

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

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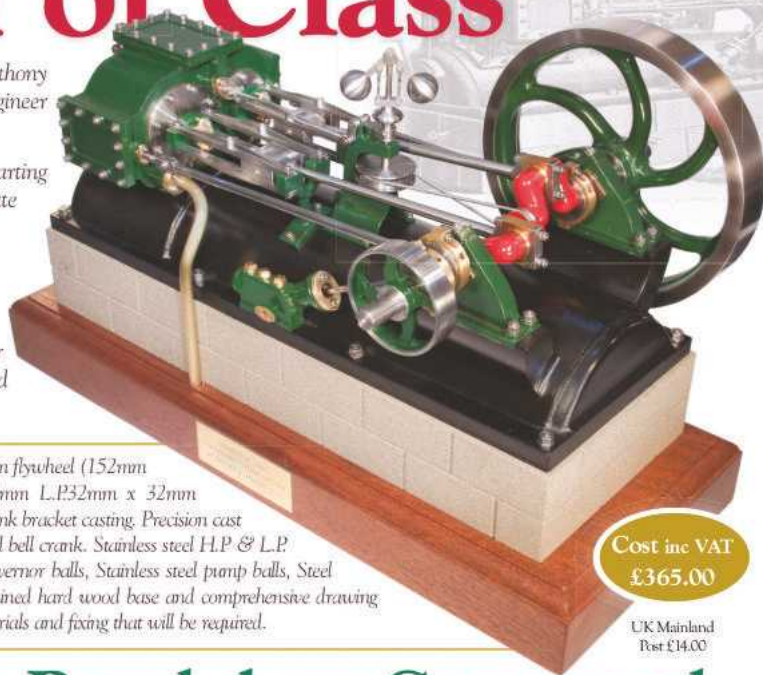
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Lego Traction Engine

John Cramp writes:

'This is my model of a Traction Engine built from LEGO. I've designed the model as part of an initiative called *LEGO Ideas*. This is where amateur designers are invited to submit their models to the *LEGO Ideas* website and then members of the public can view the models online and vote for them.

If the model is lucky enough to reach 10,000 votes then it will qualify to be reviewed by LEGO with the view of manufacturing it as an official LEGO set.

'One of the reasons I'm doing this is to try and promote interest in road steam heritage amongst children and young people. I'm sure there are many kids out there who've never seen a Traction Engine before which is a great shame. So, I think LEGO would be a great way to get children enthused and excited about these magnificent machines and steam heritage in general. Not to mention the fact it would make a great model for adult collectors as well.

'If you like the model and would like to see a Traction Engine produced as an official LEGO kit then please cast your vote on the *LEGO Ideas* website at the following address:

www.bit.ly/tractionengine

'Thank you very much.'

LOWMEX

The fifth Lowestoft Model Engineering and Model Making Exhibition will take place at the Ormiston Denes Academy over the weekend of the 20th and 21st of October. This year's event, as last year's, will showcase local and not so local clubs and societies with a range of modelling disciplines, from traditional model engineering in all its guises to boats, aircraft, model railways, dolls houses and steampunk etc. This year the exhibition takes over two large halls and at least eight classrooms, with live steamers and



other displays outside, weather permitting. The exhibition is organised by the Halesworth and District Model Engineering Society.

The beneficiary will again be Special Objective for the Local Disabled (S.O.L.D.) a local charity that helps get disabled people access back into a workshop environment. Further information about the exhibition and S.O.L.D. can be found on the exhibition web site www.lowmex.co.uk

Midlands Exhibition

This year, the ever-popular Midlands Model Engineering Exhibition will be returning to the Warwickshire Event Centre from Thursday 18th to Sunday 21st October. It is established as one of the leading model engineering exhibitions and the second longest running show of its kind in the UK. At four days in duration it is a comprehensive and full exhibition for everyone to enjoy - this is THE show for model engineers.

Over 50 of the leading suppliers to the Model Engineering world will be present - check out the confirmed list of trade attending on the website. The exhibition showcases hundreds off models from over 40 societies and individuals for visitors to enjoy along with a wide range of outside attractions, workshops and lectures.

There is also a wide range of outside attractions to see, like the well regarded 5 inch gauge outdoor track, operated by the Coventry Society of

Model Engineers and the Polly Owners Group, who will return along with the magnificent Fosse Way Steamers. There will be demonstrations from the Gas Turbine Builders Association and also Noel Shelley with his foundry work.

More information may be found at www.midlandsmodelengineering.co.uk

Welling MES

The Welling and District Model Engineering Society are looking for a new site, having occupied the present site behind Eltham Electricity substation at Falconwood for 41 years. They have to move as National Grid require the area at the end of this year to sink a deep shaft so they can bore tunnels to carry cables to other substations. The Society is in negotiations with two local councils for a new site, so their Open Day on the 6th of October 2018 for members of other societies and Gauge One members will be their last at this site.

Further information is available at www.wdmes.co.uk or from Martin Thompson on 01689 851413.



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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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An Engineer's Day Out

Roger Backhouse pays a visit to the Isle of Man and takes a ride on the Manx Electric Railway.



September 2018 sees a remarkable anniversary: 125 years since the opening of the Manx Electric Railway. It first carried fare paying passenger on 7th September 1893 from the island's chief town Douglas to Groudle, just over 2 miles away. An extension to Laxey opened the following year and the final stretch to Ramsey in 1899, making the line 17 miles long. It preceded the Blackpool tramway, making it the first true electric tramway in Britain. Cars 1 (**photo 1**) and 2 are original to the line.

Although the Isle of Man Railway and Manx Northern Railways linked Douglas with Ramsey by 1879 it was a circuitous route via St Johns. Difficult terrain on the direct east coast route suggested an electric tramway as a practical solution. The developer's name suggests the Isle of Man Tramways and Electric Power Co had ambitions beyond a



Number 1 is the oldest car in the fleet, supplied by G.F. Milnes of Birkenhead in 1893.

tramway. Like most island lines it was three foot gauge but was built double tracked throughout.

Steam locomotives were borrowed to help construction. Like a number of railways, construction was delayed by financial problems stemming from the collapse of the island's Dumbell's Bank. The Tramways and Electric Power Co went bankrupt in 1903 but was then operated by the newly formed Manx Electric Railway until the 1950's when the Manx Government took over and acquired the Snaefell Mountain Railway. (This and other railways will feature in future articles.)

The route

From car sheds (**photo 2**) and repair shops (**photo 3**) at Derby Castle at the north end of Douglas promenade the line rises at a gradient of 1 in 23 to Onchan and then on lesser gradients to Howstrake, 1½ miles from Douglas. It then dips to Groudle Glen crossing a viaduct and rises via Garwick to Ballameanagh where the line drops to 100 feet above sea level at Laxey, 7 miles from Douglas.

After a climb through Minorca it reaches the line's summit at 588 feet about 10 miles from Douglas before descending to Cornaa and then rising past Balaskeig with a mostly gentler descent, including a viaduct at Ballure, to near sea level at Ramsey where there was another depot. This switchback line tests motormen as there are few level or straight stretches anywhere on the line but it offers magnificent views across to Cumbria on a clear day (**photo 4**).

Station buildings are generally just shelters, originally built to a rustic pattern. A few originals have



Derby Castle depot and workshops. The Electric Railway sign on the hillside is worthy of Hollywood!



Derby Castle workshop interior.



Car number 7 and trailer above the sea. The line climbs to nearly 600'. This car was bought in 1894 ready for the winter service.



Car number 19 seen at Douglas is one of the "Winter saloons" introduced in 1899. The rustic style station buildings were once typical of the line. A few survive.

survived, notably at Douglas (photo 5).

Cars

In appearance Manx Electric Railway cars resemble an American Inter-Urban of the 1900's (photo 6). G.F. Milnes of Birkenhead built

saloon motor cars with a high strength-weight ratio and a distinctive corner entrance for the opening followed by vestibuled saloons and toastrack cars. They later built trailers. Motor cars used Milnes own plate frame motor bogies (photo 7).



MER cars could almost come from an American Interurban. No 57 at Ramsey. This car was built by the Electric Railway and Tramway Works in 1904. Note the distinctive high clerestory.



Motorized wheel set from MER bogie.

Later the MER purchased Brush and Brill bogies and bought cars from the United Electric Car Co of Preston. All cars are maintained in the works at Derby Castle, Douglas (photo 8).

Car No. 1 is the oldest working electric car still working on its original line anywhere in the world, a tribute to the build quality and subsequent maintenance.

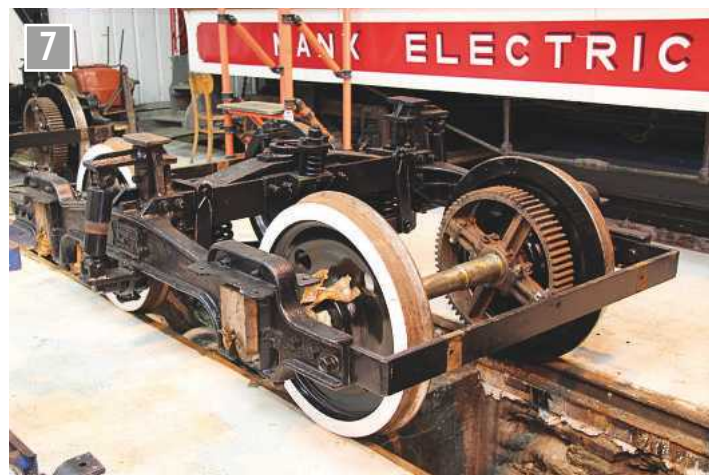
Control gear was originally provided by Mather and Platt but this was somewhat experimental and was replaced by American General Electric Company K11 and K12 controllers which proved highly successful.

Car No. 59 is the smallest in the fleet. It is known as the Royal Car because on occasions it has carried royalty. Now it is used for special excursions (photo 9).

Powered cars usually work with a trailer. Later built cars are powerful enough to work with two trailers but this practice is now unusual. Cars first used a Hopkinson patent sprung bow collector but current collection is now via a conventional trolley pole.

Cars have Hughes patent couplers. Unfortunately coupling heights are not uniform so joggled couplings are carried to enable coupling to different types of car.

The MER also had a 12 ton steeple cab locomotive (No. 23), designed by the line's engineer Frank Edmondson and built at the Derby Castle works in 1900. Number 23's main purpose was to handle stone traffic and other freight though it appears wagons were often hauled by ordinary passenger cars.



Bogie restored at Derby Castle works.



Car 59 is known as the Royal Car, having carried royalty. Built by Milnes in 1895 it is smallest in the fleet and is used for parties and special excursions.

Power supply

The line was electrically worked from the outset at 500V DC. Power came from two sources. A power house at Douglas was used initially, then one at Laxey, but soon a Victor water powered turbine generator was installed there in 1899 producing 70hp. This was followed with a major update in 1903-04 with a twin 400hp Bellis and Morcom triple expansion steam engine added at Laxey. It drove Belgian built 7000 volt revolving field alternators of 300kW.

A northern power station at Ballaglass opened in 1898. These were supplemented with battery houses. Traffic peaked as visitors left and returned to Douglas each day so batteries could be charged off peak and then used to supplement the supply at key times.

Laxey later had a turbo-alternator with steam from water tube boilers. Transformer and rotary converters at substations reduced voltage to four lineside sub stations.

From 1934 the Isle of Man Electricity Board supplied electricity and the MER's generators closed down.

Brakes

There are different braking systems in use. While cars can be stopped electrically by using the controller to reverse the car this is not usual practice! Cars have handwheel brakes and there are Milnes patent scotch brakes, applying a triangular 'scotch' to the

wheel rim. When the line was re-equipped in 1902-4 air brakes were introduced for the first time. This has a motor driven air compressor and a reservoir. The motorman has an application valve which allows air to drive a piston in an actuating cylinder applying the brakes.

Goods

Although intended primarily as a passenger line the line carried freight including stone from the MER owned Dhoon Quarry. Stone was transported in unusual road-rail wagons made by the Bonner Company, imported from Toledo USA. These were four-wheel horse drawn wagons that could be mounted on a narrow gauge transporter, one of the few uses of transporter wagons on a British narrow gauge railway. These were introduced to avoid extortionate tolls on rail wagons demanded by the Ramsey Harbour Commissioners had the MER built their line to the town's harbour.

A powered cattle wagon was another unique vehicle, built on a former tramcar underframe, which has been restored. Other wagons were more conventional (**photo 10**).

The line carried mail with conductors having unique roles as auxiliary postmen, collecting mail from eight lineside postboxes. Motorcars also had parcels vans attached. Postal collections continued until 1975, although



MER wagons. The line had considerable freight traffic until the 1920's.

latterly diminished - a remarkable record (**photo 11**).

Disasters

The MER has suffered its share of disasters. One of the worst occurred in 1930 when over four inches of rain fell on the island in 24 hours. The Laxey river burst its banks and flooded the generating station. Although the water turbine was put out of action the steam turbine and switchgear were unaffected. Another disaster occurred the same year when a fire destroyed the Laxey car shed, wrecking four motor cars, six trailers, three tower wagons and a mail van.

The line runs near cliffs in some places and a retaining wall collapse at Bulgham Bay in 1967 required 18 months civil engineering works before the line could be fully restored to traffic. Remedial works involved deep piling and grouting.

Decline

In the early years operations proved profitable with the line highly popular with holiday makers from the mainland and prospering in the Edwardian period. After wartime traffic downturns it saw more use in the 1920's and 30's as holidaymakers returned. After the Second World War visitor numbers again declined and the MER hit serious financial difficulties culminating in nationalisation in 1957. Maintenance suffered and many overhead masts were badly corroded.

Following a widely condemned Transmark

consultancy report, members of Tynwald (the Island's parliament) proposed closure of the Laxey to Ramsey section in September 1975 at a time when the steam railway was reduced to a limited Castletown to Port Erin shuttle. Railways became an election issue in 1976 when more pro-railway members were elected to the House of Keys (the lower house of Tynwald).

The MER is now run as part of Isle of Man Heritage Railways, a department of the island's government, prompting one friend to say of the island "it's so old fashioned, everything's nationalised". The role of steam railways and the MER in attracting visitors is recognised.

Modernisation

During the 1970's attempts were made to modernise the MER using consultancies. These do not appear to have fully understood the nature of the line nor the electrical engineering involved. One proposal included the use of ex Aachen tramcars but though one was brought over it proved unsuitable though some electrical equipment was utilized.

Douglas Tramways

Douglas had a three foot gauge street cable tramway from 1896 to 1929 serving Upper Douglas. The standard gauge Douglas Southern Electric Tramway had a spectacular coastal route round Douglas Head operating from 1896 to 1939. A tramcar



Parcels van used to carry mail from Ramsey and Laxey plus points en route. Post collections by conductors lasted until 1977.



12
Horse tram on Douglas promenade.
These are the world's last regular horse tram workings.

is preserved at Crich Tramway Museum, the only Manx car in their collection. The route is now a footpath. The British Film Institute has preserved film of this line: <https://player.bfi.org.uk/free/film/watch-tram-ride-from-port-soderick-to-douglas-head-1902-1902-online>

Now, only a horse drawn tram operates along the Douglas promenade (**photo 12**). It is the last surviving horse drawn tramway in Europe and still attracts visitors (**photo 13**). It is three foot gauge with toastrack type tramcars linking the ferry terminal with Derby Castle and the Manx Electric Railway. Stables and workshop are near Derby Castle with a traverser outside the car shed (**photo 14**). In 2018 the Douglas Corporation decided to abandon the tramway but it

has since been taken over by the Island's government.

Future

While nothing is certain the future of the island's railways looks assured but more visitors would help the case (**photo 15**). It is surprising how many vintage transport enthusiasts have never visited the Isle of Man. When they make the trip they will not be disappointed.

Other attractions

There is plenty to occupy a visitor with engineering interests but there is much more here than a day out. Attractions include the Snaefell Mountain Railway, Laxey Wheel and lead mining history, Groudle Glen Railway and Isle of Man Steam Railway plus of course motorcycle racing on the TT course. There's even a water powered



13
Yes, it really is Michael Portillo in the cab of a horse tram.

roundabout! The island is scenic and of archaeological interest. Places such as Dhoon Glen, reached from the MER, are undoubtedly attractive.

Getting there

Traditionally tourists sailed on the ships of the Isle of Man Steam Packet Company from Liverpool to Douglas. It's still a good way to travel though the company has few ships now. Other services go from Heysham, Birkenhead, Dublin and Northern Ireland (see www.steam-packet.com/timetables). Several airlines fly into Ronaldsway.

Thanks

Thanks to my fellow SMEE member Alan Dawes for generously allowing me to use his pictures of the Manx Electric Railway and Douglas Horse Trams taken at various

times. In lieu of payment a donation has been made to the Railway Children charity. All photographs are © Alan Dawes 2018.

ME

INFORMATION

Manx Electric Railway
<https://manxelectricrailway.co.uk>
Tel: Welcome Centre
01624 662525
Enthusiast and other special parties welcome. Why not bring your model engineering society to see this and Man's varied heritage engineering attractions?
The line is supported by the Manx Electric Railway Society.
<https://mers.org.im>
(PO Box 117 Douglas, Isle of Man, IM99 1JS)



14
Horse tram traverser at depot.



15
Horse tram shed at Douglas. The Corporation no longer runs the trams.

Stephen Harrison reports from this year's IMLEC, held at the Birmingham club.



Continued from p.373
M.E. 4594, 31 August 2018

50th IMLEC PART 2

Saturday's running

Morning running was scheduled to start at 8.30am with run 7 but Bryn Jones from Chesterfield & District MES had to withdraw from the competition prior to the event. This left a break first thing for those to enjoy the morning sun ready for run 8 at 9.15am.

Run 8

Toby Lampitt was the first of our two competitors from the Manx Steam & Model Engineering Club with his SR Merchant Navy class *IOM Steam Packet* (**photo 7**). Taking a load of 12 passengers Toby got off the start line with a bit of wheel slip getting things underway. He managed to get round the bend to start attacking the back straight but came unstuck coming to a halt with the wheels slipping. Unable to move forward Toby reversed back to have another run-up to no avail. Wheels slipping again he got stuck in the same place. Some passengers were taken off the train in the hope this would enable him to get up the gradient. Another go up the gradient was again unsuccessful. Now down to two passengers he managed to get up the gradient but travelling about 200ft up the back straight got stuck again



Toby Lampitt with Merchant Navy IOM Steam Packet.

with wheels slipping. With the Chief Judge Keith Bloor at the trackside watching events Toby had to retire due to his stoppage time reaching the 8 minutes limit.

Run 9

Next up was the second competitor from the Manx Steam & Model Engineering Club, Connor Casey with his 5 inch gauge IOM Beyer Peacock *Peveril* (**photo 8**). Taking a load of 8 passengers Connor got off to a nice steady start and put in a good first lap. Nice steady laps followed with good consistent lap times and managed to complete 13 laps in 30:14 minutes. Burning exactly 1lb of coal he managed

152,645ft-lb work done giving him an efficiency of 1.353%.

Run 10

This was the run of a familiar IMLEC competitor Ben Pavier from Southport Model Engineering Club with his LNER Q5 '1032' – a much modified LBSC *Netta* (**photo 9**). Last year was the locomotive's debut at IMLEC but the locomotive failed when the crosshead picked up on the guide bar and locked up. This year we got the chance to see the locomotive perform - and perform it did. Ben had a load of 23 passengers (the second biggest load in this year's competition) and got off to a good start with a little slippage



Connor Casey racing through the station with his 5 inch Peveril.



Ben Pavier begins his run with his much modified Q5.

which was soon corrected by the driver and he was away. His average speed was 4.625 mph and he completed 11 laps with a work done of 235,028ft-lb whilst burning 1.29lb of coal giving him an efficiency of 1.61% and landing him in 6th position overall.

Run 11

Karl Midgeley from Gravesend MES ran his *Britannia Apollo* (photo 10) with a load of 19 passengers. Karl got off to a good start and put in a good run with a few spots of wheelslip here and there but had a good overall run. Covering 10 laps in just under 26 minutes with 2:43 minutes of stoppage Karl used 1.68lb of coal giving him an efficiency of 0.993%.



Karl Midgeley on the downhill section back into the station.

Run 12

The first of the afternoon's runs was George Winsall from Rugby MES with his 3½ inch gauge Hunslet *Russell* (photo 11), which was built by his grandfather Fred Winsall (1974 IMLEC winner). George performed well, as he usually does, hauling 17 passengers and completing 15 laps whilst burning 1.818lb of coal to produce 264,776ft-lb of work done giving him an efficiency of 1.291%.

Run 13

Next up was Marcus Peel from Southport Model Engineering Club with his LNER B1 *Springbok* (photo 12). On his first run Marcus suffered a

derailment of a passenger car for some unknown reason causing a pause in his run whilst it was rectified. He struggled to start the train again but got things moving and continued. A discussion was held with those concerned and the Chief Judge and the decision was made to abandon the run and allow a re-run as the derailment was not the driver's fault. His second run was with the same load of 9 passengers and he completed 17 laps around the track in a total time of 31:42 minutes with an average speed of 6.47 mph without any hiccups. Burning 1.19lb of coal and a work done of 254,376ft-lb Marcus achieved an efficiency

of 1.889% putting him in 5th place overall.

Run 14

The second B1 in this year's competition was Les Pritchard from Harlington Locomotive Club with *Gembok* (photo 13). Taking a much heavier load than the previous run Les pulled 17 passengers and completed 15 laps managing to produce a slightly higher work done figure of 290,905ft-lb but burnt 1.98lb of coal giving him an efficiency of 1.302% landing him in 12th place.

Run 15

From Leyland SME was Adrian Hinchcliffe with his 3½ inch gauge GNR *Atlantic* (photo

14) which has competed twice before in IMLEC. Adrian got off to a good start with a slight bit of slippage but got up to a good pace with consistent lap times pulling 4 passengers for 15 laps and only burning 0.931lb of coal. With an efficiency of 1.432% Adrian was rewarded with 8th place.

Run 16

David Kerry from Chesterfield & District MES was due to run with his BR 9F *Evening Star* but due to unforeseen circumstances had to withdraw from the competition.

Run 17

This year has seen a few new faces to the IMLEC competition



George Winsall with 3½ inch Russell.



Marcus Peel from Southport with B1 Springbok.

with some new locomotives and new drivers. Tom Taylor from Southport Model Engineering Club was on his first IMLEC run with his 3½ inch BR 9F (photo 15). Tom got off to a good start but got stuck halfway up the back straight and was forced to reverse back into the station to have another go. He managed to cover 4 laps and came to a stop where he was unable to recover things and after 8 minutes of stoppage had to retire.

After the final run of the day, the track was opened up to visitors and competitors who had already competed, to run in the normal direction for a few hours to enjoy the rest of the evening along with the evening meal, which went down extremely well. After the last train was off the track, K9 the track cleaner was put on the track to complete a couple of laps cleaning the rail for Sunday's running. The track cleaner is powered via two 12V batteries and geared motor drives for the brush and the drive itself. With a 5 gallon container on top with its cleaning solution, it slowly navigated the track. Half way around the track it caught the attention of a few visitors sitting chatting away in the marquee and quite a number went to investigate the mysterious contraption to see what it was all about – so K9 had its five minutes of fame (photo 16).

●To be continued



Les Pritchard with his B1 Gembok.



Adrian Hinchcliffe with his 3½ inch Atlantic passing under the footbridge.



Tom Taylor on his run with his 3½ inch 9F.



Bromsgrove track cleaner K9 grabbing the attention of visitors.

ME Vertical Boiler - Constructing the Boiler PART 13

A project aimed at beginners wishing to develop their skills or those requiring a robust vertical boiler for the running or testing of small steam engines. **Martin Gearing** makes the stays and stay nuts in preparation for soldering the boiler together.



We now need to make a handful of small parts, including stays and various plugs, that we need before we can start assembling the boiler.

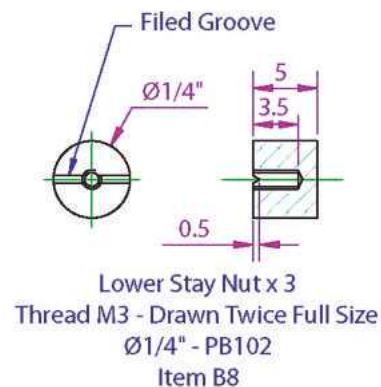
Lower stay nuts – Item B8

¼ inch diameter PB102 (fig 32)
Hold the ¼ inch diameter rod with 10mm protruding from a self-centring or collet chuck. Face off, centre drill using a centre drill with a pilot of 2.5mm diameter or less. Drill 2.6mm diameter x 3.5mm deep. Tap M3. File the groove across the threaded face of the nut as drawn, using a second cut triangular needle file. This groove will allow the silver solder to flow around the stay and through the tubeplate to form a fillet around the nut on the other side, securing and sealing the stay. Part off 5mm long. Try not to lose them in the swarf! Repeat for the remaining two nuts. Put to one side.

Inner stay nuts – Item B9

¼ inch diameter PB102 (fig 33)
Hold the ¼ inch diameter rod with 15mm protruding from a

Fig 32



self-centring or collet chuck. Face off, centre drill using a centre drill with a pilot of 2.5mm diameter or less. Drill 2.6mm diameter x 5mm deep. Thread M3. File the groove across the threaded face of the nut as drawn, using a second cut triangular needle file. Part off 3mm long. Do not lose! Repeat for the remaining five nuts. Put to one side.

fine-toothed hacksaw. Hold the rod with 15mm protruding in a self-centring or collet chuck. Face off to remove the saw cut and machine 3mm diameter x 10mm. Thread this section M3 (20 turns). I would suggest repeating this for the two remaining stays.

Take each part-machined stay in turn, return to the chuck threaded end first, face off to bring the length to 107mm. Adjust to have 17mm protruding and machine 3mm diameter x 12mm. Thread this section M3 (24 turns).

Stays – Item B10

⅛ inch diameter PB102 (fig 34)
Cut three 108mm lengths of ⅛ inch diameter rod using a

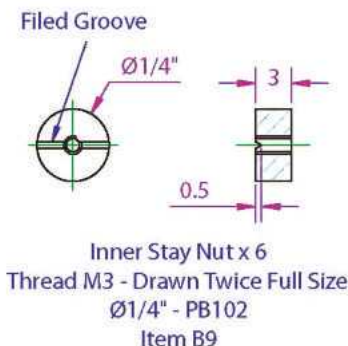
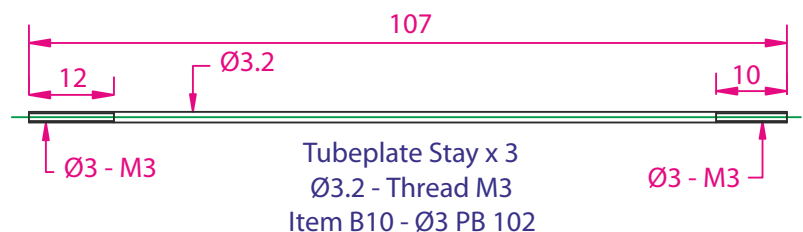


Fig 33

Fig 34



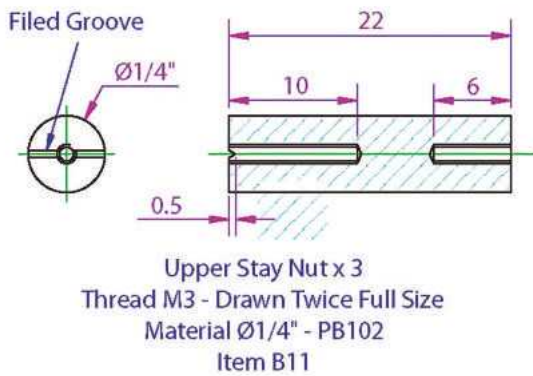


Fig 35

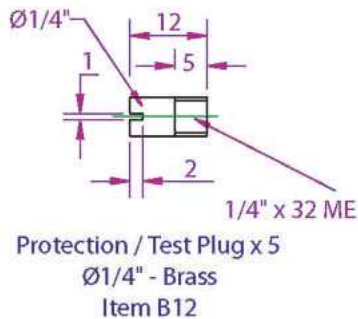


Fig 36

Upper stay nuts– Item B11

$\frac{1}{4}$ inch diameter PB102 (fig 35) Hold the $\frac{1}{4}$ inch diameter rod with 25mm protruding from a self-centring or collet chuck. Face off, centre drill using a centre drill with a pilot of 2.5mm diameter or less. Drill 2.6mm diameter x 10mm deep. Thread M3. File the groove across the threaded face of the nut as drawn, using a second cut triangular needle file. Part off 22.5mm long. Repeat for the two remaining nuts.

Taking each partly machined nut in turn, measure the length and deduct 22mm; this is the amount that requires facing off to bring to the specified length of 22 ± 0.1 mm. Return to the chuck, threaded end first with 5mm protruding. Centre drill with a pilot of 2.5mm diameter or less. Drill 2.6mm diameter x 6mm deep. Thread M3. Repeat for the remaining three nuts. Put to one side.

This gives you 15 items (photo 68 shows a selection). Photograph 69 shows one of

the three stay assemblies. Put to one side.

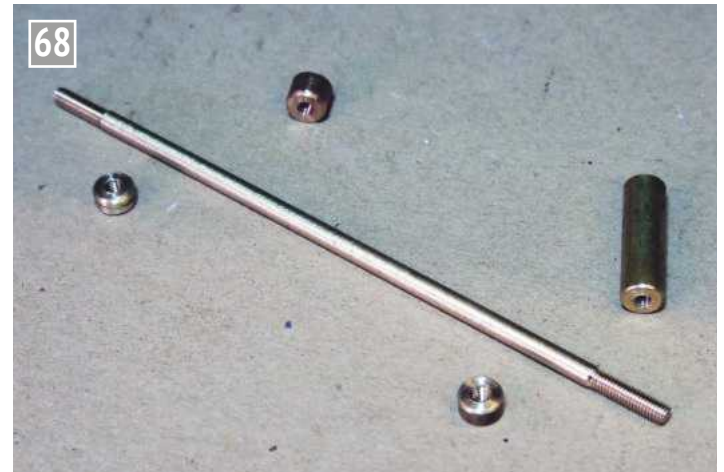
Protection/test plugs and adaptor

The bushes have been threaded completely in an effort to make gripping easier because of having a reasonable length of bar for the chuck to grip. Because of this we need to make protection plugs that will prevent the thread from being damaged when the bushes are being silver soldered if exposed to the direct flame.

Protection plugs x 5 – Item B12

$\frac{1}{4}$ inch diameter brass (fig 36) Hold in a self-centring or collet chuck with 20mm protruding. Face off and chamfer end 1mm x 45 degrees. Thread $\frac{1}{4}$ x 32 ME for 5mm (6 turns). Part off 12mm long. Repeat for the remaining four plugs.

Slot the heads using a hacksaw across the diameter to 2mm deep. If you have a



Stays and nuts.



Stay components assembled.

needle file 1 mm thick with teeth on one edge open the slot width out to 1mm width. Put to one side.

Years ago, I acquired an old short machine hacksaw blade and keep it especially for this purpose because it cuts a 1mm wide slot, saving an awful lot of time.

Protection plugs x 2 – Item B12A

10mm diameter brass (fig 37) Hold in a self-centring or collet

chuck with 20mm protruding. Face off and chamfer end 1mm x 45 degrees. Turn 9.5mm diameter x 5mm. Thread $\frac{3}{8}$ x 32 ME (6 turns). Part off 12mm long. Repeat for the second plug.

Slot the heads across the diameter to 1mm wide x 2mm deep as before (photo 70). Put to one side.

Test plugs x 6 – Item B12B

10mm diameter brass (fig 38) Hold in a self-centring or collet chuck with 20mm protruding.

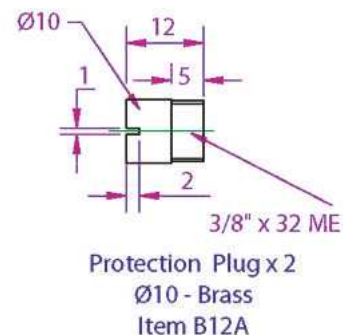


Fig 37



Protection plugs.

Face off and turn 6.35mm diameter x 5mm. Using a 1mm wide parting tool, with its left-hand edge set flush with the faced surface, undercut 0.5mm deep into the turned diameter. Thread $\frac{1}{4}$ x 32 ME. Part off 12mm long. Repeat for the remaining five plugs. Slot the heads across the diameter to 1mm wide x 2mm deep as before. Put to one side.

Test adaptor – Item B12C 10mm AF brass (fig 39)

Hold in a three-jaw chuck with 15mm protruding. Face off. Centre drill. Drill 2.5mm diameter x 20mm deep. Turn 6.35mm diameter x 6mm, undercut 1mm wide 0.5mm deep as for test plugs. Chamfer hexagon until corners just become a continuous diameter. Thread $\frac{1}{4}$ x 32 ME. Draw out of the chuck to give 50mm protruding and part off 42.5mm long. Turn around and hold with 15mm protruding. Face off. Centre drill. Drill

2.5mm until the drill breaks through, taking care as it does so. Turn 9.5mm diameter x 6mm, undercut 1mm wide 0.5mm deep and thread $\frac{3}{8}$ x 32 ME, which is a very common size that most club boiler testers can accommodate (photo 71). Put to one side.

Silver soldering – further aspects of the process

I would suggest that the beginners arriving at this point, would benefit by going back and reading the notes given under the heading of 'SILVER SOLDERING - THE PROCESS', prior to the section describing the assembly of the hand pump.

When there are a number of components to be assembled in close proximity to one another, it is sometimes advantageous to use silver solders containing different percentages of silver that melt/flow at different temperatures. If the assembly



Test and adaptor plugs.

process is planned to use a higher melting point silver solder first, then additional parts can be added in close proximity using a lower melting point silver solder, safe in the knowledge that the first joints will be very unlikely to re-melt, because of the greater temperature difference.

Constructors with a great deal of equipment and experience in silver soldering will doubtless feel 'step silver soldering' is unnecessary on a boiler of this size. For the beginner however, the added temperature difference results in a great reduction in the concern/fear that previous joints may be compromised as the work proceeds. The only trade-off is that working at a higher temperature reduces the time the flux remains active but that is not a problem if the work is done in an organised manner.

Given these comments I am going to recommend using

the following two grades of silver solder, both used with a common flux referred to as EF or Easy Flo. This has a medium to long active life, a working range of 550 – 800 degrees C, and is soluble in warm water after use, making clean up easier.

The first stage will use a silver solder with a silver content of either 38% or 40% (depending on supplier) that has a working range of 650 – 720 degrees C.

The second and final stage will use a silver solder with a silver content of 55% that has a working range of 630 – 660 degrees C. This is probably the most popular silver solder used in the home workshop.

● To be continued.

Next time we will make a start on soldering the boiler together

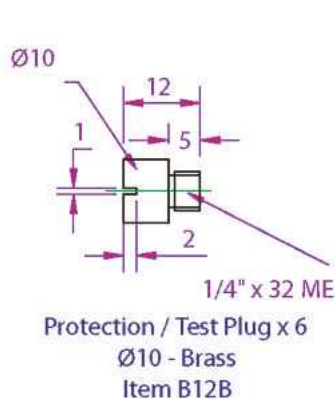


Fig 38

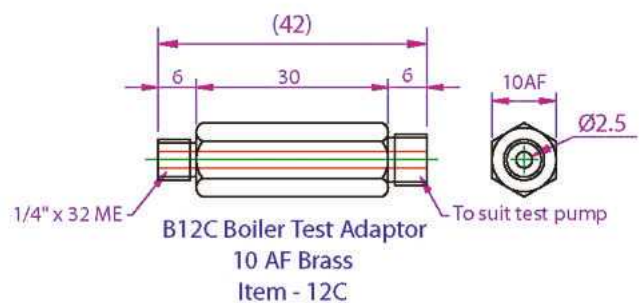


Fig 39

Model Engineer Visits the Isle of Wight MES

John Arrowsmith crosses the Solent to visit the Isle of Wight's model engineers.



Following on from my visit to the Wolverhampton Society in May, I paid a visit to the model engineering society on the Isle of Wight in July whilst on holiday on the island. I have been to this club a number of times in the past and I was pleased to have the opportunity to do so again.

Located at Broadfields behind the Northwood Cricket Club in Park Road, Cowes, this compact site is owned by the club members so they do not have any of the problems associated with other sites located in public open spaces. An interesting ground level 7¼ and 5 inch gauge track complements the raised track in 5 and 3½ inch gauges and this is combined with a usefully sized boating lake as well as a fully scenic garden railway. Regular open afternoons are held each month right up to November which all begin at 2pm for 2 hours. All in all, the club offers a wide range of facilities including good sized club house.

I met secretary Roger Scott Roberts and over a welcome cup of tea we talked about the club and their operations.



The entrance gate with a good access bridge over the raised track.

Wednesday is the work day like many clubs and the current project was the delivery of a new shed for the boating group at the club. When erected this will free up another existing storage building which will improve access for the locomotive group. The usual topics were discussed, like the lack of younger people being involved, and although they have a healthy membership the work parties are usually the same people each

time. Where have I heard that before? Nevertheless, members here are a very amiable group and get on with the jobs that have to be done. I was impressed by the 5 inch gauge storage facility they have built and I cannot think of another similar facility at any other club I have visited.

The storage arrangement consists of a row of elevated lockers into which locomotives are positioned by the use of a very neat hydraulic lift system and movable traverser in the



A general view of the track layout from the ground level steaming bays.



Across the site towards the boating pool.

shed building. The traverser is part of the support structure for the lockers. Locomotives are rolled out of their storage lockers onto the traverser which is then lowered to the ground. The retrieval of the locomotives and movement to the raised level steaming bays involves no lifting of any sort by the members. It does help ageing backs! The height of the facility enables 7¼ inch locomotives or rolling stock to be stored underneath thus saving valuable space elsewhere on the club site. Mike Clark demonstrated how easy it is to release a locomotive and position it outside on the track - a very clever and useful system.

Mike also showed me a lovely little 5 inch gauge rail bus which he had built which was based on a design



Part of the attractive garden railway at Broadfields.



The main club house is fully fitted with all the facilities needed for a model engineering club.



An adjustable access lift.



A compact maintenance workshop.



A good looking American outline switcher on the turntable.



Removing a locomotive from its storage box.

by Colonel Stephens. This colourful little bus is fitted with a 24 volt, 400 watt motor and can pull up to 10 passengers. The luggage stored on the roof was a common practice in those days apparently. I can just imagine the fuss there would be today if someone turned up at the station with a coffin to be taken on the train!! In the grounds, the club's boat group members were busy laying the foundations for the new storage shed which was due to arrive on the midday ferry that day, whilst treating pond weeds, which was also an ongoing task.

Another very clever, safe and simple system to use

was the locomotive traverser system from the steaming bays. This involves a fully interlocking mechanism which enables a locomotive to join the track whilst other drivers are fully warned that the traverser is in operation. It is fully fail-safe and uses just two relays to provide all that is needed electronically and a clever magnet to provide the last control detail. Mike demonstrated the way it all works and again I have to say it was an impressive piece of work.

In closing my notes on this interesting club I would like to thank Roger Scott Roberts, Mike Clark and Ron Truelove for their hospitality and



The boat group preparing the base slabs for the new storage shed.



Mike Clark built this attractive 5 inch gauge rail bus which can pull up to ten passengers.

information and not forgetting the two ladies who made us tea. If you are on holiday on the island and can make one of

their open afternoons then you can be sure of a warm welcome and an enjoyable visit.

ME



The battery and motor compartment on the little rail bus.



Part of the control system for the track traverser system.



The simple magnet for operating the track traverser.

A 7¼ Inch Gauge Riding Trolley

PART 5

Jon Edney makes a riding trolley for his garden railway.



Continued from p.321
M.E. 4593, 17 August 2018



A wonderful way to spend a Sunday afternoon.

Roughing out the wheels

I wanted to avoid expensive castings and so looked for round steel bar of a diameter suitable for wheels. I was surprised how hard it is to find this and in fact was not able to find round bar with a diameter larger than 100mm. This seemed a bit small to me but has been fine in practice. I have already related the mistake I made in the early days by buying a large section of bar and attempting to slice it up. Fortunately, the same supplier on eBay sells pre-sliced bar of 1 inch thickness which is easy to machine and convert into wheels, and relatively inexpensive. The four slices as purchased are shown in **photo 20**.

For the axle I used 22mm diameter black steel bar. Most designs I have seen

seem to use bright steel bar but I don't understand why this is necessary. The ends of the axle are machined to be concentric and the fact that the un-machined section between the wheels is not perfectly round should not result in significant vibration at the expected speeds of rotation. The plan for the wheels and axle is shown in **fig 7**.

There are three stages to convert each round slice into a wheel. The first stage is carried out with the slice mounted in the 3-jaw chuck using outside jaws. The second stage, forming the treads and flanges, is done with the slice mounted on a mandrel. The final stage is done after mounting onto the axles mounted between centres. Firstly, let's look at the steps taken while the raw slice

is mounted in the three-jaw chuck, pressed firmly against the back of the outside jaws.

The first goal is to make an accurate hole in the centre. Although the hole should be made a precise diameter using a reamer to make the final cut, it does not matter if the hole is off centre by a tiny amount (< 0.1mm). Therefore, time can be saved by mounting successively larger drills in the tailstock and then drilling all four wheels in turn before moving to the next drill size up. **Photograph 21** shows the first operation – using a centre drill.

I have to confess that although the plan shows a hole diameter of 18mm, I actually used a hole size of 11/16 inch (17.46mm). The reason is that I have a collection of large drills and reamers in Imperial sizes which came with the lathe and replacing them with metric would be expensive. So, I drilled the following sequence of holes: 5, 8, 10, 12mm and then ⅝ inch and ⅞ inch. I used a boring tool to bring the hole close to the final size before running through with (in my case) an 1⅛ inch reamer. This last operation is shown in **photo 22**.



Wheel blanks as purchased from the supplier.



Lathes and more

for Beginners

PART 22

Graham Sadler makes an indexing mechanism for the tool post.



Continued from p.392
M.E. 4594, 31 August 2018

Producing the indexing hole

Then first job is to set the top slide perfectly parallel to the lathe axis. The easiest way to do this is to put a piece of straight bar in the chuck, the bigger the better but it must be all the way in the chuck. Then lock the saddle and mount the DTI on the top slide and use this to clock along the bar until the reading deviates by only one or two divisions. Use very gentle taps - this type of operation can be frustrating. We will make a setting aid at a later date.

Use the ruler trick between chuck and tool post pins to set the post exactly square and lock in place using washers under the nut, not the cap, or we won't get at the grub screw hole (**photo 104**). Insert the drill bush and lock it in place. Put the drill loosely in the pistol drill chuck and push the drill in until it hits the indexing ring. Now use the shank of a 6mm drill between the chuck jaw and the drill bush to set the depth and tighten the chuck (**photo 105**). Check and check again. We can now drill

the hole and be certain it won't go into the top slide post.

Switch to the $\frac{7}{32}$ inch bore bush - and by the way this needs a flat filing all the way along the top so that the grub screw doesn't raise a burr and make things difficult. Forming the tapered socket must be to a perfect depth (**fig 24**) so put the depth gauge onto the reamer and push the faced and centred end hard onto the indexing ring and lock it. Get your caliper, use the step end to get the size and lock it (**photos 106 to 108**). Here we are using the caliper as a fixed gauge - the dimension is unimportant. Lock the caliper and check.

Put the predrilled taper sizing bush in the lathe chuck, support it with a tail stock centre and very gently engage the reamer into the hole; don't use any force otherwise it will cut into the sizing bush. Now use the calliper gauge to set the depth between the face of the bush and the depth ring. You can now form the tapered socket with the knowledge that it won't go too deep and the detent pin shoulder will not hit



Set the top slide to turn perfectly parallel then set the block square with the ruler trick.

the indexing ring. Use plenty of cutting oil and withdraw frequently to clear the swarf.

Now test the fit of the pin into the hole. Figure 24 should indicate what to do if the pin wobbles for any of the reasons suggested.

Now reset the tool post so the pins are parallel to the lathe centreline, using a square rather than the ruler from the chuck, and produce the other tapered socket. It is possible to add another couple of indexing positions. I did this on the mk2 tool post but never used them!

Finishing the detent assembly

The spring needs to be strong, but must be long enough still to exert force when the detent is in its socket and must not be bound when compressed. Assemble it onto the pin with the bush in place. Insert into the tool post which is angled away from the detent socket. Push the bush in until it sticks out 10mm, turn the tool post



Setting the depth of the pilot hole with a 6mm drill shank.



Finding the depth to ream the socket - 1: push the centred end in and lock the collar.

so the pin engages the socket (with a satisfying clunk) and check there is still plenty of force to push the pin in place. Adjust as required and, when satisfied, scribe a deep line in the tailstock side of the bush where it meets the body for future repositioning. Put the bush in the vice and saw it off to an angle of about 50 degrees so it will be angled towards the tailstock end. File dead smooth and face a tiny flat on the pointed end which will be the detent retracted platform. Lightly round all the edges of the cam slope.

The last task is to drill for the actuating lever. The position of this must be exact but it's easy to attain. Mount the assembly in the body again, pushing the bush in as far as the scribe mark. Use the caliper to get the distance between the end of the pin and the bush big end facing. Note this down and check again. Zero the calliper at that reading (**photo 109**). To mark the position for the 5BA hole so that the lever is in contact with the face of the bush it needs to be the radius of the lever diameter, which is $\frac{1}{8}$ inch in my case i.e. 3.2mm, minus about $\frac{1}{2}$ mm so the detent pin clears the indexing ring, giving $1.6 - 0.5 = 1.1$ mm. Now carefully reduce the caliper until it reads -1.1mm and lock it. Anoint the detent pin with marker and scribe a line from the end using the caliper gauge. Grip the pin

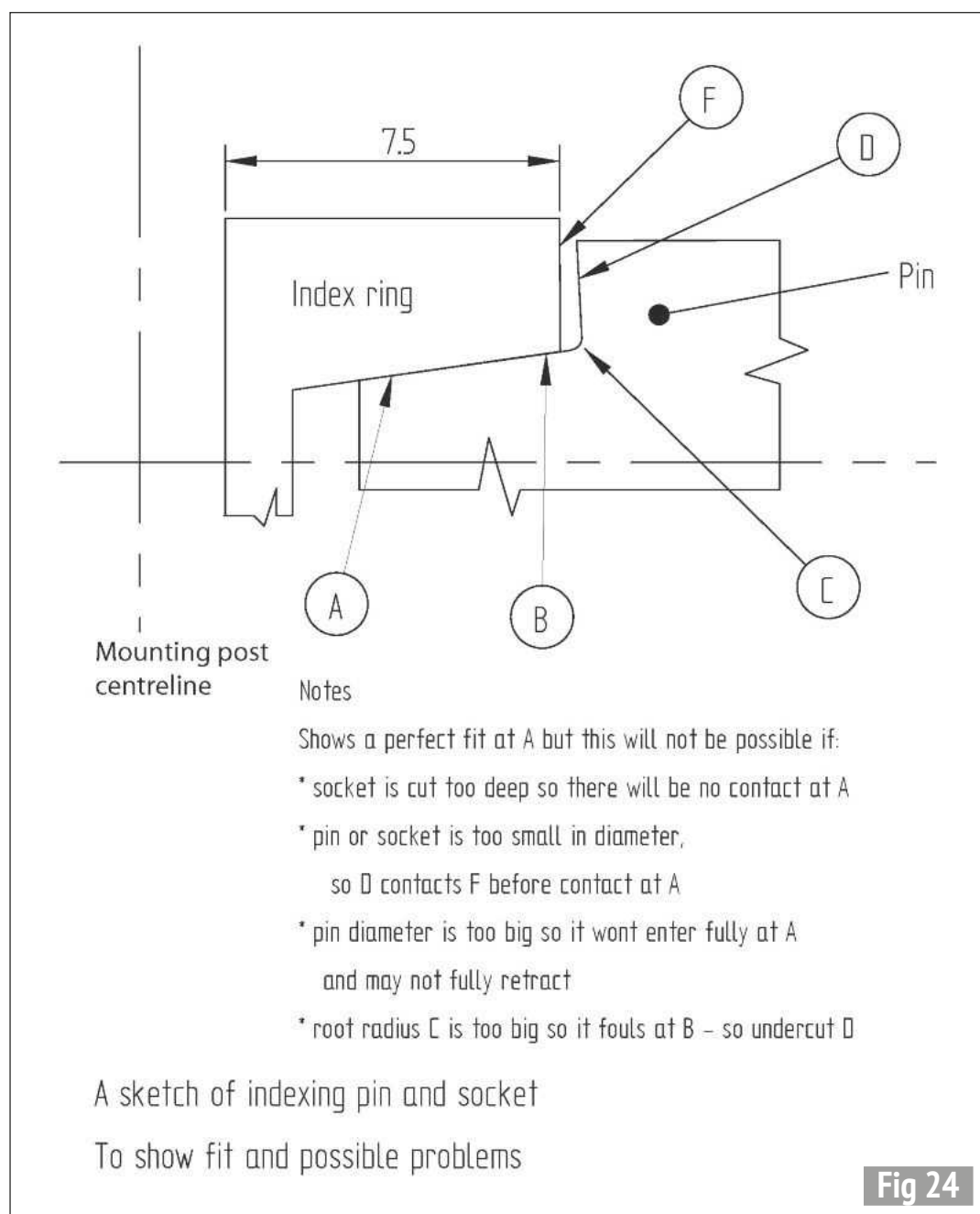
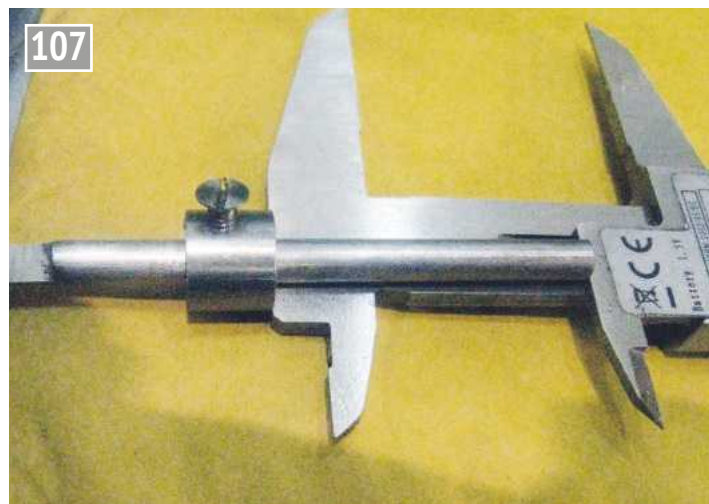


Fig 24



107
Finding the depth to ream the socket – 2: set the calipers to this size, record number and zero the caliper.



108
Finding the depth to ream the socket – 3: mount the reamer between the special bush and centre. The dimension is irrelevant. The bush and collar size are too small making it difficult as only the tips of the calipers are engaged.



109
Measuring to get the lever arm in the correct position.
Record the size and zero the caliper.

in the drill vice and use the diamond bit trick we used when making the tap holder to mark the centre position (**photo 110**). The position of the hole can now be very lightly punched, checked, moved into the correct position (use a powerful magnifier to check) deepened then drilled for 5BA tapping - correctly 2.75mm but 2.7mm is okay. Tap it and deburr making sure the bush passes over it. A tiny groove, no more than a scratch, is filed on the top flat of the bush and the lever clicks into this (**photo 111**).

Thread both ends of the 25mm long lever which, when screwed in place, can be marked for the correct side for bending to make operation easier. I used a bronze ball for a handle, but a 5mm diameter bar 12mm long will do the trick. Use thread lock to lock the pin and handle in place and, when cured, file any excess off the end of the pin. In use, the post is locked whenever possible and, when changing tool holders, your left hand pushes the holder in at an angle so it is pushed fully in and back solidly onto the pins when you tighten with the right hand. With the indexing pin withdrawn, the post can be rotated to any convenient angle but there's no repeatability in that case.

Phew! That was a long description. I had to do this all twice to check the method.

It is simpler than it sounds (the first way wasn't!) and all will fall into place when you actually do it.

Testing the result

How accurate is it? I was pleased with the lapping exercise as the small wobble present with the last tool post was eliminated. To check it, I turned a bar with my inserted tip tool, measured it and set my DRO to the size, removed the tool and put it back in. A cut was applied using the DRO (the cross slide dial will work just as well) and re-measured. Here are the results and I can say, with a smug face, "Wow!".

Measured size	DRO reading
9.299	9.3
9.200	9.2
9.105	9.1
8.895	8.89
8.902	8.89

Note here the dimensions above must be viewed with relation to resolution. My micrometer is 0.001 mm resolution and the DRO is 0.01mm so, with the accuracy tolerance, just what is the actual size I am measuring? One just has to trust readings and work with the tooling and information available. The DRO will now be used in absolute mode with my standard right-hand knife tipped tool and relative setting for everything,



110
Move the caliper to - (minus) 1.1mm and use the caliper to set the size to scribe from the end of the detent pin. Use a diamond burr to mark the top, centre punch and drill. The punch mark is there but lighting makes it invisible.

meaning that as soon as I switch on, I can turn to accurate dimensions without measuring. This of course only works if I remember to switch the DRO on before moving the cross slide and having a fixed tool post base as opposed to the top slide, any movement of which would ruin the setting. Trouble is, will I have the confidence to do this?Nope, I'll still have to measure! **Photograph 112** shows the finished tool post on my solid mount with the indexing assembly on the top.



111
The finished detent components.
Note the tiny notch - it must be small!

● To be continued.

Next time I will talk briefly about parting off and then complete the tool post by looking at the making of special tool holders.



112
The finished tool post and detent pin assembly on my solid mount. I had to change the spring shown in photo 111.

A History of Slotcars

Henk-Jan
de Ruiter

surveys
the slot car
scene, from
the early days to the
present day.



A lot of our readers probably have fond memories of their first slot car set, received on their birthday or for Christmas. Nowadays most of these sets are lying around in the basement or at the attic. Sometimes you meet people who take this a little more seriously and go all the way. They race and collect these little gems for the thrill and all the excitement of capturing Formula 1™ at home.

Well - not every slot car is 'just' a slot car - there are several categories to distinguish between. We are talking not only about a difference in scale, 1:32 or 1:24, but also differences in quality, detailing and collector's appeal. Furthermore, you can focus not only on new slot cars but also specialize in vintage slot cars from the period 1957-1975.

It all started somewhere around the 1900's, principally in the USA, where several inventors were experimenting with scale model race cars on a track, closely reminiscent to model train tracks.

The company Lionel introduced in 1912 an electric model racing car set and in 1930 the Kokomo company sold the *Electricar*. This *Electricar* was driven alongside



Original 1930's Electricar box.

a fence, making contact with the bumper in order to pick up current. At the same time Märklin from Germany had a go and came up with very fine tinplate model racing cars on a track.

However, these ventures did not last very long as it seemed that these products were not economically viable because the market was not yet ready for them. Also, a limited choice of accessories did not help. This all changed when the English company Minimodels, later Scalextric, introduced their first electric tinplate slot car set in 1957. This one proved to be hugely popular and soon the market expanded and Scalextric took the role of frontrunner and worldwide leader, a position

shared with Carrera on the continent.

Most sought after are the Scalextric Bugatti and Auto-Union, especially in scarce colours, but Carrera also made some very interesting bits of kit.

Many of these slot car lovers gather in clubs, such as the NSCC, the National Scalextric Collectors Club, although they also cater for other brands. The NSCC publishes a glossy magazine each month to keep its members up to date with all the latest news related to slot cars.

When one is talking about vintage, no article is complete without mentioning the huge following it had in the USA. The slot car hobby there had its heyday in the



USA Kokomo Electricar 1930.



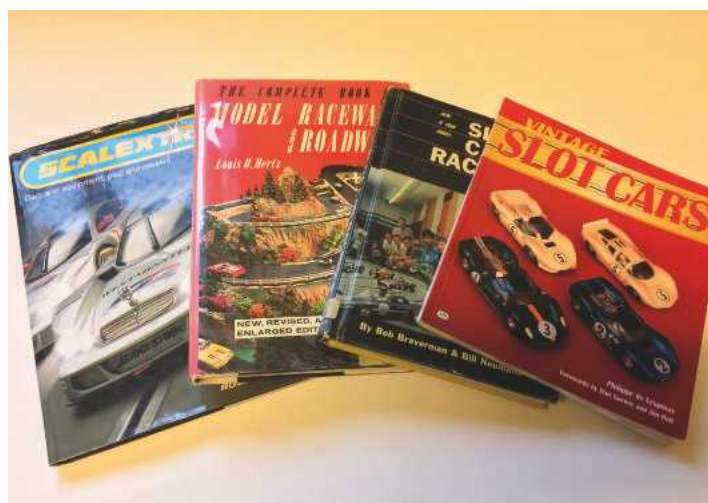
USA K & B slot car kit 1960's.



USA K & B slot car kit 1960's.



Inside of a K & B slot car kit.



Vintage slot car books.



Two Vintage metal slot car chassis:
(left) magnesium chassis, (right) aluminium chassis.



Scalextric tinplate slot cars from around 1957-1960: (left) Maserati, (right) Ferrari.

1960's and it really took off with famous names as Cox, Monogram, Revell, Russkit and Strombecker. Most of them were to a 1:24 scale, because of the large rooms in the USA, and came with a brass or aluminium chassis.

At one time there existed around 1000 commercially exploited slot car raceway centres. Slot car racing became immensely popular and slot car companies started to hire slot car drivers to become professional



Vintage Scalextric Jaguar.

factory drivers. These professional slot car drivers competed with each other during slot car races held all across the country with grand prizes to be won and many appeared on the national TV network.

People got serious, looking for special competition tyres, gears and chassis made from exotic materials like magnesium, experimenting with different slot car setups, in order to make their cars lighter and faster. They



Famous Scalextric Marshal car.



Vintage slot car brochures.



Scalextric starter set from their early period around 1957-1960.



Inside of the Scalextric starter set.

became obsessed with speed and therefore started to build scratch-built chassis themselves and build these from brass tube rods, soldered together.

Slot cars of today are more detailed and close look-a-likes of their real-life siblings. There are also more brands than ever on the slot car market to choose from, with prices ranging from around £40 to £250. Slot Classic from Spain and Ostorero from Italy make handmade resin slot cars at the top end of the market in limited series.

So, dive into your basement or closet, maybe you'll find that long lost forgotten slot car treasure again. Or perhaps a real 'barn find' - isn't that something we are all looking for?



Built USA K & B Ferrari slot car kit with an aluminium chassis and real copper rivets.

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www.circuits-routiers.fr

Magazines: www.car-on-line.de
www.modelcarracingmag.com
www.slotcarmagazine.co.uk

ME

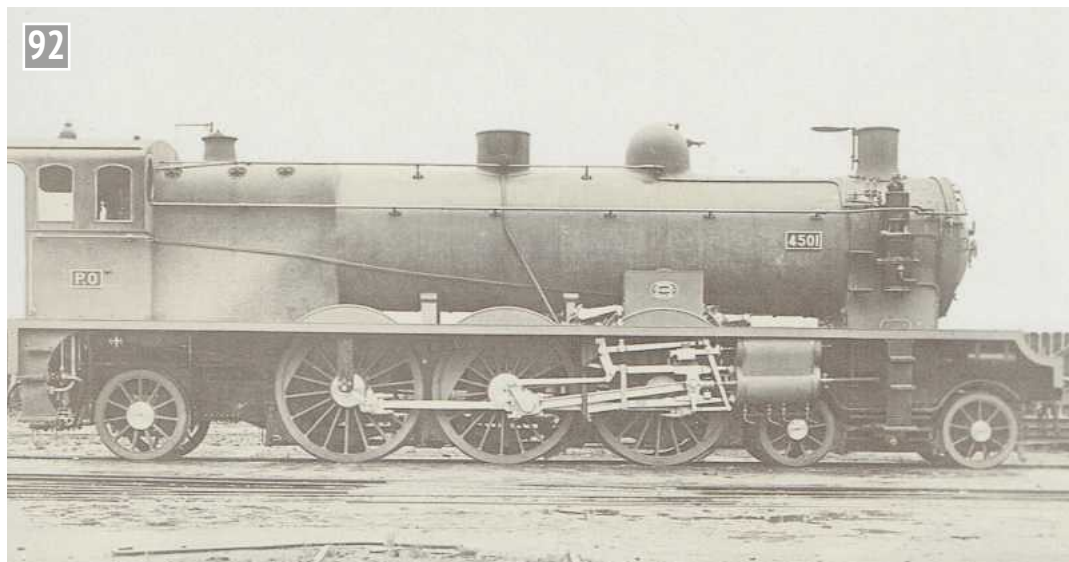
Technologie sans Frontières

PART 19

Dr. Ron Fitzgerald looks at English and French locomotive design in the second half of the nineteenth and early years of the twentieth century.

Continued from p.318
M.E. 4593, 17 August 2018

'The Nord, the Midi, Paris-Lyons-Mediterranean, the Ouest and the Est have adopted six coupled types... The Baden lines are worked by these engines... It was for these lines, indeed, that I designed the first of the six-coupled types. The Gotthard expresses are worked by four-cylinder compounds of the same type built at Winterthur; Roumania has also ordered some twenty engines of the same general type... The locomotive drawings were made by the Société Alsacienne de Constructions Mécaniques (S.A.C.M.) and the engines were built at their works at Belfort.' Alfred de Glehn to Charles Rous Martin (ref 1).



Paris-Orléans Railway Pacific No. 4502, S.A.C.M 5598/1908. The first European Pacific locomotive.

The Pacific wheel arrangement did not reach Europe until 1907 although Anton Hammel of Maffei had begun work on a 4-6-2 in 1905, eventually to appear in 1907 as the Baden IVf Class. The distinction for placing the first European Pacific in service went to the French Paris-Orléans Railway. The Orléans Railway's otherwise very effective large wheel, 4-6-0s of the 4000 series were once again being overtaken by the continuing increase in express train weights. On the long 1:100 gradients of the Paris-Toulouse line they were frequently winded and it was clear that whilst the mechanical elements of the class were satisfactory more boiler power was needed to meet the situation. Jointly, S.A.C.M. and the Orléans design staff under Emile Solacroup developed the design that ensued.

The running gear of the new Pacific (photo 92) adhered to the established de Glehn-S.A.C.M. precedents, the Orléans 3000 series Atlantics and the 4000 series 4-6-0s. The driving wheel diameter

was identical to the 4-6-0s at 1.85m (6 feet $\frac{3}{4}$ inch) but the cylinders were to a new design, increased in diameter from 360mm, 600mm x 640mm to 390mm, 640mm x 650mm and fitted with large diameter piston valves. The radical departure came with the boiler and central to this was the firegrate. The boiler used for both the Atlantics and the 4-6-0s had a grate area of 3.1m² extending in the 4-6-0s between the frames, from behind the driving axle and over the trailing coupled axle. The new design was to have 4.27m² of grate area. In grate length it was virtually identical to the 4-6-0 series boilers, the additional 38% in grate area being provided entirely by increasing the width.

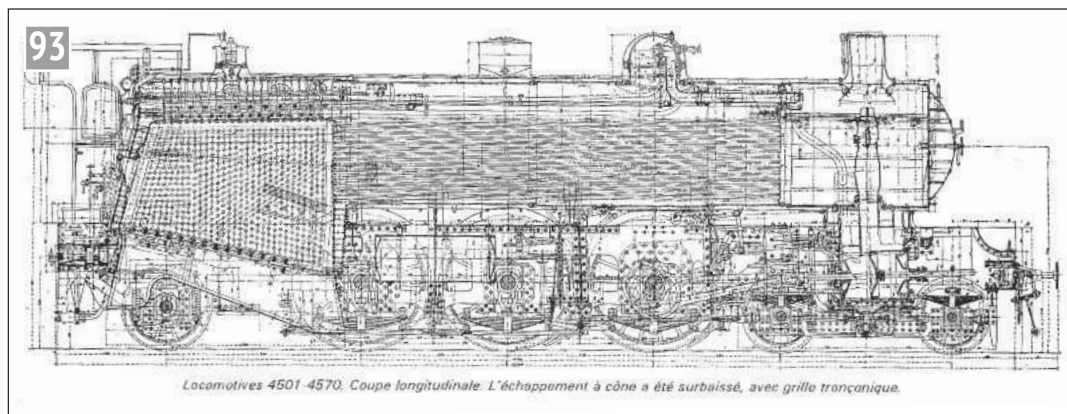
As the machine was to have the conventional plate frames and, given the need to keep the boiler centreline within reasonable bounds, accommodating the grate and ashpan called for some innovative design (photo 93). The outcome was a unique and totally distinctive grate plan, usually referred to as trapezoidal grate although

actually the plan view of the of the foundation ring was composed of two parallel sections, one more widely spaced than the other, with a tapered section connecting the two parallels. The broad section was at the firehole end, the firebox external wrapper sheets rising vertically to create a conventional rectangular backhead. At the throatplate end the firebox section was at its narrowest, the foundation ring dropping down between the frameplates and the side sheets flared outwards above the frames up to the boiler diametral centreline where the profile became that of the Belpaire boiler. From the front to the back of the wrapper side sheets the transition zone between the two planes took the form of a gentle curve sloping diagonally downwards from boiler centreline at the tube plate to the foundation ring at the cab. Thus, the French *foyer profond* or deep firebox, considered essential for satisfactory combustion, was maintained whilst the grate area progressively increased towards the cab.

The diameter of the boiler shell attained 1.68m (5 feet 6 inches), 6½ inches more than the 4000 series, and this gave the Belpaire section of the firebox its maximum width which was also the extreme grate width. The tube length was increased from 4.4m to 5.9m although the external appearance of the barrel seemed even longer as the smokebox tube plate was recessed and the cleading plates presented an unbroken surface between boiler and smokebox. In fact, the total boiler heating surface increased by only 7% over the earlier boilers, in spite of the number of tubes rising from 139 to 261, as the tube diameter was reduced from 70mm to 55mm and the Serve fins were abandoned. Thus, the enhanced steaming capacity was overwhelmingly concentrated in the area of the firebox with its wide grate. According to Vilain (**ref 1**) this firebox design was owed to the S.A.C.M. designers who had previously employed a trapezoidal grate for some Iberian locomotives although he does not identify these machines more specifically.

Only a matter of weeks after work began on Orléans 4501 Maffei's Pacific emerged. It was built for the Baden Railway and became their class IVf. The design had originated in 1902 with eighteen Atlantics also for the Baden State Railway. As previously discussed, the Baden had been an enthusiastic user of S.A.C.M.-built de Glehn compounds and, given its poor quality indigenous coal supplies, the affinity with compounding held when it decided to move to the Munich builder, J.A. Maffei. At that time Anton Hammel was head of the Maffei design department, supported by Heinrich Leppla, the technical chief. Together they produced one of the most illustrious of European compounds, instantly recognisable by its massive front end.

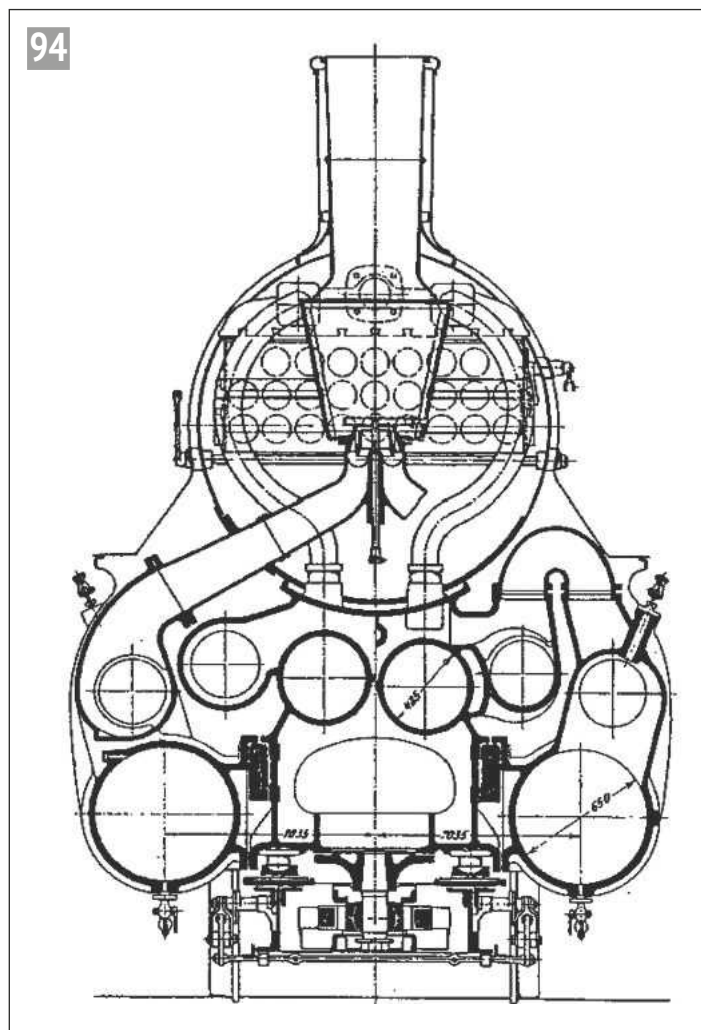
The central feature of the Maffei compound was the



Section of P. O. Series 4501.

in-line configuration of the four cylinders under the smokebox with the high-pressure cylinders between the frames (**photo 94**). Usually, the drive was concentrated on a single axle and, as the earliest locomotives built to this design were Atlantics, the drive axle was the leading coupled. Most subsequent machines were six or eight-coupled and the drive axle became the second coupled axle. In order that the connecting rods should clear the leading coupled axle the inside cylinders were raised above the outside cylinders at a steeply raked angle with exposed, upward sloping tail rods, the casing for which projected aggressively forward from under the smokebox.

Piston valves were invariably used with inside cylinder valve chests placed alongside the respective cylinder, the axes being parallel. This brought the valve chest either over the frame centreline or beyond it. The outside, low pressure cylinders were horizontal but the vertical centreline of the valve chests was displaced outwards beyond the cylinder centreline to give more space for the inside cylinder valve chest, allowing the outside Walschaert's valve gear on each side to drive both low and high-pressure piston valves. The absence of inside valve gear left ample room between the frames for the axle bearings and the Z-crank axle. The cylinder wrapper plates enclosed



Front-end cross section of the classic Maffei compound.

the transfer pipes between the high and low-pressure piston valve chests and for the exhaust pipe as it passed into the smokebox from the low pressure valve chest. The wrappers continued upwards to join the smokebox wrapper just below the boiler centreline and this combined with the high-pitched boiler, emphasised the imposing aspect of the front end.

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●To be continued.

Building a Garden Railway

PART 3

Martin R Evans tells the story of the construction of his 5 inch gauge garden railway.



Continued from p.309
M.E. 4593, 17 August 2018

SUPPLIERS

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Track and points.

What kind of signals?

I suppose you could argue, quite convincingly, that a small garden railway with probably just one train on it doesn't need signals. Even if a friend comes round and two trains are running, the argument for having signals is still a little tenuous. Even more so, the argument for dividing the track into sections and using track circuiting to detect trains is practically non-existent. Not to mention electrically controlled points.

Nevertheless, I decided to have all these things. After all, the object of the exercise is to have fun and installing a signalling system on the railway is all part of that. It also adds a little bit of realism to the whole thing, even if it is not operated quite according to prototypical principles. As I remarked at the beginning, the object of the exercise is to achieve perhaps a 5 or a 6 on the Hewson Scale, not to aim for the 'Full Monty'.

Semaphore signals would have been nice but I opted for colour light signals as they are

generally more robust, weather proof and easier to control. I decided that three aspect signals would be sufficient. I felt two aspects were rather too simple and four aspects would have been a little excessive for a small railway. Three aspects make driving on the railway a little more interesting than two aspects would, while still allowing two or even three trains to occupy the limited length of track comfortably at the same time.

Figure 3 (in part 1 – p. 185, M.E. 4591, 20th July) shows that the inner circuit of the track is equipped with six signals and the outer loop has a further two, dividing the main track into eight blocks. A ninth signal controls access from the sidings onto the main track.

Construction

I had nine signals to make so I wanted to make them simple in construction while looking reasonably convincing. I was fortunate in that a good friend had made a lot of signals for his railway and more or less gone into production with moulded three aspect signal



This is a signal with its ladder, intended to add extra realism.

heads. He had several of these left over and some of them found their way to me. All that was required then was to mount them on a suitable pole. 22mm copper pipe (as used for plumbing) fitted the bill perfectly, so I cut several 2 foot 6 inch lengths and painted them white. A degree of realism was added with a laser cut ladder for each signal (photo 11).

The signal heads were drilled to accept three 10mm Light Emitting Diodes (LEDs) which were mounted on a small piece of prototyping matrix board which fits inside (photo 12). One signal required a feather, for which a moulding was also available and this contains five white 5mm LEDs.

Now I needed to secure the signals to the ground. I decided to 'plant' each signal post into a small flower pot filled with quick setting concrete (photo 13). Installation was then simply a matter of digging a hole,



Inside a signal head. The three 10mm LEDs are mounted on a small piece of matrix board.



A signal, planted into its flower pot and secured with quick setting concrete (the type used for fence posts).



A signal, planted into position.

dropping the signal in and topping off with a handful of gravel to hide the flower pot (photo 14).

Track circuiting

I considered two ways to detect trains. One way is to use an axle counter, based perhaps on a simple treadle, actuated as the wheels pass over it. Another way is to use the 'traditional' track circuit, in which a current passes from one rail to the other via the wheels and axles of the train. This latter method has the benefit of having no moving parts (apart from the train!) so I opted for that. It does require that the rails are well insulated from each other and also, of course, from section to section. Part of this requirement is met by using plastic sleepers. Insulation from section to section is achieved by replacing the steel fishplates at section boundaries with Tufnol fishplates and inserting a Perspex insulator between the rail ends. This insulator is laser cut to the exact cross-section of the rail.

Figure 7 shows the principle of the track circuiting system I am using. A 1KHz square wave of 12V amplitude is applied to the rails through a pair of 100Ω resistors. An opto-isolator is wired across the rails. When there is no train present, no current flows from rail to rail and the opto isolator is driven. This returns a signal on the other side of the opto isolator to indicate that the section is

unoccupied. When a train's wheelset bridges the two rails, and sufficient current flows through it to stop the opto isolator being driven, no signal is returned, indicating that the section is now occupied. This system requires only that sufficient current is diverted from the opto isolator through the train axle to prevent the LED in the opto isolator from lighting up.

There is one apparent snag in this arrangement. It is well known that aluminium, when exposed to air, immediately forms an insulating oxide layer. So how can this system work? The answer is that the oxide layer is extremely thin – sufficiently so that electrons can *tunnel* through it and a current can flow despite the fact that it is an insulator. Driving the signal to the rails at 1kHz also helps a bit as the moderate capacitance formed by the oxide layer (the *dielectric*) between wheel and rail is reasonably transparent to alternating current of this frequency.

How to control them?

I proposed to control the railway from an application running in a laptop computer. To do this requires three kinds of interface:

- Signals
- Points
- Track circuits

This could be achieved by putting all the interface electronics into a box somewhere, which can 'talk' to the laptop, and run wires to each signal, point and section of track. That's a lot of wire and makes for quite a laborious installation job. The first step was to make the interfaces more local to what they control. I settled on a standard interface which could control one signal, one point and four track circuits. This would communicate with the laptop by some means. This approach reduces the system complexity to about ten of these identical small interfaces all communicating

with the central controller via a common means.

That's still, on the face of it, quite a lot of wire.

So I had a drink and a think and it occurred to me, that since I used to work in wireless communications, the solution is obvious! A radio link to each standard interface would eliminate all wires except the power ring main.

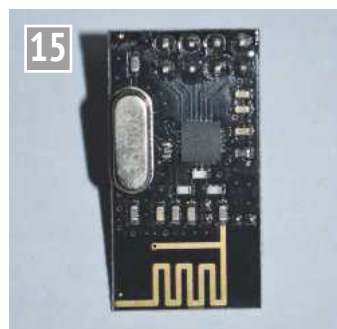
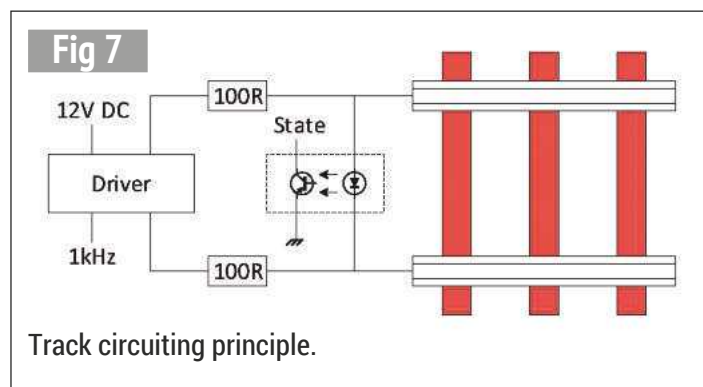
detection and retries. All for 80p! My job was thus reduced to writing the *payload* (i.e. the data I wished to send) to it and then picking up the reply.

All I had to do then was equip each standard interface with one of these modules and build a radio interface for the laptop which could allow it to communicate with any of the interfaces. This radio interface

The object of the exercise is to have fun and installing a signalling system on the railway is all part of that. It also adds a little bit of realism to the whole thing, even if it is not operated quite according to prototypical principles.

A little surfing on the electric internet threw up a very handy little module (from China, 80p each, incl. p. & p. – as they say – **photo 15**) which implements a 2.4GHz point-to-point radio link – part number nRF24L01. As a bonus, it also handles the *transport layer*, which means it deals with all the protocol to do with addressing, error

consists of a higher power version of the radio module, with a higher gain antenna, and a further module to interface it to the laptop (for those 'in the know', this is a USB to SPI interface module – about £2 from China, incl. p. & p.). These are both housed in a dinky little plastic box (again, about £1 from China etc. – **photo 16**).



nRF24L01 radio module, available ridiculously cheaply from China (via eBay or Amazon). The squiggly pattern at the bottom is the antenna.



Laptop radio interface, based on a radio module and a USB/SPI interface module.

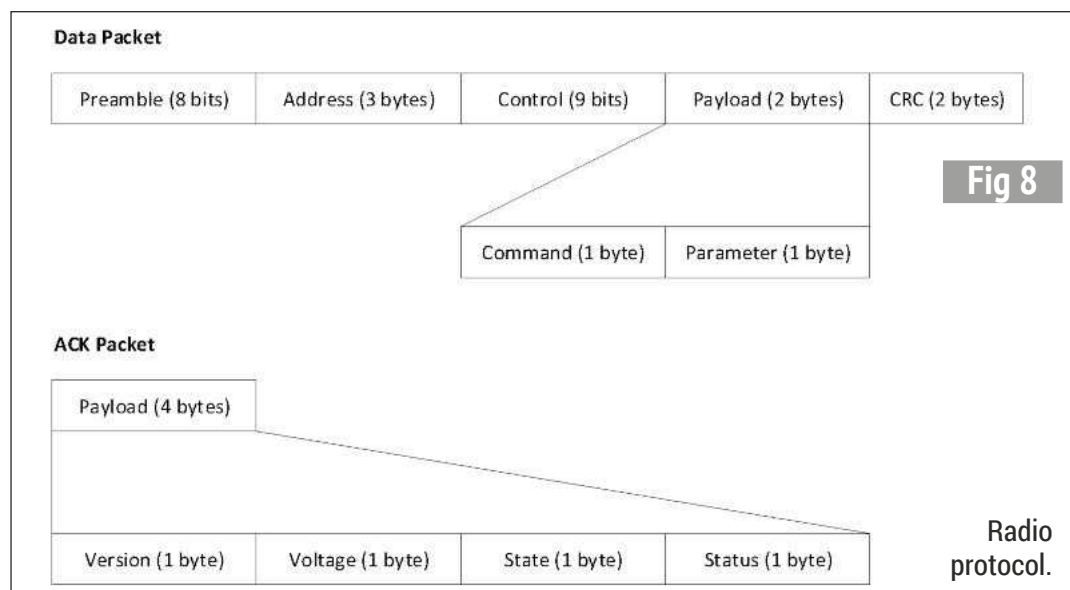
Radio Protocol

Figure 8 illustrates the format of packets sent to and received back from the standard interface.

The *Data Packet* is what is sent to the interface. Most of this is constructed by the radio module, the payload being the only information provided directly to the module. The fields of the data packet are as follows:

- Preamble** This is a sequence of alternating 1's and 0's, used to synchronise the radio receiver.
- Address** Each interface has a unique address, which is inserted into this field.
- Control** Supplies information about payload length (it's variable) and whether an acknowledgement is required.
- Payload** This is supplied to the radio module and is expanded on below.
- CRC** Cyclical Redundancy Check – this is an extension to the data packet allowing error detection and perhaps subsequent retries.

The payload consists of a command and an associated parameter. Examples are



a command to set the aspects of a signal or to set or clear the point. There are also commands for setting operating parameters, like the point operation time.

Each data packet sent to the interface results in an ACK Packet (acknowledgement packet) being returned. The payload of the *ACK packet* consists of four fields:

- Version** Provides the version number of the software running in the interface.
- Voltage** Indicates the voltage of the ring main at the interface.
- State** Returns the state of the signal aspects and the track circuits.

- Status** Returns information about any errors encountered.

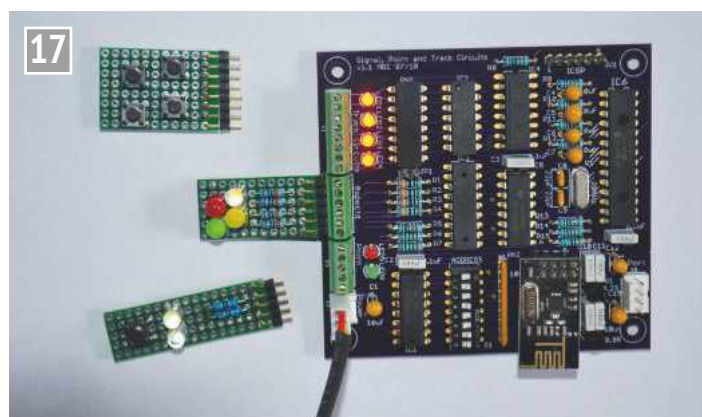
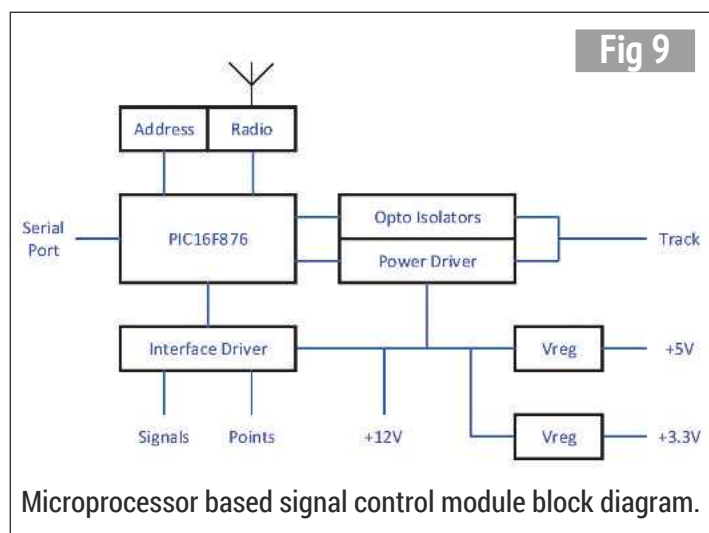
Standard interface

The standard interface is built on a small Printed Circuit Board (PCB) and is based on a PIC16F876 microprocessor (**fig 9** and **photo 17**). The 12V supply from the ring main (after converting from 48V) is regulated down to 5V for the digital circuitry on the board and 3.3V for the radio module. A set of switches allows the board to be set up with a unique address; the radio module is told what this address is and only responds to packets containing that address. An interface driver drives the signals and points and the opto isolators and power

driver provide the interface to the track circuits. Lastly, the interface board is equipped with a serial interface, which can be used for debugging and to control the interface in the absence of the radio. This was particularly useful during development before the radio was working. It can also be used to communicate via a Liquid Crystal Display (LCD) with the driver of a train waiting at a signal.

●To be continued.

Next time I will discuss the how and why of constructing a set of points.



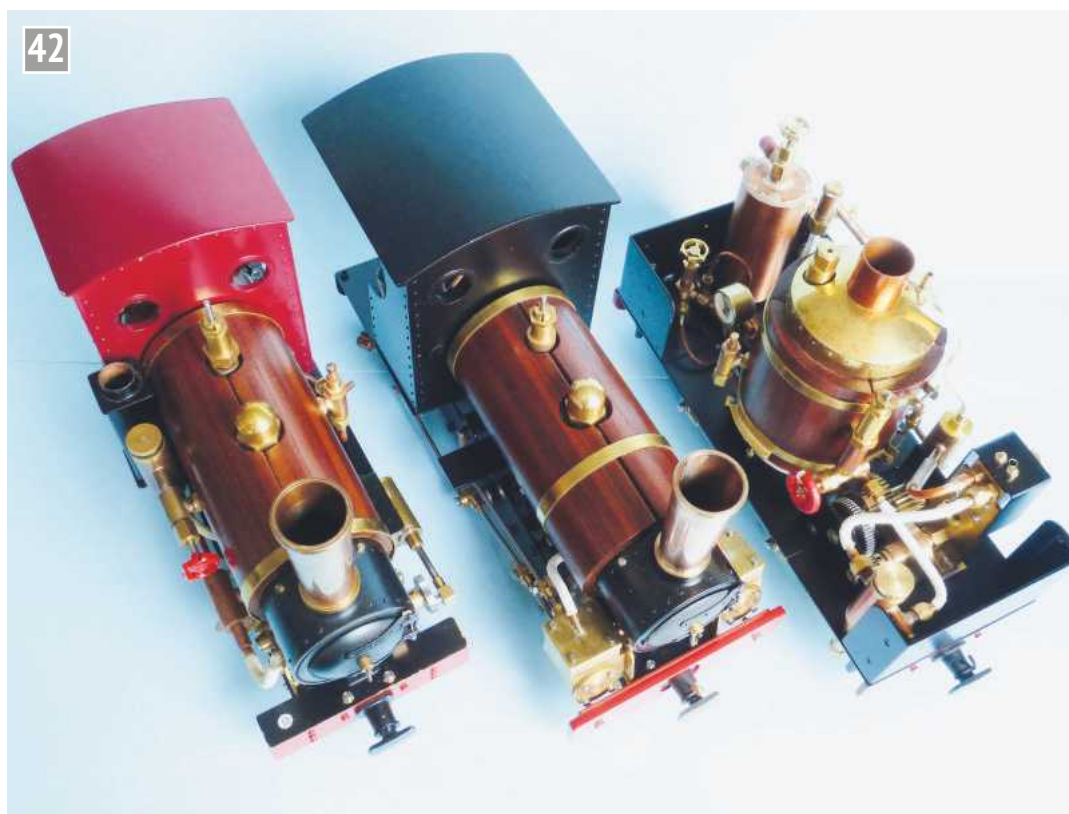
Standard interface, to control a signal, a point and four track circuits. To the left are three test 'gadgets' – from top: track circuits, signal aspects (connected) and point. The radio module is at the bottom right, mounted on the main board. The six pins at the top right are for programming and debugging from a laptop.

FALCOR A Beginner's Locomotive in 32mm Gauge PART 8

Martin Ranson presents a design for a simple, quick build gas-fired 32mm steam locomotive.



Continued from p. 292
M.E. 4593, 17 August 2018



All three engines.

Gear drive or direct drive

My garden layout has lots of tight radius bends so, of the three locomotives I have built (**photo 42**), two are geared and one is a direct drive. The two geared locos can just be left to run on their own because the steam cylinders are already running at speed, so unless I do something daft and turn up the gas to full they cannot derail on a bend (he says hopefully!).

The first locomotive, called *Idris*, is geared at 8.6 to 1 and the locomotive with the vertical boiler is geared at 9.1 to 1. On the vertical boiler I fitted a working firebox door, which is extremely useful for lighting the burner. If I built another geared engine I would

make it geared by about 10 to 1 so the steam cylinder could be fractionally smaller and the locomotive would run a bit slower. I would try to make the flywheel even bigger so the steam cylinder can run EVEN slower.

The direct-drive engine is wonderful to drive but must be watched all the way round – the best answer would be to get rid of the tight curves. I wonder what the people next door would say if I spread out and used their lawn? It is lovely and flat - maybe our lawns would be just as flat if I could break through the force field that keeps me in the garage! I could fit their lawn with 20 feet radius curves! Do you think they would like it? Perhaps

they would, especially if I made them a GWR bench (yes! – *Ed.*) to watch the trains go by.

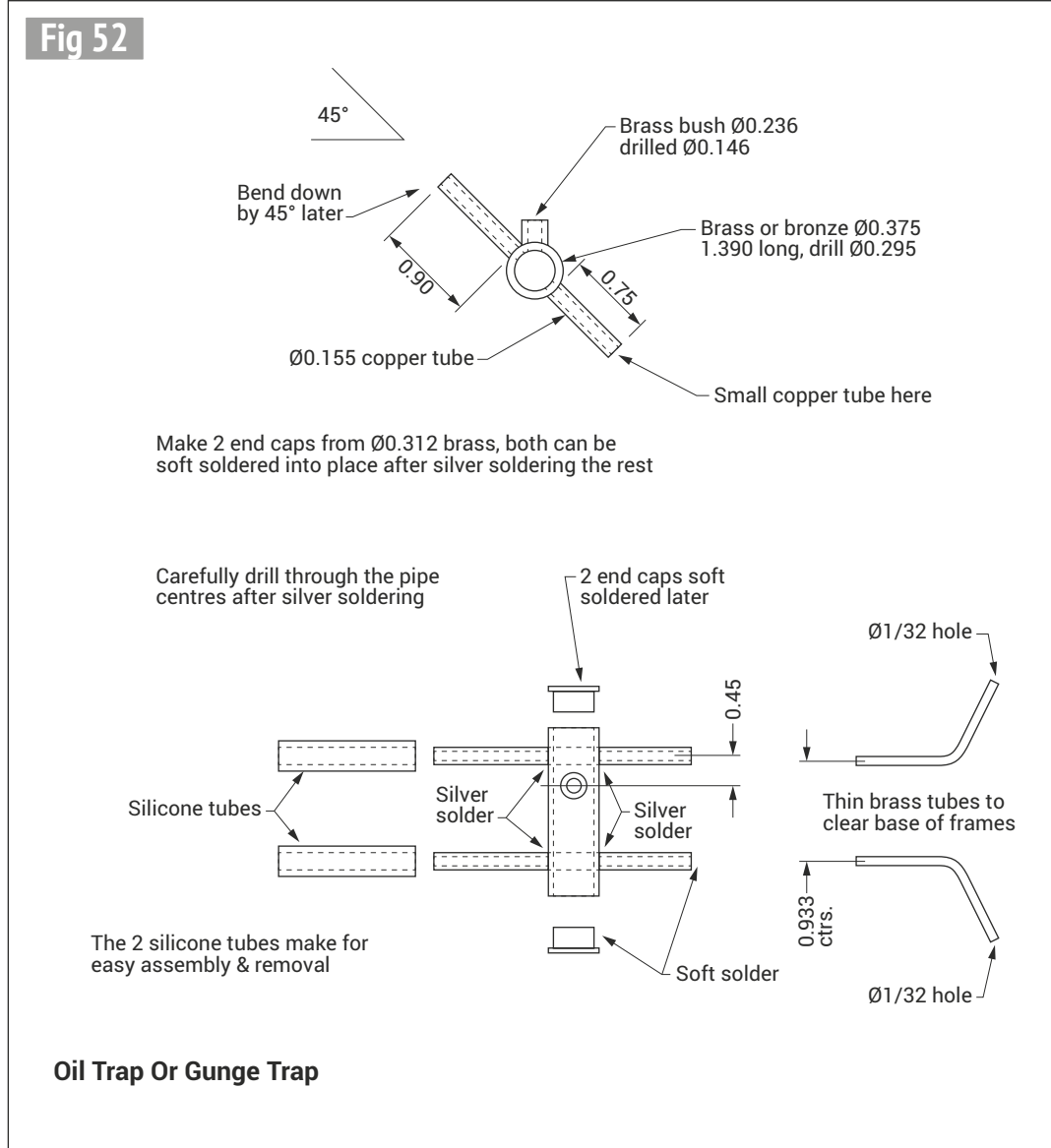
Something else I discovered was that a direct drive from cylinder to axle can produce a high rate of acceleration. So much so, that on its very first run the locomotive hit the first curve and promptly fell off into a large patch of flowers. Many pieces of foliage sprayed everywhere without doing too much damage to the locomotive. The only real damage was to the chimney and the front buffer beam, which is why there is now a piece of $\frac{3}{16}$ inch ply as extra reinforcement.

In fact, the plants made a very good cushion. I was pleased but SWMBO was not, ➤

so lots of mutterings and grovelling from me. This has given me many more things to learn, so plan B was to fit a sensitive throttle on the steam supply. This worked to some extent but I ended up chasing the locomotive round the garden, adjusting the valve between straight and curved sections.

Plan C was to rapidly fit a radio control servo under the footplate and use this AS WELL as the manual throttle to limit the top speed. It is still not 100% perfect because it needs something else to hold the locomotive back if it is running light on the long straight over two bridges which join one end of the garden to the other (the straight is 24 feet long). This gives the family lots of amusement - I think they are hoping for a spectacular derailment if I set the throttle too high!

A method of restricting the exhaust was tried but the locomotive just became very sluggish at certain speeds. One suggestion I was given was to use a windmill similar to the governors as once used to control the speed of clockwork musical movements. A very good idea, but I would far rather restrict the steam going INTO the cylinders. My assumption is that whatever the delay in acceleration produced by any sort of windmill or fly wheel will still not be effective at the end of the long straight. The



engine would fall off at the first bend. So, in other words, driving a governor to open and close a steam valve would be much better. Yet another experiment!

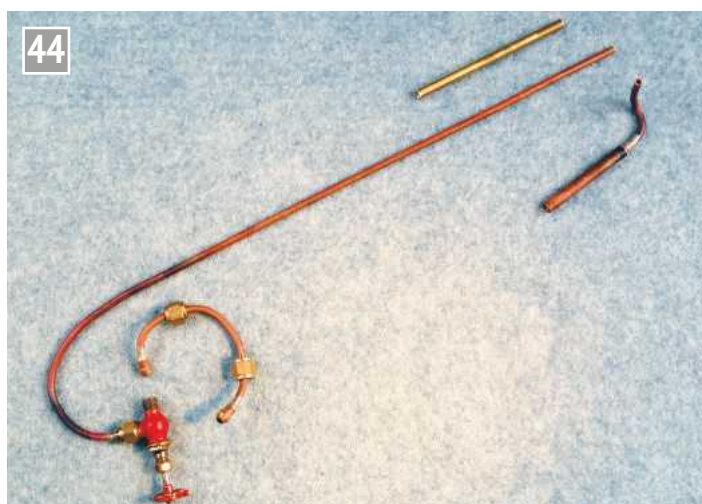
Oil trap

This (fig 52) was added to stop all of the waste steam and oil ending up splattered over the boiler and all the frames. Note the two silicone tubes which

join onto the exhaust adaptors (photo 43). Some of the water still goes up the chimney but, especially on start-up, most of it heads downwards onto the track. The two small pipes



Oil trap.



Blower piping.

which poke out sideways under the frames are $\frac{1}{16}$ inch outside diameter and $\frac{1}{32}$ inch for the inside diameter. The copper tubes were sleeved down to enable the small pipes to fit.

Steam feed tee piece

There is just enough room under the boiler to fit this unit (**fig 53**) into place. Please note the boiler lagging formed from mahogany strips is not continuous all the way round the boiler. Down at the boiler base underneath there is a deliberate gap left; the rear boiler brass band straddles this gap and the steam feed pipe fits into the gap. The pipe was pushed upwards as much as possible to touch the boiler and hopefully this will keep the pipe a bit warmer.

Note that the two pipes leaving the tee piece are angled outwards by 10 degrees to help aim the pipes towards the cylinders. Furthermore, there is an angle of about 37 degrees between the input and the output pipes. The output pipes are tipped upwards compared to the input. If anyone thinks this is far too complex just for a tee piece then you are probably correct. However, when I was trying to visualize the fit of this component into the available space I was not sure how all the pipes would fit. I did not want to force anything into any tight corner with a pair of pliers. If I built another engine with an identical layout I would pre-bend everything and only use one or two union nuts to join things end to end.

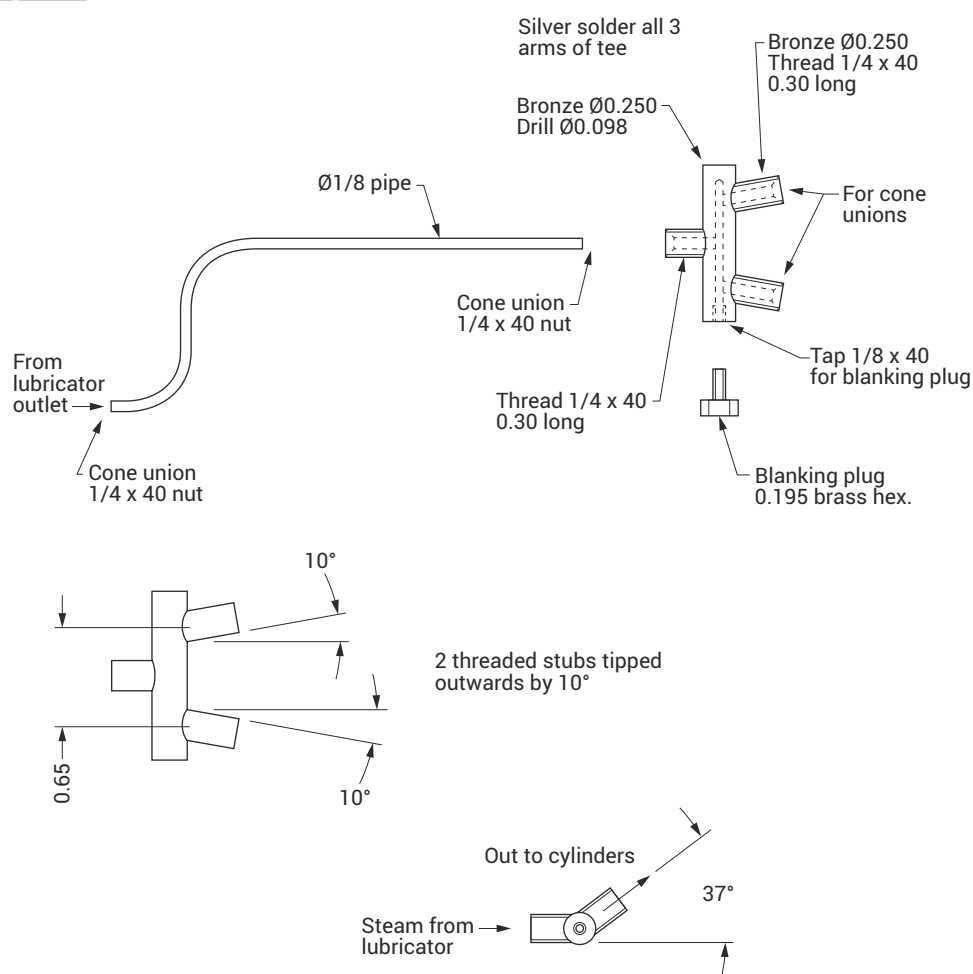
Blower

Having run the locomotive round the garden many times, I found it does not always produce a visible column of condensed steam out of the chimney. The blower (**photo 44**) can be turned on to generate enough steam to be visible, especially for photographs. It is not needed to run the engine.

Piping

The various lengths of copper tubing for the exhaust, steam

Fig 53



Steam Feed Tee Piece

feed and gas supply have evolved over the months as the engine was tested. The only one that now needs finalizing is the steam feed into the lubricator. It works perfectly but some people think it is a bit untidy and have said I should swap it. A proper

steam manifold for the blower and steam feed is another experiment for later in the year. That would make fitting the blower valve much neater and smaller.

●To be continued.

Next time, we deal with the last major component – the cab – and complete the locomotive.

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Part of the line-up of engines.



6 inch Burrell agricultural engine Albert.

Somerset Traction Engine Club Annual Rally 2018

Graham Gardner makes the most of his day out in Somerset.



This year's show was held over the weekend of July 21st and 22nd at Low Ham near Langport, Somerset. The weather could not have been better as the heat wave was still going strong and brought lots of visitors to the show during the weekend.

The club was formed in the 1950s and has been putting on rallies since 1955. This started off as a very small gathering but has now grown into a major three day event which has something of interest for all the family. The late Fred Dibnah and the late Michael Oliver of Great Dorset Steam

Fair fame have visited in the past. The club also organizes a road run on New Year's day.

As well as all the usual attractions, a display of off-road driving was put on by the Dorset Land Rover Club, which created a lot of interest. The area of ground that was used for this was once a golf course and, with its bunkers, made for a very challenging course - a display that I have never seen at any other rally before.

On the Saturday evening a road run was organized to the local cider farm at High Ham, run by Jim Lockyer. A BBQ and a skittles match was put on

and Jim's excellent cider was for sale. A great time was had by all.

There was so many other attractions and displays at the show that it is not possible to mention them all here and I hope the pictures tell the rest of the story. Come along next year and have a great weekend - public camping is available.

For further details about the club and the rally please visit www.somersettractionengineclub.com or contact the secretary on 01761-470867.

ME



1896 Gavioli fair organ, owned by Kevin Gamlen.



1933 65HP Blackstone oil engine named Harry.



1907 Stanley steam car.



Engineman's living van complete with hanging baskets!



The Cider Bus attends many events in the south of England.



A 4 1/2 inch Marshall traction engine owned by Richard Bradley.



A very nice 1960 Leyland Comet owned by David Wedlake.



Duke of Kent, a 1914 6NHP D. C. C. Burrell road locomotive giving rides.



Off-roading display by the Dorset Land Rover Club.



12 NHP Fowler ploughing engine Margaret built 1870.
Oldest working Fowler ploughing engine in the UK.

Designing Model Boilers

Or, The Truth About Model Boilers

PART 6

Martin Johnson explains what really happens inside model boilers.



Continued from p.313
M.E. 4593, 17 August 2018

Superheater tubes

It appears from this mathematical analysis that, in our process conditions, superheat is largely a waste of time - D. A. G. Brown M.E. 4307

Well, if you look at the available energy drop for superheated and saturated steam between two pressures, that is true but it does not reflect what happens in a reciprocating engine.

A boiler with superheater tubes is a compromise. Boilers, particularly on vehicles, are quite restricted in size by loading gauge or weight restrictions. Therefore, if we put in superheaters, we probably have to take out some other heat exchange surface. So a boiler without superheater tubes will always produce more steam from the greater surface area available

for boiling water. However, it can be a compromise worth making when we consider how efficiently that steam can be used.

To understand the problem, we must start from basic thermodynamics. Steam has a unique saturation temperature at a given pressure. At atmospheric pressure that temperature is 100 degrees C; any temperature less than that and steam condenses to water, anything more and steam is 'superheated'. That is of course why water condenses from the atmosphere on cold windows or bathroom mirrors. For comparison, steam at 4Bar (60psi approx.) has a saturation temperature of 150 degrees C but will condense on cooler surfaces in just the same way.

Now consider what happens in an un-superheated steam engine cylinder. It is fairly

obvious that the temperature of the metal will settle to some temperature that is an average of the temperature across the whole working cycle from inlet to exhaust. Calculating the precise temperature is actually rather tricky but from the above figures it could be somewhere around 125 degrees C for example.

So our inlet steam rushes in at 4Bar to find all the surfaces surrounding it are at considerably less than the 150 degrees C saturation temperature, so starts condensing on the cylinder walls. That is serious because the amount of steam condensed can be quite large. The amount of extra steam used varies with the size of engine, RPM, valve type etc. but the engine would be using more steam than would be expected from the cylinder volume and cut-off setting; we can express

Fig 15

STEAM RATIO AS MEASURED BY BILL HALL

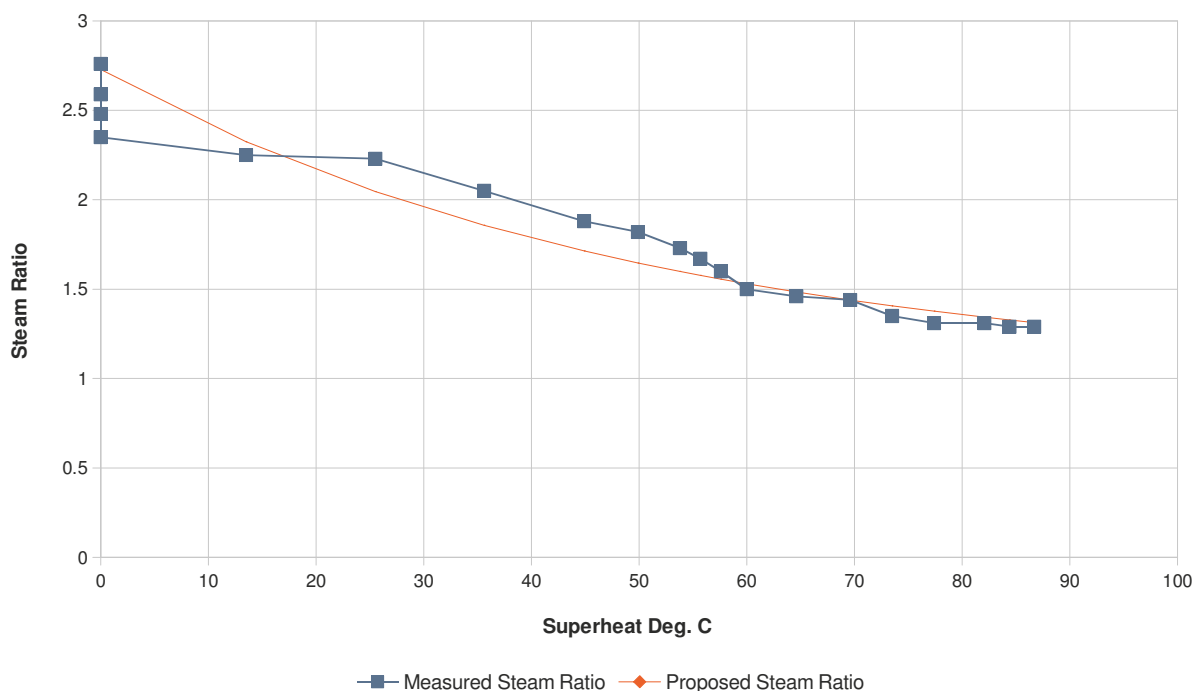
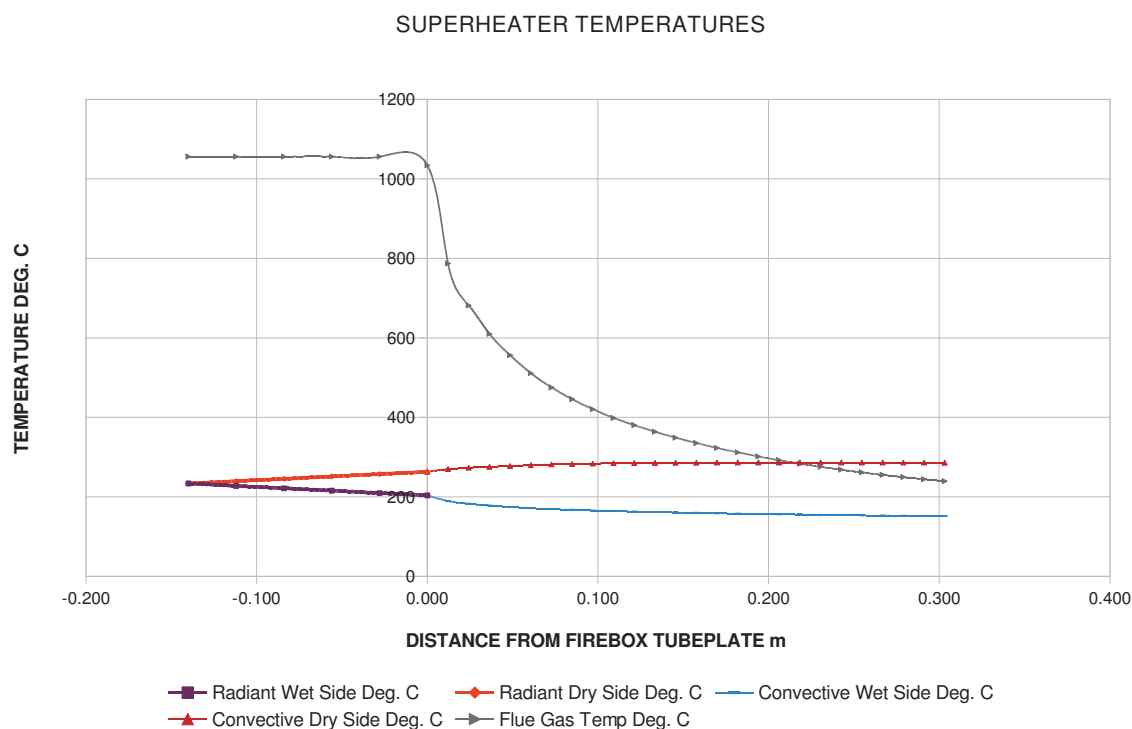


Fig 16



the steam demand as a 'steam ratio', being the actual steam demanded divided by the theoretical steam demand based on cylinder volume and cutoff. (Some older texts refer to the 'missing quantity' which is actual steam demand minus theoretical demand.) To supply the extra steam we have to boil more water and use more coal to do it. The engine can produce virtually no useful work from the condensed steam since water does not expand.

Continuing with our steam cycle, as the steam expands and the pressure drops, the saturation pressure also drops until, on the exhaust stroke, much of the condensate is boiled off by the cylinder walls which are now at a higher temperature than the saturation temperature of the low-pressure steam. This helps to cool the cylinder walls ready for the whole sorry saga to begin again!

If we superheat the steam sufficiently, three things happen:

- The average metal temperature is increased, so steam is less likely to condense on it.
- The steam has a greater reserve of heat to be

extracted before it can start condensing.

- The steam density is lower, so we use less mass of steam to fill a given engine cylinder.

The first two help to suppress condensation and the third reduces demand on the boiler even if there is no condensation.

If we are going to assess how useful superheating might be, we need to know the value of the steam ratio. Fortunately, Professor Bill Hall undertook an extensive series of tests on an engine based on a *Speedy* cylinder block under conditions very similar to those found in miniature locomotives. His results are shown in **fig 15**, where Hall's data is shown in blue and my curve fit to his data is shown in pink. I have fitted his data to the formula:

$$\text{Steamratio} = 1 + [1.7827 \times e^{(-0.0197 \times \text{Superheat})}]$$

where:

$\text{Superheat} = \text{Steam temperature} - \text{saturation temperature (at relevant pressure), degrees C}$
 $e = \text{Base of natural logarithms}$

The curve fit is not particularly good and there may be other effects in Hall's data to explain

the rapid drop in steam ratio between 50 and 60 degrees of superheat but the proposed smooth curve is sufficient for our purpose.

Now, the engine needs a **volume** of steam to fill the cylinder but we tend to talk in terms of **mass** of water boiled by a boiler. When comparing different superheat options, we must stick to volume and the effective volume available to the engine is:

$$\text{Volume} = \frac{\text{Mass of steam}}{\text{density} \div \text{Steamratio}}$$

where:

$\text{Volume} = \text{Effective volume of steam available to engine (m}^3/\text{s)}$

$\text{Mass of steam} = \text{Mass of steam generated by boiler (kg/s)}$

$\text{Density} = \text{Density of steam at relevant temperature and pressure (kg/m}^3\text{)}$

Different superheat options

A widely adopted technique of improving engine performance is to fit radiant superheaters and **fig 16** shows the predicted performance. There are several points to note here:

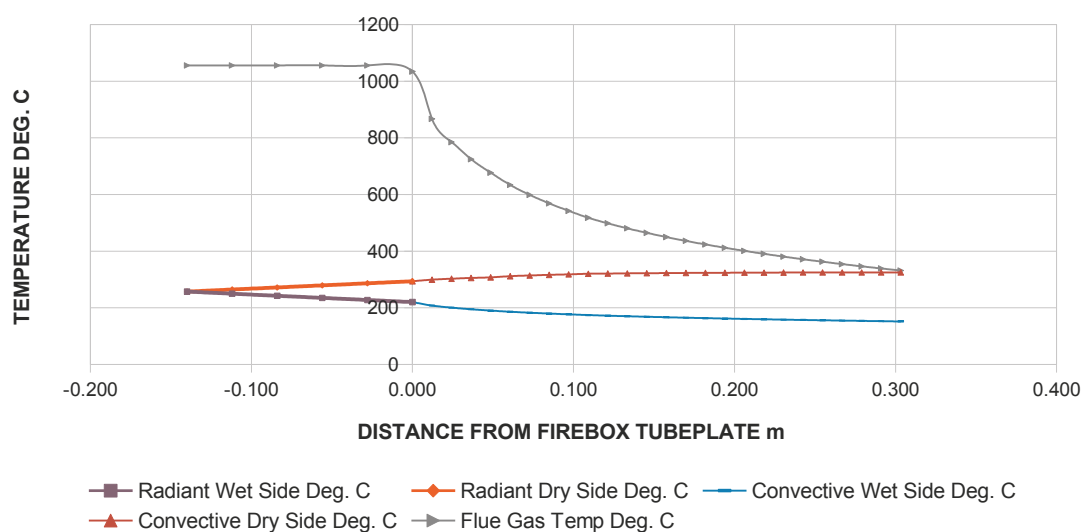
- Radiant superheaters are not magic. They offer a useful increase in heat transfer area but the increase in steam temperature with distance

along the superheater is not as great as at the flue entrance because the absence of boundary layer at the firebox tubeplate end makes the convective heat transfer at that point very effective. The radiant section only receives heat on the side facing the fire because in miniatures the firebox radiant heat transfer is predominantly direct from the fire so any areas in shadow are not heated.

- In this instance, the steam temperature in the dry leg does not change in the last 100mm of length, because the steam temperature (280 degrees C) exceeds the flue gas temperature (280 to 225 degrees C). The reason for this is discussed in detail below. (In fact, steam temperature drops very slightly.)
- The analysis of the *Speedy* boiler showed that the exit temperature from the superheater flues was considerably lower than that from the firetubes, suggesting flow through the superheaters was 'sluggish'. I have also noticed that some recent miniature locomotive designs have 4 x 5/16 inch elements in

Fig 17

SUPERHEATER TEMPERATURES



a 1 inch flue which gives similar sluggish flow to the *Speedy* design. Apart from the heat transfer problem, it seems to me that allowing a lower velocity is a good way of helping to block the superheaters. Interestingly, L. D. Porta reports using reduced diameter ferrules in the firetubes to force more gas through the superheater tubes in his work in Argentina. Keiller even addressed this problem in his original article, proposing that circumference / area should be roughly the same for superheaters and firetubes – a point on which I heartily agree! **I believe that balancing flow in superheaters and firetubes is an important factor in effective boiler design.**

Roger Froud had designed a tube layout which allowed increased water space between tubes, using 18 firetubes, and has developed his own technique for TIG welding $\frac{3}{8}$ inch stainless superheater elements. His proposed boiler design used four 1 inch flues with $\frac{3}{8}$ inch elements. I was able to use an early version of my program to predict how this might perform for him and the graph of the superheater performance is shown in **fig 17**.

In Roger Froud's design, the flows through the firetubes

and superheater flues are in better balance, giving exit temperatures of 294 and 329 degrees C respectively. Figure 16 also shows that the dry side element continues providing temperature rise throughout its length. The superheat temperature has been improved to 323 degrees C from 286 degrees C in the radiant version of LBSC's design. I was concerned the temperature might be too high but it is easier to take out excess superheater surface than to put extra in!

I then investigated just how far the superheat could be increased; was there a maximum after which performance would drop away? **There was no such maximum**; the predicted performance rose until I had eight radiant superheaters and just two firetubes! This arrangement gave a predicted steam temperature of 446 degrees C. This is not a very practical arrangement with a firebox full of radiant elements and a steam temperature that would rapidly degrade even the best superheated cylinder oil and destroy PTFE and most rubbers. Front end plumbing would also become a significant problem with so many superheater elements to connect. The required draught of 14mm water gauge did not appeal either but nevertheless

it is an interesting numerical exercise – perhaps a glimpse of a future IMLEC winner?

My final design option was found by accident. Using LBSC's original tube spacing it is possible to get four 1 inch superheater flues and $24 \times \frac{7}{16}$ inch firetubes into the tubeplate. If the superheater flues are fitted with two $\frac{1}{4}$ inch diameter elements per flue with a radiant length in the firebox then we get an excellent balance of evaporation AND superheat. This design gave the maximum effective volume of steam to the engine.

Contrary to what some have stated, the pressure drop across miniature superheaters is tiny. For all the geometries described here it is well below 1psi. In fact, the flow velocity through typical miniature superheaters could be usefully increased, which would need more but smaller elements. The various superheater options are summarised in **fig 18** and the results of investigations are summarised in **table 3**. There are several points to notice in this table:

- All the non-superheated options produce effective steam volumes less than half the superheated options, despite producing a greater mass of steam.
- The design options produce

a volume of useable steam covering a 380% range, while the evaporated mass covers only a 136% range. This demonstrates the importance of effective superheater design for miniature boilers.

- There is an advantage to further superheating beyond superheats of 150 degrees C, due to increased steam volume and further small improvements in steam ratio. However, this might not be feasible with some cylinder materials and lubricants.
- An optimum boiler design balances flow through smokeflues and superheater flues.
- Radiant superheaters provide a useful extra heat exchange area but the performance of the whole superheater system must be considered for effective design.

And finally:

One cannot discuss tube proportions without considering the boiler as a whole and indeed the whole machine, and what it has to do – D. E. Lawrence *M.E.* 3417

I could not have said it better.

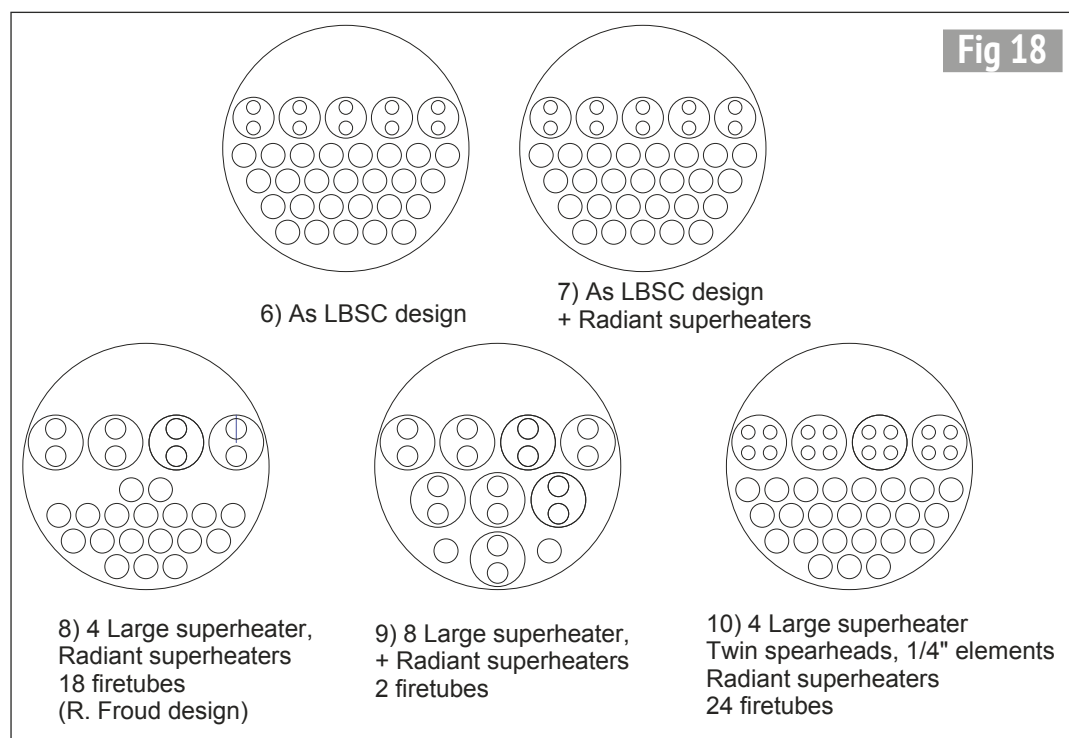
Closing thoughts

They can never be 'conclusions' on a project as open ended as this one! I am confident that the

performance of a miniature (or full size) boiler can be numerically predicted. There is still uncertainty about how such factors as grate loading, air ratio and fuel lost might vary with scale but the calculations will give a good indication of how design changes compare to each other.

I am not aware of an analysis of grate loadings in small engines that has been done before and certainly not published. A design value of specific fuel flow rate of around 40 lb/sq.ft/hr is appropriate to miniature boilers in the 5 to 7½ inch gauge range and 20 to 25 lb/sq.ft/hr as a more conservative value for smaller miniatures.

I hope I have demonstrated that really effective design of miniature boilers cannot be accomplished using simple rules such as Keiller's formula or Ewins' boiler factor, especially when the interaction of superheater and firetube flues has been shown to have such a significant effect of boiler performance.



I continue to work on refining prediction methods for air ratio and fuel lost before combustion, plus fine tuning the calculation and researching a better method of firebox heat transfer modelling. I would also like

to get the program up on the net somehow but I am not keen on starting a web page. If anybody can help I would be pleased to hear from you. I am working on other related topics such as condensation prediction, picking up from Bill

Hall's work again, but trying to extend it beyond 5 inch gauge locomotive cylinders. I also get out in the workshop occasionally!

If you would like to contact me, I am Martin Johnson 1 on the Model Engineer forum. **ME**

Table 3

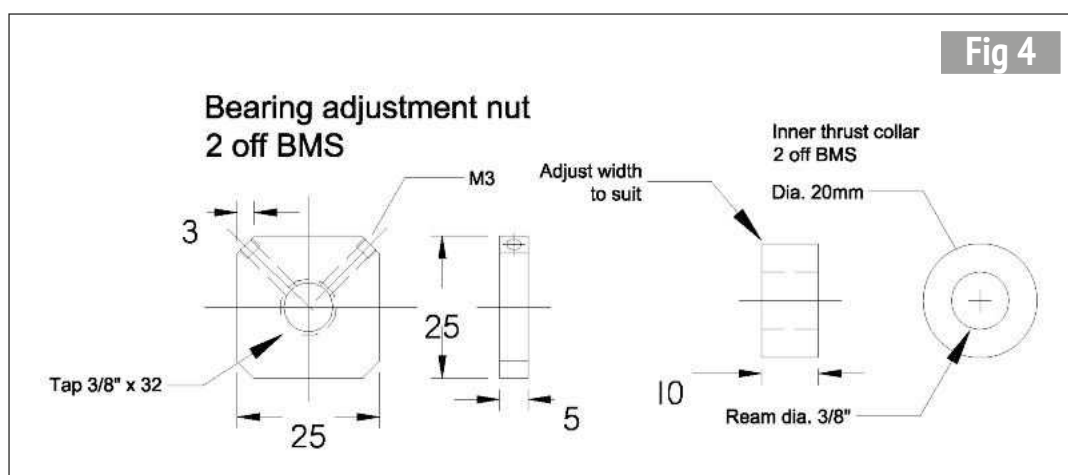
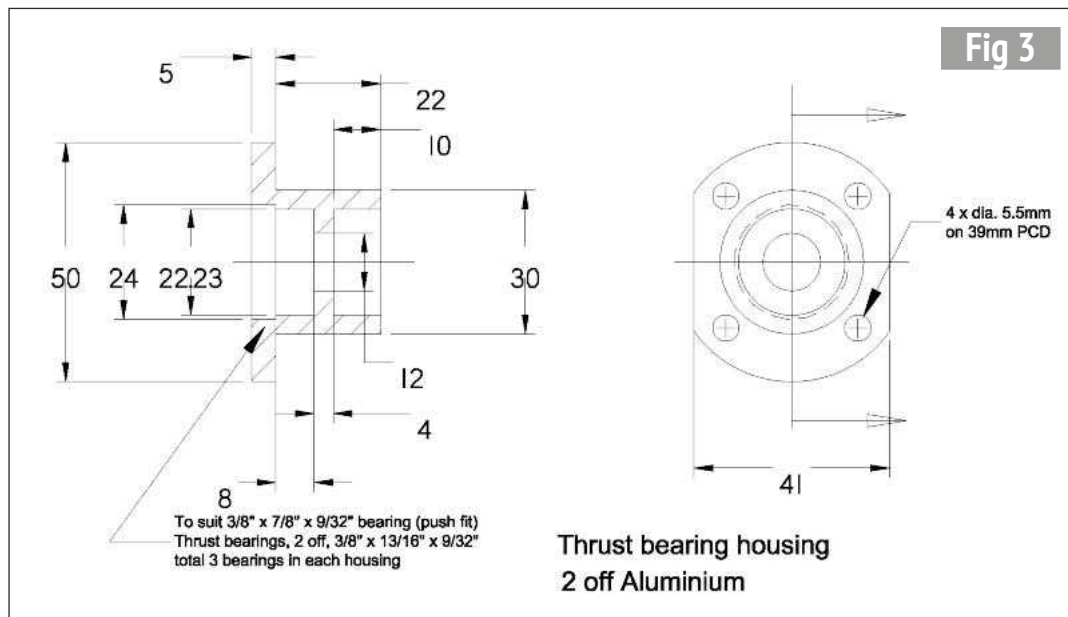
OPTIONS (See figure 18)		FLUES	S/HEATERS	RADIANT LENGTH mm	DRAUGHT mm H ₂ O	EVAP. RATE g/s	STEAM TEMP. °C	SUPERHEAT °C	AVAILABLE VOL. FOR ENGINE m ³ /s x 10 ⁻³
OPTION	DESCRIPTION								
1	SPEEDY – 129 x ¼" TUBES	129	0	1	7.62	4.11	152	1	0.569
2	SPEEDY – 55 x ⅜" TUBES	55	0	1	3.77	3.94	152	1	0.545
3	SPEEDY – 41 x ½" TUBES	41	0	1	2.94	3.83	152	1	0.530
4	SPEEDY – 33 x ½" TUBES	33	0	1	2.26	3.75	152	1	0.518
5	SPEEDY – 24 x ⅝" TUBES	24	0	1	1.39	3.61	152	1	0.499
6	SPEEDY AS DESIGNED BY LBSC	26	5	1	3.73	3.61	236	85	1.26
7	SPEEDY AS DESIGNED BY LBSC + RADIANT S/HEATER	26	5	140	3.74	3.54	286	135	1.64
8	SPEEDY AS MODIFIED BY R. FROUD	18	4	140	4.47	3.35	323	172	1.70
9	8 S/HEATER SPEEDY	2	8	140	13.91	3.02	448	297	1.89
10	MAX. VOLUME SPEEDY	24	4	140	3.31	3.55	360	209	1.98

Sieg SX2 Plus Miller CNC Conversion

Graham Sadler explains how he converted his Sieg milling machine to CNC operation.



Continued from p.305
M.E. 4593, 17 August 2018



X and Y thrust bearing housings

For these, the housing (**fig 3**) is a simple bit of turned aluminium, diameter 50mm. Concentricity is not too important as, once fixed, they will never move and adjustment is provided elsewhere, when the bore is centred and the holes pitched with the DRO (**photo 10**).

Use a single imperial bearing $\frac{3}{8}$ x $\frac{7}{8}$ x $\frac{9}{32}$ inch ball race fitted into the housing internal shoulder, with a pair of ball thrusts and washers $\frac{3}{8}$ x $\frac{13}{16}$ x $\frac{9}{32}$ inch (sorry about imperial, they are the only bearings which will fit). They are fixed by a square adjustment nut (**fig 4**) on a fine thread on the end of

the screw and, at the inner end, a 16mm diameter slug with a $\frac{3}{8}$ inch bore has its length adjusted (about 12mm long) to get things in the correct position. It provides a flat face for the thrust washer as the ball screw thread is deep and there was concern about getting a square end face for the thrust washer.

Oiling system for X and Y slides

For oiling I used Arc Eurotrade elbow fittings with the gland nuts and olives along with push fittings from eBay. The Y axis oiling holes are mounted on the outside of the base dovetails and the pipe for the left one is directed back and under the

screw. The right one doubles back to the manifold block. These are machined while the base is modified, as below. Use a 2.5mm or 3mm ball end cutter and communicate with a 3mm vertical hole meeting an M6 tapped hole in the side for standard Arc one shot lubrication fittings.

For the saddle, the elbow holes have to be at the end and need to be low down. Both are on the left, and the tubes are bent round the front bottom of the machine and left free to move back and forward to the manifold. If not, they would get in the way of the gib strip adjustment.

A simple manifold was produced. Arc will have it



10
Drilling the thrust bearing housing for the mounting screws.

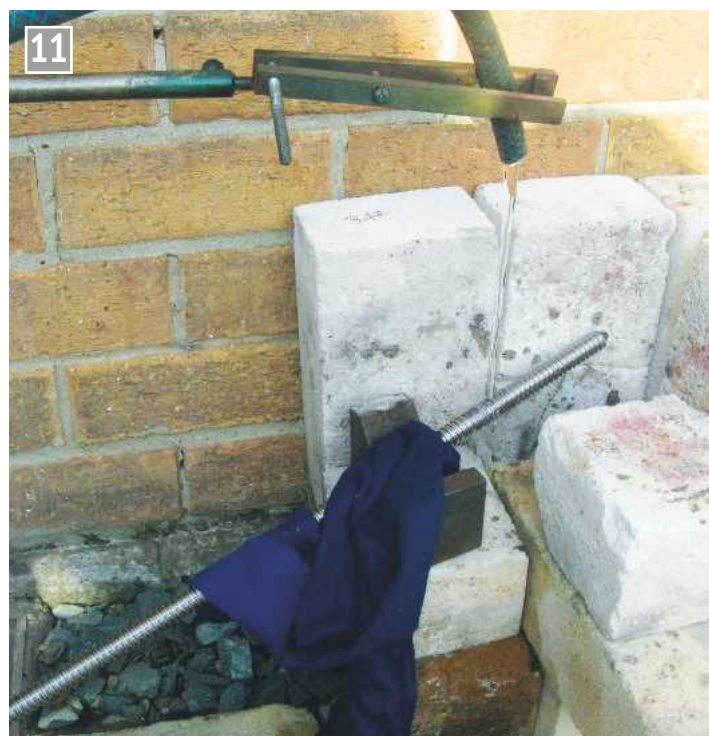
that oil metering fittings are needed but it's easy to see the oil flowing through the pipes. I used an oil can for the pump, which works well as all the supply holes are the same diameter - 3mm. Individual oilers were originally provided for the enclosed thrust bearings at the ends of the screws. These though, because of the covers, will be completely hidden so the Y feed will be connected by a tube to the upper column.

Choice of ball screws

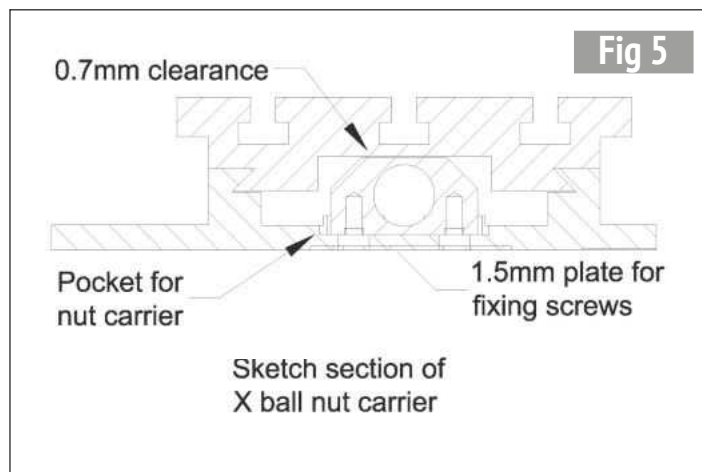
For the ball screws it was decided that the bigger the better - 12 or 14mm diameter - were the only options. The preferred size was 14mm as this has a pitch of 4mm and, with a 2:1 pulley reduction, 400 motor steps yield exactly one turn and 4mm of table movement. This gives a basic resolution of 0.01mm before any micro stepping from the motor drivers.

The problem with the motors is that the faster they run the lower the torque and excessive micro stepping exacerbates the situation. I decided to try for only 4 or 8 micro steps mainly to give improved smoothness to the drive. In practice, 8 micro steps has proved to be perfect.

The X system was the real problem, as the space between the saddle and table was just 23.9mm, although with care this could be increased to just over 26mm. See the sketch end view (**fig 5**). The problem was the mounting flange found on most of the ball nuts produced. They are most commonly top hat shape, making them in this situation just too big. A long period of research for suitable screw supplier revealed only one which would fit. Moore International had 14mm screws with an FGI type nut of diameter 25mm fixed with a 22 x 1.5mm mounting thread. Perfect, and a good fit, but expensive. If 12 x 2mm pitch screws are used the outside diameter of the nut is 20mm, which provides much better clearance and would have given a lot fewer problems but I wanted the bigger screws. I have since heard that 10mm screws are OK with this type of machine but you would need some changes to the design, especially with the work to be done on the saddle and X axis components but probably a lot simpler. In any case, the X is the only axis for which I would consider a smaller screw size but anyway the system to be shown works and it all fits.



Set up for annealing the ball screws.



Another problem with the smaller screws is the depth of the hardened outside diameter. With the depth of the ball grooves the hardening goes a considerable depth into the soft core. The three screws and nuts cost £465 – yes, eBay (or even Amazon) provides screws a lot, lot cheaper direct from China (don't forget the added VAT and the possible import duties) but for this machine they just won't fit and they are almost exclusively of the flange mounting type. After many hours of cogitating I took the plunge and ordered the screws. They arrived the next day.

I had seen on the net forums that it is possible to machine the ball screws to fit the bearing - what a laugh! When doing exploratory turning in my 6 inch Colchester on the screw, it was surprising to see how much a large heavy 6 inch three-jaw chuck can bounce about when a modest cut is applied with a 25mm square inserted tool...

The only solution is to:

- fit a mild steel insert into a drilled hole in the 'soft' core and turn that *in situ*, or
- anneal the screw to turn it.

The hardening of this screw seems to be down to a soft core of about 9mm diameter so the fitting of a plug would be easy. The Moore International web site has a video of them annealing screws by induction heating and their method was copied; this is shown

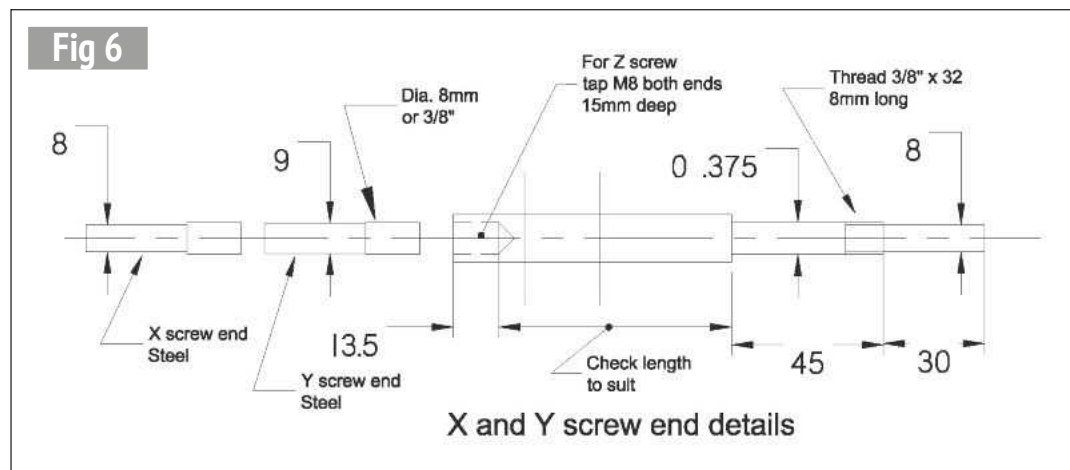
in **photo 11**, which is self-explanatory. The water is not easy to see but runs slowly from the hosepipe. A lot of heat is required as the water effectively cools the screw and sucks the heat away. Use plenty of firebricks to contain the heat. After this it was easy to turn the screws with HSS tools.

To centre them turn a piece of nylon (both inside and outside diameters before parting off) to a force fit on the screw then set up in the four-jaw chuck with a DTI on the nylon to centre. Without this it's impossible to set up because of the screw threads, which don't provide a fixed diameter reference for the indicator. Use wedges in the end of the lathe spindle to keep the back end of the screw axially true.

To produce the front-end bearing for the Y screw, the screw (left fully hard) was centred as above, faced then reamed 8mm diameter with a machine reamer. A pre-turned shouldered $\frac{3}{8}$ inch diameter steel pin was Loctited in place, then turned *in situ* to 9mm diameter. Alternatively, a pre-turned pin 8mm and 9mm diameter made at one setting before parting off may be used. Either method ensures axial truth. The left end of the X axis screw is 8mm. The thrust bearing drive ends of the X and Y screw are turned to a push fit on the $\frac{3}{8}$ inch bearings. They have a fine thread for the preload adjustment and an 8mm diameter journal for the drive pulley (**fig 6**).

Stepper motors

For the motors, I feel too many people use motors which are far too big and powerful; again, this is a small machine. The selected motors are Nema 23 (the number relates to the frame size) with 1.5Nm holding torque for the X and Y axes and 2.2Nm for the Z axis. If you're a real geek it is possible to calculate it - there are masses of calculations - but instead a very useful spreadsheet was found in a CNC forum link which does it all for you after you input a host of machine and motor details. Using the spreadsheet it seems even the motors I chose could be too big. This was later confirmed when I



found the specifications for the Sieg KX1 CNC machine, which uses the same motor for the Z axis but smaller 1.3Nm ones for X and Y (I was

pleased to see that its Y motor was mounted at the back so I did get something right!).

●To be continued.

Next time we will start work on the Y axis.

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Quarter Scale Bentley BR2 Rotary Aero Engine PART 4

Mick Knights adds yet more holes to the aero engine crankcase.



Continued from p.297
M.E. 4593, 17 August 2018

Time now to pitch out the front and rear crankcase holes. The orientation of these centres in relationship to the number one cylinder is critical so care needs to be taken with the initial setting of the crankcase to the machine spindle.

First, the number one cylinder flat is clocked square (**photo 51**) then the bore is clocked to ensure the spindle is dead centre. The centres are then pitched out. As the first hole is offset to the centre line all the coordinates need to be calculated. The coordinate print off I used was generated by software from The Trades Maths Calculator, although there are many free sites online that will do the same number crunching work for you (**photo 52**). Once both faces are pitched out the



Bentley BR2 aero engine.

holes can be drilled on the bench drill.

In order to drill and tap the previously centred positions for the cylinder securing studs the crank case was set using

an angular set piece. Each face was checked using a DTI before final drilling (**photo 53**). Each series of holes can then be drilled. The tap is started by hand, then tapped through, also by hand, as there was not a slow enough speed available to safely power the tap through.

With the crankcase now complete, it's time to turn our attention to the front cover housing. The initial machining is straight-forward turning, with a free hand operation to generate the radius. There are however a large number of holes to be drilled, tapped and reamed, so their relationship with every other series of holes is critical to the setting of the cam ring and timing of the engine.

The first operation was to rough turn the front diameter parallel in order to be able to hold on to it in order to turn the internal diameters, the crankcase location shoulder and the outside diameter. **Photograph 54** shows the finish turned internal diameters.



Clocking the reference face square.



Pitching out the hole centres.



Setting the crankcase true beneath the drill spindle.



Finished internal detail.



Roughing the outside curve.



Machining the jack shaft clearance.



Setting the cover true to previously drilled holes.



Finish reamed.



Turning the cam retaining plate.



Initial machining of the lightening holes.



Finish the central offset bore.



Machining the flat.

With the housing reversed and clocked true, the curve was generated by hand to blend with the pre-turned reference diameters. If your hand/eye coordination needs

a little help, then a simple cardboard template produced to the drawing profile can be used to check the progress of generation of the form. With free-hand operations I always

feel that when it looks right then it most probably is (photo 55).

Pitching out the hole centres for the crankcase securing bolts and the propeller

mounting nose is done at the same setting as the machining of the jack shaft clearance radius, which is directly opposite the reference hole for the number one cylinder. This will ensure that all holes are in their correct orientation, with the jack shaft clearance giving a quick visual check when pitching out and drilling the internal hole patterns, which must be produced true to the other holes drilled from the front face (photo 56).

The positions of the inlet and exhaust tappet bushes are also dictated by the position of the securing bolt holes. With the dividing head at zero, the cover is rotated until two drills, or dowel pins, poked into two opposing holes are true to a try square (photo 57). Once all the positions are centred they can be drilled and finally reamed (photo 58).

There are two plates that locate snugly into the internal bores in the front cover; one is the front cam retaining plate, the other is the front bearing plate, which also retains the back face of the cam ring. The front cam retaining plate is quite a thin section but it's important to ensure both faces are faced completely parallel (photo 59). Once set true on the milling machine the securing bolt holes, the timing hole and the cam support bush positions are pitched out for later drilling on the bench drill. The positions for the lightening holes are established with a slot drill (photo 60). The bores of the lightening holes are tied down to three decimal places imperial and they are not identical diameters or equally spaced and so are finished to size by boring. The central offset bore is then finished to size (photo 61). The final operation at this stage is the machining of a flat (photo 62).

The front bearing plate is a straight-forward piece of turning, with the bearing bore being completely concentric with the outside diameter (photo 63). There is however a very shallow angled face shown in photo 64, which will entail moving the compound



Turning the front bearing plate.



Arrangement of the compound slide to turn the angled face.



Machining the lightening holes.

slide into a position where it's impossible to turn the compound slide handle. In this case the handle is removed and the slide advanced by

using a screw driver turning the handle retaining screw (photo 64).

The final operation is to pitch out all hole centres and

machine the equally spaced pattern of lightening holes (photo 65).

●To be continued.

Next time we'll take a look at the front nose and propeller mounting.

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● Making Signals

More from Doug Hewson about making authentic signals for your railway.

● Vertical Boiler

Martin Gearing makes a start on silver soldering the boiler.

● More Trams

Ashley Best explores the further development of the Bolton Corporation tram.

● Bristol Show

John Arrowsmith takes a trip to Bristol to see what their exhibition has to offer.

● Gas Turbines at Doncaster

Tim Coles manned the Gas Turbine Builders Association's stand at Doncaster and gives us a retrospective view of the show.

Content may be subject to change.



ON SALE 28 SEPTEMBER 2018

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



'Summer is icumen in, Lhude sing cuccu', says the 13th century poem, written in Middle English. To be honest, I find Ezra Pound's 20th century attempt rather more understandable: 'Winter is icumen in, Lhude sing Goddam'. In any case, experts are divided on the meaning of 'bucke uerteb' (thank you, I have no wish to discuss it further... not in mixed company).

Debs & I are going to the Grand Opening of the West Shore Miniature Railway, Llandudno. I wonder whether to take along my pet snail, *Michelle*. The trip will broaden her horizons, what with travel to a foreign country and by rail, forsooth! I hope I don't get asked to lay some track. I think I'm past it now – it's years since I was a platelayer on the Welsh Highland - but she will keep us company and because she deserves a bit of culture, being a Ganger's Mollusc...

I have *Steaming On*, by Eric Sawford, but it is limited to modern, monochrome photos of preserved wagons, thus omitting those no longer extant. At **Gauge 1 North**, in Bakewell, I found *A Kaleidoscope of Steam Wagons*, by R. A. Whitehead, which is comprised of contemporary adverts from the papers of the day and also photographs of said vehicles in use. This means that long-lost vehicles, esp. the low production examples and unsuccessful models, are also illustrated with only the occasional



GWR clerestory carriage at G1North.

modern picture. My favourite, from my home town, shows a Hattersley-owned James Mann with demountable flat loaded up with Hattersley looms ready for delivery. See also James H. Mann in *Graces Guide*.

In this issue: Bakewell, a sinkhole, hats, circle henges, Katie Price, a record, St Tudno, 1:57 scale and bending tables.

14th July saw us at **Gauge 1 North, Bakewell**. "We can go on the bus" said I (remember this!). So, off to the Interchange to catch the half-hourly service to Chatsworth & Bakewell. Bus arrives, ticket machine not working, driver has long phone conversation with HQ. Eventually told to check tickets visually. It was a glorious sunny day, so we sat upstairs and revelled in the view. Disembarked in Bakewell, thence to the show. Met some friends, so we went around together. My favourite section here is the 'I built it myself' display, on which votes are solicited. I liked the 4F but as it's my favourite locomotive type I may have been biased,

so I chose the GWR clerestory carriage of 1890 (**photo 1**). A nice Accucraft *Dora* was a little different - we don't see many small continental locomotives in modelling (**photo 2**).

Alistair Lofthouse of ALD was demonstrating his new 3D printed BR Class 02 diesel shunter (**photo 3**). I bought an early example nearly 2 years ago, then without chassis, wheels and motor. My attempt at motorising and wheeling this model failed the first time but my second iteration using a Plastikard chassis and a Tamiya gearbox proved successful, after I added a 4 inch long by 1 inch square metal bar under the bonnet to aid traction and grip. I also bought the book mentioned above and Cupit & Taylor's *Lancashire, Derbyshire & East Coast Railway*. If Mike & Ivan Law had not built their LD&ECR locomotives I may have remained in blissful ignorance of this short-lived enterprise (1896 to the GCR takeover in 1906). The main exhibit of the event was the *Moorside* layout,



Accucraft Dora at G1North.



Alistair's BR Class 02 shunter at G1North.

a large and comprehensive track. After about 2 hours, we all met for a drink and a meal, before returning to wait for the next bus. Time passed, the sun beat down, the queue began muttering, every newly arrived bus was closely inspected but of the '218' was there none. When it did arrive, about 90 minutes late, the delay was attributed to a large sinkhole appearing in the road and a diversion had to be organised in real time. One occasion when waiting a while did NOT produce a convoy of buses... So, after leaving at 2pm, we got home at 5, shattered. This of course, was MY FAULT! (see above). Someone who shall be nameless asked, "How do the people going to Chatsworth get back home, when the bus only calls there on the way TO Bakewell?". I said, "Perhaps they get on the bus, travel to Bakewell and stay on board until it returns to Sheffield!" - Doh... (The other way round, surely? - Ed.)

W. www.g1mra.com

The Blower, July, from **Grimsby & Cleethorpes Model Engineering Society**, reports that work has begun on the foundations and subterranean cable ducts for the track extension. John Rhea visited the Bala Lake Railway, for reasons that are somewhat convoluted. Anyway, he wrote a well-illustrated, comprehensive article, in which mention was made of a stone circle. I remembered one just outside Porthmadog, but didn't inspect it closely. If I had, I would have learned that it was the site of the National Eisteddfod in 1987. It is traditional to build a stone circle for such events, if one does not exist already, and if there are not adequate monoliths to be found in the vicinity then fibreglass examples are made. (Another myth shattered! First Gelert's Grave, now fibreglass stone circles! - Geoff.)

W. www.gcmes.com

PEEMS Newsletter, July, from **Pickering Experimental Engineering & Model Society**, covers the Mike Sayers Trophy. Several excellent models were

entered, including David Hicks' ornamentally turned pin box. Mike said he tried ornamentally turning some years back, making a present containing jewellery for his wife. After presenting it, he had to retrieve the box from the bin, where it was discarded in the belief that it was plastic! John Powell's freelance timepiece based on a Harrison design was declared the winner. Mike went on to specify the criteria for judging such models. Neil Campbell set a new push bike speed record of 135.3 mph at Elvington near York, in June.

Reading Society of Model Engineers, *Prospectus*, July, has '61249' pondering the current situation at Thameslink. When he began, it was a simple operation and profitable. It is now ten times the size and not profitable. He thinks that the objectives have been lost, not helped by the DfT. John Spokes continues his series on the impermanent way by examining friction and creep. Creep control compares forward motion of the vehicle and driven wheel rotation. Forward motion can be detected by monitoring non-driven wheels, GPS, Doppler radar, accelerometers or motor torque.

W. www.prospectparkrailway.co.uk

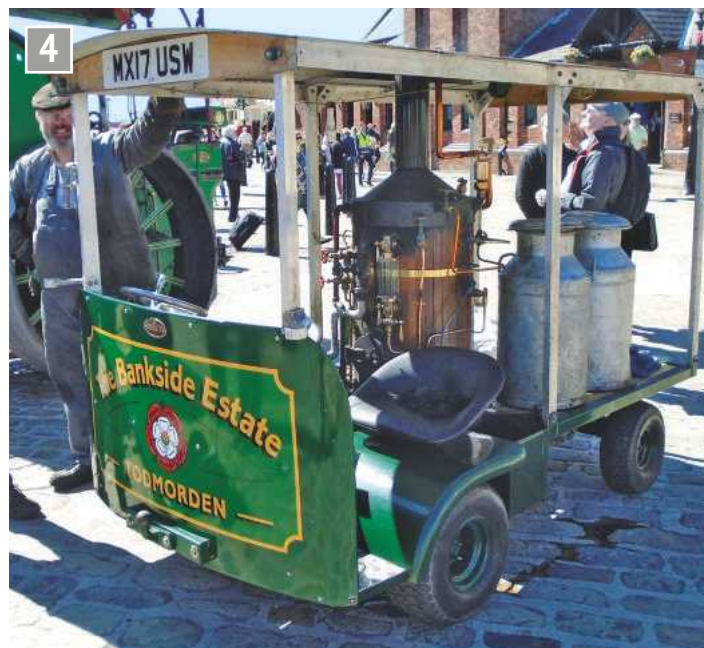
Welling & District Model Engineering Society Magazine, August-September, opens with Chris Moulange and his SR *Maid of Kent*, now donated to the Society. The locomotive has been named after him, and renumbered 1927, his birth year. Mark Evans built a 4-cylinder 35cc petrol, water cooled, OHC engine with electric start and CDI ignition. He then built a power boat to take it, to Vic Smeed's *Vivacity* design. At *Faszination Modellbau*, Richard Dedman found a 1:57 scale model of *HMS Victory*. The scale was chosen to fit in the builder's residence, and EVERYTHING had to be recalculated to match. A scale ropeworks was also built to make the 830 yards of rigging. Two ground level tracks amounting to

4km ran around the halls, 5 inch gauge for model freight trains and 5 and 7¼ inch for passengers, giving a ride lasting about 9 minutes. This was followed by a reprint of a 1925 article from *Model Railway News* featuring a visit to a similar Munich exhibition of the day. Bob Underwood resolved to make a double-chimneyed GWR King. Finding that the originals used the standard dimensions of chimneys fitted to locomotives with half the King's grate area, twice, he stayed with those proportions. Making the chimney took some time and effort, and much copper! After several failures he devised a way to do it. The blast pipes were easier. Bob says there are 'bending tables' for several materials and radii, and with a better explanation of the process than his. Several thousand miles away and over 100 years ago, some brick lighthouses of the Great Lakes were in need of reinforcement. They were strengthened with iron plates, a larger diameter tower being built around the original and the gap filled with concrete. In France, in 1918, a special train was provided for Field Marshall Haig. Electrically lit and fitted with landline connections for telephones and telegraphs, built by the LNWR at Wolverton and called the Headquarters Staff Train, it was

the original HST!

W. www.wdmes.co.uk

Seeing my item on the Queen's Pier, Ramsey, in M.E.4590, inspired the new Editor, Mike Casey, to send me a copy of *Peveril*, the newsletter of the **Manx Steam & Model Engineering Club** for June. The cover picture features members Toby and Connor at Douglas with a train from Port Erin. Workshop staff also double as footplate crews, not uncommon on a small island where everyone seems to wear about six hats. A specialist carriage for the conveyance of wheelchair users has just been introduced. Several clubs now have these vehicles. In an interesting juxtaposition of interests, glamour model Katie Price was Guest Editor on Woman's Hour and took the opportunity to campaign for wheelchair accommodation on theme park rides. Good point! Eddy Ryan and friends visited the Doncaster show and were suitably impressed. Mike reports on Old Hall Farm, in Cumbria. It's a working farm, using steam and heavy horses, one of whom has had a blue rinse(!). Eddy and company visited Albert Dock, Liverpool, for their steam event, spotting a steam milk float (Espresso Dairies?) by John Bregazzi (photo 4) and a Stanley



Steam milk float, from Peveril (photo courtesy of Mike Casey).

Steamer, which travelled by Seacat, and was allowed to be driven on and off under its own power, a nice change from going by the Steam Packet! Incidentally, the newsletter is named after a character in *Peveril of the Peak*, by Sir Walter Scott. Peveril Castle still exists near Castleton, Derbyshire, and the connection is via the Earls of Derby, who at one time owned the IoM (and whose family name is Stanley!).

Port Bay Express, from **Portarlington Bayside Miniature Railway**, bears more tales of Queensland Railways from Norman Houghton. This time it is regarding the supply of wood for heating and cooking at stations, and the bureaucratic nonsense for allocating it.

W. www.miniaturerailway.com.au

On 21st July, Debs & I took a weekend holiday in Llandudno, and I visited the Grand Opening of the **North Wales Model Engineering Society's** new track at West Shore. I met Chairman, Dennis Postlethwaite, and Secretary, Keith, plus other members. I was welcomed and allowed to wander hither & thither, accosting visitors and members alike in my



Freelance Gauge 1 trucks at NWMES Grand Opening.

quest to spread the word. I was informed that the Editor of *Engineering in Miniature* was present but when I asked to be introduced he could not be found. The day was overcast, in contrast to the hot sunny days before and since which, to be honest, was rather a relief for a day-long outdoor event. Anyway, to business. The coffee flowed, the models were displayed, much general chat (In Welsh and in English) until we reached the opening formalities. Dennis spoke of the history of the Society, and

welcomed the Mayoral parties from Llandudno & Conway, whereupon 'Alice' (Of Lewis Carroll fame, a constant theme around Llandudno) cut the red ribbon to start the festivities. The official train was hauled by *St Tudno* and I must mention the attractive freelance Gauge 1 model trucks on display (**photo 5**) and oldest member David Faulkner's highly individual mobility scooter (**photo 6**). More pictures next time. We had a free day on Sunday so ascended the Great Orme by the 3ft 6 inch gauge

cable tram, despite some clueless motorist reversing into 37 feet & 6½ tons of steel and cast iron, whilst we all watched and chortled*. After enjoying the glorious views from the top and listening to visitors debating whether the vast, cerulean, briny beneath us was Liverpool Bay, the Irish Sea or the Atlantic, Debs descended by aerial cable car whilst I remained faithful to the 'iron horse'. An interesting aspect of the latter is that the cars carry water, which is used to cut wheel flange noise and keep the pulleys cool. I had asked Dennis for restaurant recommendations but the first two were booked up or queuing for tables, so we tried *Snooze*, a wine bar with a limited menu. It was wonderful! Possibly the best meal I ever had!

W. www.nwmes.org.uk

* Also originated by Lewis Carroll.

And finally, verify - 100 bugs in the code,
fix one bug,
compile it again, verify,
101 little bugs in the code,
Repeat until BUGS = 0

(There's a song there somewhere - Ed.)



David Faulkner's mobility scooter NWMES.

Contact:
geofftheasby@gmail.com

SEPTEMBER

- 13 Sutton MEC.** Club Night: 'Constructional Toys – Lego, Meccano, Mamod etc.' Contact Paul Harding 0208 2544749.
- 14 Tiverton & District MES.** Club meeting at Old Heathcoat Community Centre, Tiverton, 7.30pm. Contact Chris Catley: 01884 798370.
- 15 Bradford MES.** Raised track re-opening ceremony, 11am, Northcliff track. Contact: Russ Coppin, 07815 048999.
- 15 Cardiff MES.** Steam up and family day. Contact Rob Matthews: 02920 255000.
- 15 North Wiltshire MES.** Invitation Saturday, Coate Water Country Park, Swindon, 10am-5pm. Contact Ken Parker: 07710 515507.
- 16 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 16 Chingford DMEC.** Public running at Ridgeway Park. Contact secretarycdmec@gmail.com.
- 16 Grimsby & Cleethorpes MES.** Public running, Waltham Windmill, noon-4pm. Contact Dave Smith: 01507 605901.
- 16 Guildford MES.** Charity Day 2-5pm. Contact Mike Sleight: pr@gmes.org.uk
- 16 Lancaster & Morecambe MES.** Public running at Cinderbarrow. Contact David Wilson: 07721 020489.
- 16 Oxford (City of) SME.** Running day. Contact: secretary@cosme.org.uk
- 16 Portsmouth MES.** Public running, Bransbury Park,

- weather/participant dependent, 2-5pm. Contact Roger Doyle: doyle.roger@sky.com
- 16 Plymouth Miniature Steam.** Public running, Goodwin Park (PL6 6RE), 2 – 4.30pm. Contact Malcolm Preen: 01752 778083.
- 16 Tiverton & District MES.** Running day at Rackenford track. Contact Bob Evenett: 01884 252691.
- 17 Peterborough SME.** Talk: 'LMS Patriot Company Locomotive Build' – Kevin West, 7.30pm. Contact Terry Midgley: 01733 348385.
- 17/18 West Huntspill MES.** Live steamers' visit, 10am-4.30pm. Contact Geoff Stait: 01278 794176 (eve).
- 18 Grimsby & Cleethorpes MES.** Monthly meeting, Waltham Windmill, 7.30pm. Contact Dave Smith: 01507 605901.
- 18 Nottingham SMEE.** Winter steam-up and visitors' rally. Contact Pete Towle: 0115 987 9865.
- 18 Romney Marsh MES.** Track meeting, 1pm visitors/spectators. Contact Adrian Parker: 01303 894187.
- 19 Bristol SMEE.** Autumn auction. Contact Dave Gray: 01275 857746.
- 19 Leeds SMEE.** Meeting night – '750cc Austin Racing Cars' – Keith Taylor. Contact Geoff Shackleton: 01977 798138.
- 19 Salisbury DMES.** Talk: 'A Novel Clock Based on a Water-Damped Gravity-Driven Inertia-Regulated Oscillator' – Dave Tonks. Contact Jonathan Maxwell: 01722 320848.
- 23 Cardiff MES.** Open day. Contact Rob Matthews: 02920 255000.

- 23 Chingford DMEC.** Public running at Ridgeway Park. Contact secretary cdmec@gmail.com.
- 23 Grimsby & Cleethorpes MES.** Public running, Waltham Windmill, noon-4pm. Contact Dave Smith: 01507 605901.
- 23 Lancaster & Morecambe MES.** Public running at Cinderbarrow. Contact David Wilson: 07721 020489.
- 23 Northampton SME.** Club run 10am – 4pm. Contact: secretary@nsme.co.uk 07907 051388.
- 23 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 23 Pimlico Light Railway.** Public running 3-5pm. Contact John Roberts: 01280 850378.
- 23 Portsmouth MES.** Public running, Bransbury Park, weather/participant dependent, 2-5pm. Contact Roger Doyle: doyle.roger@sky.com
- 23 Romney Marsh MES.** Polly Owners' Group rally, Rolfe Lane, 10am. Contact Adrian Parker: 01303 894187.
- 23 Welling DMES.** Public running at Falconwood 2-5pm. Contact Martin Thompson: 01689 851413.
- 25 Romney Marsh MES.** Track meeting, 1pm visitors/spectators. Contact Adrian Parker: 01303 894187.
- 25 Wigan DMES.** Presentation by Bob Hayter on 'Boiler Explosions in Engineering'. Contact Kevin Grundy: 01942 522303.

- 27 Sutton MEC.** Afternoon Run from noon, followed by Club Night: pressure gauge testing. Contact Paul Harding: 0208 2544749.
- 29 Romney Marsh MES.** Track meeting, noon. Contact Adrian Parker: 01303 894187.
- 29 Saffron Walden DSME.** Picnic Field Railway – 'Anything Goes' – running day. Contact events@westonstar.org.uk or www.swdsme.org.uk.
- 30 Chingford DMEC.** Public running at Ridgeway Park. Contact secretarycdmec@gmail.com.
- 30 Grimsby & Cleethorpes MES.** Public running, Waltham Windmill, noon-4pm. Contact Dave Smith: 01507 605901.
- 30 Lancaster & Morecambe MES.** Public running at Cinderbarrow. Contact David Wilson: 07721 020489.
- 30 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 30 Oxford (City of) SME.** Running day. Contact: secretary@cosme.org.uk
- 30 Portsmouth MES.** Public running, Bransbury Park, weather/participant dependent, 2-5pm. Contact Roger Doyle: doyle.roger@sky.com

OCTOBER

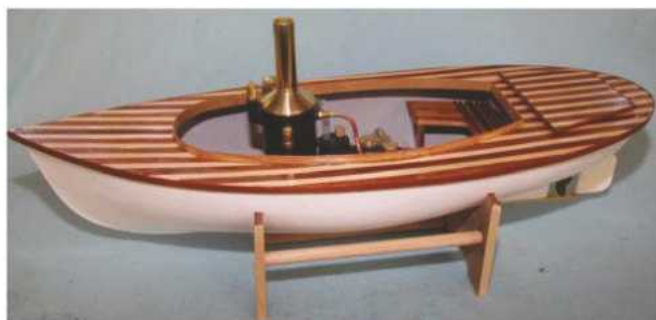
- 1 Peterborough SME.** Bits and pieces, 7.30pm. Contact Terry Midgley: 01733 348385.
- 2 Romney Marsh MES.** Track meeting, 1pm visitors/spectators. Contact Adrian Parker: 01303 894187.



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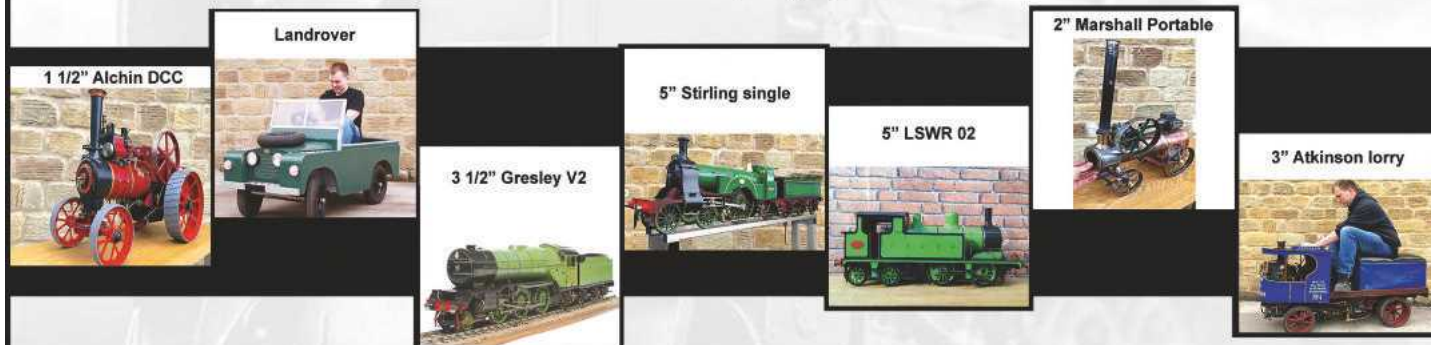
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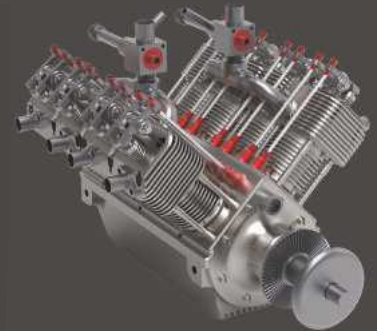


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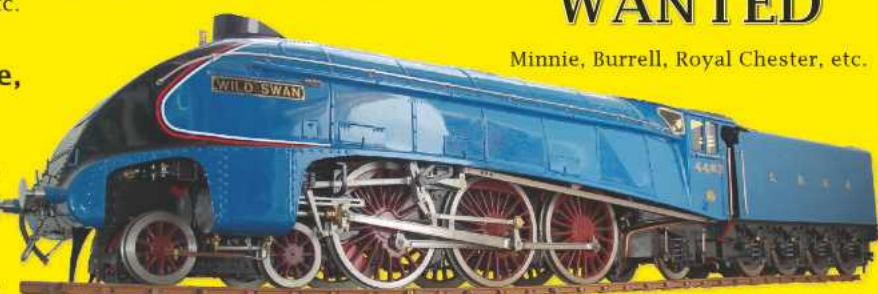


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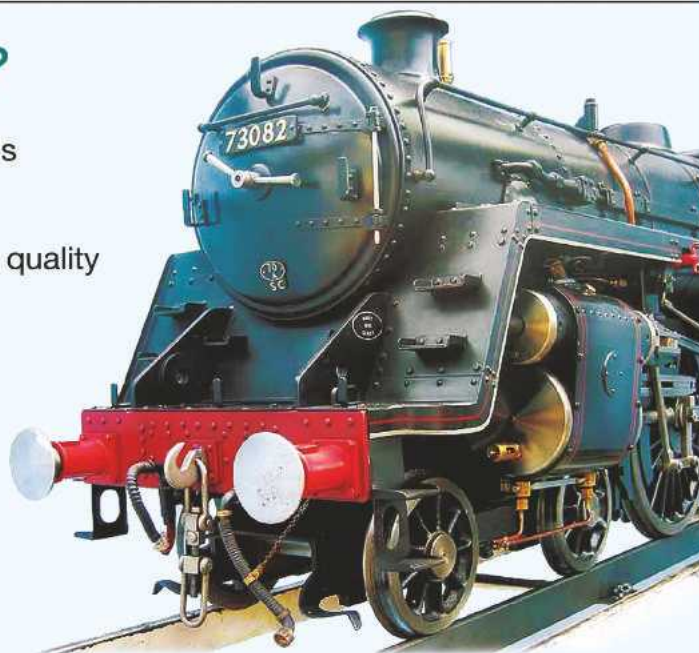
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Buffalo turret mill R8 50" x 10"



£375

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£375
very nice example!

Startrite Mercury drill



£2250

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Burnerd LO collet chuck + collets



£425

Harrison lathe vertical slide



£625

Micrometers Various! 0-16"/300mm



RJH 240V linisher



£325

SIP stratus 41050 3HP compressor



Eclipse De-Magnetisers



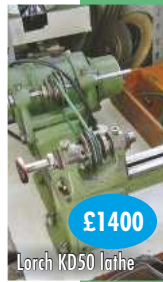
£195
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Nottingham



240volts!

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Nottingham



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RJH grinders grinder/buffer



£345

Diamond grinding wheels



£345

Blacksmiths anvil (tinmans) stakes!



£345

Britan bank of grinding wheels



£20

Each

Diamond grinding wheels



£345

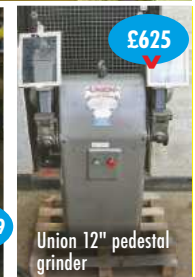
original as new!

Burnerd D13 8" 4 jaw chuck



£10-£49

Myford non standard wheels



£625

Union 12" pedestal grinder



Burgeon 6200 bushing tool + 6200-R bushes

£375
very nice example!

Startrite Mercury drill



£625

Myford capstan attachment + tooling (some to be adapted)



£3750

Harrison M300 lathe + gap



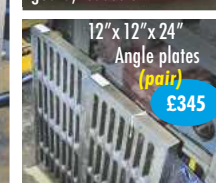
£345

Waltons jenny



£950

Myford 7 series gearbox, guard, leadscrew



£345

12" x 12" x 24" Angle plates (pair)



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Each

Diamond grinding wheels



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Boxford Little Giant toolpost grinder



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£375

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WD-40

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WD-40



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Clarke 917 vacuum forming machine



£20 each

DP/MOD gears

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6MM

New

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Myford chuck & nose collets



various!

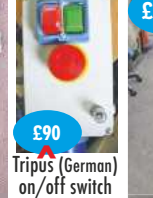
Angle plates + surface plates



Special

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Myford ML7 Super 7 Rifle/Bridge bed felts



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Colchester steadies to fit Student, Master, Bantam 2000, Triumph, Mastiff!



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