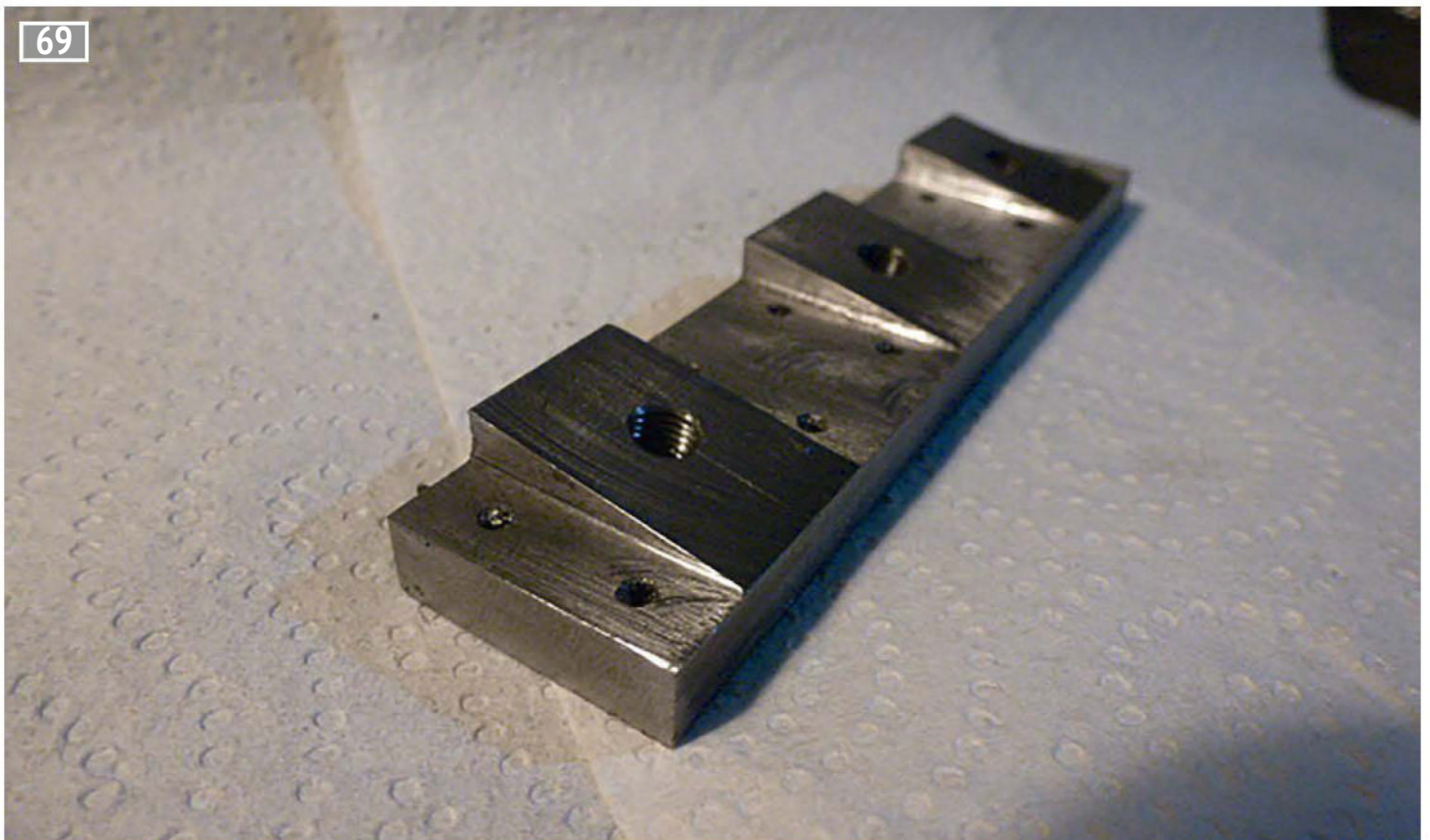
The plate was now positioned in the four jaw chuck on the lathe and then the chuck was transferred to the rotary table on the mill to machine the clearance curves on the inside of the column brackets (photos 65 and 66).



Using a boring head to finish the two bores to provide clearance for the cylinder head covers.



Front support columns. Trial fit of fixings.



Block of the machined column bases. When split and finished these will become part of the base plate. They are drilled and tapped at an angle of 12 degrees to take the bottom of the columns.

Once this was done the centre holes could be opened out to provide clearance for the cylinder covers and glands (photo 67).

Front support columns

These columns (photo 68) are $\frac{1}{2}$ inch diameter mild steel and are set at an angle from the vertical of 12 degrees. At the base they are threaded $\frac{1}{4}$ inch x 40 and screw into angled

feet, which may be considered as part of the bed plate, although it was easier to make them with the columns and secure them to the bed once a trial assembly of columns, cylinders, crossheads and piston rods had taken place (photo 69).

At the top end they are again threaded $\frac{1}{4}$ inch x 40 but this time for a considerable distance as they pass through

the brackets on the cylinder support plate. Below the plate are threaded adjusting discs and above it, angled washers with hexagon nuts.

I found it necessary to have these washers and nuts to provide a degree of adjustment to the angle of the support plate and cylinders. I found that with the crossheads, pistons and piston rod glands set up properly it only needed the

cylinder support plate to be 5 or 10 thou out in height and it would cause everything to bind up. This is only fractions of a minute of angle but the longer the piston rod, the more the sideways movement. Once adjusted (and it took only seconds) everything worked perfectly and has continued to do so.

●To be continued.

A Five-Inch Gauge 0-4-0 Padarn Railway Tender Locomotive

PART 18

Luker builds a five inch gauge model of a Welsh slate quarry locomotive.



Continued from p.737
M.E.4730 December 1



The model Fire Queen tender posing for the camera on satin sheets!

Introduction

I nearly never made the tender for *Fire Queen* (**photo 188**). It's an odd looking tender that doesn't match the engine (at

all!) and is a little small in five-inch gauge to be a ride on. Then I thought about it and those very qualities changed my mind. Making it a ride-

on is a challenge and all the idiosyncrasies of the design, or mismatch to the engine if you like, add character to the build and series. In the end it deserves a little more than a footnote, so I added it to the *Fire Queen's* build as a mini-construction series. Before I jump into the design (and build) a little background on the prototype is in order.

The tender as it stands at the Penrhyn castle

The tender weighs roughly 6½ tons dry, carried around 1000 gallons of water and 1 ton of coal between the front tank legs. The tender was most likely a bought-in item modified from standard gauge to fit the 4 foot gauge (**photo 189**).

The wheels were shifted inward away from the axleboxes with makeshift



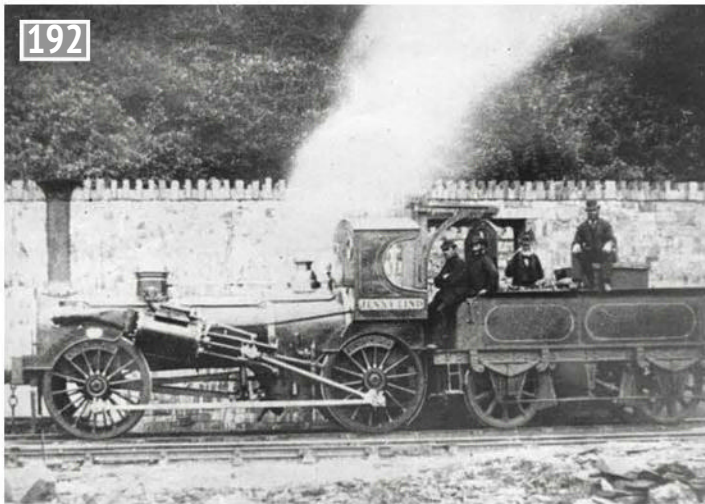
The Fire Queen tender at the Penrhyn castle.



190
Wheels moved inward for the 4 foot gauge with spacers between the axlebox and wheels.



191
The wheels that didn't match the engines. The spoke layout is very interesting as a model!



192
Fire Queen's sister locomotive, Jenny Lind with the braking gear on the left side.



193
Back light bracket.



194
Coupling link with different ends at the engine and tender.

spacers keeping the frames central (**photo 190**). The tender looked a little odd with the wheels so far away from the axleboxes and this did cause a few practical issues. The leather hoses between the tender and engine weren't shifted on the tender side and these hoses would have rubbed against the rear engine wheels, even with a rather large kink. Yes, you read correctly, leather hoses! Imagine the skill required to sew up water tight leather hoses that still need to be flexible!

The wheels also don't match the engine with an interesting cross (literally) section, rounded and flanged at the outer rim (**photo 191**). These wheels are a backyard foundryman's delight; a little challenging to cast making the success very



The current sanding gear fitted to the tender isn't the original, which was badly corroded.



The original sanding funnels which were badly corroded.

rewarding. The spring hangers were cast and riveted to the frame, which was constructed from beams and plate work, then riveted together.

The tender was braked on the right side only, with no evidence of brakes on the left. Interestingly enough, *Fire Queen's* sister locomotive, *Jenny Lind*, looked like the tender was braked on the left (photo 192). The brake lever was actuated by a large brass

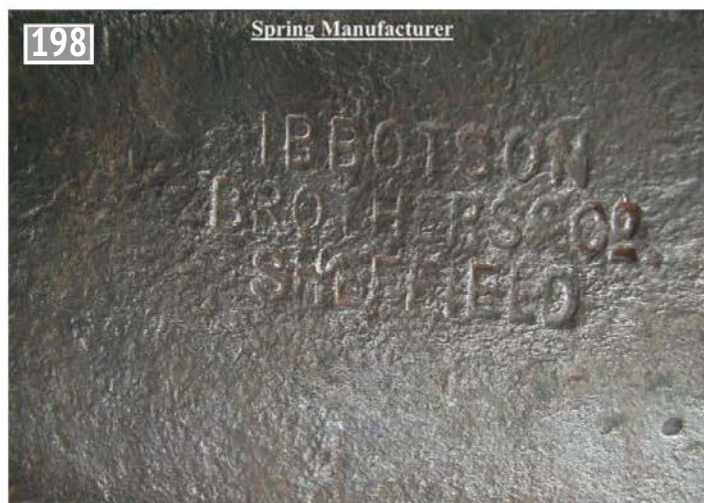
hand wheel identical to the reversing screw on the engine. I'm guessing the builders used the one as a pattern to cast the other.

The light bracket at the back of the tender (photo 193), as well as the coupling link mismatch to the engine (photo 194), is yet another clue to the tender's previous life on a standard line.

The sanding gear for the locomotive was on the tender



A very rare photograph of the inside of the tender tank; notice the wheel cut-outs to the left of the tank leg.



Stamping on the tender springs.

and not the blower box at the front of the engine, which is continually referenced as the sanding gear by the 'experts' on the Internet. These were just funnels mounted to the front of the tender tank with pipes to the front wheels (photos 195 and 196). This would suggest that the locomotive ran chimney front to Penscoins, and reverse to Llanberis, which was uphill.

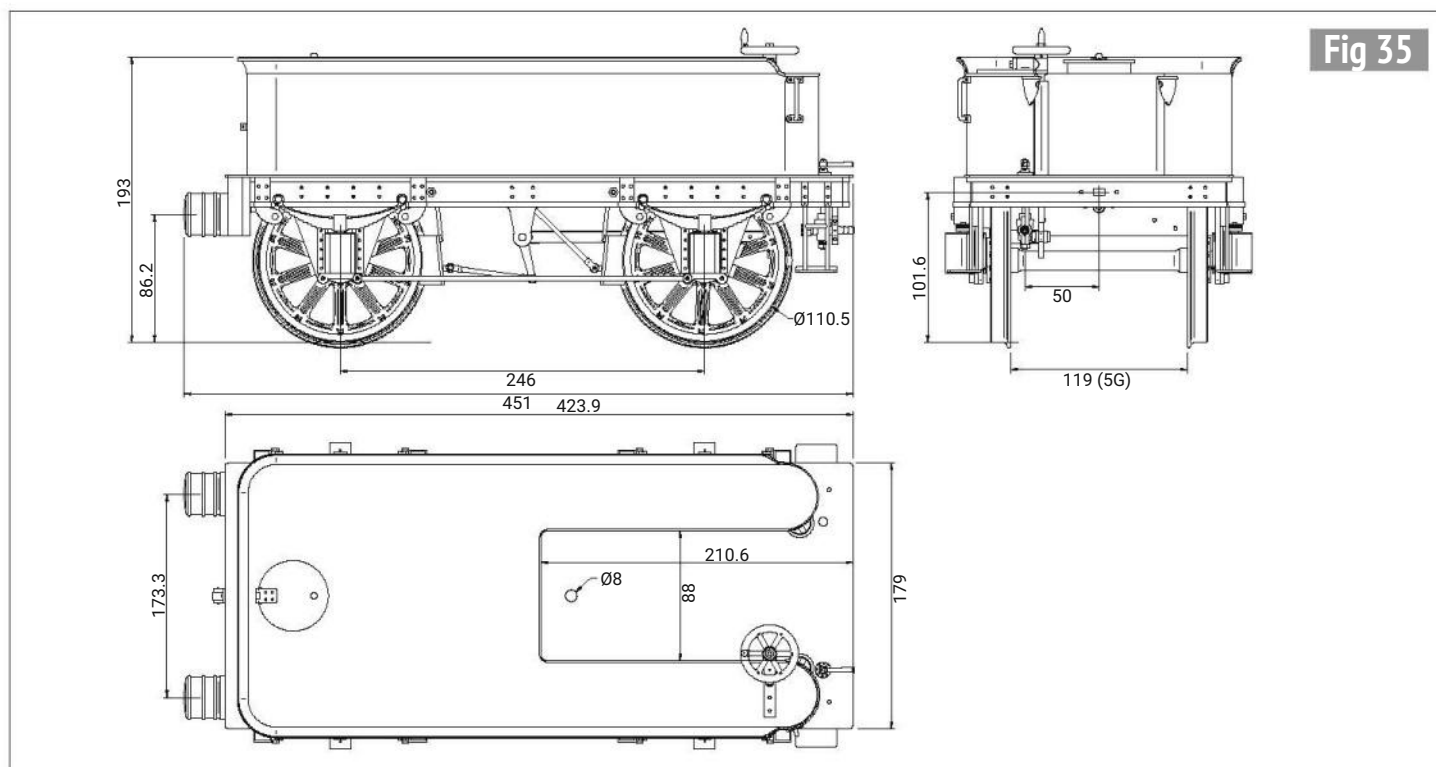
As a little side note, Mr. Lander was kind enough to send me rare photographs of all parts of this locomotive that the average visitor would not be able to see. One such photograph was the inside of the tender (photo 197). The cut-outs for the wheels are just visible; this was one of the details that I kept in the design to get the relative height of the assembly and the size of the wheels to scale. What

struck me is how good the tender looked on the inside; I would have expected far more corrosion.

The origins of the tender

Mr. Lander's notes did not mention which line this particular tender came from. In the past, readers of *Model Engineer* have come to the rescue when information was lacking and I was left scratching my head. It would be interesting to know where this tender came from, so if any reader is keen to give us a keyhole glimpse into forgotten railway history, the clues that Mr. Lander gave me are as follows:

- The springs and centre holding box were stamped with 'Ibbotson Brothers & Co.', Sheffield (photo 198).
- The coupling hooks on both the tender and the engine



The Fire Queen tender general arrangement.



Front view of the tender showing the pipe couplings in line with the tender wheel flanges. This alignment caused the flexible to rub on the engine rear wheels.

are at right angles to the norm, resulting in undesirable twist when hooked. This would imply that a link was removed to shorten the free play in the chain.

- The water pipe fittings were 2½ inches in diameter and are only ½ inch from the engine back wheel flange, again pointing to the tender coming from a standard gauge line (photo 199).

The model tender design

In the end I designed the tender to be a partial ride-on for the

driver. The design itself is very close to the prototype with very few changes (fig 35). The frames and tank were shifted inward to match the gauge which serendipitously sorted out the water flexibles rubbing the engine wheels. This minor change made the tender look a little better in my humble opinion. You would, of course, need to be a keen railway historian to pick this up as it is not visible from the side.

I designed the tank to be a stainless welded construction which would require a certain

amount of skill (actually just practice) to weld. Nothing stops any builder modifying the design for a brass construction with angles (or tabs) and a dash of soft solder, although the cost of this would be more than two stainless tanks, the welding equipment and a good book on the basics of TIG welding. And of course, the chance of learning a new skill set would be lost!

The coupling point for the driver's cart is bolted to the bottom of the tank to avoid any holes or bars on the frame, and is a much stronger point on this tender than connecting to the frames. This would need to be changed if a brass construction is adopted. When I get to the tank I'll give a little more detail on the methods I use to make these types of tanks and the common pitfalls with this type of welding.

The springs on the prototype were incredibly stiff. Interestingly enough, Mr. Eric Lander did a few calculations of the spring deflection of the tender, and with the tender fully loaded the deflection was a mere ¼ inch. For the model they were lightened slightly to carry some of the driver's load

but they were still designed to run at the bottom of the horn blocks like the original.

I modelled the brake system to be fully functional but the intention was to only use it to lock the locomotive in place on the display stand, or in the steaming bays when steaming up. The driver's cart that I use for my other tenders has a neat little hand brake that works really well by braking the wheels loaded by my unique physique. This will be added to the series and can be adapted relatively easily for any small tender, even on raised tracks.

Enjoy the mini-series!

This quirky little tender gives the finished assembly the character it deserves. There are a number of little bits and pieces that make the construction and design interesting, accompanied by my usual use of modern manufacturing techniques and casting methods. I hope readers enjoy the mini-series!

All photographs except photo 188 are courtesy of Mr. E. Lander.

●To be continued.

The Midlands Model Engineering Exhibition

Display Classes

PART 2

John Arrowsmith reports on the display classes.



Continued from
M.E.4731 December 1

I covered part 1 with the club stand winners and some of the other displays which made up the 2023 Exhibition. Hopefully, I can complete the rest of the presentations on show here in Part 2.

One of the features of the whole show is the outside activities of the **Fosseway Steamers** (photo 25). This group of regular participants can always capture the sounds and conditions of steam operated road vehicles which so many people enjoy. They did not disappoint this time either with some good-looking engines and demonstrations which provided endless entertainment for the whole show. I never fail to be amazed at the build time of some of these engines, which I know these days can be acquired as kits but nevertheless to build a 4 inch scale traction engine in about three years when you



The line-up of the Fosseway Steamers during the show.



A picture of contentment, with grandfather and grandson preparing their 4 inch scale traction engine.



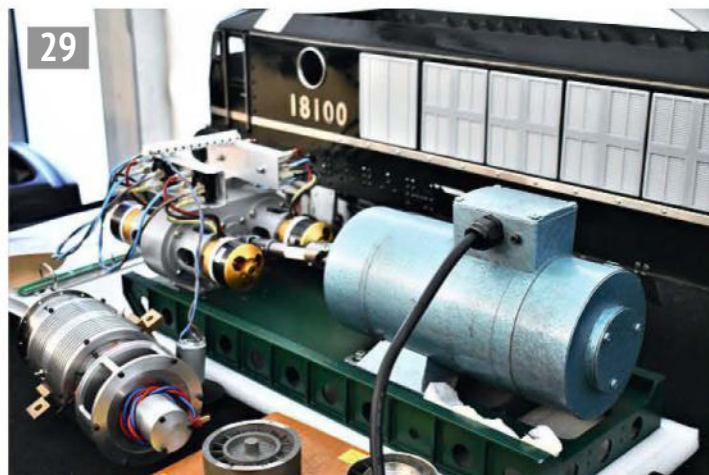
10-year old Will Haynes with his dad's 4 inch scale Burrell traction engine.

are 15 or so takes some doing. That was the achievement of Luke Crowther who was there with his granddad and a 4 inch scale Burrell traction engine aptly named *The Apprentice*. Luke had made a fine looking engine (photo 26) and clearly knows what he is doing because his fellow steamers voted him to be the winner for the **Best Engine Management Trophy** during

the show. Another young man who enjoyed himself at the show is 10-year old Will Haynes who even at this young age is an experienced traction engine driver. Not only does he manage his dad's 4 inch Burrell like a seasoned pro (photo 27) but he is accepted by the senior members completely and was quite happily driving the engine which won the **Fosseway Steamers Award**, Paul and



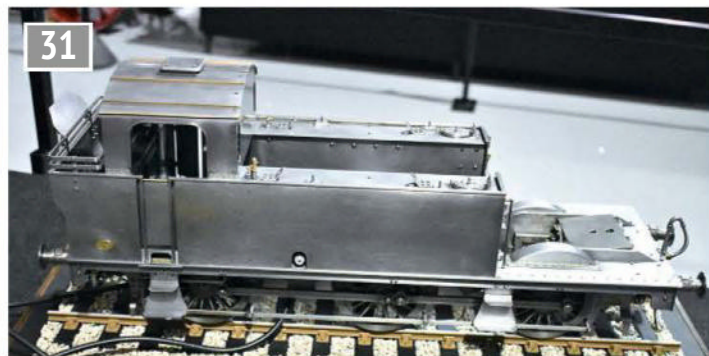
Will Haynes driving Paul Riley's 4 inch scale Foster on the rally field.



The Western 18100 gas turbine locomotive.



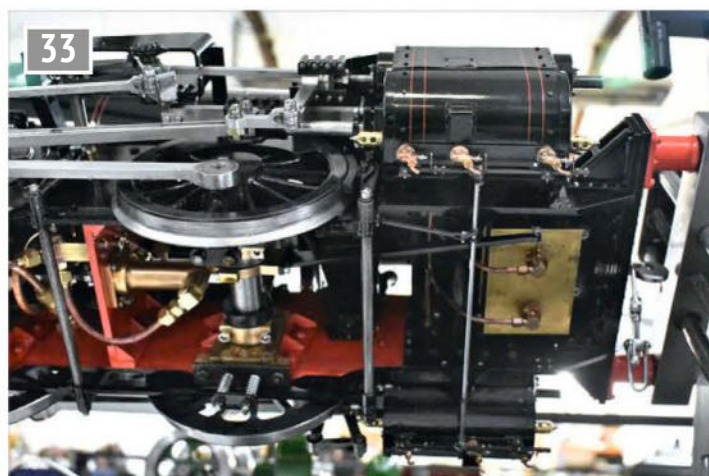
In Display Class 2 was this excellent Ivatt Class 4 Mogul built by Bernard Clark.



A little 3 1/2 inch gauge LMS 3F Jinty under construction by Richard Folwell.



This 1501 tank locomotive was on its building stand and showed some excellent details.



Impressive work on the 1500 tank locomotive being built by Roger Froud.

Sue Riley's 4 inch McLaren, around the site field (**photo 28**) with the owner sitting relaxed on the trailer. Not only that but he was also looking after Richard Kew's engine while it was operating the large saw mill. It is very nice to see such a capable young man working away who has a good future in front of him in the traction engine world.

It was good to see the **Gas Turbine Builders Association** returning to the show with their range of high-tech models and

equipment. One of the almost completed models on show was the Western Region class 18100 gas turbine locomotive started by Gerry Burchell a few years ago and now being completed by the Association. My picture shows the main body and chassis with the twin engine unit alongside on its test bed (**photo 29**). It will be good to see how this locomotive performs on the track in the future.

In **Display Class 2** there were two excellent entries,

one by Bernard Clark was his 3 1/2" gauge Ivatt Class 4 2-6-0 Mogul, a rare model prototype with a double chimney (**photo 30**). The other model in this class was still under construction but such is the quality of the work I think it will be a future prize winner. The model was a 3 1/2 inch gauge LMS Jinty 0-6-0 being built by Richard Folwell (**photo 31**). Another individual entry in **Display Class 3** was a Western Region 1500 class tank locomotive displayed on

a building stand, still under construction by Roger Froud. This model is showing some excellent workmanship and fittings and was a real crowd puller (**photos 32 and 33**). There were two other models in this class as well, both 5 inch gauge models. The scale model of a BR Class 9F Evening Star is being made to works drawings by Bob Shephard and regular visitors to the show will have seen the progress over the last few years. It is now approaching completion with



Bob Shephard's impressive 5 inch 9F is progressing well.



Bob Shephard's 9F tender chassis.



The 4 inch scale Garrett traction engine under construction by Richard Betts.

the boiler cladding fitted and the tender chassis showing real quality (**photos 34 and 35**). Another fine chassis in this class was that of a Class 37 Diesel locomotive being built by Michael Checkley which is also showing some fine work.

There was only one entry in **Display Class 6** for Steam

Road Vehicles and that was the 4 inch scale Garrett being constructed by Richard Betts. This will be a good example when complete (**photo 36**). In **Display Class 10** the radio-controlled large sailing barge built by Tony Judd was an excellent example of this type of craft, full of detail and



John Luscott displayed this superb example of a BSA Gold Star motor cycle in Class 15.

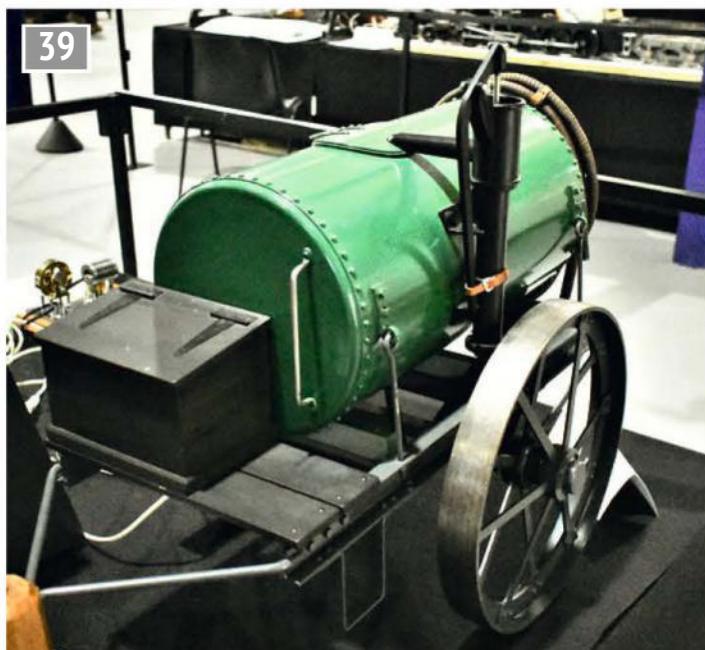
interest (**photo 37**). The original was based at Lymptsham Wharf on the River Exe in the 1900's. One model that created a lot of interest was the 1:3.5 scale model of a BSA Gold Star motor cycle built by John Luscott in **Display Class 15**. It was a superb example and brought back lots of memories

for some people including one of the judges who still owns one (**photo 38**).

Another entry in this class was the little traction engine water cart based on the John Fowler 200 gallon cart and built by Derek Morris (**photo 39**). In the final **Display Class 16** the little 'Jan Ridders'



The large sailing barge by Tony Judd.



A little water cart based on the John Fowler design.



John Wing's example of a Jan Ridders hot air engine.



This 3½ inch gauge 2-2-2 LBSCR Grosvenor was built by Carl Jones, a member at the Birmingham SME.

engine built by John Wing was an excellent and well finished model (photo 40).

Going back to the club displays, the **Birmingham SME** stand (photo 41) had lots of interesting models on show including a very nice example of an LB&SCR G Class 2-2-2 locomotive *Grosvenor* in 3½ inch gauge built by Carl Jones and finished in Stroudley's 'improved engine green' livery (photo 42). Also on this display was a nice 2 inch scale model of a Burrell Gold Medal traction engine (photo 43) owned by Stephen Harrison. There was a predominately locomotive theme to the **Bromsgrove Society** display with a range of locomotives in different gauges and regions but all were to an excellent standard and finish. **Wolverhampton MES** also had

a very large display of models (photos 44 and 45) covering many different prototypes providing lots of interest.

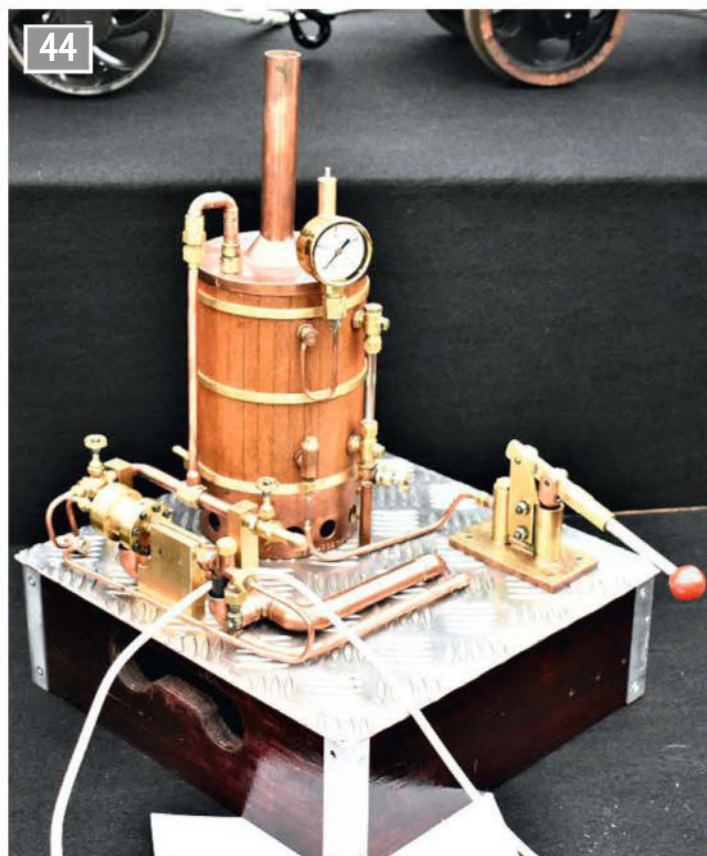
On the **Model Steam Road Vehicles** display the John Fowler traction engine in a striking blue livery stood out as a very well made model (photo 46). As always, the **Stirling Engine Society** had a large range of very diverse engines and models including one I had never heard of before and that was an Essex hot air engine using the Myford Boys castings. This unusual engine was a basic beta configuration with the power cylinder at one end and the displacement cylinder at the other. I was informed the castings were made in a small foundry and were of excellent quality providing an easily machined body for the engine.



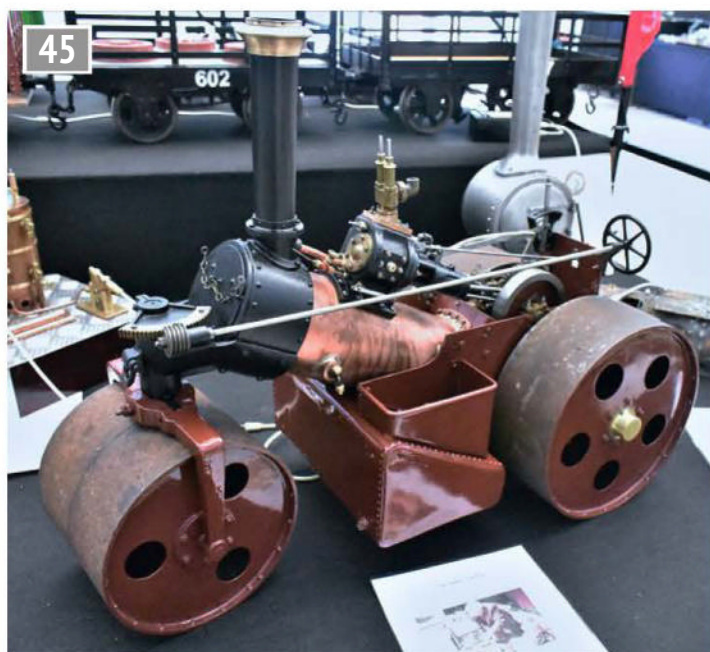
The main display by the Birmingham Society.



A good looking 2 inch scale Burrell traction engine from Birmingham.



A neat little steam plant on the Wolverhampton display.



A Simplicity road roller on the Wolverhampton display.



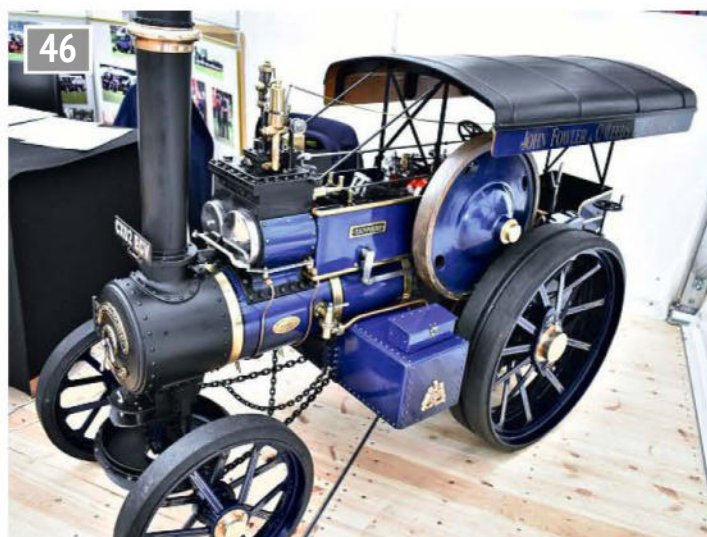
This large field gun was part of the Welwyn Garden City stand.

If nostalgia was your interest then the photographic display supplemented with some fine models on the **London & North Western Railway Society** was the place to be, with many reminders of what this old company's railway was like. A colourful display by the **Gauge 3 Society** showed off what the scenic side of the 2½ inch gauge railways could offer. Alongside was the **National 2½ Inch Gauge Association** which a well filled display of locomotives and fittings covering the large range of prototypes offered by this group. From the **Welwyn Garden City SME** came a very diverse range of excellent models from some well-made military examples, through radio controlled rally cars, to

boats and more traditional model engineering models all laid out in an easy to see style (photo 47).

A display which always fascinates me is that by the **Society of Ornamental Turners**. These amazing machines make some superb shapes and designs which are almost impossible on a normal lathe but here they are just almost second nature. Tom Badger was busy on the lathe and looked completely at ease (photo 48).

Well that was the Midlands Exhibition for another year. I think it was an excellent show which hopefully next year will have more entries in each class and provide an even better experience for both visitors and stand holders.



A very smart John Fowler engine on the Model Steam Road Vehicles display.



Working on the lathe is Tom Badger from the Society of Ornamental Turners.

I must thank the organisers Meridienne Exhibitions and all the participants again for producing an excellent event for visitors and modellers alike. The catering was very good with reasonable prices, there was ample free parking and the

location in almost the middle of the UK makes for easy access. So put next year's dates in your diary now and make the effort to attend, you will not be disappointed.

Geoff Theasby reports on the latest news from the clubs.



In a box of miscellaneous items from the auctions, I found some 1950s model train speed controllers by H&M, which were highly regarded in their time. One was mains powered but did not provide a negative 12 volt output for reversing. I discovered that the transformer was not wired as I thought but I did think that a quick and easy variable 12 volt supply might be useful on the bench so I rebuilt it, replacing the selenium rectifier, and it works fine. Electrically, it is a variable transformer - a moving contact varies the voltage out, like a Variac - but the transformer is double wound for safety and operates at 12 volts only.

In this issue: pictures, suds, boilers, trams, AI, turds and high-tech dust suppression.

Vale of Aylesbury Model Engineering Society sends *Aylesbury Link*, autumn, in which the entries for the Chairman's Cup are discussed. This award is for the best-made item and is not restricted to railway items, or even metal of any sort, viz. Sue Denty's quilt. Ian Meikle's flower, taken on his mobile phone, was an entry in the photographic competition and Ian's bumble bee (digital section) covered in pollen grains as it raids a plant. Clive Ellam was awarded the Editor's Cup for his three contributions to the *Link*. An accessible viewing platform has been constructed so that wheelchair users and buggies can get close to the trains in safety. Bill Spear writes on the Oxford Worcester and Wolverhampton railway, otherwise known as the *Old Worse & Worse*. The relationship 'twixt GWR and OWW was tempestuous, not to say cantankerous, which only ceased when they amalgamated 18 years later. Roger Lloyd describes the purpose to which Catesby Tunnel has been returned to use, not for a railway, but as a stable weather and windproof testing ground for Formula 1 cars. Other purposes include noise measurements and emissions etc. for motor bikes,

campervans etc. Other useful facilities widen its appeal to many industries. Due to the presence of bats making one tunnel entrance their home, and the need to leave them in peace, the tunnel took four times as long to modify as the original did to build in the 1860s. Mike Oxley wrote in *Model Engineer* of the 1950s, on how to turn items in the lathe. For instance, making a replacement Thrupple Nut for a lawnmower - these are frequently needed because of inadvertently finding such an item in the long grass, which damages the mower. A neighbour of mine decided to start his own business, recycling chewing gum. An ancient suds (cutting coolant) formula was resurrected, involving gearbox sludge, phosphoric acid, corrosive sublimate B.P. which was then applied to a piece of Admiralty Bronze, using a 273 tooth gear. Grind off 2 teeth if you only have a 275 tooth gear. (It continues in this improbable vein, concluding with an appeal for buyers of a second hand lathe, 49 gross half-finished Thrupple Nuts and a disgusting brown fluid.) Robin Howard improved a cheap puller, which worked very well afterwards. The gardeners in the membership may care to consider a method of disposing of whitefly in the greenhouse. As this involves the production of chlorine in quantity, light

the blue touch paper and retire immediately.

W. www.vames.co.uk

Reading Society of Model Engineers, *The Prospectus*, autumn, has a plea from boiler inspector, Nigel, who complains that boilers are being submitted for test in an unsuitable condition - which are with leaks, missing fittings and definitely not checked at home before bringing them in. David Wilkinson discusses means of ensuring that the boilers of steam locomotives sit level in the frame. Mike Manners works on removing problems in the signalling system, with reference to two signals in particular. Terry Wood finalises his 7 1/4 inch gauge locomotive.

W. www.rsme.uk

On the way to MMEX, we spotted a Ford Anglia 105E being trailed to an event (**photo 1**). Just in front was a Triumph Herald of similar vintage. The Ford appears to have some special rear suspension fitted. Hardly a surprise if it is to be raced...

Bradford Model Engineers Society November *Monthly Bulletin*, found president Adrian Shuttleworth feeling good. The month of October passed very well for BMES, what with the Annual Dinner, the Open Day and the Visitors Day, which brought model engineers from Spenborough, Wakefield and Keighley. Dominic Scholes took some of the stationary engines on tour to various



Ford Anglia 105E race car.



Ashmead sail boat at MMEEX.

schools and groups. Martin Birch talked (and wrote) about making his Three Trams from the Isle of Man. SMR Car 4 was built first, 3 foot 6 inch gauge, and with a bow collector for the 500 volt supply. This was followed by Manx Electric Railway Car No 1, 3 foot gauge, which has a trolley pole current collector, and is fitted with Hughes patent couplers, of 1888, US patent 376386. The third will be a battery electric steplecab locomotive from the Groudle Glen railway for the 2 foot, Manx Narrow Gauge (Manx standard is 3 foot) 4 wheel drive engine, *Polar Bear*. Jim Jennings referred to an incident at Aviemore on the Strathspey Railway. He was standing on the platform watching a locomotive couple up to a coach. They were both fitted with buckeye couplers, which demand quite a forceful contact to mate properly. The first attempt was too gentle and the locomotive backed off to try a more insistent connection. This time it was successful but a female passenger spilt her coffee. This was the exact platform and location where, 65 years later, *Flying Scotsman* was involved in the very same type of incident. Well! David Jackson spotted a DFP Car at a rally, which led him to information of which he had no ken. (A French vehicle, M'Lud, the company lasted from 1906 to 1926.)

W. www.bradfordmes.uk

Also at MMEEX was this rather fine Severn Trow, *Ashmead* on the Lymsham Wharf diorama (photo 2).

Stamford Model Engineering Society, October, had editor, Joe Dobson, driving *en famille* to 'La Grande Republique' in his Citroen TA. This got them there and, hesitantly, got them back. The people with whom they stayed had bought a business offering short stay holidays in two restored Pullman cars at Petworth station. The station is two miles from the nearest town and was built solely to

give Edward VII easy access to Goodwood. Bolton Abbey station on the Embsay & Bolton Abbey Railway was built for a similar reason, to give the Duke of Devonshire easy access to Bolton Abbey. Joe is very exercised about AI and its unclear connections between intelligence and artificial, novel methods introduced since 1845 which are aimed at improving productivity and efficiency. One such was known as Critical Path Analysis; it was pushed by the US, in building Polaris submarines. The UK, with its centuries of experience, eschewed these techniques and as a result the UK-built Polaris submarines were late and over budget. This may not have been important, as the missiles proved inaccurate when launched. This led to Expert Systems which collect seemingly insignificant details which were discovered to be linked in various ways. Thus 'Big Data' and the ability to go Data Mining. This is all very well but it is derivative, relying on historical data, and thus not allowing for innovation and originality. John Hennessey has bought a jukebox, which he has cosmetically restored.

The innards have a few problems, as it is very complex electromechanically, but it does work and sounds good. Colin Furze, a local inventor and stuntman, with his own YouTube channel, showcases his extremely inspired engineering projects. It is claimed that his channel makes between £26k and £425k p.a. mostly from advertising. He was booked to explain all at the meeting on 7 November.

Another unusual contribution was this Meccano *Flying Scotsman* by John Thorpe. I have not seen such a comprehensive Meccano model before. Well Done (photo 3)!

Model & Experimental Engineers, Auckland Newsletter, for October, has been edited by Graham Quayle, as Murray is in hospital. Ken has begun a steam group at MOTAT and they are restoring the John Key twin beam engine. It is based on Tubal Cain's *Mary*. Ken made drawings 20 years ago and Graham has laid out the valve events in AutoCAD and they are fine. It will weigh about ¾ ton, is 6 feet long and with a 1 metre flywheel. (Interesting conjunction of



John Thorpe's Meccano Flying Scotsman at MMEEX.



Witham Cove, at Sheffield Model Railway Exhibition.

mensuration standards there – Geoff.) Ken Pointon spoke on the Newcomen engine. The barrel acts as the top-level water tank. It had been fibreglassed twice but still leaked. A rubber sealant fixed it. Ray applied compressed air to his Fowler ploughing engine, which runs beautifully in forward gear but not reverse. It is a dual crank compound using Firth gear, a modification of Hackworth. Another publication *Steam Torque* is the magazine of the Auckland Steam Engine Society. MEEA's Russell Ward is a member.

My long case clock works! As with any pendulum timepiece it must be truly vertical or it will not run. I found that mine is very sensitive to this and after trying credit cards, post cards etc. as a means of tilting the clock slightly, found that the ideal material for the purposes was a defunct computer CPU devoid of its heat sink etc. Using a circular spirit level on the movement (the case may not be truly vertical) brought about the correct angle – 'The Leaning Clock of Firth Park'. I am now inclined to sort out the chimes. The hammers were mangled for some reason – mouse body-building club mayhap? Instead of a nice parallel row of hammers they were every which way, even interfering with each other.

Watching a recording of QI on the TV, mention was made

of unusual words, one of which was 'turdoid' (see M.E. 4727). No sniggering at the back, there! The Latin name for the mistlethrush is *turdus turdus* and the family includes the American robin and the UK's blackbird. Also, goodness knows how, I found some electronic music by Perseveres Squirms (?), one track being labelled 'Turdoid'. Not a lot of people know that...

Witham Cove at Wakefield Model Railway show was very good. The stallholder told me how he made the railbuses from two period model vans (the green model apparently stuck in the mud below the bridge) (photo 4).

The Stephenson Link, from **Chesterfield & District Model Engineering Society** editor John Walker, makes a rash offer of a prize for a winter project from a drawing. Each of the two components shall be in one piece, or fabricated. The material is available from Auntie Wainwrights' emporium and judging will be on April 1st. Kev Willis, a 'Steam Rookie' normally spends his time on the fencing at Hady Hill. One fellow member of the team, Derek Blackshaw bought an American NY&HRR 4-4-0 about eight years ago but has only just finished making it presentable. So, hearts in mouths, the fencing team tentatively took the engine once round the track, with the rest

of the team acting as travelling mechanics or offering moral support. After a successful run, tensions eased and the others had a try. Everything went so well that they began to wonder what the fuss was all about. Matthew Smith borrowed Dave Penney's Austerity 0-6-0 ST and after a little shunting, made up a scale length goods train. Such Fun! Adrian Lloyd continues the

tale of his Land Rover Series 2. Don't ask about MOT, tax or insurance, he was young then. All was well, until, descending a steep ravine, he mistook the hand throttle for the windscreen wiper. Oh Calamity! Four passengers and a spare wheel slid helplessly around the rear floor as the engine propelled them out of the ravine at a rate of knots. The next adventure involved the colour of the diesel fuel, nudge, nudge, say no more, Squire...! In accordance with H&S suggestions, the cutting machine for plastic sleepers has been provided with a dust suppression cover. This comprised a large cardboard box, dwarfing the cutter but collecting most of the plastic dust.

W. www.cdmes.co.uk

This calculator works without electricity or the internet. Gosh! What will they think of next (photo 5)?

And finally, my neighbour, a retired power line technician, is 100. He's reached his catenary...

ME



Power cut? Work onwards with this calculator? Kelham Island Museum.

Club Diary

15 December 2023 – 18 January 2024

December

15 Bristol SMEE

Zoom meeting – your questions answered by wise men, 19:30. Contact: secretary@bristolmodelengineers.co.uk

14 Newton Abbot & District MES

Mince pie night at Rydon Community Hall, Kingsteignton. See nadmes.org.uk

15 Rochdale SMEE

General meeting, Castleton Community Centre, 19:00. See www.facebook.com/RochdaleModelEngineers

17 Canterbury MES

Public running. Contact: ginapearson@btopenworld.com

17 North Wilts MES

Public running at the Coate Water Railway, 11:00-dusk. See www.nwmes.info

17 Taunton Model Engineers

Public running – Santa Steaming, Vivary Park, 12:00-15:00. See www.tauntonme.org.uk

17 Warrington & District MES

Running day at the club track. See www.wdmes.org.uk/events

19 North Wilts MES

Public running at the Coate Water Railway, 11:00-dusk. See www.nwmes.info

19 North Wilts MES

Public running at the Coate Water Railway, 11:00-dusk. See www.nwmes.info

20 Bristol SMEE

Ordinary meeting, Begbrook Social Club BS16 1HY, 19:30. Contact: secretary@bristolmodelengineers.co.uk

21 Warrington & District MES

Talk: Julian Stow on 'Talyllyn Railway', St Mary Magdalene

Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

26 North Wilts MES

Public running at the Coate Water Railway, 11:00-dusk. See www.nwmes.info

26 Sutton MEC

Boxing Day run from 10:00. Contact: Paul Harding, 0208 254 9749

27 Bradford MES

Mince pie steam-up, Northcliffe, 12:30 until frostbite sets in. Contact: Russ Coppin, 07815 048999

4 Sutton MEC

Bits and Pieces evening 20:00. Contact: Paul Harding, 0208 254 9749

4 Warrington & District MES

Projects/natter night, St Mary Magdalene Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

14 Sutton MEC

Track Day from 14:00. Contact: Paul Harding, 0208 254 9749

17 Bristol SMEE

Talk: 'Narrow Gauge Railways of India', Begbrook Social Club BS16 1HY, 19:30. Contact: secretary@bristolmodelengineers.co.uk

18 Warrington & District MES

Talk: Ian Lewis on 'Early Jet Aircraft', St Mary Magdalene Church, WA4 3AG, 20:00. See www.wdmes.org.uk/events

2024

January

3 Bradford MES

Talk – Graham Astbury, 'Twist Drills', Saltaire Methodist Church, 19:30. Contact: Russ Coppin, 07815 048999

NEXT ISSUE

Butterside Down

Steve Goodbody is back with further tales of the trials and tribulations of pursuing our all-consuming hobby.

Workshop

Peter Seymour-Howell moves *Flying Scotsman* into his newly completed workshop to resume work on construction.

Dynamometer Car

Brendan Gill builds a dynamometer car for the Chichester and District SME

Huddersfield

We visit the Huddersfield Model Engineering Society.

Biscuit Tin Engine

Tony Bird discovers a tin of random parts and turns them into a slightly less random impression of a steam engine.



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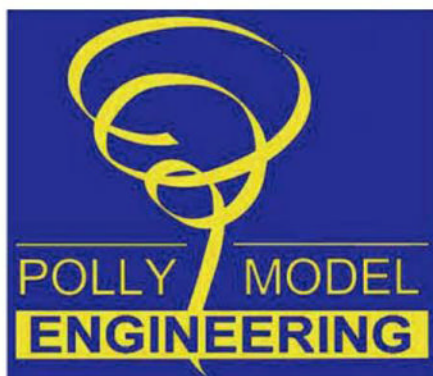
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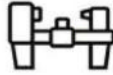
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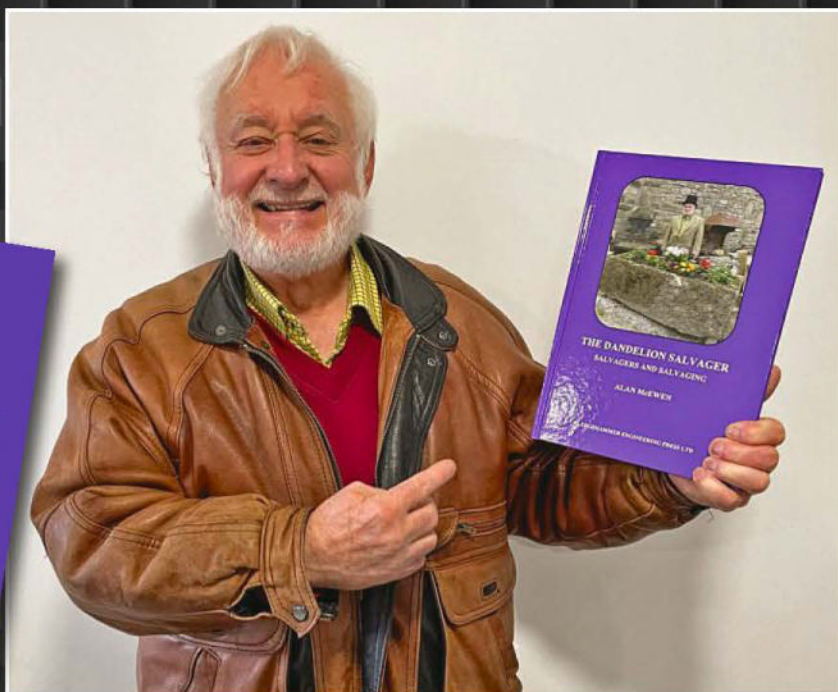
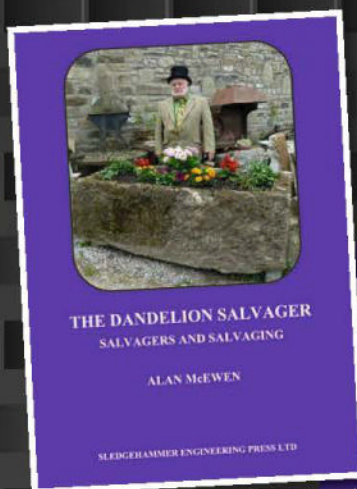
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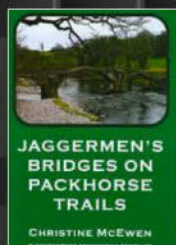
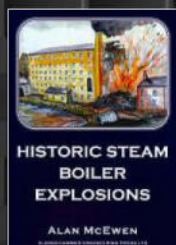
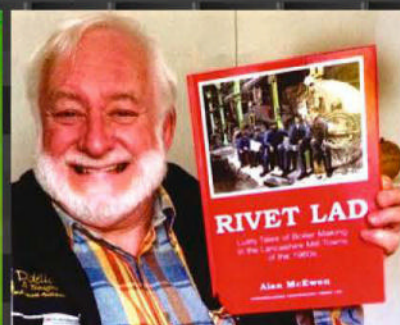
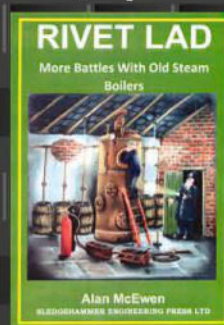


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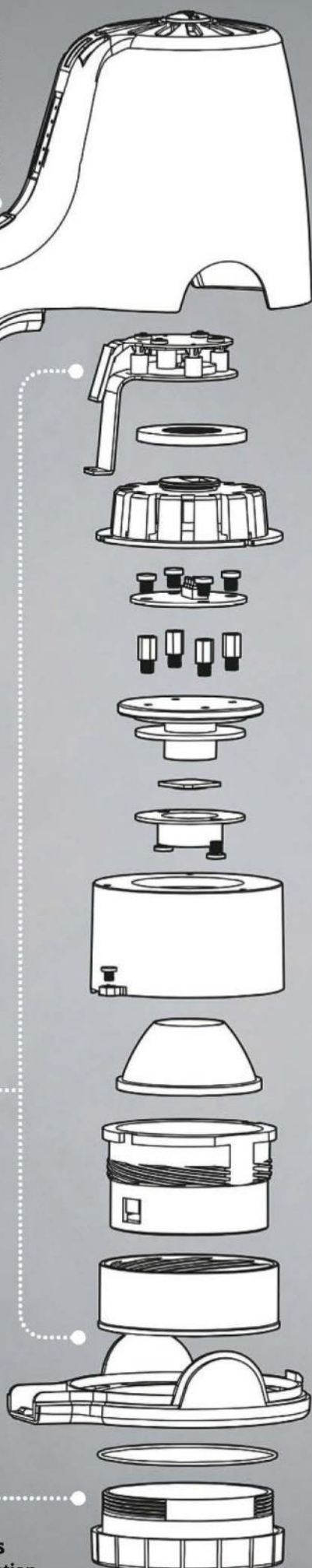
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