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MODEL ENGINEER

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Flying Scotsman

Xmas EYEs

COVER FEATURE

Strutt Clock

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CURRENT AND BACK ISSUES
Tel: 01795 662976
Website: www.mags-uk.com

EDITORIAL
Editor: Martin R Evans
Tel: +44 (0)7710 192953
Email: mrevans@cantab.net
Assistant Editor: Diane Carney
Club News Editor: Geoff Theasby

PRODUCTION
Designer: Yvette Green
Illustrator: Grahame Chambers
Retouching Manager: Brian Vickers
Ad Production: Andy Tompkins

ADVERTISING
Advertising Sales Executive: Angela Price
Email: angela.price@mytimemedia.com

MARKETING & SUBSCRIPTIONS
Subscription Manager:
Beth Ashby

MANAGEMENT
Group Advertising Manager: Rhona Bolger
Email: rhona.bolger@mytimemedia.com
Chief Executive: Owen Davies

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IN THIS ISSUE

Vol. 226 No. 4655 1 - 14 January 2021

ON THE COVER...

William Strutt's epicyclic clock, built by James Buxton and described in this issue (photograph James Buxton).

SMOKE RINGS

MARTIN EVANS
Editor

DIANE CARNEY
Assistant Editor

YVETTE GREEN
Designer

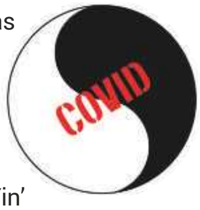
New Year

A Happy New Year to all our readers!

Let us hope that it will be a happier year than the one we have just experienced. I believe it is reasonable to suppose it will be, as it appears to me that we are on the 'cusp' of the covid-19 pandemic. The availability of vaccines, now being administered, promises to change the direction of the current plague and bring life, albeit slowly, back to normal.

For many people, it has been a dreadful year – jobs lost, lives cut short, isolation and loneliness. We will all suffer the effects of the pandemic on our economy and social cohesion for a long time into the future.

However, as with most things, the covid-19 pandemic has two sides – its 'Yin' and 'Yang'. It has most certainly brought darkness but also brought light. The spotlight has been shone on those things that are of real importance and perhaps made us realise what are the things – and people – that really matter. It has allowed us to explore, and discover the extent of, our own inner resources and perhaps prompted us to find out more about ourselves. It has urged us to try out things we never dared try before and, in many cases, realise that we can find unexpected fulfilment in those things. I am quite sure it will make us appreciate much more in the future those things which we had rather taken for granted before.



As model engineers, I think we were perhaps better equipped to deal with this disruption to our lives than many. A workshop is a great refuge. In my own case, I now have a 5 inch gauge GWR pannier tank on the verge of completion (as regular readers will know). Perhaps I shall name it *Covid*. Ummm… no, perhaps not!

Mystery Object

Reader Tony Holcombe writes to tell me that our Christmas mystery object is a handsaw setting pliers. He used it regularly, he says, when he first started work as an apprentice 'chippie'! It sets the width of the cut before you sharpen the saw. That was an exercise that used to take ages - now people just buy another saw. Such are modern times.

Carol

From our roving reporter Roger Backhouse.

On the twelfth day of Christmas
the Shedmaster gave to me…
Twelve Drummonds running
Eleven shovels sizzling
Ten bobbys bodging
Nine fosters fettling
Eight wheels a spinning
Seven trains awaiting
Six cans are oiling
♬ Five copper springs ♬
Four railway nerds
Three red lights
Two furtled wrens
And a boiler for an A3

Written by members of York City and District Society of Model Engineers S and T gang, plus the vice chairman, namely Messrs R. Gibbon OBE, H. Tuke, T. Dykes, G. Granger, D. Foster and Bob Lovett. According to Bob Lovett 'The 12 Days of Christmas' was concocted for a Christmas themed WhatsApp get together in lockdown. The reader should imagine a group of old blokes with croaky voices and limited musicality gathered virtually around an appallingly played piano and frightening all the cats/dogs/young children as they sing it from the start '*piu vivace e forte*' (aka 'giving it some on the regulator'!).

Futurology

It is a brave man who would whip out his crystal ball and attempt any predictions for the coming year, given the unexpected turn of events at this time last year. Your editor, however, can provide a foretaste of the things to come that are – at least partially – under his control.

Starting today, Peter Seymour-Howell describes the construction of his 5 inch gauge A3 locomotive *Flying Scotsman*. This is being built to Don Young's design *Doncaster*, with added detailing, and promises to be a first class model when complete. The start of this series may be found on page 69.

We have two interesting clocks coming up. The first is an epicyclic skeleton clock designed by William Strutt, made and described by James Buxton. His account begins on page 98. Later in the year, Adrian Garner will describe his astronomical bracket clock, inspired by Tompion and Banger (1708), which displays both mean time and sidereal time.

Luker will describe the construction of a small Australian 0-4-0 locomotive *Ballaarat*, dating from 1871. This project, in 5 inch gauge, is aimed at beginners but the result is a locomotive that is fairly true to prototype and rather 'out of the ordinary'. I've seen the video and can confirm that it also runs very nicely.

John Arrowsmith will continue his Grand Tour of model engineering societies and Roger Backhouse will continue his series of Engineer's Days Out.

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.
07710-192953
mrevans@cantab.net

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

Painting by Diane Carney.

Flying Scotsman in 5 Inch Gauge PART 1

Foreword

I started this model approximately 2010, or should I say the first picture was taken then. This is my build of 4472 *Flying Scotsman* using Don Young's *Doncaster* as the basis but also many works drawings to improve the detail where required. The drawings were purchased in 1998 from Reeves 2000 along with Don's 'words and music' from his *Locomotives Large and Small* publications (LLAS). Back in 1998 the magazines were still available so I have all of the originals. Today, alas, if you buy from Reeves you'll most likely just get photocopies of the relevant pages.

I hope that the information contained within these articles (there will be many) is of interest and, more importantly, of use in helping others who are on a similar journey. To help encourage others, this is my first entry into model steam locomotive building. Some may say chose something simple as your first model but I disagree for two reasons: first, everyone has different levels of skill that have developed throughout their lives, be they young or - shall we say - of more advanced years. My background in Film/TV was very much working with models that needed to not only look real but also needed to work first time. Add that to building models as a hobby for, dare I say, over 50 years

Almost complete – front view.

Almost complete - rear view.

now and you naturally gain a lot of experience in making miniatures, no matter what their subject matter.

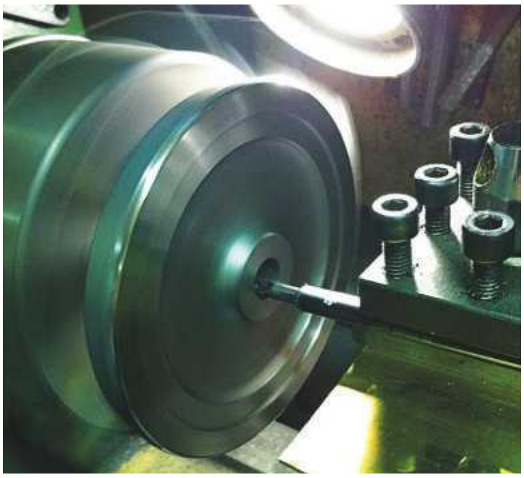
The other point - and this is probably of more importance - is to choose something that you really want to make. Don't start a model that you don't really like but think it will help you gain experience for building what you really want later. No matter what you choose, there will be good days and bad days; it's when you have a 'bad' day that you'll need that little bit of extra encouragement to keep going and building something that you love will get you over any hurdles which may be thrown at you.

As I said, this is my first model and it's by no means an easy design to begin with. If I can do it with my very limited tooling, then so can you - have a go, I'm sure that you'll enjoy the ride just as much as I'm enjoying my own. Please forgive some of the pictures, the early pictures were taken on a pretty low resolution phone camera so, as phones have improved, so have my pictures.

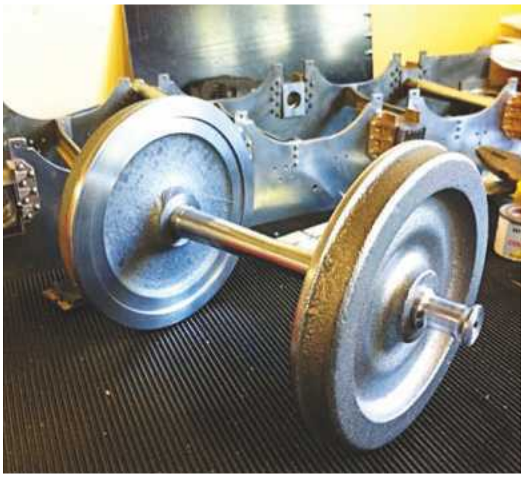
With this introduction I include a couple of images of the build as she is today to give you an idea of where this story is leading, which, hopefully, will be the making of one of the most - if not *the* most - detailed model of this locomotive built in this gauge. I plan to have as many functioning parts as what's humanly possible and what physics allows to be possible in this size. This will involve most of the fittings being built true to scale. All these details will be announced as I progress further into the build.

The Scotsman's *tender.*

Tender frames erected, axles turned, horns fitted, axle boxes being constructed.



The first tender wheel having the back machined and then bored out.

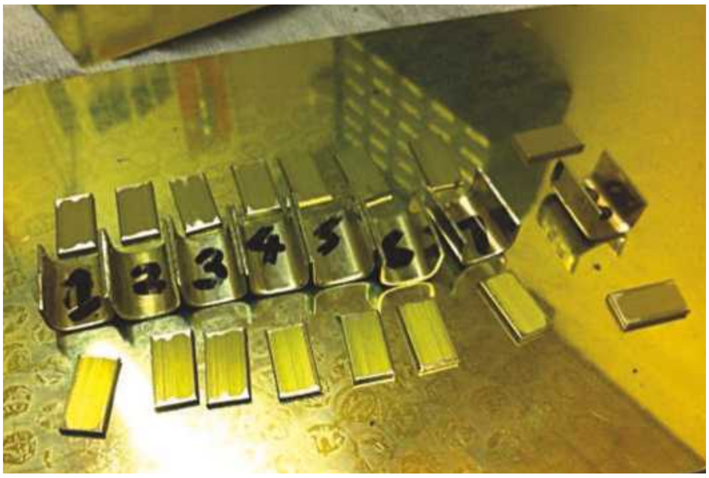


Trial fit of wheels onto axle before machining the fronts.

The tender

A little more information on my build first: I am building 4472 as she appeared in the late 30's, long travel valves, right hand drive, A1 with a high sided tender. I have taken a little modeller's license with regards to the tender as I want what I consider the best possible appearance for the model but also, of more importance, is for the model to be practical in use but with a very high degree of attention to detail. So, whereas the tender will look right it has differences to what 4472 actually had during the late 30's. 4472 had a high sided streamlined tender No.5640 from 2/7/38. this looks a little odd to my eye with a much more pleasing shape being the new high sided non- corridor type. The two types are very similar, the main difference being that the side sheets curve in at the front and that it has the beading fitted. This matches the locomotive cab nicely. The soleplate also has a step to it which again suits the locomotive better. In

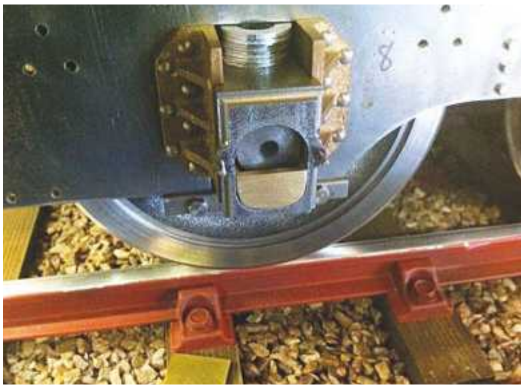

A rolling chassis at last. It seems strange getting to this stage already when in fact it took many weeks. It makes it look so easy!

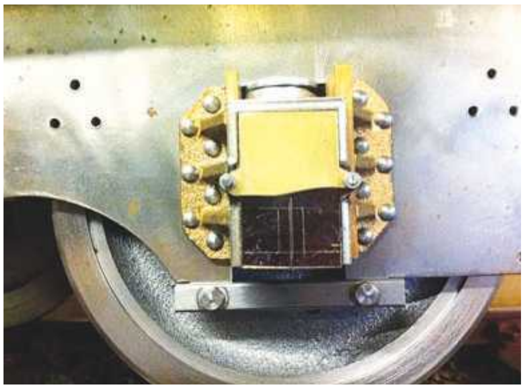

The eight oil tray components cut, formed and now ready for soldering.

The tender was where it all began and I'm glad that this was the case; starting with the locomotive wouldn't be the best way in achieving my goal.


First tray brazed together with the rear panel shaped to clear the axle.


Test fit of a tray to an axle box making sure it's a good fit for the axle. I still need to make the oilway blocks which will then fit through slots in the covers when machined later.


Tray in place. The washers above the box are just there temporarily holding the chassis at the correct height.


Cover put loosely in place showing marking out for oilway block to be machined later.

practical terms, this tender has a lower front coal wall and the middle section of the cab roof being removable (scaled to the prototype's own removable section) will allow me the access required to the controls in the cab. This also means that I can include all of the detail on the tender itself.

The tender on a Gresley Pacific is a pretty large affair, with its eight wheels and large capacity it's an impressive sight in its own right. It's also a fairly large amount of work to build in model form, perhaps as much as building some small tank locomotives.

The model has most parts working; water gauge, handbrake, vacuum brakes etc. the exception being the scoop. I have followed Don's advice here and left it off for safety reasons. Once completed the tender will be full of detail, including its lockers with their white painted interiors and wooden floor pallets which will be full of the correct tools. The front coal wall is highly detailed (there will be no removable section on this model). Also no hand-pump - the boiler will be fed as per prototype with two injectors.

The tender was where it all began and I'm glad that this was the case; starting with the locomotive wouldn't be the best way in achieving my goal. Tenders left till last tend to get rushed a little. This tender, which actually isn't fully finished yet, took a couple of years to get to the near finished stage that she is today. The thought of spending approx 10 to 15 years building the locomotive to then have to spend a further two to three years on the tender doesn't really appeal to me if this is where things could get rushed.

As I stated in the beginning, things may be a little sparse on details to begin with. That's because I had already done some of this work before actually writing anything about it and thus I have more or less just listed the parts made to begin with. As we progress I'll be giving greater detail about how I approached the parts as they were built. I'll let the pictures tell the story for the rest of this first part.

●To be continued.

Petrol Engine and Alternator Sets

PART 5

How to make them work well and why they often don't

Jon Freeman explains how to make petrol engines and electrical alternators work efficiently together.

Continued from p.44
M.E. 4654, 18 December 2020

A new engine

Pondering these two mechanical failures, it was decided to abandon the GX35 engine and source a quieter, lower revving four stroke of similar power. A 'Lifan 152 F3' was obtained, this having the benefit of a proper output shaft. A new test rig was constructed using the side-by-side belt driven arrangement, as had been used with no problem in the *Brushless Brute* (**photo 20**). One possible disadvantage, the alternator shaft will now spin the 'wrong' way. This doesn't matter apart from the cooling fan. This is a simple centrifugal fan, quite effective at pulling air and throwing it outwards, far less effective in reverse.

The new engine data claims a rated power output of 1.1kW at 3600 RPM. This 79.5cc engine produces only 10% more power than the 35cc Honda, but it does so more quietly, at half the speed. Pulley sizes were chosen to provide a maximum alternator speed of about 5500 RPM. This is a little slower than before but should prove sufficient. The engine is fitted with an on/off switch but tracing the wiring suggested the arrangement was similar to the Honda, with the switch shorting the magneto to earth to stop the engine. A wire was spliced into this and taken to an emergency stop switch. This is of the type that latches in when pushed and released by twisting and pulling. In some future locomotive design this will be sited on the main control panel.

New engine with Brushless Brute *power plant.*

Photographs 21 and **22** show the renewed test rig and **photo 23** shows the engine control servo and linkage.

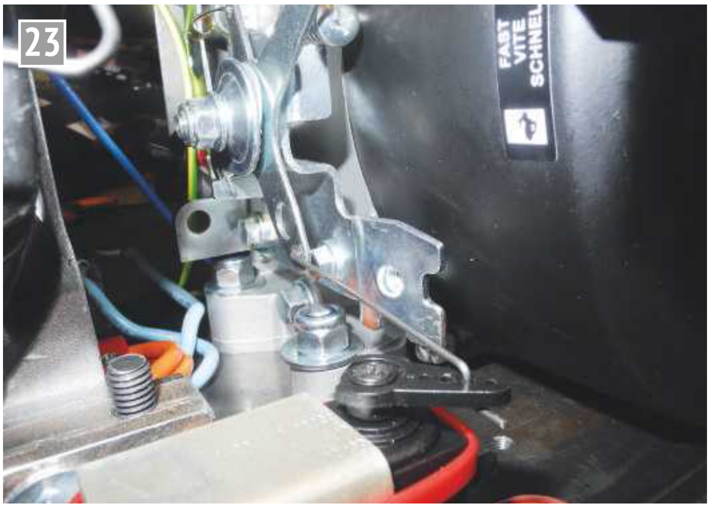
On first firing up the Lifan engine results were not, it seems, as perfect as can be expected of Honda engines. Following the instructions to start the engine with the choke 'on', and to turn the choke 'off' once started, was not found the best advice. Tickover proved problematic with the engine frequently misfiring and stalling at low speeds. By accident it was discovered this could be solved by not turning the choke fully 'off'. Testing could now resume.

A new section of code was written, an 'Auto Test' function. In this mode, the controller sets the engine to a selection of speeds, holding each for a few seconds, during which time the controller takes a set of readings. These are output to the laptop via USB, displayed on the 'PuTTY' screen, and

Mk II test rig.

Mk II test rig.

23



Engine control servo and linkage.

saved to file for later analysis using a spreadsheet. Values recorded are output voltage, output current, requested engine RPM, achieved engine RPM, engine control servo position, and measured PWM duty ratio. In using the Auto Test function, the alternator output is wired to the filament lamp load rig so that loads can be switched from one to ten 60 watt bulbs (previously eleven, until one failed!).

Experiments were conducted with several lookup table configurations in order to try to find a set of values well suited to the battery-less 'Low Cost Loco' design, where output voltage is free to vary. After a few attempts, the lookup table setup shown in **fig 17** was chosen. Running auto test using loads comprising one, three, seven and ten bulbs, alternator output voltages and currents delivered are shown in **figs 18** and **19**. Clearly seen in the voltage plots, voltage rises steeply with speed once the output exceeds 12 volts. This is because a 12 volt battery was used to power the field and electronics at low outputs, the rising voltage beyond this enabling rising field current and output. Once output reaches 25 volts the PWM regulator takes control limiting the output to safe values. A 24 volt battery would have been a better choice.

Changing operating mode from 'Auto Test' to 'Variable Voltage', the driver's control pot now sets engine speed, which in turn determines output voltage and current. Different numbers of lamps were switched in with brightness being controlled by the pot. It was interesting to note engine speed regulation is very effective, small and moderate step load changes causing only minor short term perturbations.

Fig 17

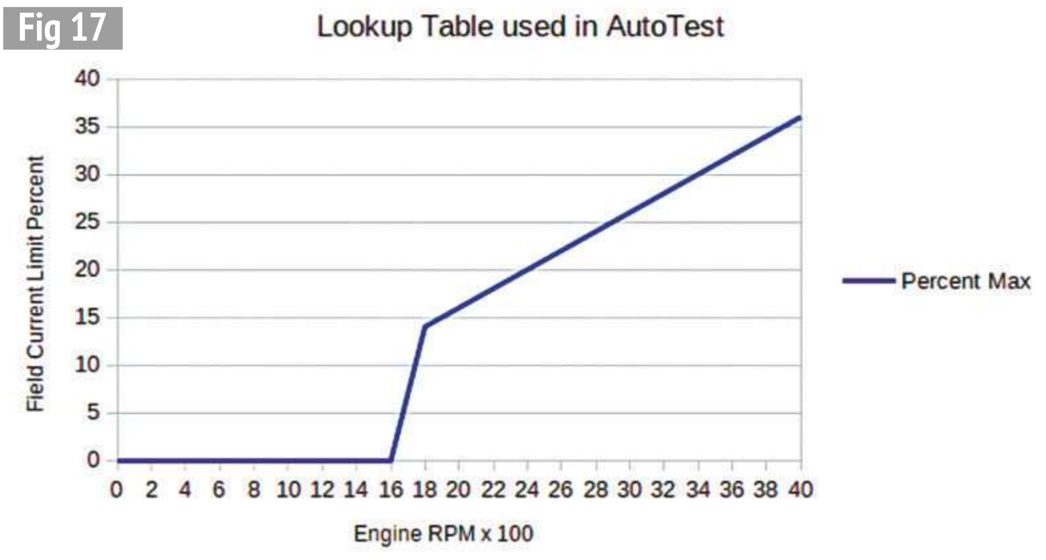
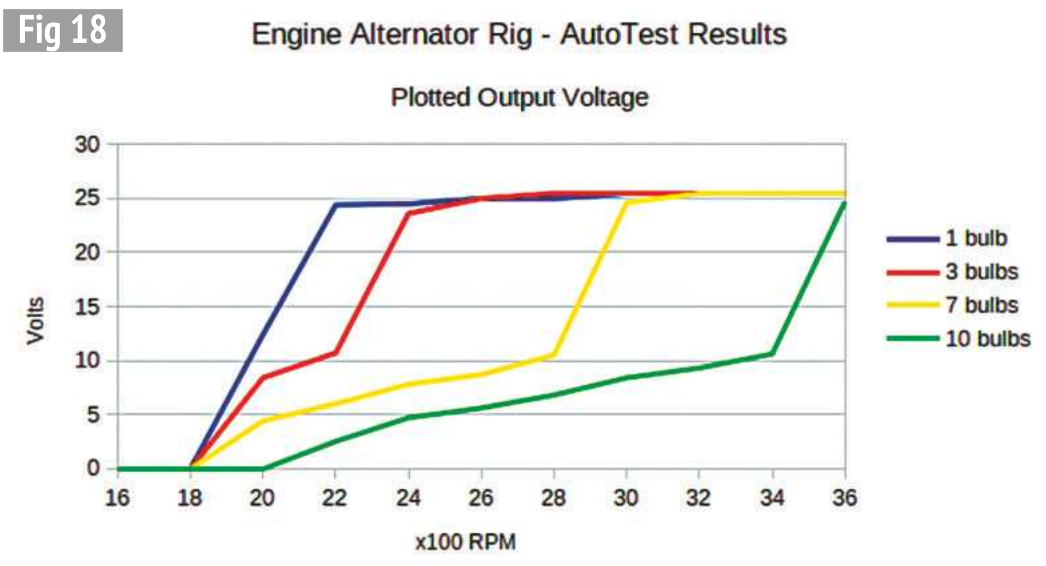


Fig 18



Low cost loco

Having already proved operation of the new smart regulator, work continued to prove conceptual design of a 'Low Cost Loco'. This would use the engine alternator set in variable voltage mode connected directly to a set of DC traction motors, with no traction batteries and no other controller (see fig 3, M.E.4651, 6th November 2020). Not having a locomotive with DC motors or any DC motors at all, enquiries were made of friends at Bristol SMEE and a plan emerged to borrow their 5 inch gauge petrol electric locomotive *Michigan*. The idea was to power just the motors in *Michigan* from a following truck loaded with the test rig.

After some extra minor metalwork and lashing-up, the engine alternator set complete with smart regulator was fitted into the *Brushless Brute* chassis (**photo 24**). Next step – a day out in Bristol at the Ashton Court Railway.

Trip to Ashton Court Railway - first outing of the year!

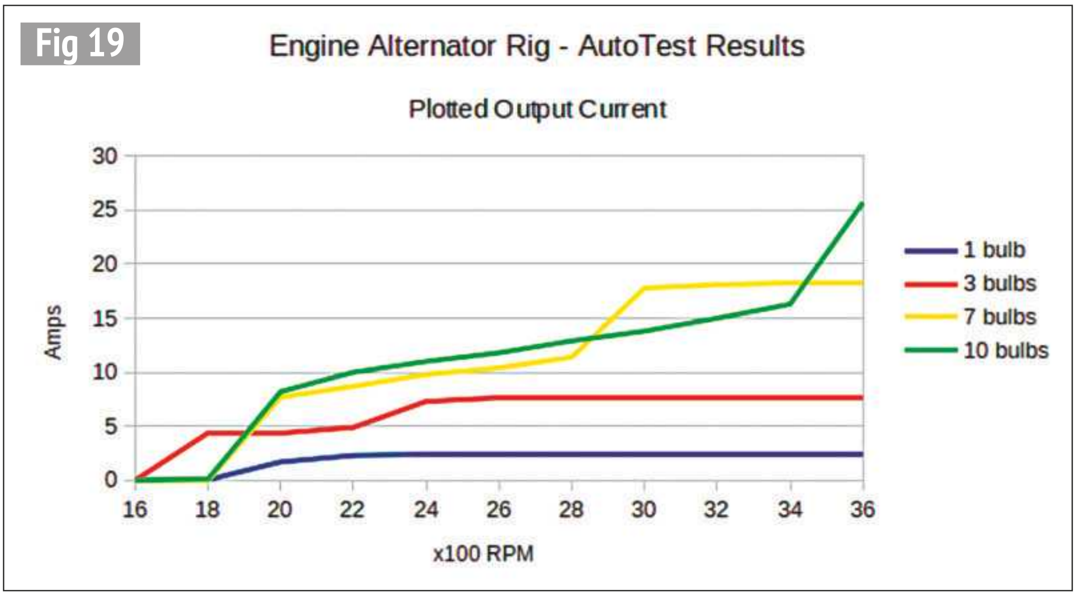
On arrival at Ashton Court, the first task was to have a good look at *Michigan*, a Bristol club petrol electric locomotive in 5 inch gauge. This started out as a manual control locomotive with separate engine and

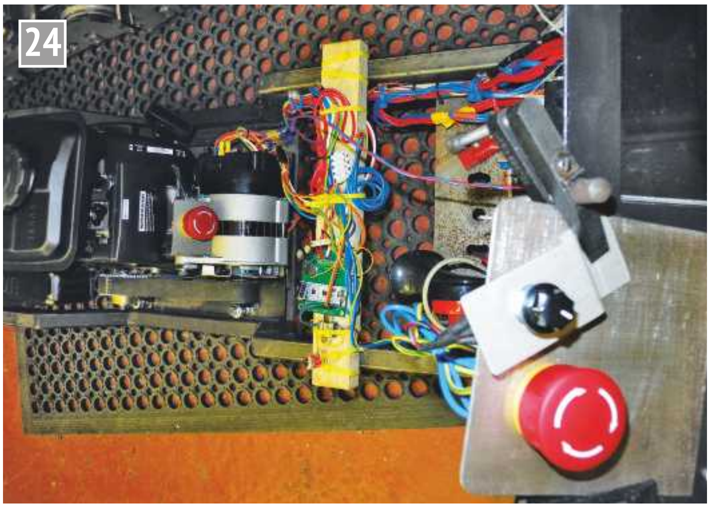
»

speed controls but some time ago work had been started to see if it could be made to behave a little better, stalling being one of a few minor irritations. This work, which only went only so far, was in some part inspiration for this project. Further improvement work might be considered for *Michigan*, but …

For the day's tests, aiming to use only the motors in *Michigan*, the motor power leads were disconnected from the internal controller and connected by flying leads to the test generator rig fitted into the *Brushless Brute* chassis (**photo 25**). With the test rig and smart regulator all set for a 'Variable Voltage' or 'Low Cost Loco' configuration, the engine was started. A lap was completed at cautious pace. The laptop was then connected and used to re-write the lookup table with figures to increase current by around 20% - this was simple and quick to do. Subsequent laps were run at a more normal speed for the track. Driving the mass of two locomotives and two passenger trucks, the whole gave the impression of being not as powerful as *Michigan* alone, but this was to be expected as the 50cc Honda engine in *Michigan* is rated at 1.6kW whereas the 79cc Lifan manages only 1.1kW.

Driving the 'Low Cost Loco' design feels very different from driving *Michigan* in normal use. This is because the motor speed controller in *Michigan* is a mobility scooter type. The driver need only turn the control knob to '6', or whatever their preferred number is, and the train will go round the track at a more or less constant speed once that speed is reached. As configured on the day, the 'Low Cost Loco' control feels more like the accelerator pedal of a car with automatic transmission, or possibly even a little more like driving a steam locomotive. This makes driving more realistic and interesting as the control needs different settings around the track taking gradients and track conditions into account. This seems good in that engine revs need never be any higher than needed to supply the load of the moment and, when running down gradients, turning the control to '0' lets the train drift freely with the engine at tickover.





Rig and smart regulator lashed into the Brute.

Conclusion

Thanks are due to Bristol members Bob Lilley and Andy Harding for their help and assistance on the day, which all agreed was very interesting and successful. A driver's eye video of a lap can be seen here - **www.youtube.com/watch?v=bQbI7Ybu52E**

Full circuit diagrams, parts lists, updates and software listings can be found at **www.jons-workshop.com**

Work now continues finalising improvements to the smart regulator design, new boards are about to be ordered and a new locomotive is likely to emerge in time for resumption of 'normal' service, whenever that may be.

ME

Michigan *and* Brute *at Ashton.*

Young Engineers at Christmas

Patrick Hendra, tutor to Eastleigh Young Engineers, reports on progress.

Christmas 2018 – tray.

Lucas's jewellery box.

In normal years, the Eastleigh Young Engineers would be working away very hard to be ready for the next show. We regularly compete at the Winchester Show in September. The Midland Model Engineering Exhibition comes up in October and we finish the season with a stand at Alexandra Palace in January.

This season - NOTHING!

My problem is to keep the youngsters interested and you can see Bethan Cooling's article in this issue (page 77) telling you how the Young Engineers kept going on Facebook Messenger during the big Shut Down in the spring of 2020.

For the last three years, the Young Engineers have made a 'Christmas present for Mum' and 2020 is no exception. They normally start this little project in November - however, I'm not sure why but I had a gut feeling back in the summer that it might be an idea if the youngsters got cracking in September. How right I was!

Choice of presents

This is not easy.

I have to come up with something that is acceptable to Mum. In addition, it has to be relatively simple because some of the Young Engineers are very new members and others are pretty experienced. I also try to come up with a project that teaches something about model engineering AND the finish on whatever is made has to be professional. In their normal projects, Young Engineers are not given drawings or jigs because I teach them how to scale from pictures or real-life prototypes. For the Christmas projects I am asking a lot particularly from the very young and inexperienced members so I make a prototype and produce detailed instructions.

Christmas 2018

I came up with a tray **(photo 1)**.

I bought in finished timber for the side rails from B&Q and a large sheet of 3mm thick mahogany faced plywood for the bases. Clever joins are fine for the old hands but definitely not for the new members (remember, the ages of the EYEs covers 9-18 yrs) so I went for simple wooden pins and butt gluing.

To make this work and for the finished products to be reasonably flat the pins have to be exactly drilled. Each youngster made his/her own jig from aluminium angle and used this to drill 3mm holes into the side rails. They used 3mm kebab sticks to assemble the frames. The tricky bit is to cut and then carefully sand the bases to fit accurately. 'Accurate' to a 9 year old is not exactly professional but they all did a really good job. Once sanded and then treated with the hardest grade of Ronseal diluted with white spirit and mopped on, the trays were very presentable.

That year seven trays were made by three girls and four lads.

Christmas 2019

This year I came up with an exercise in accurate milling - to a hairsbreadth!

Quietly, these projects include an educational element. Being taught something is pleasurable if you don't know you are being taught! Also, I emphasise measurement and accuracy and my principle - everything should be done on a machine - hand tools went out with grandpa!

I 'discovered' a source of really well finished hardwoods available in 2ft lengths (from »

SLEC Ltd) and designed a jewellery box made from black walnut and mahogany.

Lucas Hall's* example is shown in **photo 2**. Why AN example? - each young engineer was told to design and make their own so each box is different.

The side pieces were cut on the vertical mill from supplied black walnut stock using the DROs and the youngsters were expected to get the dimensions absolutely square and of lengths equal to the prototype to within 0.05 mm. I made a simple jig to make sure that the butt gluing produced a square outer section. If the youngsters were a bit slap happy, I always pointed out that mum might well be checking their workmanship with a magnifying glass on Christmas Day!

Again, the mill was used to cut the base and lid pieces in mahogany and the liner, whose dimensions had to be made to just fit inside the surround. They had problems gluing the liner to the underside of the lid UNLESS they did it before the base was joined to the walnut. Hmm - good idea to think ahead!

One box, a simplified one - from Bella (she was 10 and our newest recruit) was shown on our stand at Alexandra Palace. Many visitors were amazed at the accuracy and finish until I told them that the pieces were cut on a mill (**photo 3**).

This time the gang comprised four boys and four girls.

Alexandra Palace 2019.

Christmas 2019 – trees.

2020's COVID Christmas

Apart from trying to find something new, I had the further complication in that I had to think of two projects because Bethan and Toby are sister and brother. I decide with the EYEs approval on a necklace 'tree' or a small bedside lamp.

The tree would be in 5mm brass and with a mahogany base. The YEs had more time than usual - *or rather they thought they had more time* - so the girls decided on more exotic shapes than I suggested.

Here are some examples (**photo 4**).

Bethan* went for a star, Zahra* a heart and Rueben a more solid piece of metalwork. Each youngster decided on the disks so each tree is very much a personal piece. Some discs are soldered on, others screwed on, some are brass, others bronze.

The nicest piece of machining was the joint which you can see in closeup in **photo 5**. The YEs learned how to drill accurately and tap the M2.5 and M2 holes on the lathe. The 2.5mm radius concave surface was precisely cut on the mill using the DROs.

The lamps were easy to make except for the aluminium tubes holding the bought-in light fittings and joining the bases to the stems. The youngster was shown how to identify threads and how to cut them using taps on the lathe.

Unfortunately, the supplier could only supply two switched bayonet lamp fittings but he had a simple one so Sophie—a brand new member but at the incredibly mature age of 12 - was taught how to fit and wire up the switch.

The base was hollowed out on the mill - NO CHISELS! She decided to turn the pillar on the Super7 rather than leave it in square section and to use two woods (**photo 6**).

The shades were supplied for a giveaway price by a friendly local gift shop.

The lamp project enabled me to teach wiring codes and to emphasise grounding and the need for cable stress relief. At school they are taught very little.

This Christmas, the membership has expanded to nine and the young ladies predominate!

I hardly need tell you how these presents go down on Christmas morning - a present made by the youngster is something really special.

Perhaps other clubs might try this sort of mini project next Christmas?

* All contributors to *Model Engineer*!

ME

Closeup of neat joint.

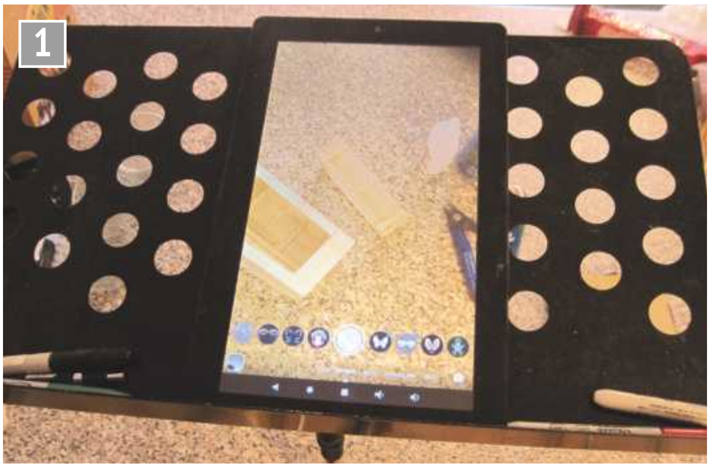
Sophie's lamp.

A Model Lockdown

Bethan Cooling, of Eastleigh Young Engineers, makes good progress in spite of Lockdown.

Ever since Mr Johnson forced us out of school and into lockdown, Eastleigh Young Engineers (EYEs) have been enjoying the StayAtHome Project. I was fairly apprehensive about the prospect of everyone being stuck at home for a long time; I had a feeling that it wouldn't go too well. I was pretty much correct – the economy is in tatters and there are very real concerns about the well-being of a lot of our population including their reluctance to get back to normal life – whatever that will be!

The StayAtHome Project was an alternative to being in the workshop whilst we had to self-isolate. The Eastleigh Young Engineers are made up of four boys and four girls (who said that engineers always have to be men?) between the ages of 9 and 16. Individually, we communicated with Patrick over Messenger Video Call. He worked at the kitchen table with a tablet on a music stand looking down at his hands and, by video, my workspace, which he saw as a small image at the top of his screen—this caused lots of trouble because Patrick could not see what we were doing in detail (**photo 1**).



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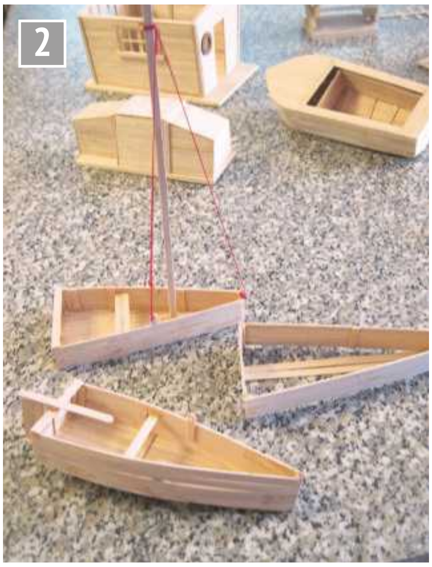
Patrick's set-up at the other end!

Quite a few EYEs were involved in this project. Unfortunately, it isn't *quite* the same as being in the workshop. Models made have ranged from cranes to jeeps to a full-blown (but of course, not full-sized....) Eiffel Tower! It has been a fantastic chance to keep our mental cogs turning during these months out of school.

The reality is that I've only just become an EYE at the beginning of lockdown. My younger brother has been taking part for a while now and, when I saw what the StayAtHome Project involved, my antennae really picked up the obvious enjoyment and benefit of this as I was looking for something that would nurture my creative skills over this difficult time. Schoolwork was very tough – we had little help from teachers and were expected to do five hours a day! So, I needed a break. After just one modelling trial session with Patrick, I was hooked!

At first Patrick asked all the EYEs to craft very simple boats (**photo 2**) so we could get the hang of how the sticks were used and how we all coped with Instruction by Messenger. Patrick did everything that we did, so has ended up with loads of models crammed into his spare bedroom!

All of the EYEs were using the same base material for their models; coffee stirrers or sticks, whatever you prefer to call them. These are thin, flexible wooden sticks that are easy to bend, glue together and sand down. A few other



2

The simple starter boats.

3

These are the main materials we used for our models.

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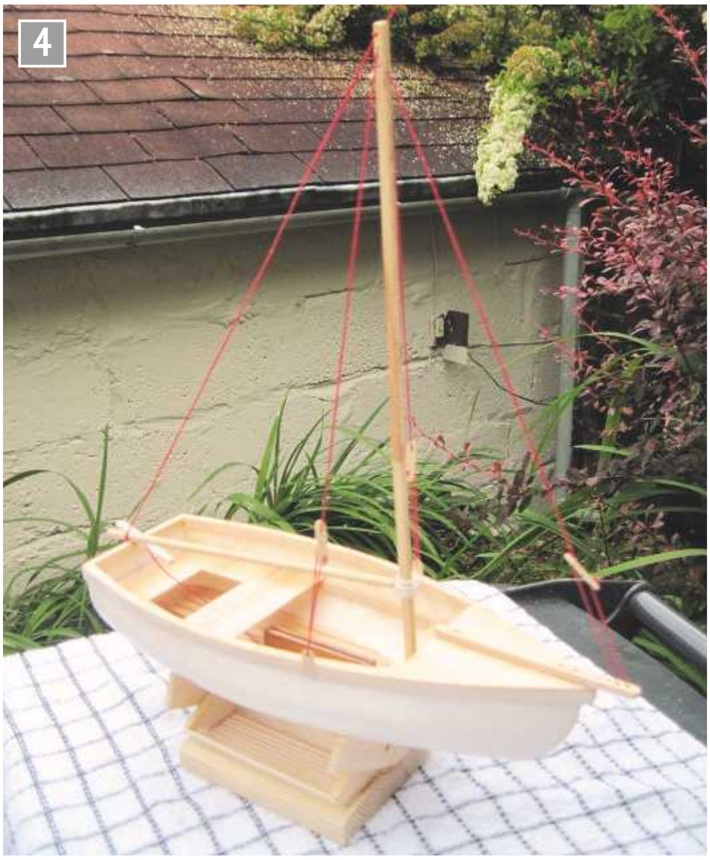


Amazon*.*

Zoe's Easter tableau.

materials we used were adhesives such as super-glue, glue activator and plastic (**photo 3**). All of these materials were delivered to our homes by the Tooth Fairy, who, even though she was furloughed, had to get cracking with other jobs. Her normal duty is to sort out messes that we Young Engineers get ourselves into—you know, broken screws or stripped threads or even holes in wrong places.

For my first model, I chose to make the sailing boat *Amazon* from Arthur Ransome's famous children's adventure novel *Swallows and Amazons*. My younger brother chose to make *Swallow*. Even though *Amazon* is pretty similar to *Swallow* in reality, I decided to shake it up a bit and add more sophisticated aspects.

First of all, I lined the rim of a vacuum formed plastic hull which Patrick had supplied, using coffee sticks. The hulls were made for us by Terry Brown, one of the EYEs' tutors and a member of the Eastleigh And District Model Boat Club - thank you Terry. This proved to be a difficult task, as I had to bend the coffee sticks to the legs in the middle.

The mast was quite complicated. To make it tall enough and strong enough, I had to glue together the sticks at different points, and then do a lot of sanding to round it off and smooth it. Patrick then drilled three holes in the top for the different lengths of cord needed to tie the boom, sails and mast itself. To ensure that the mast was completely secure and balanced, there had to be three halyards, one either side and one attached to the bowsprit. The bit involving triple jointed fingers was threading these cords through pre-made wooden adjusters that I could use to make them shorter or longer. The front curve of the hull's edge was formed – carefully! I then covered the bow and made the floor. There was a *lot* of sanding involved; a very laborious thing when we don't have the belt sander at our disposal...

Unlike *Swallow*, *Amazon* had a centreboard that could be lowered down through the bottom of the boat. So, it was only natural to incorporate this into my design. The slit for the keel was pre-cut in the hull, by the Tooth Fairy but the floorboards had to be built around it.

The main seat in the boat was at the stern and, unlike the typical transverse bench, this one closely resembled a trapezium as it was curved to fit the shape of the hull. I would describe this as a 'rear

Patrick's demonstrators.

wraparound bench seat' (**photo 4**). This way, the children in *Amazon* could all sit facing each other. I tied the halyard to the bowsprit which I made earlier when I covered over the bow. The other two cords either side were threaded through little eyelets placed in line with the mast on the hull. And as soon as that was completed… I took it down because I had to spray paint the hull (this was – errr - fun…!).

I chose to paint mine white – it isn't too garish and would be very easy to paint over if I didn't like it. For this I had to turn up at Patrick's garden on a dry wind free day (under strict social distancing, which was allowed by then) and wave a can of paint around vaguely near the boat. Of course, to protect the pieces inside I covered the top with masking tape. I also varnished a wooden stand I had made from pre-cut pieces. It would be a subtle but smart method of displaying my model when it was finally finished.

For the sails, Terry gave us some very thin but slightly stiff plastic sheet which was already cut into the right shapes. This too was white. First, I threaded the main sail onto the boom which I had attached to the mast using special metal and plastic rings. Fortunately, the sail already had holes punched in it. After this tedious – sorry - exciting task I used more cord to tie the jib to the boom, bowsprit and the top of the mast.

Finally, after many dodgy internet calls, I had completed my first proper EYE model! I was quite proud of it and, for my first attempt, I don't think it was too bad. I really enjoyed this StayAtHome Project - it has certainly kept me occupied! A massive thanks to Patrick as he has worked extremely hard to keep all of the Eastleigh Young Engineers busy and creative and for supplying the materials for us (these were bought with club funds). Thank you, Patrick!!

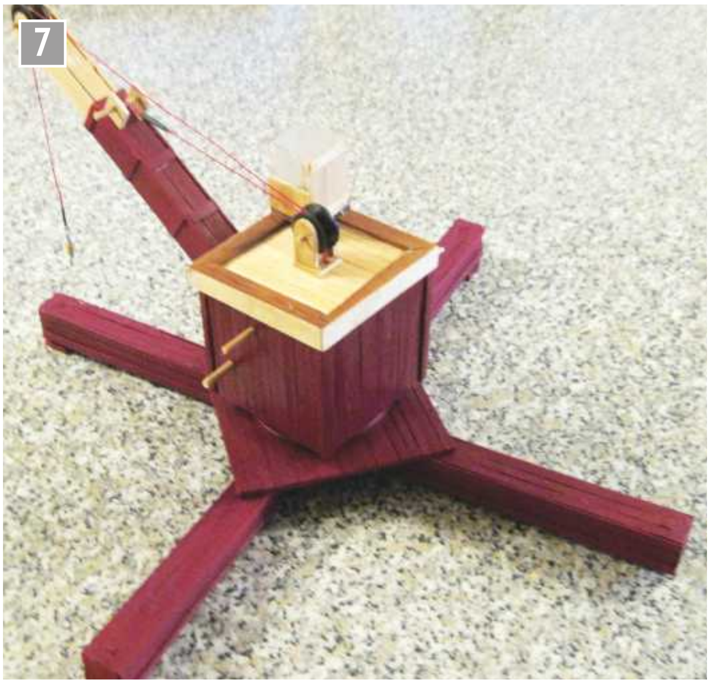
These were the models that the other EYEs made:

Toby:	*Swallow* (he has now started on an ATAT from Star Wars)
Mimi:	Jeep
Bella:	Eiffel Tower
Rueben:	Fishing boat
Lucas:	Crane (he has finished and painted this)
Ryan:	House
Zoe:	Easter tableau (**photo 5**) for the church (again finished and was shown on the Crawley and related parishes web site - the church was sadly closed**)**
Zahra:	Barge

At his end of Messenger, Patrick built everything we did so that he could demonstrate. **Photograph 6** shows his efforts.

The StayAtHome Project wound up in the first week of August when the workshop finally reopened. We have to wear masks and visors but it is better than being at home. Most of the EYEs have dropped their stick models for their almost forgotten previous projects. However, two of us (me included) have decided to continue with our stick models, using the machines in the workshop and proper help from Patrick. Lucas has finished his crane (**photo 7**) and I have moved on to making a Gypsy caravan which is now almost completed. I have been making the wheels using the lathe and vertical mill, which is much more fun, and easier, than trying to do such a task at the kitchen table (**photo 8**)!

ME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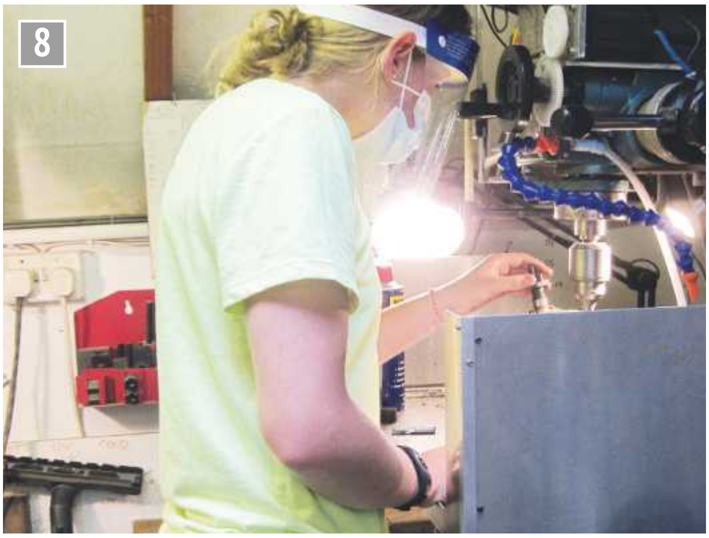
Lucas's crane.

The EYE StayAtHome project was operated entirely within the government guidelines. When I had to deliver components to their homes, I stopped at the door. Painting was done in my garden AFTER we were allowed to meet outside. Now we are back in the workshop, clad in masks and visors (photo 9) - the Young Engineer and myself are within the room but satisfying the latest directions. I attempt to keep as distant as I can from the youngsters.

Patrick and (of course) the Tooth Fairy!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Me making wheels on the mill.


9

Safe but uncomfortable!

How to Run a Miniature Railway Post Lockdown

Les Stiff passes on the experience gained in North Wilts.

Coate Water Railway, operated by North Wilts MES, is situated in a large public park in Swindon. We are heavily focused on public running and are open every Sunday throughout the year – weather permitting.

At the height of lockdown, the only activity we carried out was the occasional security patrols but, as conditions started to ease, we resumed Tuesday work parties. Public running started as soon as it was allowed. It was difficult to decide how the government would classify our activity but we thought that 'theme park' was the nearest thing.

Before opening the club, the directors met via a digital meeting and decided how we were going to deal with the carriage of passengers practically.

Now I appreciate that COVID-19 is a significant health hazard but my personal view is that a sense of proportion needs to be maintained. News and media hype do not help with regards to this. As a former traffic officer in the Wiltshire Constabulary, I tend to equate the risks to road accident statistics. I know that the infection rate is higher in some areas but, in the South West, you are more likely to be killed or seriously injured driving to the railway than you are to catch the virus!

So how did we do it? The first thing required is a positive mindset. It is far easier to come up with reasons not to open than it is to develop positive solutions to the – perceived – problems. A lot of time was spent discussing various options and 'what ifs' but, in the end, we came up with a plan and decided that if issues occurred then we would deal with them at the time.

We carried out a risk assessment of the various aspects of public running to

show that we had considered all the relevant factors. Social distancing notices were printed and laminated. The walkway to the ticket office and on to the platform was marked with yellow boxes two metres apart. A Perspex screen was installed in the ticket office window and card payments were encouraged. We always could do this but if this is 'new technology' to some clubs, then a card reader that links to the internet via the Bluetooth of a smartphone can be used. A company called Sum Up provide these for £29 and they only charge 2% of any transactions. We have stopped issuing tickets now.

Hand sanitiser is provided at the entry and exit points on the platform for the public to use. Social distancing on the coaches was the next problem to address. Our coaches are about two metres long, and so it was decided the alternate coaches would be used for each group of passengers. We now run one or two main trains comprising seven coaches with the guard sitting on his own 'guard's van' at the rear. This enables us to carry three groups of passengers on these trains. Also, subject to the number of members turning up, smaller, less powerful locomotives will pull two coaches with the passengers sitting on the second coach. No guard is required on these trains. The coaches that are not used for passengers have signs attached to them that state 'This coach is not in use for your safety'.

This arrangement can sometimes result in just one or two people sitting on an entire coach, leaving far more than the two metres distancing, so it was decided to trial the use of a 'distancing stick' which was a two-metre-long polystyrene tube (used to insulate water pipes). This failed as it was all too complicated and took too long to sit people in the right places. Additionally, we then had to wipe down the roofs of all the carriages after each ride rather than just the alternate ones. Wiping down the roofs was also a technique that needed refinement. The 'carriage cleaners' tended to squirt too much disinfectant onto the roofs which then took a relatively long time to wipe/dry off. Three quick squirts along the length of the carriage were found to be enough. Blue paper roll was used as this can be bought in bulk quite cheaply; however again, effective use of this was initially an issue with members tearing off more than was needed. One sheet was adequate for each wiping session. Otherwise, over time, the waste and cost would mount up – it doesn't grow on trees!

The limited numbers of passengers that can be carried at any one time, together with the time taken for cleaning, has resulted in longer queues but, generally, our customers are just happy that we are open and running again. However, to mitigate this timing issue, a sense of urgency needs to be maintained – no time for idle chit-chat! The guards need to direct the passengers who have completed their rides off the platform, the roof cleaners immediately get to work, the station manager needs to direct new passengers onto the train, and the driver needs to be ready to depart as soon as possible. If a steam engine is being used, the driver needs to multi-task, taking on water, tending to the fire, raising pressure and adding water to the boiler – all at the same time. Luckily, the regular steam engines used are large and powerful and are perfectly capable of making steam 'on the run' if required.

To conclude, I know that all club tracks are different and may well have individual issues that will need to be resolved but, with a bit of ingenuity and a 'can do' attitude, I am sure that most will be able to re-open within the current guidelines. Remember that once you start taking fare-paying passengers, then you are a business and the rules for businesses are quite different from those regarding social gatherings.

If anybody wishes to contact me for any further information or advice, please e-mail me at **les@stiffland.co.uk**

ME

POSTBAG

Prince of Wales Crank Axle

Dear Martin,
I was always under the impression that all Gresley three cylinder locomotives suffered from overheating of the inside cylinder big end and that they had an aniseed capsule that gave off a strong smell if the big end started to get warm. The driver and the fireman had instructions to reduce speed and replace the locomotive at the first opportunity. I have not read of axle failure before the articles in *Model Engineer*. However, with at least four axle failures in such a short time and a small class of locomotives, it is a very serious design defect. With *Prince of Wales* only time will tell. I hope the redesign gives many years of trouble-free operation. Locomotive history books tell us the P2s were rebuilt as Pacifics because of the long rigid wheelbase compared to other Pacifics and that the wood wedges which secured the rails to the chairs needed replacing by platelayers after a P2's passage.

The rebuild would need a lot of drawing office time, something in very short supply at this time during the Second World War. I would ask the question – would design work to allow more horizontal movement to the driving wheels have cured a lot of the problems these locomotives had? I remember many years ago a gentleman who remembered the P2s in service, saying they were a good design but the long rigid wheelbase tended to straighten out the curves on the Edinburgh to Aberdeen railway. Wear on the locomotive flanges and on the rail head was also a problem. Using the P2s between Edinburgh and York would have been a better route with fewer curves but various banks to climb. During the war Pacifics and Green Arrows were taking 22 coaches unassisted, with rear end assistance only when starting. Will the axleboxes on *Prince of Wales* have more movement in the horizontal plane to reduce flange wear and wheel squeal on curves? *Model Engineer* issue 4646 (28th August 2020), page 325, photograph 3 shows the crank axle with an undercut between the wheel seating and the roller bearing seating. Surely this is a stress raiser and was this the area where the original design failed - see *Model Engineer* issue 4636 (10th April 2020), page 590, photograph 1? Going back to page 325 photograph 4 of the crank axle between the web and the inside of the axlebox has a large reduction in diameter, again a stress raiser.

I would hope Robert Walker could be persuaded to contribute his thoughts on the new design of crank axle. His article was very interesting but I would imagine many readers would not understand the article. I passed HNC Strength of Materials in 1968 but have not done any stress calculation work since 1980. With 50 sq.ft of grate I would hope that *Prince of Wales* has a mechanical stoker. I am looking forward to see *Prince of Wales* with 18 coaches on the Leeds to Carlisle line.

If we look at the USA the Union Pacific had some three cylinder 4-12-2s, 88 in class. These locomotives had a lateral motion device on the first and last pair of drivers. I am not aware of any crank axle problem with these locomotives. In the book *Guide to North American Steam Locomotives* by George H. Drury (ISBN 0-89024-206-2 pp. 390-392) are photographs of a three cylinder one-piece casting and a crank axle which appears not to have any changes in diameter (in other words no stress raisers). No doubt our North American readers will know if these locomotives had crank axle problems?

During the 1930s the Timken Bearing Company ordered from ALCO a 4-8-4 with roller bearings everywhere (even the bell hammer). Called the *Demonstrator*, this locomotive toured US roads from which many orders resulted. At the time the late LBSC did an article for *Model Engineer* about the *Demonstrator* and a model a *Model Engineer* reader built, with an offer to readers of a drawing of the *Demonstrator*.

May I suggest a rerun of the E. T. Westbury articles on the 'Perseus', 'Theseus' and 'Unicorn' stationary engines for beginners.

Yours sincerely, Clive Barton (Ilkley, W. Yorkshire)

Dear Martin,
As the new Gresley P2 *Prince of Wales* is being built with Lentz valve gear as per *Cock o' the North* could someone explain how this works as I have never seen a model locomotive fitted with it. All the other five locomotives in the class had Walschaerts valve gear. I read somewhere that *Cock o' the North* was heavy on coal so maybe Gresley had the others fitted with Walschaerts valve gear. Lentz valve gear is limited on cutoff so maybe the driver had less control over the amount of steam being used.

J. R. Vaughan (Shifnal, Shropshire)

Lockdown

Dear Martin,
Model Engineer issue 4652 arrived in the mailbox today and, on scanning through it, I see you mentioned about toilet paper flying off the shelves in the UK and you asked did it happen here in Australia. It sure did back in March - or whenever we started to go into lock down - and I cannot fathom out why, then or now. At the time we did see on the TV news two youngish women coming to blows over the issue in a supermarket somewhere on the mainland - probably a Sydney suburb - which ended up in the magistrate's court. You'll probably have a host of replies from Australia on that question.

Regards, Tony Reeve (Australia)

Write to us

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Martin Evans, The Editor,
Model Engineer, MyTimeMedia Ltd,
Suite 25S, Eden House,
Enterprise Way, Edenbridge,
Kent, TN8 6HF
F. 01689 869 874
E. mrevans@cantab.net

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150 Years of the 'Quarry Hunslet' Dynasty

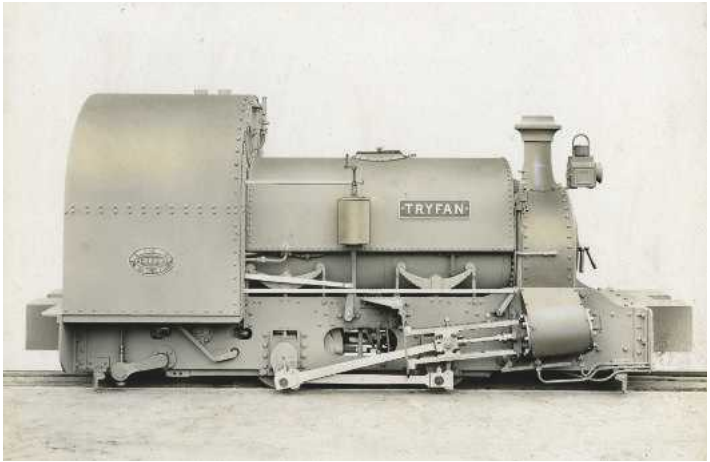
PART 7 - ALICE VARIANTS AND THE LATER 'PORT' CLASS

Mark Smithers celebrates 150 years of the famous Leeds locomotive builder.

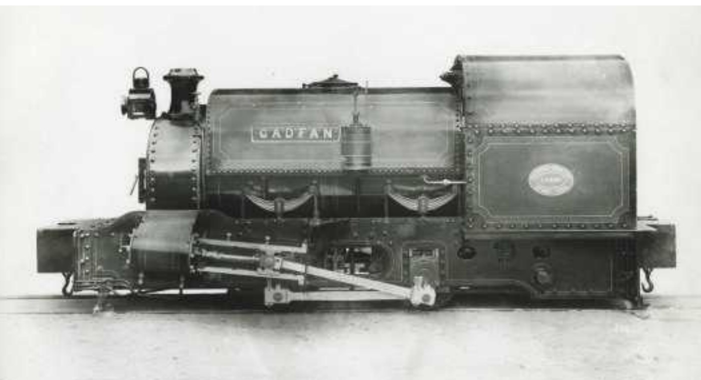
Continued from p.36
M.E. 4654, 18 December 2020

Three locomotives, all illustrated by Hunslet works photographs, deserve to be considered under this heading. The first pair were built to 1ft 11in gauge for the Moel Tryfan Slate Quarry Co. as W/N 781 of 1902 and 848 of 1904, respectively *Tryfan* and *Cadfan*. The Moel Tryfan workings were a feeder system to the N.W.N.G.R.'s Bryngwyn branch and the quarry and mills were separated by a very restrictive tunnel. This meant that although the locomotives could be built with standard *Alice*-pattern boilers, cylinders and running gear etc., they were supplied with sideways 'blind' rear entry cabs (for safety in the tunnel) and mainframes of basically rectangular pattern but with a dropped rear footplate and no running boards above the motion. It may be that the lower overall height associated with W/N 848 was specified as a consequence of experience with the earlier locomotive.

With the general drop in demand for slate during the inter-war years, there was less work for the steam locomotives and in late 1940 it was felt that a Ruston Hornsby Diesel would suffice. *Tryfan* and *Cadfan* were therefore cut up for scrap in 1941, no doubt falling victims to the scrap metal drives of the period. The third locomotive to be considered here is W/N 1020 of 1910. As we have seen with *Fergus*, the 'Leeds Mainstream' pattern of narrow gauge locomotive was readily adaptable to wider gauges than nominal 2ft and this was certainly the case with *Tryfan's* design. W/N 1020 *Abandonada 1* was built to 750 mm gauge for a Mr. John R. Banks (probably an agent) for working on a mine system on the outskirts of Bilbao. Apart from the necessary modifications to the design of frame stretchers, brake rigging, expansion brackets and front tubeplate etc. to suit the revised gauge, W/N 1020 was very similar to W/N 781 in its construction. Sadly, no further details of the engine's revenue-earning career have come to light at the time of writing.



Tryfan ***was the first of three adaptations of the basic*** **Alice** ***specification, built with rear entry 'wrap over' cabs, cut down boiler mountings; rectangular profile lower mainframes (with dropped rear upper portion) and close set block buffers.***



Cadfan ***was a modified version for the same customer as*** **Tryfan,** ***Moel Tryfan Slate Quarry. The overall height was reduced and the rear mainframes were downwardly extended, presumably to make good the loss of headroom incurred by reducing the height of the cab although this would have entailed dropping the footplate between the frames.***

More wider gauge inside framed variants

Hunslet built a number of locomotives utilizing the basic *Alice* class wheel, wheelbase, cylinder and boiler diameter dimensions, but for gauges up to 3ft 6in employing, in most cases at least, 'waisted-in' fireboxes and inside frames, *Little Egret* fashion. The best-known group of these locomotives were built to 3ft gauge for W. A. Darbishire & Co. Ltd's Penmaenmawr Granite Quarries as W/Ns 706 of 1899 *Hughie*; 771 of 1902 *Stephen*; 798 of 1903 *Singapore*, and 866 of 1905 *Donald*. In addition to their inside frames and *Jack*-pattern cabs, these locomotives were characterized as built by the fitting of left-hand crosshead-driven feed pumps (in effect a reversion to *Velinheli's* arrangement as built).

A peculiar pattern of rear suspension was employed in which the longitudinal

Tryfan's *design was modified for 2ft 6in gauge for a Spanish customer in the Bilbao area and the resultant 1910 vintage locomotive* Abandonada 1 *is illustrated here. It was effectively to* Tryfan *what* Fergus *was to* E. Jago*. Sadly, little further is known about the locomotive's career.*

Inside framed variants of the dynasty intended for wider gauges than nominal 2ft continued to be constructed after Little Egret *and this 3ft gauge variant,* Chamerico*, apparently incorporating* Peep-o'-Day *(or similar) - pattern boiler, cylinders and motion was dispatched on December 14th 1883.*

Perhaps the best-known wider gauge relatives were the four 3ft gauge locomotives built for Penmaenmawr Granite Quarries. This maker's photograph shows Stephen *(W/N 771 of 1902). Unfortunately, all four locomotives were scrapped by 1951, being outlasted in their workplace by De Wintons. As with* Velinheli *the feed pump was on the left-hand side.*

This maker's view is of the Dinorwic system's second 'Port' class (W/N 1430 of 1922, originally No.2 later Dolbadarn*). This design was built to basic* Alice *class proportions but the illustration clearly shows the higher pitched boiler (updated from* Peep-o'-Day*); cab derived from* Dorothea *short chimney; kidney buffers; plain rectangular mainframes with no lower extensions, and rectangular buffer beams with cylinder access holes.*

centre axis of the springs was set forward of the rear axle centreline, presumably to allow the former to accommodate the firebox, which encroached into the wheelset arc. It is interesting to compare this arrangement with the one used on *Little Egret* where coiled springs (which took up less space) were used in lieu of leaf to provide adequate clearance. These locomotives were all scrapped by 1951.

A similar design was employed by Mancetter Granite Quarries near Nuneaton to 2ft 8½in gauge (W/N 754 of 1901 *Oldbury*), whilst the last surviving member of this group is *Angola*-based 3ft 6in gauge Benguela Railway *General Machado* (W/N 847 of 1906). The interesting point about this latter locomotive is despite the fact that its mainframe spacing would appear to accommodate a standard *Alice* class firebox, the longer firebox and offset springing of the 'Granite Quarry' locomotives were retained. One distinctive feature of *General Machado* is that its wheelbase is 3in less than its gauge.

The Later Dinorwic 'Port' Class

The final design (to date) of the 'Quarry Hunslet' group to evolve first appeared in 1922 and was initially produced for transfer and shunting work at the Port as per W/Ns 678-9. The first two class members, *Nos. 1* & *2* (respectively W/Ns 1429-30 of 1922) were fitted with similar drawgear and bufferbeams to their precursors as built and incorporated a raised boiler pitch as pioneered on the Penrhyn Railway 'Large Quarry' class. In many respects, however, this class harked back to *Peep-o'-Day* as it was fitted with a flat-topped dome on the boiler barrel (albeit with Ross 'pop' safety valves); rectangular profile mainframes (of a simplified pattern with no downward extensions), and a cab, this time of a pattern derived from that one fitted to *Dorothea* but with rounded rather than rectangular vertical corners. The pair were followed by a third class member, *Michael* (W/N 1709 of 1932), which although constructed for Quarry work and fitted with the appropriate buffers and drawgear, was otherwise rather

The final member of the Dinorwic second 'Port Class', Michael, *was built in 1932 for quarry work, with appropriate buffers and drawgear. It subsequently lost its cab but this was restored prior to shipment to Canada. It is seen here at Statfold Barn on April 9th 2016 and, as with* King of the Scarlets, *no restoration work has taken place since repatriation. The original pattern sandboxes are still in place.*

Michael's *design, sans buffers and with revised drawgear, was repeated in 2005 for a new locomotive,* Statfold, *constructed in Statfold Barn's workshops as Hunslet W/N 3903. The locomotive is seen here on Statfold Barn's turntable on August 8th 2020.*

perversely constructed to the 'Port' class specification.

During their revenue earning careers W/Ns 1429 and 1430 both acquired names, *Lady Joan* (initially the original designation *No. 1* was restored) and *Dolbadarn* and lost their cabs and special drawgear when transferred for Quarry work. In addition, W/N 1430 last its domed boiler in the early 1950's in favour of one of standard *Alice*-pattern. *No. 1* was sold in 1967 and after spells at Woburn Abbey and Knebworth is today to be found on the Bredgar and Wormshill Railway in Kent. Its cab has been restored and tank-mounted sandboxes (apparently carried throughout its revenue-earning career) retained, but the name *Lady Joan* has been re-instated and conventional drawgear fitted.

W/N 1430 worked until 1967 and was sold at the 1969 auction, passing to the Llanberis Lake Railway. Today, the original-pattern cab and boiler (now a replacement) have been restored, although not the original sandboxes and drawgear, whilst the name has been retained. Both W/Ns 1429 and 1430 were, of course re-gauged to nominal 1ft 11½in after initial sale.

Michael was sold (along with the current *King of the Scarlets*) in June 1965 to Charles Matthews of Thornhill, Toronto, Canada following re-fitting of the upper cab. After decades of storage, *Michael* was eventually returned to the U.K. and is now on display in the museum at Statfold Barn in substantially original condition. Some years before this event, however, *Michael's* basic specification was chosen for two new locomotives constructed at Statfold (as Hunslet W/Ns 3903-4 of 2005 and 2006) respectively *Statfold* and *Jack Lane*. These locomotives have been very much in evidence at Statfold events during the ensuing years and will no doubt be in operation at the delayed '150 Years of the Quarry Hunslet' event planned for March 20th 2021. **ME**

A cabless sister to Statfold, Jack Lane, *was completed in 2006 as W/N 3904. This locomotive is seen outside the locomotive shed at Statfold Barn on August 8th 2020.*

A view of Statfold *and* Jack Lane *posing for photographers at Statfold Barn on March 25th 2017.*

Back-to-Basics

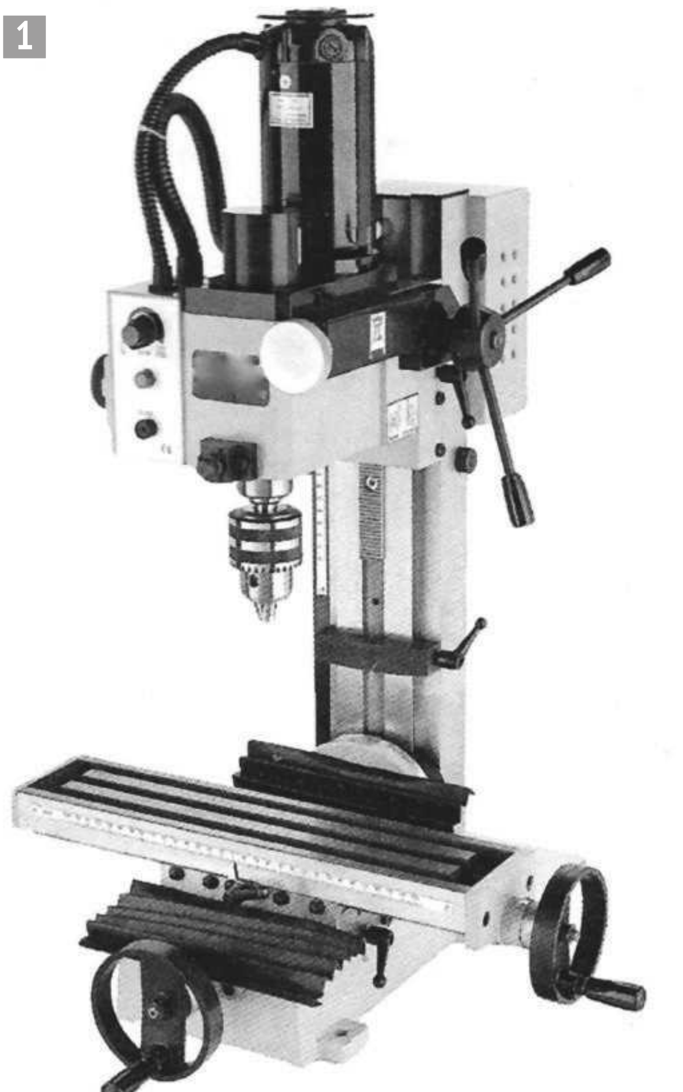
Trials and Tribulations with a Mini Mill PART 1

Terence Holland gets tooled up.

A milling saga

A few years ago, after ages of struggling with methods of milling metal, I finally 'bit the bullet' and purchased an X2 Mini Mill (**photo 1**) – but it wasn't long before I wished I'd kept the money and gone down the pub!

To cut a short story long, the tale starts in the late 1960s when I attempted to become a 'model engineer'. My first understanding of the phrase was that it represented a man who repaired his own car and didn't swear at and blame 'er-indoors when he got 'spanner rash'! Eventually, however, a visit to the local steam rally, held annually at the time in Lulworth Park, Dorset, introduced me to the real meaning of the phrase and the delights of miniature steam machinery – the likes of which I had not experienced before. **Photograph 2** is a picture, taken at Lulworth in 1968, of the locomotive that inspired me.



1

Generic X2 Mini-Mill (author's collection).

2

Model locomotive at Lulworth Rally ca. 1968.

Surprisingly, it turns out that this engine is still operational and running on the Bankside Miniature Railway in a garden centre near Eastleigh. It's a 2-6-2 tank engine to the unique gauge of 8¼ inches, which was built in 1924 – so it's almost 100 years old and definitely a 'one-off'. **Photograph 3** is a more recent (and far better) picture of *Carolyn* at Bankside. She is unusual in having a very narrow gauge, almost Single Fairlie, look - even though running on 8¼ inch gauge track makes her more likely to have a broad gauge profile.

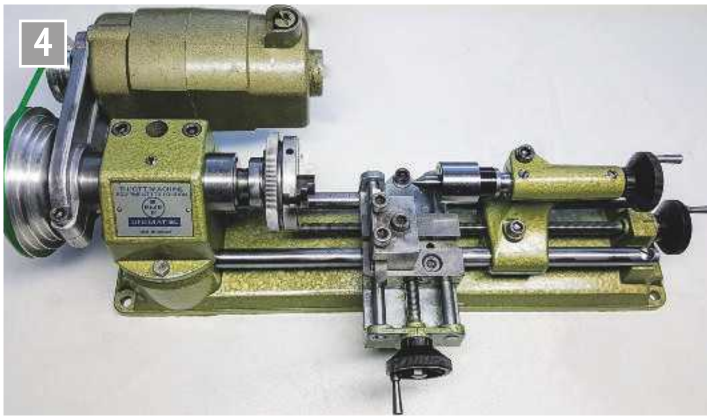
Returning to my tale, I discovered that such engineering perfection could only be attained via two methods; one, buy an existing machine or two, build one from scratch. It soon became apparent, however, that both options unfortunately involved the expenditure of lots of hard-earned loot. Things therefore went on hold for a while...

Enter the Unimat

Not long after that I had a windfall. I had submitted some idea or other (I can't remember exactly what) to my company's suggestion scheme and was awarded the grand sum of 100 pounds – an amount not to be sniffed at in those days, I might add. So then came a dilemma – do I put it in the bottomless, household financial pit or selfishly spend it on myself? Fortunately, the latter option won the day or I wouldn't be sat here writing this article. I hasten to add, of course, that my young family did not suffer, as my salary went straight to *la jefa*; 'she who must be obeyed' – 'don't pass go, don't collect £200' as they say!

The money was soon spent on a new Unimat SL1000 lathe (**photo 4**), along with a few accessories, and I set up a small workshop at the side of the house in what had been the coal shed – well it would have had to have been pretty small wouldn't it? But so was the lathe, which would have fitted into the boss's handbag. It was probably about this time that I made another discovery - as well as spinning the metal against a fixed tool, it was also possible to fix the metal object and spin the tool - I had discovered the delights of milling.

Carolyn at Bankside (locoyard.com).



Unimat SL1000 lathe (Arreton Amateur Timepieces).

The old Myford gearbox and new motor.

The next surprise was discovering the *Model Engineer* magazine and its associated *Plans Handbook* – there was no stopping me then. At last I could turn small items of metal so that they could be assembled into various items, made using plans from the handbook. But the ability to carry out a milling operation still eluded me. And I still couldn't justify taking out a subscription to *Model Engineer*.

The Myford revelation

Moving on, I was reading the local paper one day when I spotted an advert for a Myford ML7 lathe. It was in a factory in Poole, just up the road from where I lived, so I went to see it. It looked fine to me and not expensive and I decided to buy it. I noticed, however, that it was fitted with a gearbox, which, in my ignorance at the time, I decided I didn't want. So I said to the man "how much will you reduce the price if I don't take the gearbox?" to which he replied (as you might guess) "take it or leave it – the gearbox is built into the lathe making it almost impossible to remove". That decided the matter and all that remained was to pay him (I seem to remember it costing about 120 pounds) and fetch it home. Now of the removal I have a complete mental blank because, although I can remember later moves (about five of them altogether), how that first move was carried out remains a mystery. And a Myford's a big old lump of cast iron to sling around!

I often reflect with hindsight how fortunate I had been, as most ML7s at that time came without a screwcutting gearbox and, since then, mine has received a lot of use over the years, both for cutting threads and driving the leadscrew whilst turning. When I purchased the ML7B it was only about five years old and had probably been used for a mass-production job and then sold on, as the bed was fairly worn up close to the

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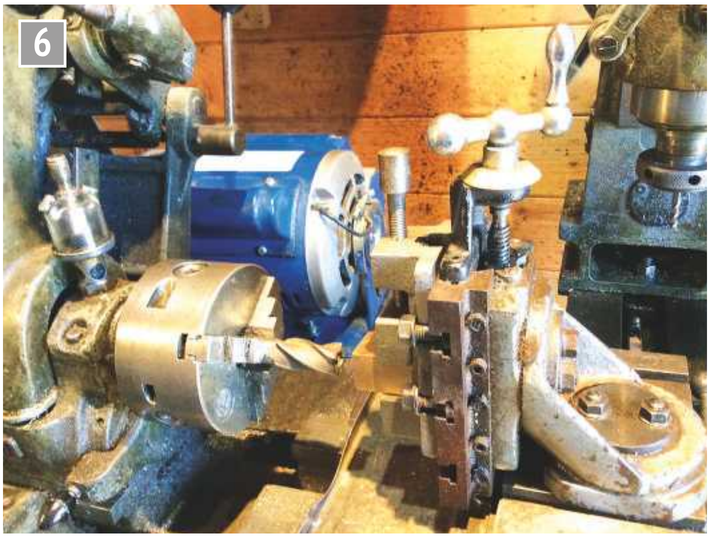
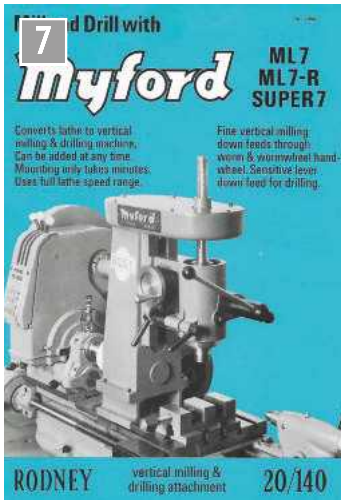
I have never been one wanting to spend time making various machining accessories – although I have to admit that, over the years, I've made life a lot easier by making quite a selection.



Myford vertical slide.



Myford Rodney attachment (author's collection).

chuck. It still functions well, within certain limitations, and the only replacement parts in some 50 years of use are the leadscrew and the motor seen in **photo 5**. Maybe I'll give it a decent paint job one day!

In with the Rodney

Over the years following this marvellous acquisition I gradually added various accessories, including a vertical slide and machine vice (**photo 6**). The milling work it could carry out was very limited and it was somewhat awkward to operate. But needs must...

Things improved somewhat when I acquired a second-hand Myford Rodney milling attachment. But it wasn't the same as having a separate milling machine, as setting up the attachment on the lathe was not easy – mainly due to its heavy weight. And of course when milling is being carried out turning is impossible, without removing the attachment and reinstating the topslide. **Photograph 7** shows the advertising 'blurb' from 1980.

Things went on like this for quite a while until one day I had a eureka moment – I should modify the Myford Rodney with a bit of 'heavy' engineering to make it more 'user friendly'. I have never been one wanting to spend time making various machining accessories – although I have to admit that, over the years, I've made life a lot easier by making quite a selection. However, even at this early stage I was experiencing lower back problems so something needed to be done – 'er-indoors didn't help because she reckons I had a job getting off it!

The modification consisted of a short, 18 inch long mock up of the lathe bed, welded together, which fits at right angles to the main bed. This is fixed to the back of the lathe bed using the screw holes Myford provided for fixing their taper turning attachment (**photos 8** and **9**). Additional support is given using steel rods bolted into the suds tray. The set-up is powered by its own ¼ hp motor via a belt drive reduction.

Once all is in place it's an easy matter to slide the Rodney up and down the dedicated bed fabrication, 'as and when'. But it was still 'either/or' so I kept a look out for a suitable free-standing machine.

●To be continued.

Modified Myford-Rodney attachment.

Close up of the mounting arrangement.

Old girl all dressed up posing for the camera.

PART 8 - BOILER

WAHYA A 5 Inch American Type Locomotive

Luker builds an American 4-4-0.

Continued from p.753
M.E. 4653, 4 December 2020

The smokebox assembly (fig 11)

As I mentioned in the first article the matching of the various bits and pieces for any locomotive is important and that's where a little research is indispensible. Looking at existing examples of locomotives is probably not the best idea because the NGO that invariably builds or maintains them does the best they can but not necessarily what the master mechanics of the day would have done. The best source of information is the handbooks written by the master mechanics or even the publications of the various designs and models written in that era.

All the external bits around the smokebox and boiler match the locomotives of the day for the extended smokebox (**photo 57**) but when it comes to the internals, modern materials and design methods were applied for good steaming, track adhesion, etc. On the topic of materials, the smokebox door, chimney and smokebox saddle were all cast from aluminium to move the centre of gravity closer to the front drive wheel, improving the adhesion of the coupled wheels.

The chimney

The outside of the chimney is scaled directly from the original drawings, 3D printed and cast in aluminium. The internal draft angles are based on the standard angles published in *Model Engineer* from time to time, adjusted slightly to incorporate some of my development and recent

Smokebox front end.

Smokebox.

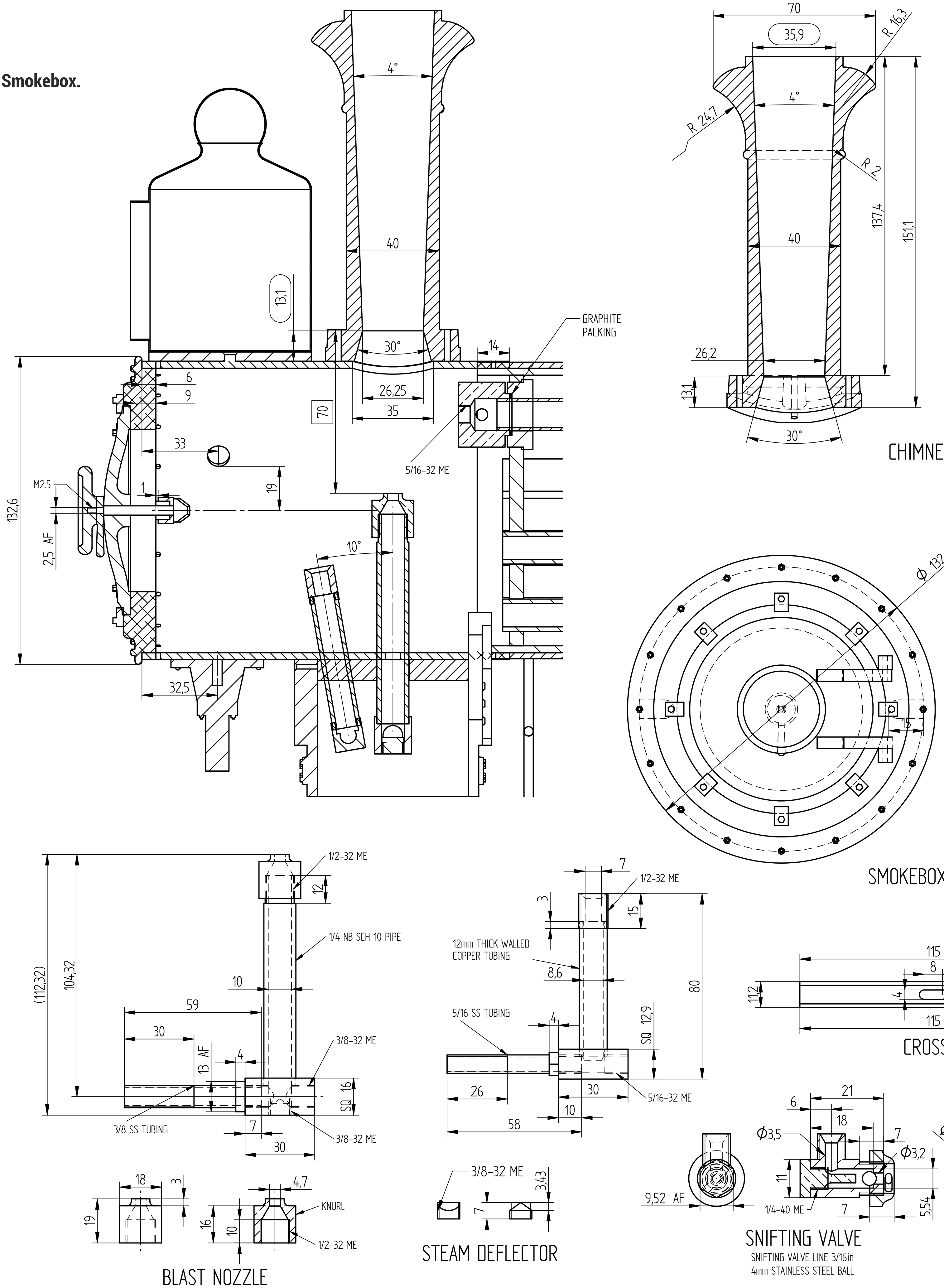
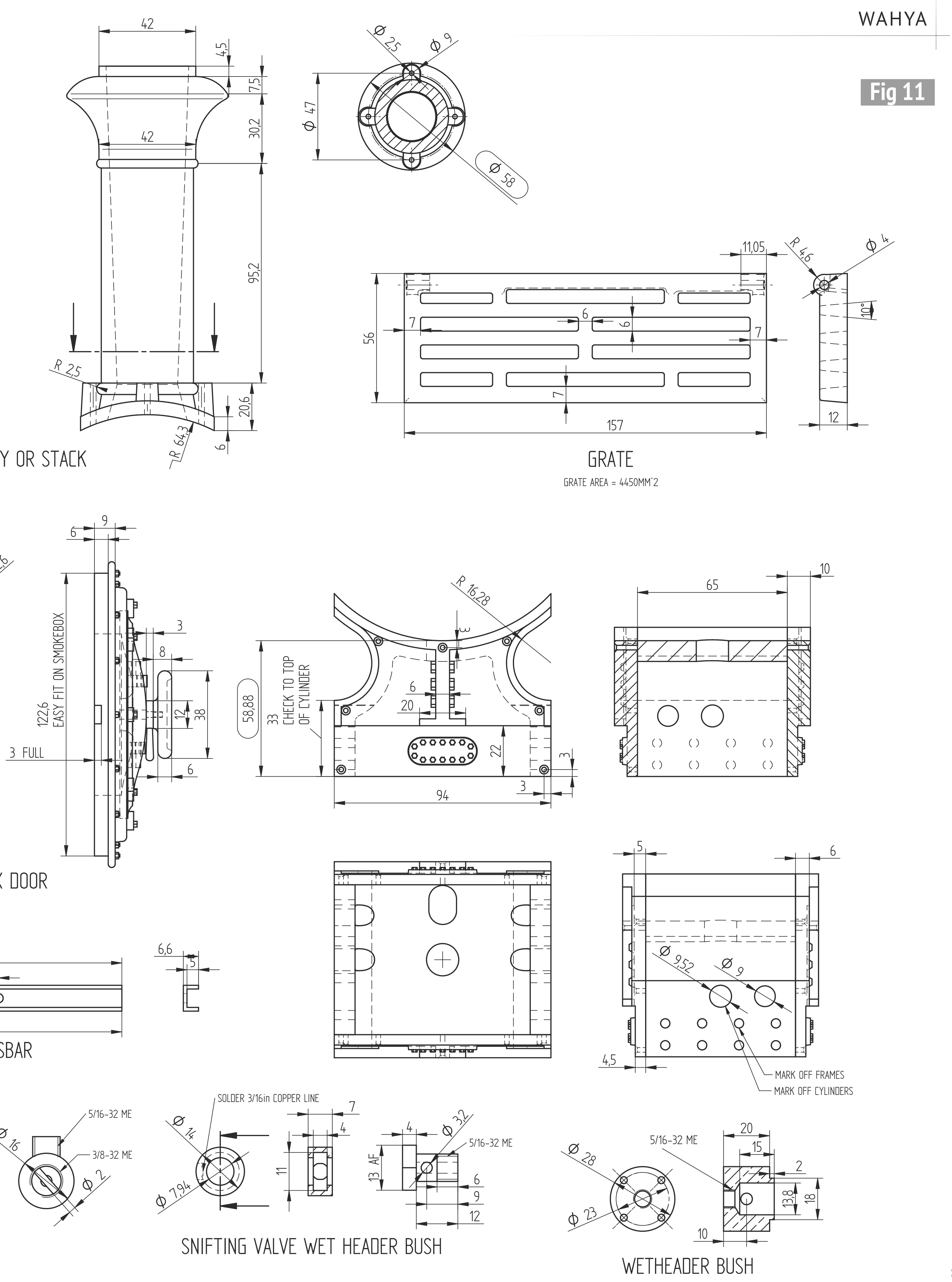

GRAPHITE PACKING
5/16-32 ME
M2.5
2,5 AF
CHIMNE
SMOKEBOX
1/2-32 ME
1/4 NB SCH 10 PIPE
3/8-32 ME
3/8 SS TUBING
13 AF
SQ 16
KNURL
BLAST NOZZLE
12mm THICK WALLED COPPER TUBING
5/16 SS TUBING
5/16-32 ME
SQ 12,9
STEAM DEFLECTOR
CROSS
9,52 AF
1/4-40 ME
SNIFTING VALVE
SNIFTING VALVE LINE 3/16in
4mm STAINLESS STEEL BALL

Fig 11


Y OR STACK
GRATE
GRATE AREA = 4450MM^2
EASY FIT ON SMOKEBOX
3 FULL
K DOOR
CHECK TO TOP OF CYLINDER
SBAR
MARK OFF FRAMES
MARK OFF CYLINDERS
SOLDER 3/16in COPPER LINE
5/16-32 ME
3/8-32 ME
13 AF
SNIFTING VALVE WET HEADER BUSH
WETHEADER BUSH

research in steam jets. This negated the need for any type of petticoat and, as long as the dimensions and distance to the chimney throat are followed, you'll get a good draught through the chimney.

There's very little machining for the chimney. A decent spigot for holding in a three jaw chuck was cast with a core, making the chimney a simple taper turning operation on the taper slide. A stout boring bar and lighter cuts are the order of the day but with aluminium it didn't pose any problems. The top rim can then be cleaned and the chimney parted off, with a rod into the bore from the tail stock to prevent the chimney getting damaged when it comes off the tool. The chimney can then be clamped to the milling bed with a taper mandrel and the base of the chimney can be machined using a fly cutter to match the smokebox, creating a good seal (**photo 58**).

The smokebox door

The smokebox door is another example of a component that is scaled directly from the full-scale drawings and from the outside looks incredibly complicated but the inside is drastically simplified to make cleaning of the tubes after a day's run easy and decreasing manufacturing time on my side.

Again, a handy spigot was included in the casting to make machining easy (**photo 59**). The door needs to be machined to an easy fit. The sealing surface is the flat at the end of the smokebox tube, not the internal radius and both the smokebox door casting as well as the smokebox tube needs to be skimmed to get an airtight seal.

The cross bar is cut from ½ inch square tube and the draw bar or dart slot is milled in the middle. The cross bar is fitted to two tabs welded or riveted to the inside of the smokebox. I bent the corners of the drawbar slightly to get a tighter fit to prevent the drawbar pushing the crossbar off the locating lugs when assembling the smokebox door. The fancy looking maker's plate locks the whole assembly in place and the usual square on the back handle can be manoeuvred to make sure the maker's plate is always facing the right way. A 1mm recess is needed for an engraved (or in my case, electro stripped with a cell phone charger and some copper sulphate) nameplate that should be painted and polished with pride.

Smokebox saddle

The smokebox saddle is designed to look like the integrated cylinders and smokebox saddle the large scale locomotive had and consists of three components assembled and match machined (**photo 60**). This was done primarily to reduce the weight of the front end, drastically improving adhesion on the coupled wheels, and it also simplifies the smokebox and plumbing considerably.

With the three cast components assembled and the sides skimmed to drawing, all the holes can be drilled. The side holes are drilled through the frames with the saddle resting on the bogie brace, and the holes for the steam and exhaust pipes are marked off the cylinders with the cylinders bolted in place. The exhaust pipe hole should line up with the hole for the chimney and it needs to be in the centre of the cylinders. The saddle can be fitted to the smokebox by four M3 cap screws in the corners of the saddle recess.

Smokebox plumbing

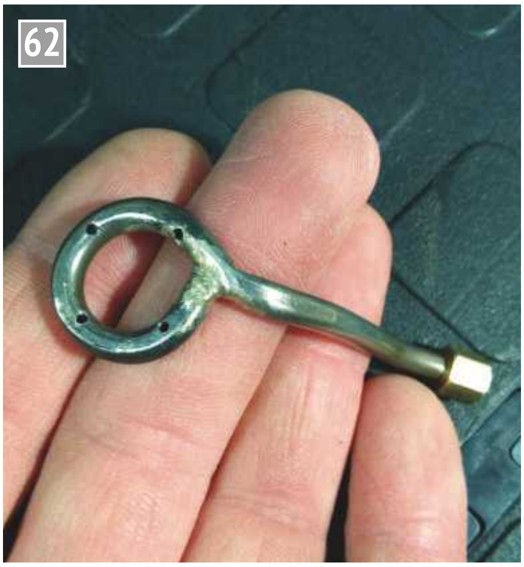
The 'T'-pieces for the steam and exhaust lines make the plumbing inside the smokebox

Machining the chimney base using a fly cutter.

Trial assembly of machined smokebox door.

Smokebox cradle machining.

Plumbing fitted to the smokebox cradle.



Blower line.

Superheaters.

very simple and easy to adjust (**photo 61**). Both 'T'-pieces are made from tubing that should be common and the exhaust uses the tubes used for the boiler. The 'T'-pieces are assembled from the bottom so the bogie brace needs to be removed as well as the front bogie. This is a bit of a pain but once they're fitted they shouldn't need to be fiddled with until a major overhaul.

The blast nozzle hole size is very dependent on the track conditions but the given dimension should be a good starting point. These are easy and quick to make and I normally make a few that I test on our track to get the best results. If under normal running conditions the safety valves continuously blow off, and you need to ride with the fire door partially open, it's a good sign that the blast nozzle should be made bigger. If you get poor steaming then there are a number of factors that need to be looked at before messing around with the exhaust blast.

I have never liked some of the fancy nozzles and integrated blower systems that are sometimes combined with the blast nozzles. For my last couple of locomotives I have made the blower from some 4mm stainless steel hydraulic tubing. The blower part is bent around a piece of bar (**photo 62**). In this case I used 16mm and silver soldered the end. The holes (1.2mm) are drilled by hand, slightly to the middle of the ring, using a power drill at low speed… very carefully! I previously made these holes 1mm, but I have found 1.2mm creates a better draught and is easier to control with the blower valve. The blower line is coupled through the smokebox to a simple elbow connection to the outside of the boiler that then runs to the blower valve in the cab.

Snifting valve

The snifting valve, especially when using superheaters, needs to be designed correctly. Some guys at our club connect this valve directly to the cylinder valve chest and others don't even bother with a snifting valve. This is bad practice, to say the least. Without a snifting valve, with the regulator closed while coasting, it is possible to pull a vacuum through the exhaust. This is a sure-fire way to suck ash into the valve chest, which is a quick way to score the nicely lapped valve surface. If superheaters are used in the model the best position for the snifting valve is connected to the wet header. If air is drawn in then it will prevent the superheaters from overheating and stop unnecessary cooling of the cylinders, both good for efficiency.

For *Wahya*, the snifting valve is hidden in the smokebox inspection hatch that was typically situated at the front of the extended type smokebox. Gravity will prevent the ball from resting on the seat when the locomotive isn't in steam; this will limit any chances of the ball getting stuck due to calcium build-up, etc. The wet header bush for the snifting valve is a banjo type fitting that allows the line to be moved to a convenient position in the smokebox that won't obstruct cleaning or the exhaust jet. Provided the wet header bush and the back of the banjo nut are good machined surfaces no further sealing gasket is needed. If, however, the fitting leaks with the boiler on pressure, the reverser in mid gear and regulator open, then thin copper gaskets (soft annealed) will put any leaks in their place.

Superheaters

The superheaters are a tube in shell configuration with the outside tube 16mm SS316 and all inner tubes 5/16 inch or 8mm copper tubing (**photo 63**). The copper tubing should end 8mm from the stainless steel end cap, which is TIG welded to seal the outer shell. The copper tubing is needed to give a little flexibility when assembling the super heaters with the boiler fitted to the frame. They're designed to be pulled out through the smokebox should they need to be replaced at a later stage, or if the wet header gland needs replacing. While on the topic of the wet header gland, I have started using graphite packing after failures with other packing types and have been very happy with the results so far.

The wet header can be made from either bronze or stainless steel and is a simple machining operation with the lip at the end used to compress the graphite packing in the wet header bush of the boiler. When bolting everything up don't use stainless steel bolts of the same grade as the boiler; that's just looking for cold welding issues. I used studs with a liberal coating of copper slip and a different grade of stainless but high tensile studs and nuts would also work.

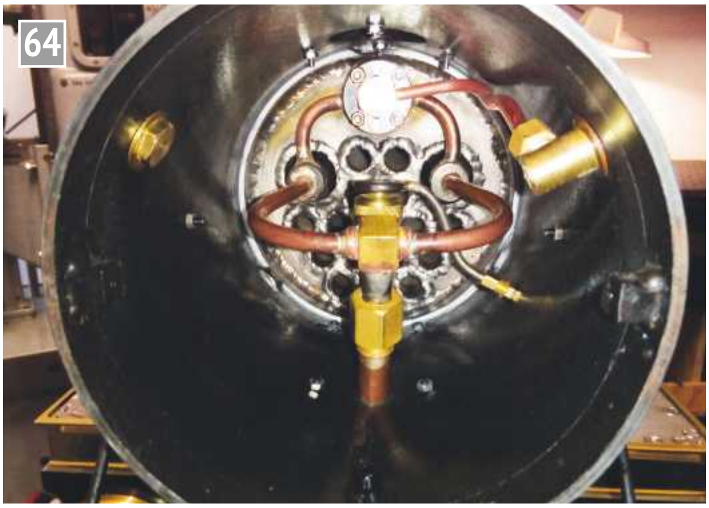
Photograph 64 shows a view of the inside of the smokebox.

The grate

A part of model locomotives that doesn't seem to receive the same attention that it did with full scale is the grate. The grate should be designed to match the boiler and the smokebox volume, and with my locomotives, through a little experimentation and comparative checks with large scale volumetric ratios, working ratios can be empirically derived. All my locomotives run on anthracite and they're designed specifically for that fuel. I don't like driving behind a plume of smoke; tears are for the workshop not the track.

Most of my grates are hinged with a pull bar to drop the fire quickly should there be any issues while steaming. They're also all made from cast iron, which for me is just quicker to cast than to fabricate something from stainless.

●To be continued.



Inside the smokebox.

We Visit the Echills Wood Railway

John Arrowsmith enjoys a warm September day at Kingsbury Water Park.

This fine railway is located in the Kingsbury Water Park near Sutton Coldfield which is an area of some 600 acres of woodland and has fifteen lakes. The park is managed and run by the rangers and staff of Warwickshire County Council. The Railway Society itself has been in existence for around forty years and was previously at Stoneleigh in Warwickshire where the name Echills Wood comes from. It moved to its present location in the early part of 2004 and the first steam hauled passenger trains began at Easter 2006. The railway and its infrastructure has grown considerably since then and now has a main line of over 2km plus a large number of sidings and branch lines along with large locomotive and stock storage areas. Add to this a large, excellent and fully equipped workshop and you begin to see that this is no ordinary miniature railway.

Like most model engineering societies and miniature railways, it is the membership who, through their dedication, have built this Society to its present day standing. A 'not for profit' organisation, the railway carries around 30,000 passengers a year and included in that are the many different special days they organise. Of course, this year is the exception because, like everyone else, all these activities have been curtailed by the Covid 19 problems. However, this has provided the members with time to carry out the many maintenance tasks necessary on such a large railway system, as well as rebuild and update some of the existing working apparatus without having to reorganise their public running schedule.

The ballast train heads off into the country.

My visit was on one of those comfortable September days with warm sunshine and little breeze. Secretary, Jeff Stevens met me and we talked about the railway and how the present public health situation was affecting operations. There have been quite a few changes since I last went to Echills as a passenger and now they are faced with an even bigger challenge as the new HS2 Railway project will impact their site when it comes through on Stage 2B. It will be built on an embankment which means access roads etc. will also have to be built; this will impact on the club and will require the demolition of part of their track, followed by a subsequent rebuild in order to complete the circuit again. For those of you who know the track, the area affected is near the Picnic Green Station and will require about 250 metres of track to be lifted completely. The track will then be rebuilt into the wooded area alongside. Their biggest concerns, of course, are when it is likely to happen and the costs involved. Jeff told me that they have a good working relationship with HS2 so hopefully all these preparations will come to a satisfactory conclusion for both organisations.

During my visit, members were busy on a number of tasks including re-ballasting parts of the track adjacent to the main station and workshop areas. The four-wagon ballast train was

Track maintenance gang at work on Old Oak yard.

Harvesters Middle Box and barrier.

Flashing lights display on the main road crossing.

Awaiting completion of the circuits in Harvesters Middle Box.

Harvester Station Signal Box.

Lever frame and track diagram in Station Box.

The secure and complex track circuitry locations.

One of the compact point operating mechanisms complete with blade contact sensors.

being kept busy transporting loads to where it was needed while the members did the necessary with the tamping and levelling to suit the track (**photos 1** and **2**). Another major refurbishment has been carried out on the Harvesters Middle Box which is adjacent to the main road crossing on the track. As this is also part of the internal Echills Wood roadway system, the crossing equipment has to be up to modern road traffic standards (**photos 3** and **4**). The work carried out and continuing is to a very impressive, high standard and should ensure the railway can work safely for both its own members and the public in general. The old signal box was in need of serious work to rectify the building's deterioration. Simple but effective repairs have been carried out by using sectioned concrete garage panels cut down to the required size and then erected on site. This has resulted in a smart looking building fully fitted with all the equipment needed to operate the departure side from the station and control the level crossing. Inside, the scale 18 lever frame was resplendent in its new coat of paint and the wiring looms look very professional (**photo 5**). This signal box is connected to the Harvesters Station Box (**photo 6**) which has also had a re-paint and upgrade and also looks very smart (**photo 7**). To improve the track work from the station a new double crossover has been incorporated between the station box and the crossing box which gives them much more flexibility. There are a number of fixed track circuit installations securely fitted to sleepers and the ballast around the site so that there is continuity throughout the system (**photo 8**). Points are pneumatically operated and are fitted with blade indicators so that the signalman can check the point has operated correctly (**photo 9**). At the station (**photo 10**) a new three phase supply has been fitted into the station building (**photo** »

11) and has been split to supply the different sections of the railway, including the 16mm section, and ensures that there is ample power including at the bottom end of the site at Far Leys station (**photo 12**). This four road station is situated at the extremity of the site where trains pause on their journey to enable steamers to take on water or have a blow-up. Passengers can alight here and enjoy the wooded walks adjacent to the station. To get to this station, passengers pass through the 75 foot long twin bore Wren Tunnel which offers one of the few opportunities in life to actually see the light at the end of the tunnel (**photo 13**)!

I mentioned the excellent storage and workshop facilities on site and the Society has been very innovative in its use. Basically, the buildings are standard storage containers which have been modified to suit their needs. Six have been positioned together with a new pitched roof and along the front a useful overhang has been fitted with high security roller shutter doors. This makes for an impressive looking building (**photo 14**) and certainly provides superb facilities for the many locomotives and coaching stock stored on site (**photos 15** and **16**). A large scale traverser provides full access to all the stock storage areas. The club workshops are another excellent facility enjoyed by members and to accommodate lifting of the large locomotives and passenger stock at the railway, a useful heavy lifting shop is adjacent. This has the capacity to lift the heaviest stock on the railway so that both long term and running maintenance can be carried out.

In the main workshop a full range of machine tools and equipment is available (**photo 17**) to facilitate a wide range of operations. An example of this is the fine passenger carriage bogies built on site by members (**photo 18**) along

The main Harvesters station.

The new power installation box and distribution board at the station.

The four road Far Leys station and water tower.

The twin bore Wren Tunnel.

The full set of storage buildings.

The standard gauge carriage storage shed.

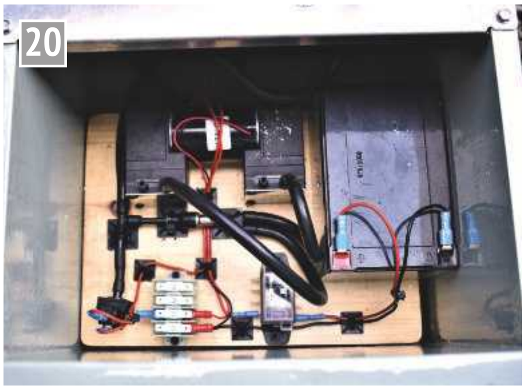
Inside the standard gauge electric stock shed.

Heavy milling and shaper machines in the machine shop.

One of the new passenger carriage bogies built on site by members.

with some new baggage carriages to go with the scale coaches (**photo 19**). These incorporate a special guard's seat which give access to the vacuum braking system so that the train is fully protected. Should the locomotive vacuum system fail or malfunction, the guard has an overriding electrical vacuum pump he can use to bring the train to a halt (**photo 20**). One of the storage buildings has been turned into a carriage repair shop which is again proving its worth by having a good working space for these long vehicles (**photo 21**). Health and safety is a prime concern for the railway which has its own Health and Safety officer who works closely with the Warwickshire Health and Safety team and the railway also has a team of First Aid trained members. As an example of the H & S consideration, the main running line turntable, which can take the heaviest of locomotives, has had a protective barrier installed to prevent anyone from falling into the pit (**photo 22**). This is fixed to the table so that all movements are protected.

One of the new baggage carriages - note the impressive paint job.



The auxiliary vacuum assembly fitted to the new baggage carriages.

The impressive carriage repair shop.

Ample protective barriers on the main shed turntable.

With a railway this size, there are many tasks needed on the administration side of things and combined with all the different events they hold it is quite a job to maintain the paperwork necessary these days. One of the committee members, Tom Bailey came across a new system developed by one of the Heritage Railways called HOPS, which stands for Heritage Operating Procedure Systems. This system covers any administration or paperwork task you need to operate a railway, from rostering members to paying the bills. Echills Wood is one of the first clubs in the model engineering world to be trying it out. A computer based system, Tom was extolling its virtues very strongly and as they are trying it out for a full 12 months it will be interesting to hear how this helps the busy admin side of things on the railway. With the HS2 project on the horizon and other major plans for the railway itself under consideration (such as a members clubhouse), this system may prove to be the answer to the committee's paperwork and organising procedures.

I hope you have enjoyed this all too brief a visit to a superb miniature railway system. Why not go along and see it for yourself? Situated in the Kingsbury Water Park there is something there for all the family to enjoy while the railway enthusiasts are exploring the railway.

I must thank Jeff Stevens and all the members I met on the day for their hospitality and information and I am sure that despite the current restrictions on operating it will continue to flourish for many years to come. Thank you all.

ME

James Buxton makes a skeleton clock to William Strutt's design.

The finished clock.

PART 1

Making an Epicyclic Clock

I have always been interested in skeleton clocks because I enjoy seeing what goes on inside. While reading of some well-known examples I came across an illustration of William Strutt's epicyclic clock. There was a good description in Royer-Collard's seminal work on these clocks (**ref 1**) and also in Derek Robert's book (**ref 2**). There is also a splendid exploded diagram of Strutt's clock in Roberts' book. I soon realised that there is also an interesting mechanism using the 'sun' wheel for the motion work (**ref 3**).

At the time I made this clock (**photo 1**), I was relatively new to making clocks but this seemed to be a case worth pursuing. What I needed, though was some instruction as I was feeling that the arithmetic was a little beyond me. I developed my interest from John Wilding FBHI MBE and my first clock was from what I believe was his first book (**ref 4**). Wilding has been particularly good at not only step-by-step instruction but also explanation of some of the side issues that inevitably crop up.

I found that Bill Smith in America had not only made a reproduction of Strutt's clock but had so many folk asking for instruction for their own versions, he made another one with note-book and camera at hand (**ref 5**). I was interested, not only in the calculations but also how he had cut the internal teeth of the annulus gear. So, with a copy of Smith's book in one hand (metaphorically), I made a start.

The first set of frames I cut on my big fret saw (**photo 2**).

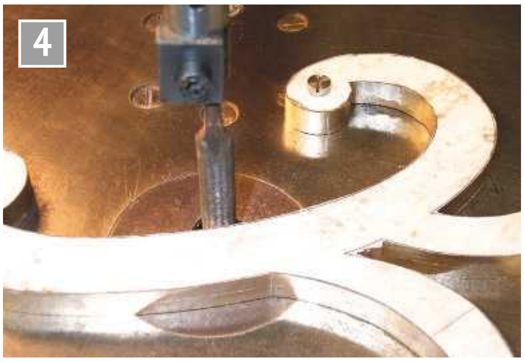
Sawing out the frames.

Cutting the second half with CNC after flipping the material over.

This was exceedingly tedious, so I cut the second set on my little CNC miller. This was interesting as the 'Y' direction travel is not sufficient to cater for anything quite so large. As the frame shape is symmetrical about its centre line, I planted two pegs in the table top, divided the contour NOT down the centre and, when just more than one half was profiled, flipped the frame over and repeated the program to complete the shape (**photo 3**). I replaced the saw blade in my fret saw with a file to finish the edges (**photo 4**). When I had turned the pillars and washers I made a quick assembly to give me some encouragement and to get an idea of what it might look like when finished (**photo 5**).

I made a start on the train with the great wheel. I screwed the sawn blank to a block of wood that I could hold in the four jaw chuck. The outside diameter was turned and the centre was bored (**photo 6**). I was then able to transfer the whole chuck to the miller to cut the teeth (**photo 7**). The crossings (windows) were cut by CNC when I had inserted enough screws to avoid released pieces flying into the cutter (**photo 8**). It was only necessary to develop a program once to cut one piece, then the table was rotated to present the next section and the program repeated.

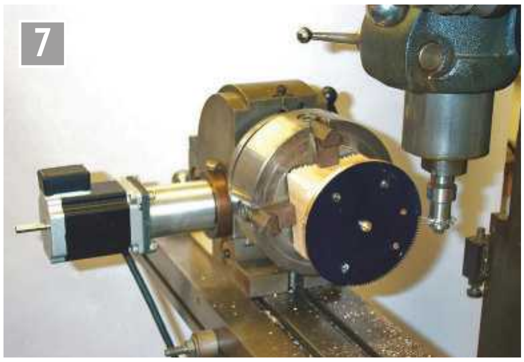
Sharp corners are traditionally made at the intersection of spokes with clock wheel rims. This would require hand finishing if the crossings had been cut by machine. I decided to forgo this procedure and leave fillets in the corners. Provided they are neat, then what is the problem? Before I started any CNC cutting, I had modelled the whole shooting match (except the dial) in 3D (**photo 9**). The program that I use to generate a tool path requires a DXF file to start on. Having modelled the appropriate part, a 2D DXF drawing is easily produced and a tool path can



Using a file in the fret saw to clean up the frames.

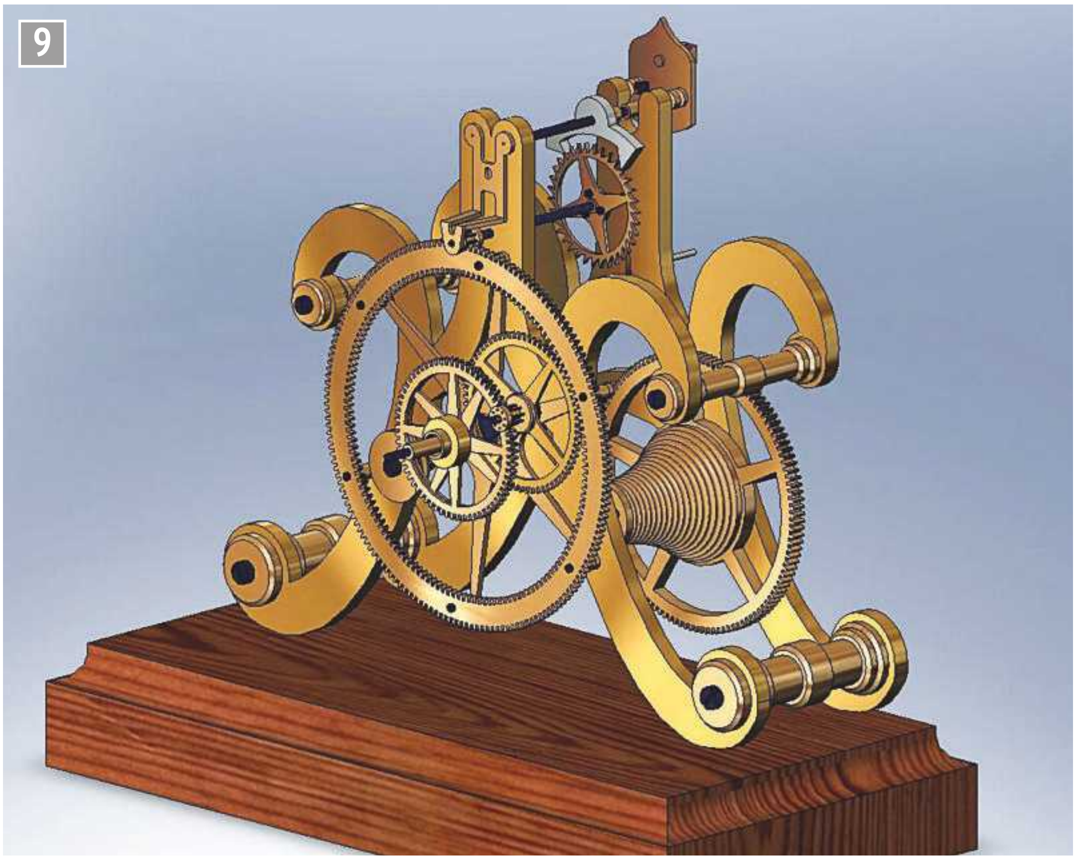
The frames set up to see how the finished clock might look.

Turning and boring the great wheel.



Cutting the great wheel teeth with the dividing head on the big miller.

Cutting the crossings (windows).



Most of the clock modelled in software.

be generated. I start with an outline and then I modify it with the radius of the cutter that I am proposing to use.

The next operation was to cut the fusée. There are some machines designed specifically to cut a fusée once the shape has been calculated from the requirement raised from the clock train. John Wilding, for his construction notes for his skeleton clock, devised a way to make a fusée that is a very adequate representation. This involves using the compound slide, loosened sufficiently so that it can be swung from side to side to generate the curve. Then, with the lathe set up for screw cutting, the cross slide lead screw is removed and as the tool traverses it is pushed up against the work so as to cut the groove as needed. It works really well.

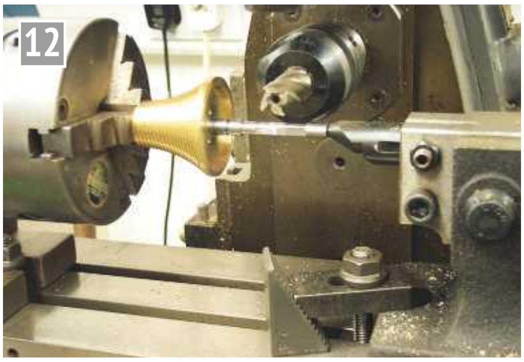
Unfortunately, this clock has to be wound from the back as there is no way that a winding square can be approached from the front. There is too much in the way. This means that some extended tools are required to attach the winding ratchet (**photos 10** and **11**). I cut the tapered square on the fusée arbor by mounting the dividing head and its tailstock at a slight angle to the 'X' axis and fed the pass in a vertical direction (**photo 12**). The only other operation on the fusée was to drill for the fusée wire, although this was done a little later (**photo 13**).

The cutting and filing of the click spring for the winding ratchet looked to be a bit of a challenge (**photo 14**) until I considered cutting it on the little miller. I mounted the bored blank on a stub arbor and turned the outside. It was the inside shape the was the challenge. The benefits of double-sided adhesive tape were much appreciated (**photo 15**)! After that the finishing was very straightforward, and so was the fitting (**photo 16**).

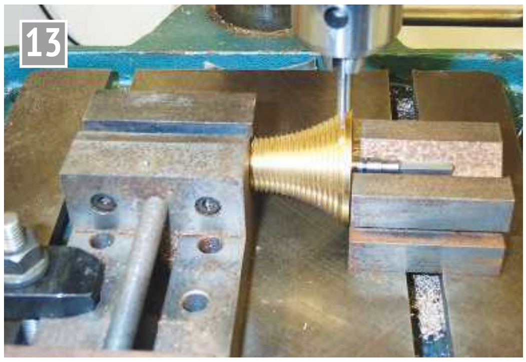
It seemed that now was the time to make a start on the movement proper, and that meant the annulus gear. This gear has no hub but is carried

Modified tooling.

Tooling in use to drill and tap for the winding ratchet fixing screws.



Cutting the tapered winding square on the fusée arbor.

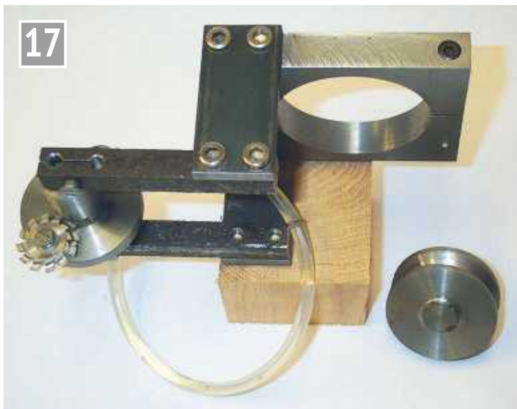


Drilling for the fusée wire.

The winding click spring.

Cutting the inside shape of the click spring.

The winding click and click spring fitted.



The cutting frame. The Thornton's cutter is prevented from rotating by a pin. The whole rotor is counterbalanced with a stack of washers.

on a six-leg spider. The spider was finished first, then used to centre the blank that was to become the annulus (**photo 17**). This was then mounted on a wooden carrier such that the centre of the spider ran true. The outside and inside diameters were then turned to size (**photo 18**).

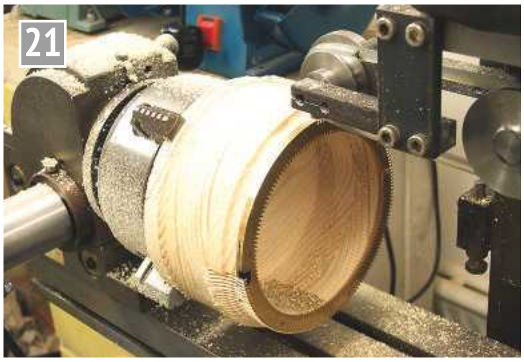
I have spent many happy hours using Thornton form relieved cutters; they have always performed for me beautifully. The cutter frame I made had much to thank Bill Smith for. It relied on using the Thornton cutter as a fly cutter. By that I mean the cutter didn't revolve about its own centre but was so mounted that a single tooth did all that was required. As my miller has a quill, I was able to use this as a suitable mounting post on which to mount my newly made cutter frame (**photo 19**). This worked well and I was able to cut both sets of teeth with only having to re-set to adjust for the different diameters. First I cut the inside teeth (**photo 20**) and then the outside teeth (**photo 21**). The drive pulley I was able to mount in the horizontal drive option with a suitable drill chuck. The finished annulus gear is shown in **photo 22**.

●To be continued.

The six-legged spider attached to the blank prepared to become the annulus gear.

The annulus blank mounted ready for tooth cutting.

First cutting the internal teeth ...



... and then the external teeth.

The finished annulus gear.

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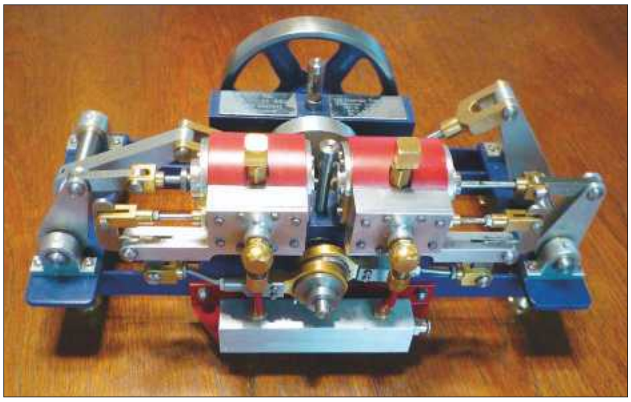
1. *Skeleton Clocks*, F. B. Royer-Collard FBHI; NAG Press, London 1969.
2. *Skeleton Clocks, Britain 1800-1914*, Derek Roberts; Antique Collectors Club 1987.
3. What clock makers refer to as 'motion work' is that reduction gear that drives the hour hand at one-twelfth of the speed of the centre arbour that carries the minute hand, while also returning to run concentrically.
4. *How to make a Weight Driven 8 Day Wall Clock*, John Wilding; Brant Wright Associates Ltd. 1972.
5. *How to make a Strutt Epicyclic Train Clock*, W. R. Smith, Copyright © 1993 by W R Smith.

NEXT ISSUE

Monitor Engine
Rodney Oldfield builds Bob Middleton's 'Monitor' engine.

Realistic Rust
Ron Wright shows how your models can sport 'rust you can trust'.

Drainage
Roger Backhouse visits Holland to discover how the Dutch keep their feet dry.



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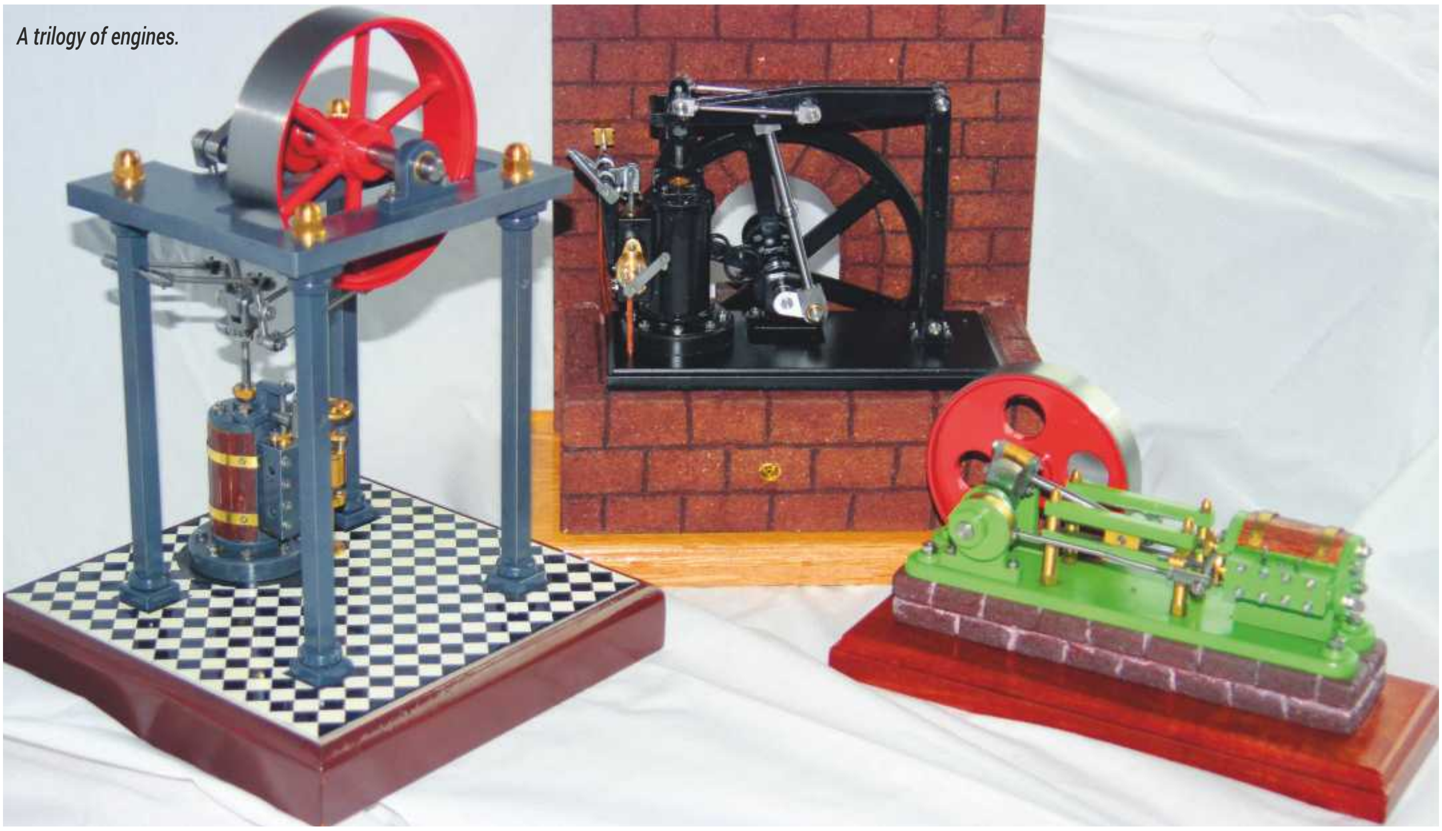
ON SALE 15 JANUARY 2021



A trilogy of engines.

Stewart Hart completes his trilogy of stationary engines with a grasshopper haulage engine.

Grasshopper Haulage Engine

PART 10

Continued from p.15
M.E. 4654, 18 December 2020

Finishing off

Now is the time to add those little details that make all the difference to the appearance of the engine.

I wanted to make the base to simulate a stone built engine house with a back wall to take a winding drum. I also added a regulator to give the engine man a means of controlling the speed at which the wagons were hauled and a whistle for the engine man to sound, to warn the men working on the bank that he was about to haul wagons so that they could get out of the way - hi-visibility jackets weren't worn in those days. At this stage it's up to you if you want to add these finishing touches - as the man said "it's your engine, lad, you can do anything you want with it".

Wooden base.

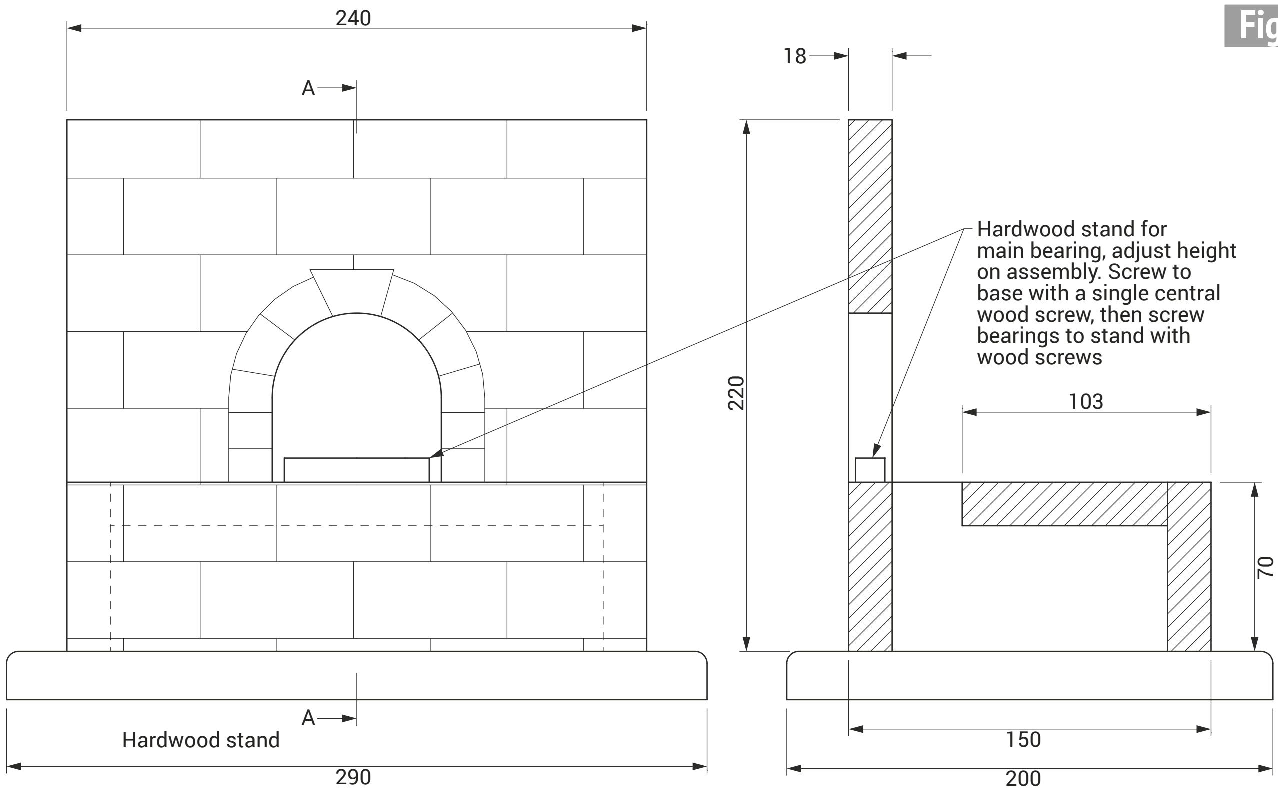
The wooden base (fig 17)

The base doesn't call for finely made dovetail joints. It's glued and screwed together using those plastic chocolate block gizmos and is made from rough chip board (**photo 103**) with the stone courses cut and chiselled in. They're darkened with a black felt tip pen so that they stand out, and stained with a brown water based stain, which is sealed with a watered down coat of PVA glue. The rough chip board gives a nice stone effect texture and the whole lot is screwed to a hard wood base just to neaten the effect up.

Regulator assembly (fig 18)

This is more or less identical to the stop valve I used for the vertical engine and should be familiar to those who are

Fig 17



Part 85: Wooden Base
Mat'l: 18mm chipboard, 1 off
Notes:
Glue & screw together with inside plastic fixing blocks. Score surface to simulate stone masonry, stain with water based stain & seal with watered down wash of PVA glue

following this series. The main difference is I've replaced the hand wheel with a cranked handle that would have given the engine man finer control over the speed of the engine.

The valve body, the top cover and the stem nut can be all made off the same length of bar. First clean up the bar and drill the tapping drill size for the four M2 holes in the body, drill the holes deep enough, including allowance for the parting off blade to make all three parts. Follow this up with a 2mm drill but stop the drill short so that you can still tap the body M2.

Next, finish off the stem nut by drilling and tapping a short length M3 and turning the 5mm boss, part off and cut away the unwanted 2mm holes and tidy up with a file. Then drill 5mm and part off the top cover, finish off the 5mm hole to depth for the body using an 5mm slot drill or a flat bottom drill, use the parting off tool to form the waisted portion and chamfer, then part off. All that remains is to tap the four M2 holes using a tapping stand and to drill the four 2mm holes in the base and the M5 hole on the centre line for the flange - use the rule and point method for finding the centre.

Cutting a slot for the whistle valve lever.

Valve spindle

This can be a tricky little beast, particularly if you try to make it in one setting as you will have to turn a relatively long slender part, which will flex, but by looking at the function of each feature you can make thing simpler. The only features that have to be concentric for the valve to work correctly are the 5mm diameter and the 90 degree cone. The M3 thread, as long as you make it a slack fit, doesn't need to be perfectly concentric and the worse that can happen with the M2 thread is that the valve wheel won't run true - and who will notice that?

So, the solution is to turn the part in steps. Make it from 5mm diameter stainless steel or silver steel. First pull out a short length and turn and thread M2 for the 3.5mm length, then pull out another short length and turn and thread the 14mm length of M3 thread.Pull out another length and clock the bar up to check that its running true and, with the compound set at 45 degrees, towards the head stock, turn the cone and keep going until the part falls off the bar - this way the cone will be concentric to the 5mm diameter.

Stem bolt

This is made from 3⁄16 inch hexagon but round bar will do just as well.

Regulator handle

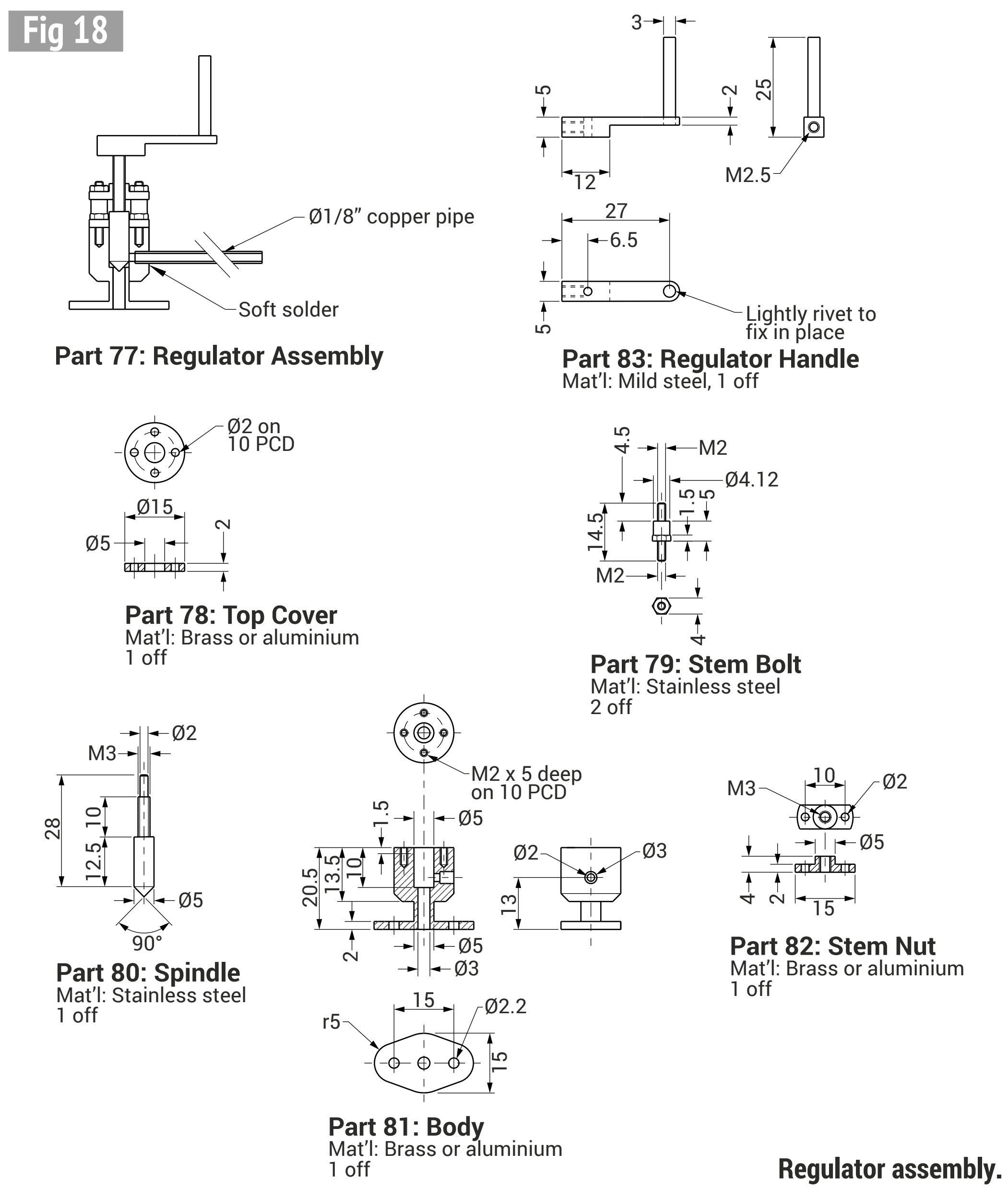
This is made from 3⁄16 inch square bar. Simply drill the two cross holes, file away the reduced section and rivet the handle in place.

Whistle assembly (fig 19)

The basic design for the whistle valve and whistle came from LBSC's book *Shops Shed* »

A crafty hack using two blades to cut a slot.

Whistle valve parts.



Regulator assembly.

and Road, the bible for any builder of live steam models. It’s mainly basic machining but a couple of features do need a little more explanation.

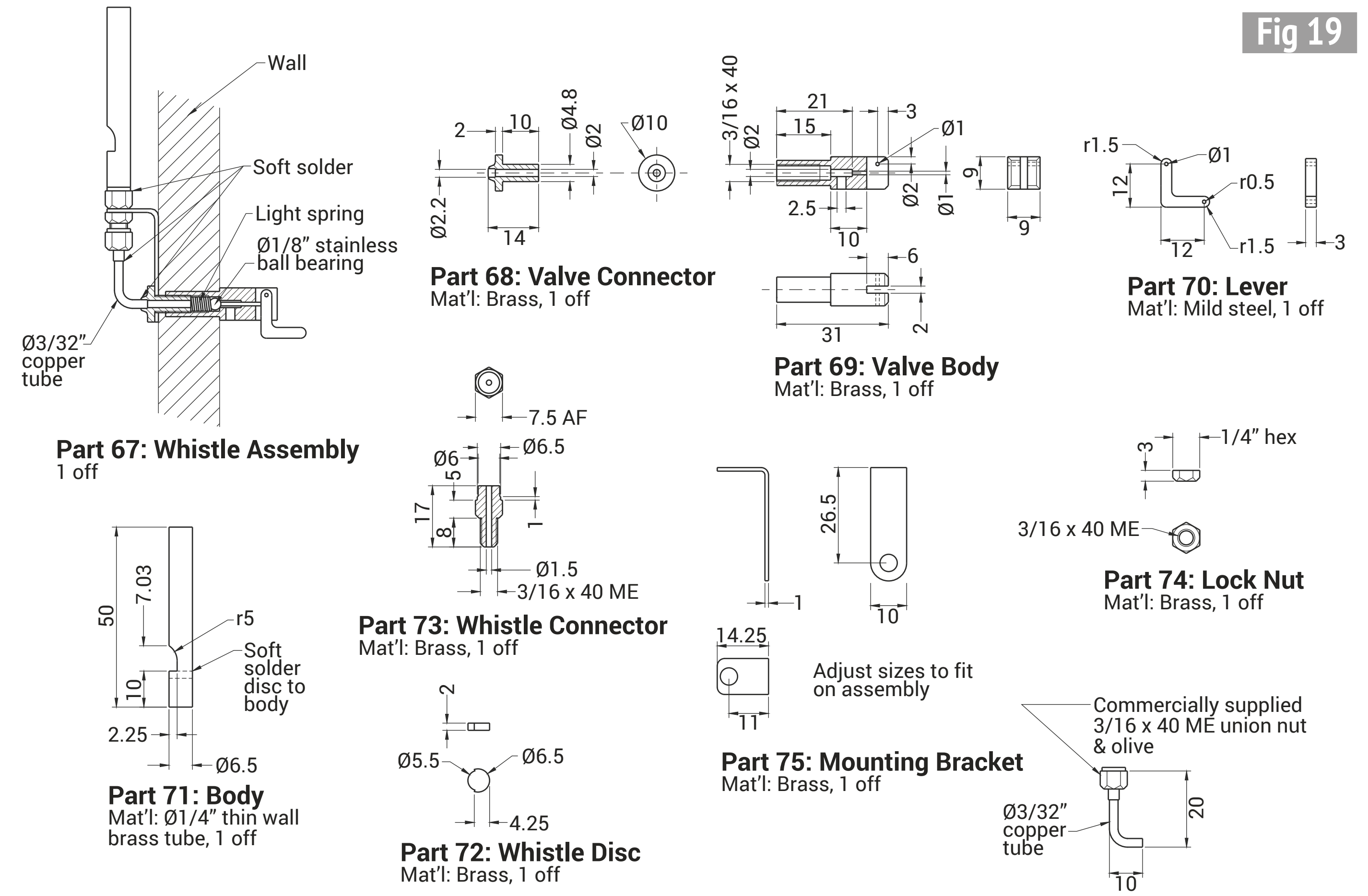
Valve body

This has a slot cut in it to take the lever. I machined this using a slitting saw in my mill (**photo 104**) but don’t panic, there is another way to achieve the same result. If you put two hacksaw blades in your hack saw frame, with care you can cut a perfectly functional slot (**photo 105**) and after a little attention with small files no one will know. Another little hack sawing tip; when cutting thin sheet use a blade with a higher tooth count for a smoother cut - the teeth won’t straddle the material, jam and break off. The parts for the valve are shown in **photo 106**.

The whistle body

This is made from ¼ inch thin wall brass tube; the mouth is easily filed to the general shape. When it comes to the disc LBSC was very specific about getting the correct shape of the cut out. This can be done by using your lathe as a shaper. First, you need to turn the disc up to a tight fit in the body then, using the parting off tool and 2mm back from the front face, machine an undercut. Switch the power off, turn the parting off tool on its side and set the top edge of the tool on centre. Set one of the chuck jaws to the vertical position and gently touch the tool onto the bar. Put on a 0.05mm cut, wind the tool towards the chuck until it passes into the undercut, then take it back to the start. Rotate the chuck slightly and take the tool across again another slight rotation and repeat until the jaw is at 4 o’clock position. Set it back vertical, put another cut on and repeat until you’ve

Fig 19



Whistle assembly.

gone to the desired depth. To square up the other corner, set the tool bottom edge on centre and square it out as before. When you are happy you have the desired shape part the disc off. The rest of the parts are straight forward enough to make. The body, disc and connector can be assembled with soft solder or super glue.

All that's required now is to remove all the sharp edges from the parts that are to be painted. Thoroughly degrease them, give the non-ferrous parts a flash of acid etch primer and prime the ferrous parts with a suitable ferrous primer. Carefully reassemble the parts, sealing the joints with a suitable sealer, set the valve events and sit back and admire your work (**photo 107**). To see the engine in action take a look at https://youtu.be/ZERrt1BqCp4

The finished engine

Conclusion

Well that's the trio of engines completed. I hope you have enjoyed following my build articles as much as I have enjoyed designing and building them. You don't tend to stand still in this game, so I'm planning an ambitious project - a 2-6-0 Horwich 'Crab', not quite to Don Young's design but inspired by it. In the meantime I hope some of you have been inspired by this series of articles to have a go at designing your own engine, using these methods and procedures, based around the standard kit of parts. So just to get you going here's a few suggestions:

* Beam engine using Watt's parallel motion.
* Vertical marine type engine with Stevens reversing gear.
* Self contained horizontal engine; this type had the cylinders bolted onto the end of the bed plate with the other end opening out to contain the crank shaft bearings.
* Table engine, with the cross head above the cylinder and long cranks operating underneath.
* 'V' twin with cylinders at 90 degrees to each other acting on a single crank shaft.

There are plenty of examples out there for you to draw inspiration from but don't get too hung up about making a perfect scale model. The important thing is for you to work safely and to enjoy the process. I'd love to see pictures or even an article about your creation published in the magazine.

ME

Wenford

PART 15

A 7¼ Inch Gauge 2-4-0 Beattie Well Tank

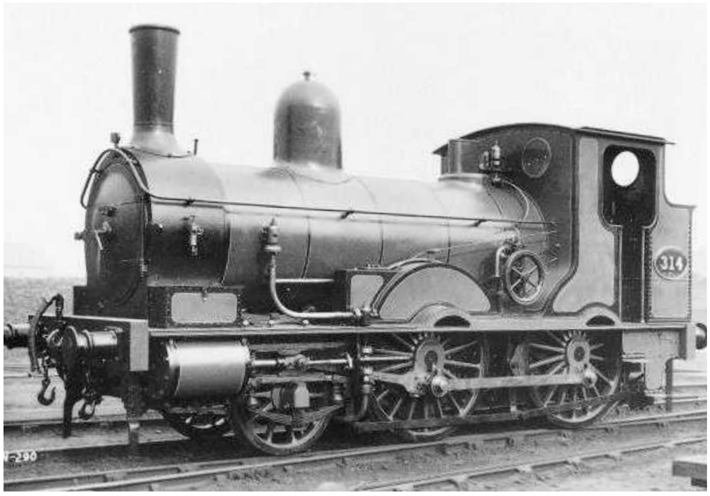
Hotspur catches up on the description of his Beattie well tank.

Continued from p.739
M.E. 4653, 4 December 2020

The boiler feed check valves

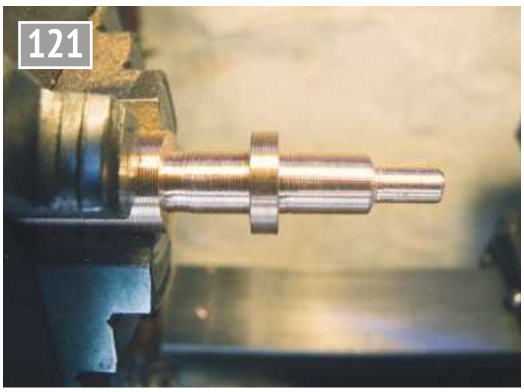
Much has been written about the types of valves that are used to allow feed water to be fed into boilers so this will not be a new design. All the pictures of the Beattie Tanks, whether the early one as pictured here, or the later rebuilds, had a traditional valve with large round flanges that were fitted with gaskets and bolted up to the boiler and the feed pipes. This was the practice of the day but, even in this larger scale, the creation of a representative component that faithfully reproduces the visual appearance would be difficult to produce; not because it could not be made, but because the assembly with scale bolts and nuts would be a tease for any sane model engineer.

So, I have elected to use a conventional screwed attachment with an equally easy to assemble pipe fitting nut and olive. I have, though, incorporated the top and side features that give the valve some measure of accuracy to the original. The outer bolt can be used as a cleaning aid if required but the top fitting is the more important as this cap screw acts as the lift control for the enclosed ball. My drawing (**fig 15**) shows the details.



Make the valve assembly using round phosphor bronze bars and, while turning the external threaded shoulders, put a starting thread on them for future completion. The main vertical body of the valve needs to be drilled in two stages to take the horizontal part of the assembly and it is best if the latter can be turned with an angled section to match the drill point and an extension to protrude through to the outside for the access plug fitting. **Photograph 121** shows the turning in progress but do not make the fit in the body too tight as solder has to penetrate. The right-hand end can be centred to be the start for the No. 44 tapping drill for the plug later on. The threads for all the screw connections are made with a ⅜ inch diameter by 32 TPI die and an undercut is included for the boiler thread connection. **Photograph 122** shows one of the two assemblies ready for silver soldering.

Holding the valve bodies in the four-jaw chuck for the internal drilling and tapping operations is straightforward and the seat for the ball valve can be done with either a ‘D’ bit or a milling cutter. The bore size is the tapping size for the internal thread for the top cap and the drilled hole for the water inlet should be left a little undersize for reaming to the finished diameter after the creation of the flat ball seat. I have not included any pictures showing how to hold the valve body in the four-jaw chuck as I am sure builders will know how to do this with suitable packing to protect the machined faces. The last operation on the valve



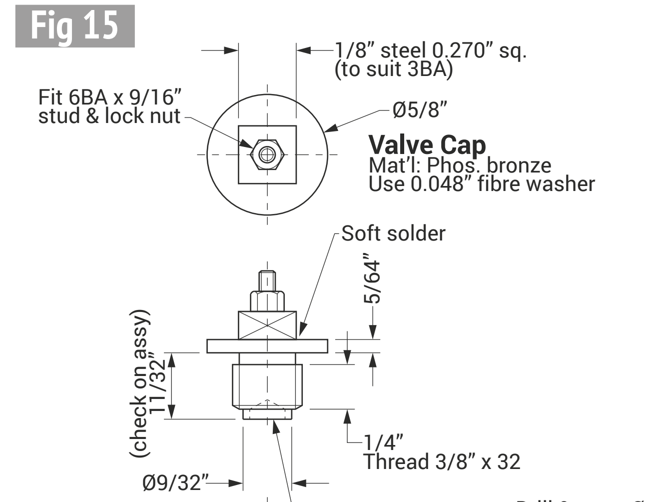
121

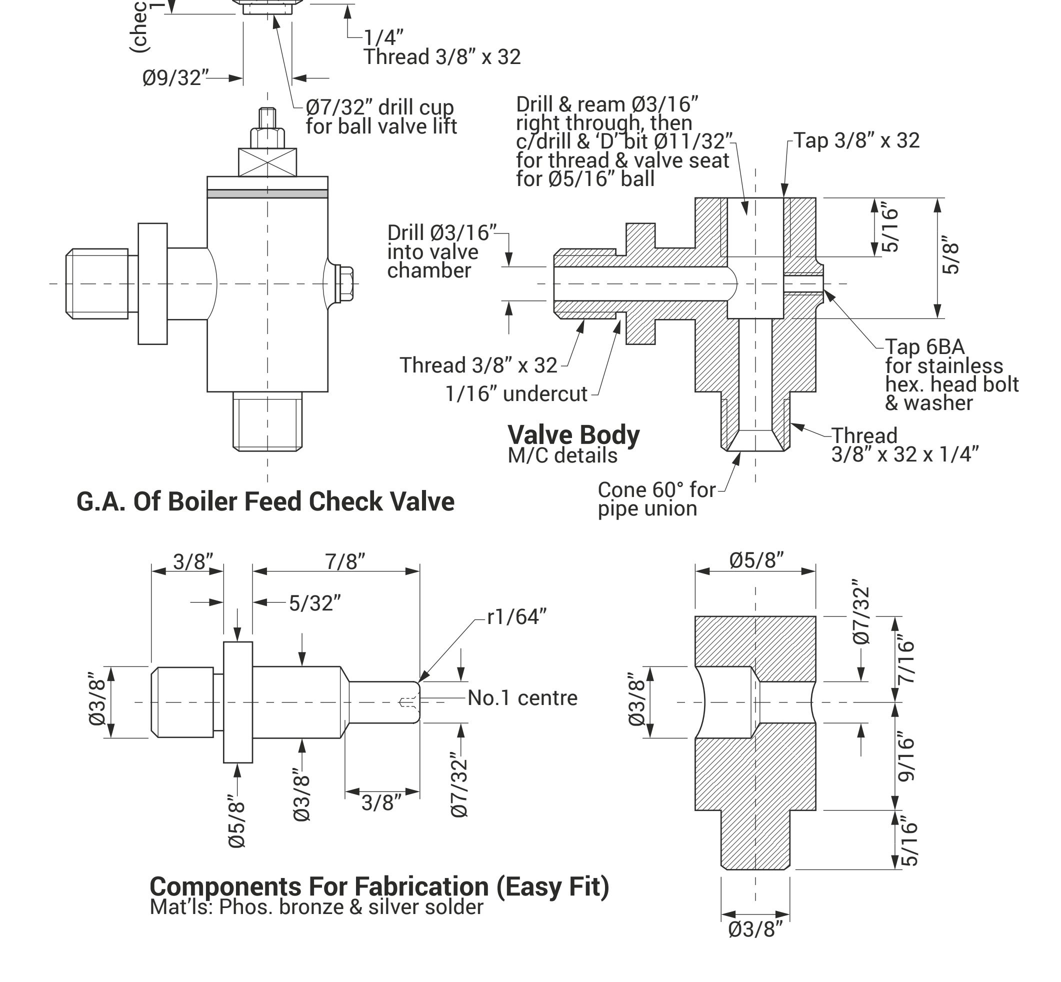
Here the horizontal component of the valve is turned to suit the cross hole in the body. Note the angled shoulder which is made to match the drill point. On silver soldering the assembly there should not be any internal cavities.

122

The ends of the holes through the body have been chamfered and the two parts assembled ready for silver soldering.

Fig 15





Here both valve bodies have been machined and cleaned up ready for the ball valves to be added with the screw caps.

bodies is to drill and tap the outer plug 6BA for a hexagonal head stainless steel bolt and washer which needs to be about 3⁄16 inch long. **Photograph 123** shows the two valve bodies completed.

Before making the two valve body caps it was important to measure down inside the valve body with the steel ball in place to judge the internal height available. On my assemblies the distances were just over 5⁄16 inch so each valve was marked with centre punch dimples and the decimal reading was recorded. For reference the distance internally up from the base of the valve was also checked with the ball held down onto its seat. Turning a short length of bar-end for each valve cap proved an interesting task. The shoulder and an undercut for the ¼ inch long thread were machined to begin with, leaving an additional ⅛ inch that was shouldered down to 9⁄32 inch diameter with a 7⁄32 inch diameter drill point added to form a cup for the ball. At this point one of the valve bodies was assembled on the cap with a sealing washer and a ball so that the internal height could be measured up from the bottom with a Vernier depth gauge. The aim was to provide the ball with a lift of 0.040 – 0.450 inch and any small adjustment to the reading was made by turning or drilling while the stock bar is still in the chuck. To complete the cap, part off the flange with a width of 5⁄64 inch and do the second example. **Photograph 124** shows the underside of the two valve caps.

Keeping the parts as pairs, the final task is to add a square drive to the top of the cap and simulate the lift control device that is so plain on the prototype. The need is to make two squares from ⅛ inch thick mild steel with a flat dimension of around 0.270 inch which will take a 3BA spanner and soft solder them onto the centre of the cap. It is unlikely that the temperature of the valves will exceed the melting point of soft solder in service but if the centres of each of the squares is marked and drilled down a full 9⁄16 inch with a No. 44 drill each can be tapped 6BA and a dummy stud added with a locknut as shown in my GA drawing. Finally, **photo 125** shows the two finished valves. The stud can even be fitted using Loctite for added security.

●To be continued.

Here the two valve caps have actually been completed but the lower cup portion is illustrated.

A close-up of the pair of finished boiler water feed check valves with the dummy top fitting completed.

NEXT TIME

I will fit the forward well tank air vent.

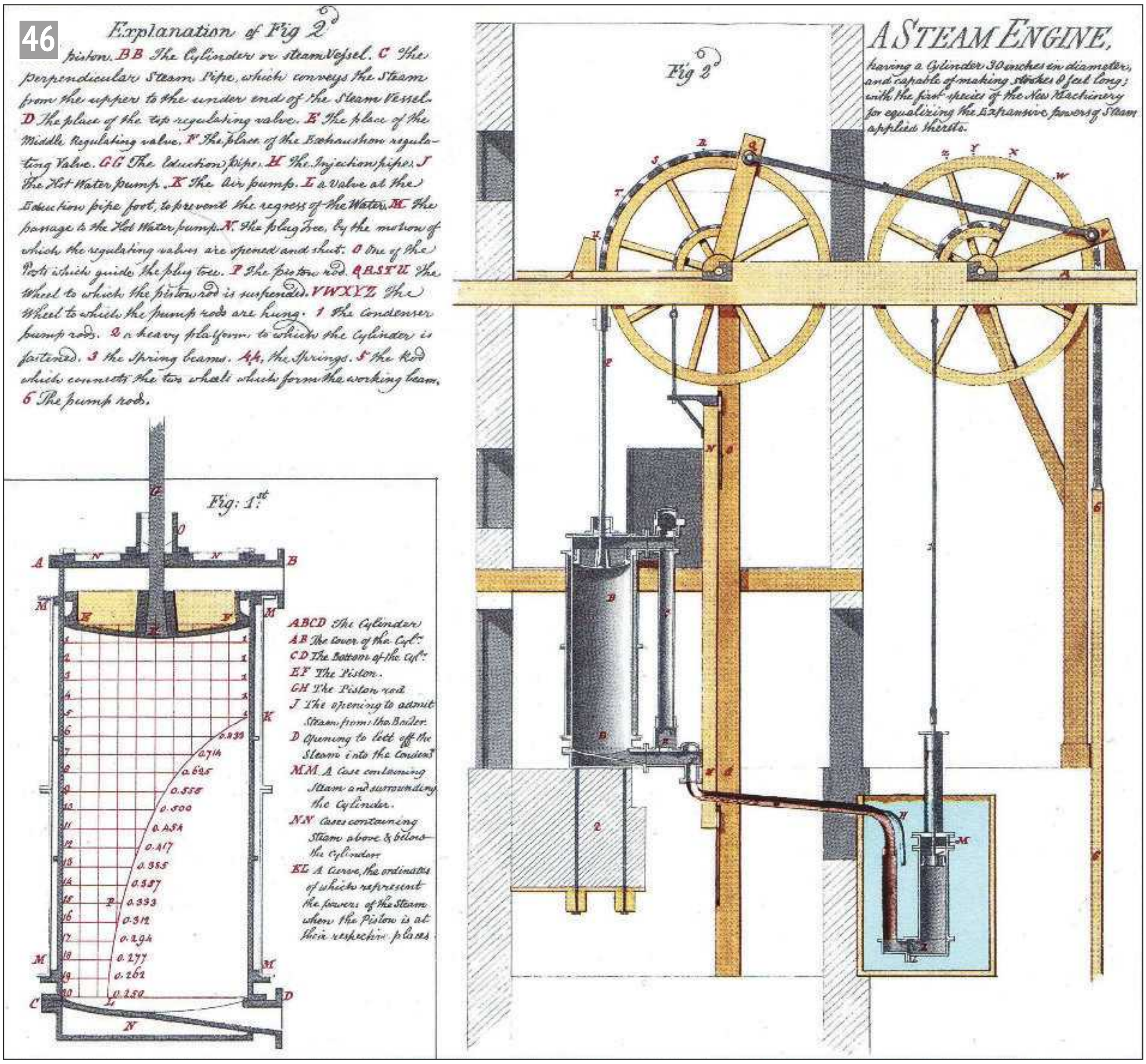
The Stationary Steam Engine

PART 16 - EXPANSIVE WORKING, PROMISE DEFERRED

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

Continued from p.748
M.E. 4653, 4 December 2020

From his earliest experiments James Watt had been aware of the potential energy (**ref 98**) contained in steam at pressure. Clause 4 of the 1769 patent specifically stated that the engine might be worked by the expansive force of steam. Thereafter he continued to be tantalised by the need to recover energy as work without waste which, he was clearly aware, meant expanding the steam to a minimum residual pressure. In his discussion relating to the steam wheel with Small he had considered admitting steam for one quarter of the normal admission period and leaving the rest of the 'stroke' to expansive working. The same idea was carried over into the reciprocating engine. Boulton was equally convinced that partial admission followed by some form of cut-off might lead to more economical working and Watt also saw



Graphical presentation of steam expansion in the cylinder as shown in the 1782 patent.

If Watt needed any further evidence of energy wastage in the early engines the rush of steam into the condenser provided it. Even at the boiler pressure of 10 psi, this was explosive as long as constant pressure was maintained throughout the stroke.

an advantage in varying the cut-off to suit changed loading conditions as might be the case when the depth of a mine shaft increased over time.

Boulton had a plan for a valve in the piston which could be opened by an adjustable rod and a 33 inch cylinder engine was built for trials at Soho in 1777. The engine, *Beelzebub,* did show that economies in steam consumption were possible but it justified its name by its rough running. *Beelzebub* had a chequered career over the next few years. It narrowly escaped being destroyed by fire in July 1778 and despite being rebuilt, both Watt and Boulton regarded it as one of the worst machines that they had built. In spite of this Dickinson and Jenkins make the case that the principal parts of *Beelzebub* were to survive and to continue in service at Soho until 1848. At that time it was recognised as, if not the first Soho engine then certainly the oldest extant when Soho Works was dismantled; thereafter it was privately preserved by a Mr. Walker, the Birmingham metal roller and subsequently sold to Bransen and Gwythen, Birmingham builders. It then gravitated to the Patent Museum which became the Science Museum. Here it survives, re-named as *Old Bess*, doubtless to dissociate it from earlier infamies.

It has been suggested that Watt's interest in expansive working fell away after 1779 (**ref 99**). The argument is that the problems with *Beelzebub* had led him to believe that similar steam economy was available with more equable power output from throttling at the inlet valve. His interest in expansive working is said to have revived only in 1781, when a patent was taken out by Jonathan Hornblower, the son of Watt's deceased ally. Watt countered with his patent of 1782 which was much engaged with expansive working. To illustrate graphically steam expansion in the engine cylinder a drawing was prepared to accompany the 1782 patent (**fig 46**) but this differs only very marginally from a sketch in Watt's notebook made two years earlier, under February 1780. The notebook page is headed *Expansion Engines* and proposes cutting off the steam at 25% with 75% expansion. A curve was plotted against 20 horizontal ordinates and beyond the fifth ordinate the expansion of the steam was shown by a hyperbolic curve. The lengths of the horizontal ordinates show that the expansion was assumed to follow Boyle's Law (**ref 100**). The experimental basis for these results must rest with *Beelzebub,* almost certainly using a manometer to determine the initial and final pressures in the cylinder as the indicator was not introduced until 1797, by John Southern, then the senior draughtsman at Soho. This would seem to imply that rather than dying away in 1779, Watt's interest in expansive working was sustained over this period and certainly seems to have been active in the first months of 1780 at least.

If Watt needed any further evidence of energy wastage in the early engines the rush of steam into the condenser provided it. Even at the boiler pressure of 10 psi, this was explosive as long as constant pressure was maintained throughout the stroke. Whilst he saw that an early cut-off would reduce this effect by extracting more energy he appreciated that the variation in mean effective pressure throughout the stroke was responsible for *Beelzebub's* rough running (**ref 101**). The parts of Watt's 1782 patent that were not concerned with an attempt to outmanoeuvre Hornblower's double cylinder engine patent were directed at a number of devices which would adjust the load to match the varying expansion ratio. In the main the devices were of limited practicality and the patent in this regard was ephemeral.

Beelzebub seems to have represented the limit of Watt's interest in expansive working. He almost certainly realised that to secure real economies the initial pressure had to be considerably higher and this devolved upon better boiler design. Whilst Watt's boilers improved greatly in steam raising capability between 1770 and 1800 they remained structurally weak. In the event, later developments in the design of the valve operating mechanism of the Boulton and Watt engine precluded any further pursuit of expansive working.

The thermodynamic progress of the Watt engine over the lifetime of the patent can be summarised in the following terms. In the fifteen years, between 1765 and 1780, James Watt transformed the steam engine from its atmospheric powered origins into the first truly thermodynamic machine where the properties of steam were employed as the power source. In this he had raised the thermal efficiency by one third but after 1780, when this first period of Watt's innovations was completed, his pursuit of thermal efficiency effectively ceased. The Watt engine of 1800 was no more thermally efficient in its use of steam than *Old Bess* had been in 1780.

●To be continued.

NEXT TIME

Rotary motion enters the picture.

REFERENCES

98. The concept of energy in its modern form had not been determined in Britain at this time although continental physicists were formulating a clearer definition. Watt would be more familiar with the Newtonian ideas of force and the distance through which it acted. He was to codify the principle of horsepower in terms that are accepted today.

99. Dickinson and Jenkins op. cit.

100. This is, of course, before the true adiabatic law for steam had been derived but Watt was clearly aware that the curves would differ if only because of the condensation that occurred when expansion took place. The difference between the two curves was incidental to the general condition that Watt was exploring.

101. Richard Hills points that with *Beelzebub* and in an engine at Shadwell where early cut-off was tried, matters were made worse by the fact that the pumping gear and water load was relatively light weight and thus the upward momentum that might have been available in a deep mine was not available to carry the piston over cyclic irregularities.

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.

Now for a Christmas Appeal on behalf of Help the Aged Engineers. 'Sponsor an engineer today! These people lead an isolated existence in the attic or shed, divorced from human company and condemned to make ever more accurate models of old means of transport. Old Ged Klampe, for instance, hasn't met anyone in weeks. He claims to be happy and content, yet this is not always the case. Keep this declining species up to date with the old ways. Let him teach Imperial measurements to the young. £5 will keep him in nuts and bolts for a week, £10 will buy him a video of a previous model exhibition. Sponsor a poor engineer for Christmas and see him smile every time he receives one of his free lifetime's supply of *Model Engineer*.'

'This 'ere's the story of a
man named Ged,
a poor engineer barely
kept his family fed.
Then one day he was
writing up an article,
when his wife complained that
of food there was no particle...'

Tea there was, gallons of it, and that's what fuels these lonely shed-bound old men, but their inner creative ideas need sustenance too.

Enough of eleemosynary matters, Onward!

In this issue: a wager, a centrefold, McVities, personalised tools, a limited repertoire and a tiny part.

This is *Deborah* on my home-built rolling road; eight bearings, some aluminium angle and some threaded rod to make it. I have to fit a spring balance to measure the tractive effort (**photo 1**).

From Ryedale Society of Model Engineers, the well-weathered J63 mentioned in the last issue (**photo 2**).

Raising Steam, October, from the **Steam Apprentice Club** of the National Traction Engine Trust arrives once more. In the summer competitions, the photographic competition was won by Tristan, whose picture adorns the rear cover, the colouring competition by Harvey and the model competition by Emily. I haven't room to show them but I did like Henry's cardboard model of a Marshall roller. Another virtual steam fair was staged by Henry in his garden, as the family visit to the Great Dorset Steam Fair for his birthday was cancelled. A small traction engine was steamed, an air show took place, with a Red Arrows Hawk, a B52 and a Spitfire, all made from bits if wood and gaffer tape. Then Henry was given a certificate, of which he is very proud. Another such 'rally' was held by Nathan, in the adjacent field to his house. Nathan also made an illuminated sign for a steam wagon. Appleford 70 was cancelled, being the 70th anniversary of the first traction engine race. One of the original participants is still in steam. The story is related in *A Wager for Ale*, by Chris Edmonds. The NTET offers bursaries (max. £500) for those wishing to participate in keeping steam on the roads - details are on the NTET website. One recent award was to Emily, who is taking a level 3 course in blacksmithing. *Unusual Engines* features a Darby steam digger, which didn't catch on, being too big for the roads and slow to erect on site compared with a plough.

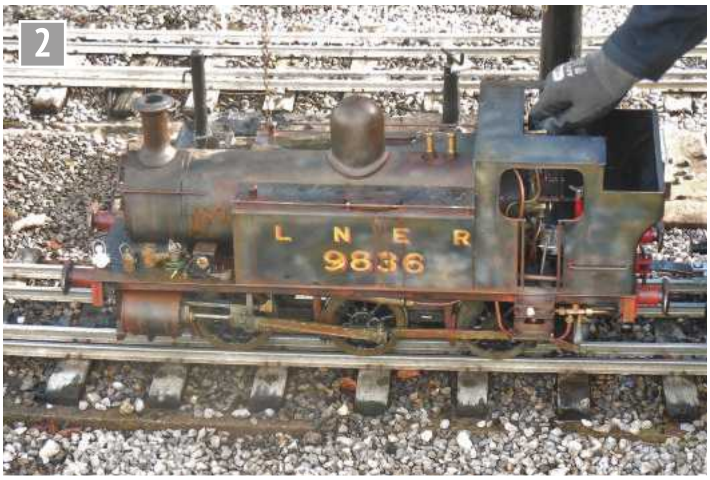
W. **www.ntet.co.uk**

Worthing & District Society of Model Engineers' *Newsletter*, winter, begins with John Parsons mowing the grass for the final time this year. He looks lonely - it's a solitary job - maybe he could use some help? The mower the merrier... Meanwhile Secretary, Leigh Gibbins, is complimentary about the Editor and hopes that by such flattery he might earn extra choccybix. Editor, Dereck, taking a smart one pace backwards, points out that the McVities are courtesy of the Hon. Chair.... Undeterred, Leigh continues the story of Black Propaganda. (You see, even in WWII it was clear that Black Lies Mattered - Geoff) Mike Wheelwright is concerned with slide bars and crossheads.

W. **www.worthingmodel engineers.co.uk**

Another pic from 'Scoop' Theasby, of the mayhem at Sheffield station, following the derailment in Platform 1 on November 11th (**photo 3**). As well as a powerful crane, I spotted a refreshment van and

5 inch gauge battery locomotive, Deborah, *on my rolling road.*



J63 at RSME (photo courtesy of editor Bill Putman).

Derailment at Sheffield.

what appeared to be a mobile control vehicle.

The Prospectus, November, from **Reading Society of Model Engineers**, has Mark Kirton building his Gemeinder HF130C, a Feldbahn Lok, or field locomotive, dating from 1937. It was intended for use in industry, airfields, quarries, even the 'front line' and built by O&K, Deutz, etc., with a Deutz engine and Voith hydraulic drive. Up to ten still survive. Mark's model is 5 inch gauge, with flat panels, being easy to construct - very important when living on a narrow boat! David and Lily Scott are painting *Jessie,* the 'Lady in Red'. We learn that Japanese motorbikes create a problem for British mechanics. They sit on the bike and their left is the bike's left etc. Japanese mechanics stand in front and their left is the bike's right. Simple! Terry Wood bought his first team locomotive earlier this year. The most frequently-made 'LBSC' locomotive, a Juliet.
W. www.prospectpark railway.co.uk

Maritzburg Matters, November, from **Pietermaritzburg Model Engineering Society,** opens with editor Martin Hampton reviewing the care and use of injectors on steam locomotives. This is followed by a picture of a 3½ inch gauge model having suffered a catastrophic boiler explosion. No details of how and where are given.
W. www.pmes.co.za

Tonbridge Model Engineering Society, *Newsletter* for November begins with editor Robin Howard writing of his interest in blacksmithing, starting at an early age. Lately, he acquired an anvil from a fellow member when buying something else. Traditionally, they were mounted on a log rather than a stone or metal stand, because the log was 'dead' to heavy hammer blows whilst another material would reflect the shock back up to the anvil and cause 'bounce'. Robin also writes on renovating a Stuart D10.
W. www.micklow. wixsite.com/tmes

B&DSME News, October/November, from **Bournemouth & District Society of Model Engineers**, explains that Techchat meetings have been held via Zoom, the latest attended by five people and two dogs. Chris Bracey describes the little-known Birkenhead tramway museum. Even enthusiasts are often unaware of its existence and it is so easy to reach.
W. www.littledown railway.org.uk

St Albans & District Model Engineering Society newsletter for November, has Roger Stephen beginning a series on the building of his Winson GWR 1400 class. Mike Collins makes guard irons for his Stirling Single. Mike also continues his notes on owners' marks on tools. Some are scratched on and some have a name carefully punched into them. One is written in a flowing script and one is, unusually, dated 1917. Malcolm Beak has a ⅛th scale model of a Vic Smeed-designed 'River Queen'. Carvel planked, and named *Cyril,* she has an engine and boiler designed and built by Malcolm and is equipped with a gas burner. The mystery equipment from last month was the steering gear from a Thames barge.
W. www.stalbansmes.com

In *The Blower,* November, **Grimsby & Cleethorpes Model Engineering Society,** are celebrating the completion of their track extension. Having seen the 'before' state of the land, I am intending to go to the official opening next year, when the date is decided.
W. www.gcmes.com

Durban Society of Model Engineers', *The Workbench*, November, has a picture of the nearly-completed *Xena*'s cab, made from 1mm louvred mild steel, which is quite light. It gives me a design idea for my electric locomotive.
W. www.dsme.co.za

Stamford Model Engineering Society, *Newsletter* continues Dave Smith's series about his apprenticeship years, this time the 'characters' he encountered. My favourite is the tenor who had a fine voice but a repertoire of only two songs. I can see how that would be received. Dave has also built a couple of fine fishing boat models, pictured.

The Frimley Flier, November, from **Frimley & Ascot Locomotive Club**, reports in these trying times of crisis and universal *brouhaha* (ack. Tom Lehrer) from the Chairman's Parlour. The centrefold is of Peter Gardner's fine 7¼ inch gauge Stirling Single (**photo 4**). Peter advises that the splasher plates were made by our very own Diane Carney. Finally, the editor's page concludes by saying that 'The editor accepts no responsibility for the content of this page'.
W. www.flmr.org

Centurion Society of Model Engineers sends *The Centurion Smokebox,* November, consisting of only one page so I decided not to use it here. Then, a day later, the REAL version arrived. Sender Jon Shaw admits his brain does

Stirling Single at Frimley & Ascot LC (photo courtesy of Peter Gardner).

>>

not function well in the small hours… As I write this, the Sandstone Heritage Trust are holding their spring Steam Festival, and the CSME issue concludes with a picture of their repurposed car lift for raising locomotives from steaming bay track height to the storage lines height.
W. www.centuriontrains.com

Chingford Model Engineers' *Newsletter* has a picture of ten people standing around, each labelled with an official title, watching Dave digging a hole. According to the Rule of Six, Dave has to go! Ted Jolliffe describes an easy method of dividing for his Zyto lathe.
W. www.cdmec.co.uk

Lionsheart, November, from the **Old Locomotive Committee**, has an article about treasurer, Jon Swindlehurst's 7¼ inch gauge *Lion*, highly polished, he says, to distract onlookers from noticing the faults. So well made is it that it will tick over on just one psi. Piston rings are still to fit. A recommended book is the *Life & Inventions of Richard Roberts, 1789 – 1864*. He generated many patents in the fields of machine tools and textile engineering. (As I once worked for Prince Smith & Stell in Keighley, who were very active in the latter field, this book sounds most interesting - Geoff.)
W. www.lionlocomotive.co.uk

Sydney Live Steam Locomotive Society sends their November *Newsletter,* with an apology for the space occupied by the handsome beast on the front page (plus his driver…). First there is a note seen in the periodical of our friends the Portarlington Bayside Miniature Railway, where one member says he is staying up until midnight on New Year's Eve, not to welcome the New Year in, but to say 'Good Riddance' to the old one. (Could we perhaps tell Old Father Time that we don't want any more like 2020? - Geoff.) Then, the front page picture is discussed. Warwick Allison (for it is he) acquired the LBSC Britannia in an unfinished state, with a boiler which would not pass the current boiler code. When an acceptable design was produced, Warwick went on to finish the locomotive, named 70029 *Shooting Star*, earlier this year, that is after finishing a 'Beaver', a Heisler, *Ayesha*, eight Pullman car bogies and a lathe rebuild! (And for an encore? - Geoff.) The colour is Deep Bronze Green, also a Land Rover colour. John Lyons describes how he formed the side tanks for his Avonside. Another item by Warwick concerned rail expansion joints. He investigated on his trip to UK, discovering that most tracks had no such joints, even those with aluminium track. In Oz, with a daily temperature range of 50 degrees or more, their track, if so built, would expand by more than a foot! He therefore designed flexible fishplates which are performing well. As a bonus, this picture features an *Austere Ada* (**photo 5**).
W. www.slsls.asn.au


5
Warwick Allison's rail expansion joint (photo courtesy of Andrew Allison).

Lastly, because I have run out of newsletters to review, **Model & Experimental Engineers, Auckland**, began their recent meeting with Chris Ratcliffe showing a massive machined alloy TV stand by Bang & Olufsen, whilst Bruce Lawson picked up an 1880 model locomotive, which needs more restoration than at first thought. Hugh Martin has not had a good time recently. He made some hinges for a chest that he was asked to repair, only to have them thrown out and replaced with mass produced versions. The barring engine for his model Doxford developed so much power that it damaged the keys and plastic gears in the rest of the model and, having made sight feed lubricators for it, he cannot now find them and thinks they were accidentally thrown out. Michael Cryns's latest clock is a ship's chronometer with a missing 'stop work'. This device prevents overwinding. It is very small, less than 4mm diameter, and many of us would struggle to hold it, let alone work on it – and, if it were dropped, Well! The timepiece in question was rated as varying only 0.6 seconds over 11 days. Murray tried to fit better castors to his computer chair and found some difficulties. (I have some similar, unbranded ones, which were the very devil to take apart. Probably not designed with this in mind…Geoff)

Robert McLuckie writes from **Edinburgh Society of Model Engineers** to say that the road bridge at Almondell has been finished to perfection by stonemason Andrew Newton (**photo 6**).

And finally, my friend calls me a Flat-Earther, which annoys me. Just because I'm a bulldozer driver...


6
The road bridge at Almondell (photo courtesy of Robert McLuckie).

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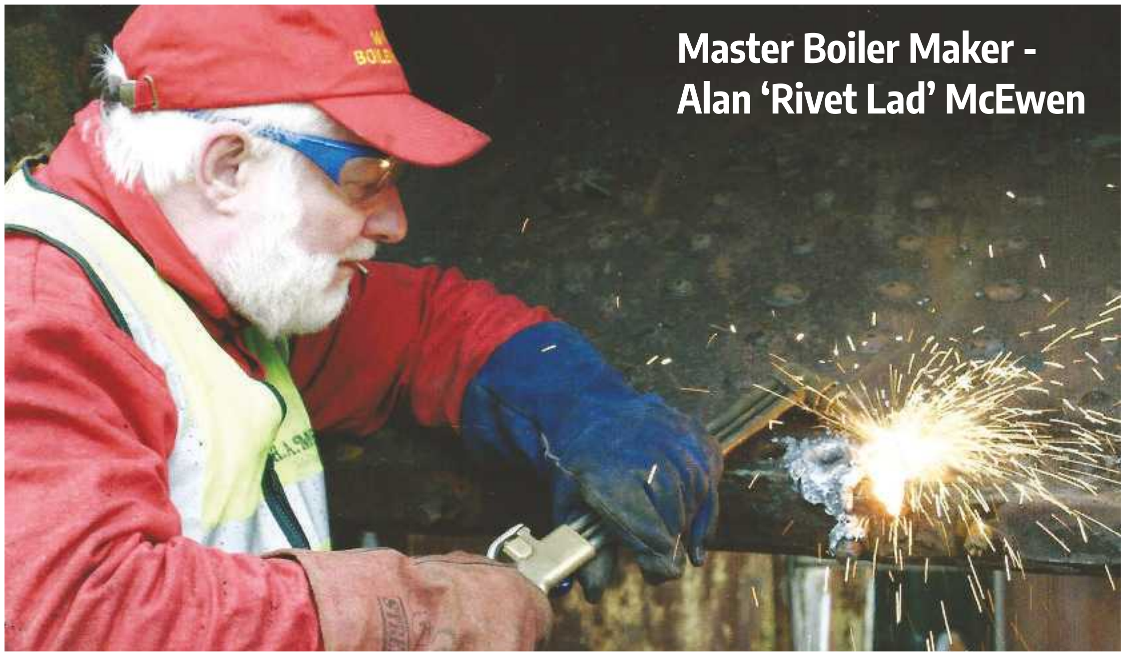
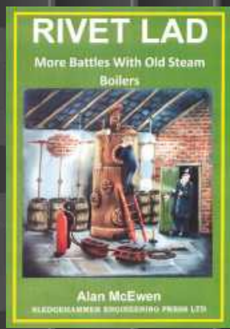
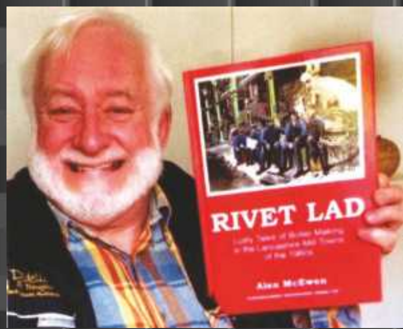


Master Boiler Maker -
Alan ‘Rivet Lad’ McEwen





When Master Boiler Maker and author, Alan McEwen was a young sprog, he loved banging and hammering on rusty old boilers; now that he is an old hog, he just prefers others to bang and hammer!
Alan McEwen’s Boiler Making adventures and also ‘potted histories’ of several Lancashire and Yorkshire Boiler Making firms, can be read in **RIVET LAD** - ***Lusty Tales of Boiler Making in the Lancashire Mill Towns of the 1960s.*** The book is crammed with ‘hands on’ technical information of how Lancashire, Locomotive, Economic, and Cochran Vertical boilers were repaired over 50 years ago. The book’s larger-than-life characters, the hard as nails, ale-supping, chain-smoking Boiler Makers: Carrot Crampthorn, Reuben ‘Iron Man’ Ramsbottom, Teddy Tulip, genial Irishman Paddy O’Boyle, and not least Alan himself, are, to a man, throw-backs to times gone by when British industry was the envy of the world.

Alan McEwen’s first RIVET LAD book: *RIVET LAD – Lusty Tales of Boiler Making in the Lancashire Mill Towns of the Sixties* published September 2017 is now priced at £25 plus £3.00 postage and packing to UK addresses.

Alan’s second RIVET LAD book: *RIVET LAD – More Battles With Old Steam Boilers* was published in September 2018. **Now priced** at £25 including postage and packing to UK addresses.

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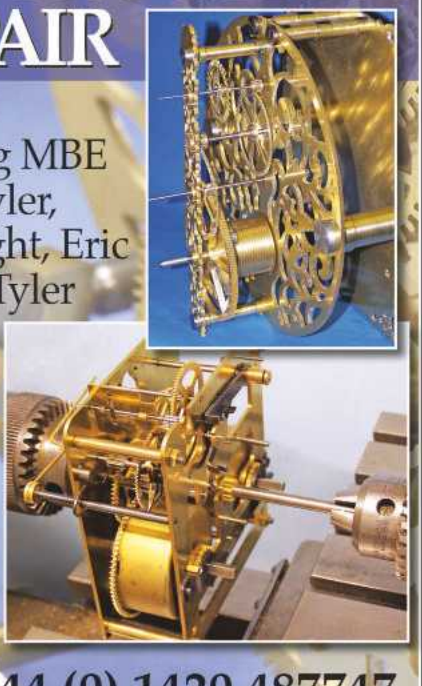

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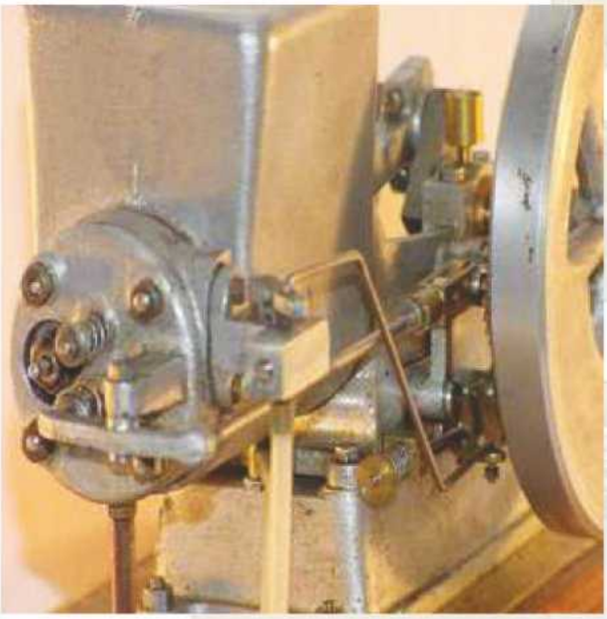

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