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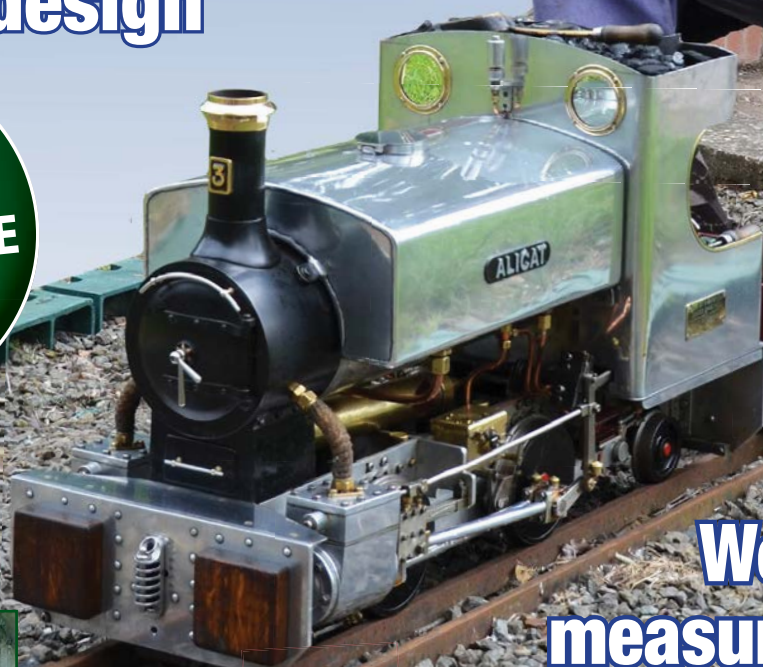
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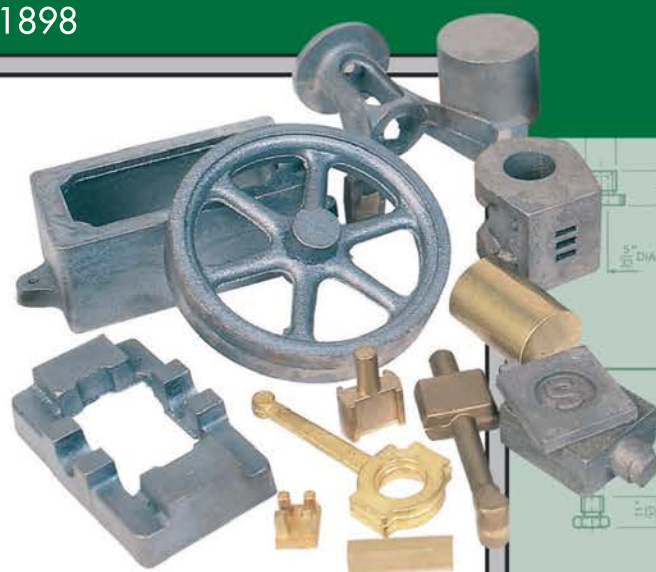


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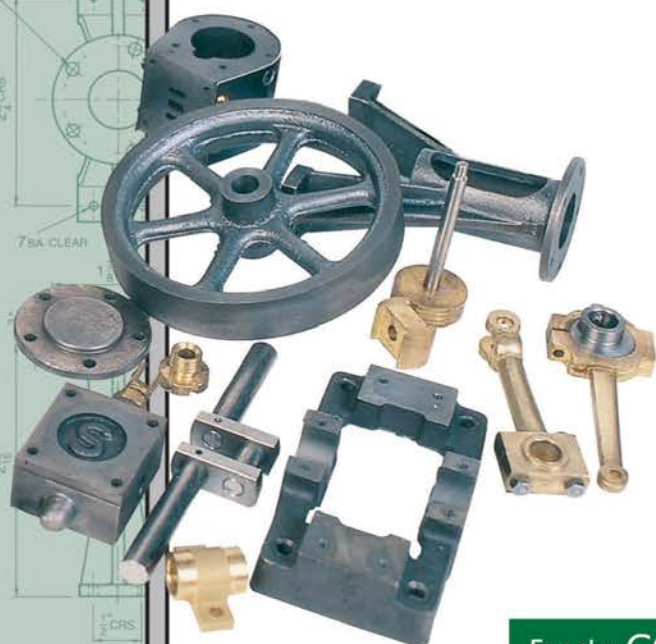
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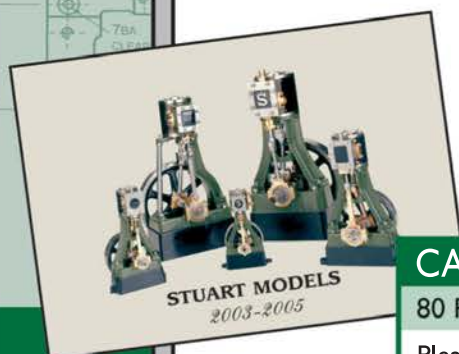
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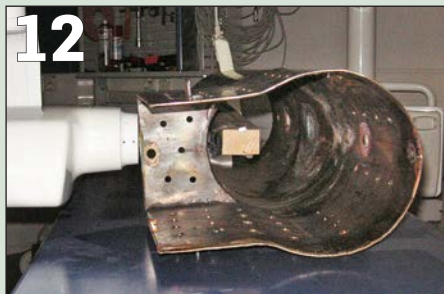
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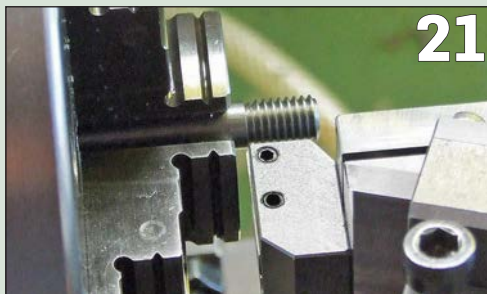
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FRONT COVER

John Ward has made major modifications to the lightweight Sweet Pea he acquired, much of it built in aluminium. He describes his powerful loco starting on page 6.

Photo: Terry Dell



EDITORIAL

Home workers...

Welcome to EIM and as you read these words the UK might be starting to very gently ease its Coronavirus lockdown measures. Very likely, however, we will still mostly be confined to our homes, and as last month I start by hoping you and your family are well and safe from the very real challenges we currently face.

You are spared the usual view of my ugly mug on the right-side of this page this month, in favour of something much more useful. We offer a number of options enabling you to keep on reading EIM without stepping outside your front door. These range from single issues in printed or digital format to money-saving subscriptions and even a digital membership scheme that gives you access to more than 180 editions going back to 2005 – with new issues added to it every month!

In terms of the magazine's production these are indeed highly difficult times – for myself as editor and designer working at home is the norm and the only current major difference is having the family around me all of the time – at least it means plentiful cups of tea! But for the rest of the Warners Publications team working away from the office brings huge challenges, alongside the economic pressures the pandemic is causing. But we are all determined that it will be business as usual as far as is possible and that you continue to be able to read your magazine every month.

Meanwhile I hope those of you that can have been making use of the extra time in your workshops – I have (though mostly until now it has been bringing my workshop back into commission!). A reminder, we want to see your lockdown projects! Send them in for us all to enjoy in these pages.

Meanwhile stay safe, and enjoy your EIM.

Andrew Charman – Editor

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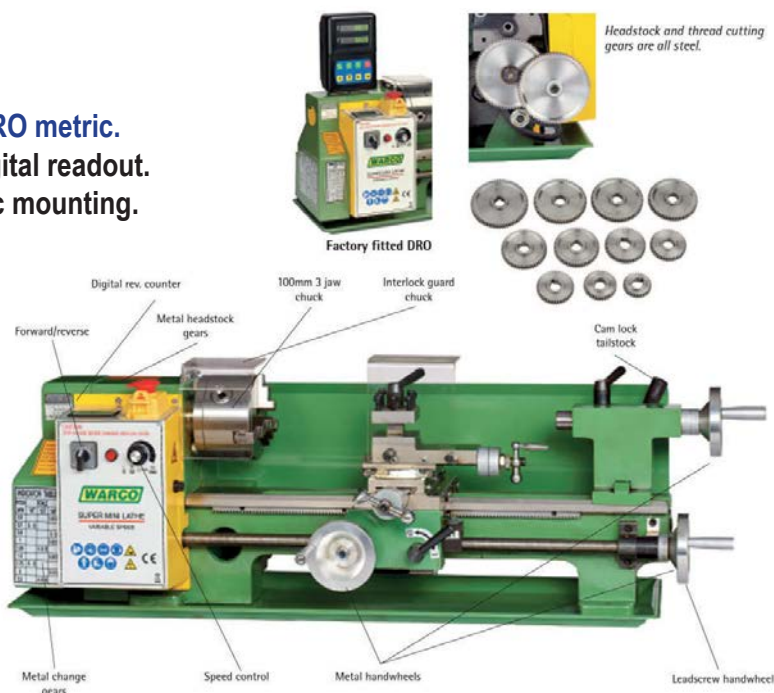
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Available in 1/4 x 26tpi thread for MSS and early Mamod standard loco boiler or 1/4 x 40 tpi for our Premium High Pressure Boiler.



MSS Mamod Solid Fuel Pack - 20 Tablets £4.00



MSS Mamod Upgrades - 3 Wick Meths Burner
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- * Screw mounting nut
- * Curved tip syringe
- * Special milled chassis spacer
- * Full instructions

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MSS Mamod Enhancements - Small Brass Chimney Cowl £4.50



MSS Mamod Enhancements - Narrow Gauge Buffer Beams £8.50



MSS Mamod Enhancements - Side Tank Hand Rails £5.20
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MSS Mamod Upgrades - High Pressure Safety Valve £15.00

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MSS Mamod Spares - Brass Buffer Set £9.00



MSS Mamod Loco Spares - Single 32mm or 45mm Axle & Wheels £9.50



MSS Mamod Enhancements - Cylinder Covers £12.00

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MSS Mamod Loco Spares - Standard Boiler £35.00
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Alicat – a new twist on the Sweet Pea design

John describes his unique lightweight aluminium variation on the popular Jack Buckler 5-inch gauge locomotive design

BY JOHN WARD

This article has been written in response to many requests, including from the editor of this magazine, for more information on 'Alicat' following the locomotive's attendance at the Midland Federation Rally at the Burton-upon-Trent Model Engineering Society track in June 2017 and the subsequent editorial that appeared in **EIM** in August 2017. I have finally got around to putting pen to paper!

For me, the 'Alicat' story began 40 years ago when I was invited by Don Dutton to join Cannock Model Engineering Society, which had a track in Cannock Park. It was at Cannock Park that I met Bob Hooper who 'liked making things'. Bob decided to build a 5-inch gauge loco that he wanted to "lift and carry around on his own", and so he settled on producing a lighter version of the 0-4-0 'Sweet Pea' with the heavier components made from aluminium rather than steel or brass.

The resultant 'Alicat' has a remarkable list of aluminium components including;

- Main frames
- Buffer beams
- Stretchers (all welded)
- Toast rack couplings
- Horn guides and keeps
- Cab
- Saddle tank
- Cladding
- Safety valve vent tubes
- Reverser
- Handbrake stanchion,
- Chimney saddle
- Coupling and connecting rods
- Cylinders (no liners)
- Pistons
- End covers
- Steam chests and covers
- Whistle – the 3/8-inch diameter one!

By 1983 Bob Hooper had almost finished the loco and it was running regularly on the Cannock Park track as 'May No 3' (**Photo 2**).

Challenge of a new line

The author was fortunate enough to acquire the loco in July 1987, and I ran it both at Cannock Park and at many portable track events. The Cannock



"Bob decided to build a 5-inch gauge loco that he wanted to 'lift and carry around on his own'..."

PHOTO 1: 'Alicat' feathers its safety valves following circuits of the Rugeley track pulling all 12 of the Rugeley club's passenger trolleys.

PHOTO 2: Bob Hooper driving 'May No 3' at Cannock Park in 1983.

Park track was redeveloped into a golf course in 1986 but members were able to construct a new multi-gauge raised track in the grounds of Rugeley Power Station, and so they formed the new Rugeley Power Station Society of Model Engineers. The superb new track was close to 2000 feet long and brought about a need for some modifications to the newly named 'Alicat', whilst retaining as much original material and appearance as possible.

Now with a much longer track to run on, it was apparent that the bottom rows of Alicat's tubes were becoming blocked. The solution was to cut out the bottom of the smokebox

and fit a steel plate to the bottom of the saddle.

Four bolts secure the location disc for the spark arrestor and most importantly two O-rings of different sizes which locate and are compressed in the recess atop the exhaust tee piece as seen in the photograph (**Photo 3**). The second photo shows right side up, the baseplate, the disc to locate the spark arrestor, blastpipe and nozzle (**Photo 4**). These are shown fitted between the frames in the following photograph (**Photo 5**).

The smokebox and boiler fit firmly in place and are air tight and steam tight. The spark arrestor slides down through the chimney saddle



and locates on the brass disc, then the chimney slides into its saddle and locates the spark arrestor by $\frac{1}{8}$ -inch in its bore (Photo 6).

Audio accompaniment

A large whistle, 8 inches long and $1\frac{1}{2}$ -inch diameter is fitted below the boiler and rests on a frame stretcher which has been filed away to create a cradle (Photo 7). A $\frac{1}{4}$ -inch pipe is used from the valve to the whistle. Despite the size of this whistle it does not empty the boiler! It does, however, give a deep mellow sound.

The vertical pipe in front of the firebox outer wrapper from the blower valve can be seen in the photograph. It runs under the insulation and through the thick-wall smokebox to the base of the chimney. Although the jet is positioned at the side of the chimney it works as it should. However, this idea would not be suitable for a short chimney.

The cylinders are $1\frac{1}{2}$ -inch bore. Blackgates Engineering (usual disclaimer) type 218 O-rings are used on the pistons which are easily replaced. Two screws release the dumb buffers exposing a clearance hole in the buffer beam, which allows the piston and rod to be withdrawn. Removing the cylinder cover requires six bolts to be removed and eight nuts release the crosshead sideplate. Then two crosshead/piston rod shearpins are pushed out using a cranked tool made from a cycle spoke and out comes the piston and rod for the fitting of new O-rings. It's all very straightforward and takes not very long at all.

When the loco's valve gear

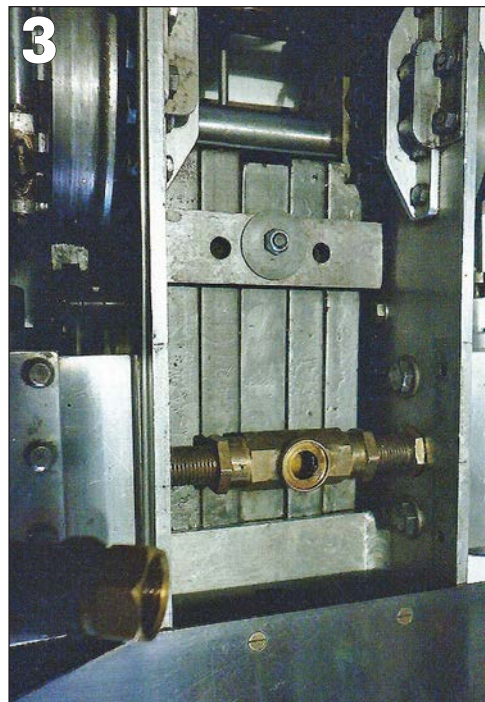


PHOTO 3: Exhaust tee-piece showing 'cup' for the O-rings and lead ballast bars.



PHOTO 4: Blast pipe, nozzle and smokebox baseplate.

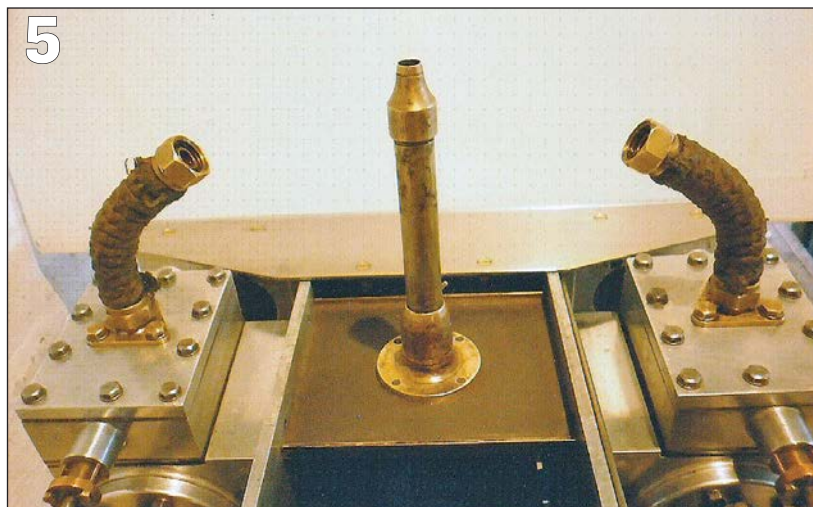


PHOTO 5: The blast pipe and nozzle fitted between Alicat's frames

PHOTO 6: Spark arrestor, smokebox, baseplate, and chimney assembly.

PHOTO 7: Alicat without cab and saddle tank – the 8-inch long x $1\frac{1}{2}$ -inch diameter whistle and blower pipe are clearly visible. Note saddle tank water gauge, painted white, one side only, to right of the handbrake stanchion and left of the steam turret.



eventually needed attention, the opportunity was taken to set the driving axle and weighshaft to a correct relationship, and dowel the stainless steel portplates to the cylinder blocks.

My great expectations of the modifications were fortunately met with good results. 'Alicat' was now a locomotive which steamed and pulled very well, and was very reliable. However, when pulling a load slowly, ►



to my ear, the exhaust was not equally defined, and occasionally the loco would not start away when the regulator was opened. Despite the cries from fellow members of “leave it! – it runs doesn’t it?” having got this far with the modifications, I decided

to investigate further.

The slide valves and port plates were two of the original components. I removed these and on careful inspection found that one valve was six thou’ short on length, and the other exhaust port was five thou’

“One supply to the club was of coal that once put on the fire completely disintegrated and mostly fell into the ash pan, so creating two fires...”

oversize, easily corrected by silver soldering the slide valves to match. Phosphor bronze shims were added where needed and machined to correct size. This was a worthwhile modification – the loco now performs to my entire satisfaction.

I found the 1/8-inch diameter lubricator ram feed was feeding too much oil to the cylinders, and reduced this to 3/32-inch diameter, fed into the regulator block below the poppet valve, thus ensuring that both cylinders are equally fed. A snifting valve was also fitted.

Other lubrication is by wick-feed oil pots. I made these using a variety of cotton threads as wicks, retained in the oil pipes by a twist of very thin copper wire.

The crank pin bearings were bored oversize, heated in a jig and a teaspoon full of whitemetal poured into each half bearing. No machining was required, and they have never needed attention despite being worked hard, perhaps due to those lubricators being filled with cylinder oil?

Being so light, as an 0-4-0 Alicat would bounce along. I read about a design by Andrew Mitchel (*Model Engineer* 2nd June 1983) for a pair of pivoted trailing wheels. I made and fitted one of these trailing trucks, and also added a few bars of lead ballast under the smokebox shown in the exhaust tee-piece photograph. Now as an 0-4-2 Alicat no longer bounces, and the ballast gives the loco more or less equal axle loading. However, this now means that much of the weight that Bob eliminated with the use of aluminium, I have put back!

Cleaning the ashpan on Alicat always made a mess of the footplate, so I removed the middle section, cut out a rectangular slot and fitted a chute. Now, with a curved blade the ash can be drawn out to fall down the chute, leaving the footplate clean.

When purchased, Alicat had three spare different-sized blast nozzles, all of which have been used, the larger for heavy loads, the smallest for just driver and trolley. Firebar spacing has been increased and decreased to find the best option.

All in the coal?

As we all know, coal can vary in quality. One supply to the club was of coal that once put on the fire completely disintegrated and mostly fell into the ash pan, so creating two fires! That was when Alicat won the club efficiency trials (**Photo 8**), so perhaps I should keep that quiet! (all competitors were issued with the same coal of course!).

The saddle tank has been fitted with a fine mesh filter, so no debris enters the tank, which has its own



PHOTO 8:

Alicat on its way to winning the Rugeley efficiency trials in 2014 hauling four trolleys loaded with nine passengers.

PHOTO 9:

The loco was temporarily renamed ‘Jubilee’ for the Queen’s Jubilee celebrations at the Rugeley Power Station Gala Day held in 2002.



PHOTO 10:

Don Dutton is the leading driver for Rugeley’s first ‘double-header’ with, hidden in this picture, the author driving Alicat as the second locomotive.

water gauge in the cab. Water supply to the boiler is by hand-pump, a $\frac{3}{8}$ -inch diameter axle pump and a very reliable injector, this injector being used most often. After each run the injector is removed, steam and delivery cones cleaned with suitably tapered matchsticks, and then kept dry until the next 'steam up'.

All of the above modifications might lead readers to believe that Bob Hooper's original work on May No. 3 was not satisfactory. This is far from the truth. The work that I have carried out was always because of my determination to investigate what Jack Buckler's design, with its Hackworth gear, could achieve on our demanding track at Rugeley.

This track in the grounds of the power station is just short of 2,000 feet long, with a long back straight on a gradient, and one 43-foot radius curve adding flange drag with a long train. Along with the opportunity to participate in annual efficiency trials, Rugeley was a perfect test track on which to measure Alicat's performance. All of the modifications have been carried out over many years, during which time much running of the loco has been enjoyed, sometimes with astonishing results, well beyond the usual 'one loco plus driver plus one trolley'.

The Rugeley society built no less than a dozen 5-foot 1-inch long passenger trolleys, each weighing 168lbs. On one occasion Alicat pulled all 12 club trolleys plus my own driving trolley for several laps of the club track. Nothing could have pleased me more than to hear Alicat's exhaust and look behind to see such a long train. The steel rails are 10mm wide and adhesion was good. It was also pleasing to see the reflection of the paint on the trolleys which had been totally refurbished and painted by the author.

Another challenge for Alicat was the evening passenger carrying runs for the local Girl Guide 'Beavers' pack involving heavily loaded trains. Although the children were always well behaved, they were encouraged to shout and scream in the tunnel whilst the drivers blew the whistles – smiles all round, and wonderful occasions.

Royal renaming

For the Queen's Jubilee celebrations the power station management asked if we would run our trains for the hundreds of visitors expected to attend their 'Gala Day'. Alicat became 'Jubilee' for the day complete with its 'ER 50' headboard and Union Jack flags attached to the front buffer beam (Photo 9).

With so many visitors visiting our railway on the Gala days and



PHOTO 11:

'Alicat and Alan Stewart's Meter Maid 'Annie' double head a heavily loaded train for a visit from the Branch Line Society.

PHOTO 12:

Alicat and Annie again with a heavy six trolley train approach the tunnel on the Rugeley track during a Power Station Open Day on 20th July 2013.

subsequent open days we had to give a great deal of thought to how best to run our trains. For the Jubilee celebrations, as a trial, and for the very first time, we double-headed a train (Photo 10).

The double-heading worked well, and every Gala, visiting society, and open day that followed included two double-headed, six-trolley train formations. Although challenging, queues for train rides were kept short, and it worked well with one train in the station changing passengers whilst the other was on the circuit, although very slick operating and high levels of concentration by drivers and station dispatchers was required.

At several of these events fellow club member Alan Stewart coupled his Meter Maid, named 'Annie', to Alicat and there was never a problem coping with a large number of passengers (Photo 11, 12). At one

event in particular the Meter Maid and the author's Sweet Pea ran a very busy passenger carrying service for 2 hours and 40 minutes without a break!

In 2002 it was a great pleasure to meet Jack Buckler along with 'Team Blackgates' at the Sweet Pea rally at Chesterfield. I have no hesitation in recommending the Sweet Pea design to model engineers who wish to experiment, develop, or simply have fun with their own versions of this excellent design of model steam locomotive. I certainly have had a lot of fun with mine!

I would like to dedicate this article to Jack Buckler, Bob Hooper, and all of my very good friends at Rugeley Power Station Society of Model Engineers.

■ Many thanks too to John's fellow Rugeley ME member Terry Dell for his essential assistance in ensuring this article came to fruition. **EIM**



A cut above the norm

Harry makes simple mods to a pair of shears to increase their usability.

BY HARRY BILLMORE



I recently bought a pair of plate shears from Warco – they are excellent for the price and do exactly what I require of them, which is mainly cutting tinfoil and thin brass sheet.

The only aspect I have found difficult with them is getting a consistently perpendicular edge without a lot of concentrating and time, so to improve this I built the following attachment.

Digging around in my bits pile I dragged out a sheet of aluminium and some aluminium angle with a square outside edge – this is important as if I had used bar stock, this comes with a slightly bevelled edge and can cause problems with thin material.

To start with I cut two rough

ABOVE: Two views of the pair of shears as delivered.

PHOTO 1: First step, measuring out the aluminium sheet found in the bits box.

PHOTO 2: Box folder used to fold up sides.

All photos by the author

squares out to give me a bendable end piece to attach to the shears, as well as two bent sides to provide some stiffness. I first bent the end piece down before measuring from the top surface to the mounting hole positions – this ensures that any errors in the bending process have been removed.

Bargain buy

I then drilled the mounting holes out using a step drill, one of the most useful items to have to hand when working with sheet material. I acquired a set of these from Lidl some time ago for not a lot of money and they are fantastic.

The next step was to bend up the long-edge stiffeners. After bolting the basic sheet onto the shears,

ensuring the top lined up with the non-moving part of the shears, I then set up the piece of angle perpendicular to the blade using a square, before clamping it and drilling through to bolt it down.

Finally I checked how well the modified shears would cut square using an off-cut of tinfoil and it proved to be pretty good.

Having used the tool for a little while, I have since added a stiffening piece of angle, attaching the long side to the bent piece that is bolted to the shears. This has just stiffened everything up that little bit more to make the tool a little easier to use. I also filed the front edge of the upright angle down to make it easier to go past the stop when making a longer cut. **EIM**



“A step drill is one of the most useful items to have to hand when working with sheet material...”



PHOTO 3:

A step drill was used to drill mounting holes after folding, to ensure their correct height.



PHOTO 4:

Finished box with all sides folded and holes drilled.

PHOTO 5:

Checking for alignment with the top face of the non-moving table.



PHOTO 6:

Base fitted to the shears.

PHOTO 7:

Using square to ensure the fence is clamped perpendicular to blade.



PHOTO 8:

The fence once fitted.

PHOTO 9:

The fence in action.

PHOTO 10:

Success! A perfectly square edge after cutting.

Building a Ten-Wheeler

Jan-Eric moves on to what is for many the most challenging part of a loco build – the boiler...

BY JAN-ERIC NYSTRÖM Part Five of a series



Material warning

■ My first attempt to build a boiler for the ten-wheeler was a disaster. The reason was incompatible materials – I used copper-nickel (Cu-Ni) tubing and silver solder, which are not compatible unless the entire structure is heated to annealing temperature during soldering, a fact I was unaware of at the time.

Thermal expansion induced stresses in the material, causing it to



crack by 'intragranular penetration' of the solder, as in the photo – this does NOT happen with pure copper. That is a reason for the requirement of pure copper in boiler codes.

I have learned that the proper way to build a boiler of copper-nickel is by using TIG welding, not silver soldering. I tested the necessary welding techniques by building a small vertical boiler (see the March and April 2018 issues of *EIM*), and thanks to that experience, I had confidence to make a new attempt.

Please note that I have used copper-nickel only because it was available to me as 'surplus material' at practically no cost. This alloy is not approved in any hobby boiler codes I'm aware of, but calculations show it to be a suitable material nevertheless – when TIG welded, not soldered, that is! We do not have boiler codes or hobby boiler inspections in Finland, so I was entirely on my own.

Note that this article is not a 'how-to', but rather a 'what-I-did'.

FIGURE 21:

A half-scale drawing of the boiler.

PHOTO 37:

The root (back) of the weld is protected with glassfibre and aluminum tape.

Photos and drawings by author except where noted

Please take that in consideration when reading! To comply with UK boiler regulations, I suggest you use only copper for your own projects.

Unfortunately, availability of copper tubing in the sizes needed for a 1.5-inch scale locomotive is virtually non-existent, so the shell will most probably have to be rolled from copper sheet. You should also discuss your proposed boiler design with experienced club members in your neighbourhood, and with any boiler inspector you can find!

The new attempt

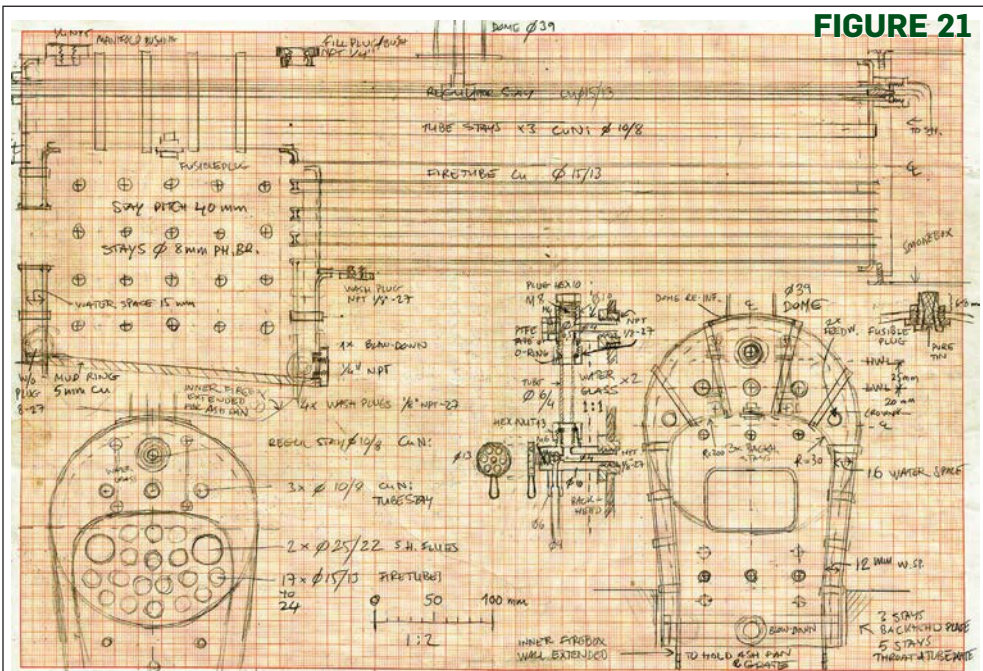
Since I still had enough 220mm diameter Cu-Ni tubing for a second try, I could continue from where the unsuccessful attempt had left me. The basic welding technique is explained in the 'Small Boiler' article, so I won't

go into all details here, but some methods that are also useful for boilers built of pure copper are worth looking into.

I made a half-scale sketch of the boiler on millimetre graph paper, **Figure 21**. Designing everything on paper avoided errors that might have been time-consuming or even quite costly. A drawing is also necessary to get approval for starting construction by your own boiler inspector.

Copper and its alloys must be welded using shielding gas on both sides of the weld, or, alternatively, 'root protection' must be used. **Photo 37** shows how I prepared the weld area between the boiler barrel and the outer firebox using a strip of glassfibre and aluminium 'backing tape'. This tape prevents the oxygen in the surrounding air from reaching the weld root – without such protection, the weld would become porous and brittle. In industrial welding, other protective measures are used, including enclosing the entire workpiece in an argon-filled 'glove-

FIGURE 21



How strong is your boiler?

Any and all boiler designs should be checked for mechanical strength before building commences. A simple way of doing this is to use a spreadsheet program. This will immediately reveal design deficiencies, such as plates or stays that are too thin, or a too wide spacing of the latter. Spreadsheet programs are available from many source. They differ somewhat, depending on the boiler codes used by the clubs, authorities and even countries. I suggest you contact your local club to obtain more information and guidance.



box'. However, using the special tape was more practical for me.

It is important that the glassfibre strip is pressed tightly against the seam in order to exclude air, and that there is a proper chamfer on the other side. The Australian Miniature Boiler Code (the best reference I have found) requires total-penetration welds to be made from one side only, by a professional, certified welder, in order for the boiler to be approved for use on club tracks 'down under'. Other boiler codes may have different rules.

Well, I'm no professional, but having received hands-on instruction from one, I decided to tackle the job myself – as already mentioned, we have no Live Steam clubs in Finland with codes and special requirements, and I was going to use extra safety measures to ensure that my welds were sound.

Photo 38 shows my weld after the protective tape was removed. I noted two slight defects in the penetration, so I ground these clean, and did a second pass in these spots only. The result can be seen in **Photo 39**.

Safe welds

Longitudinal seams in a boiler shell are subject to double the stress of transverse seams. Since my original 220mm diameter tube was too large, I had to cut away a strip and re-form the tube to 185mm, finally welding it together again with – you guessed it, a longitudinal weld!

In industry, all important welds are X-rayed, and with the help of a friend who writes software for digital dental X-ray machines, I had the opportunity to do this, too! **Photo 40** shows the setup; a small, 25 by 35mm solid-state sensor is attached to a wooden stick, and the boiler seam is positioned in front of the sensor. The X-ray tube is placed so that the beam will penetrate the seam and generate a 'shadow image' of it on the sensor.

This modern way of taking X-rays obviates the use of film, and the results are visible immediately on a

PHOTO 38: After welding (on outside), the tape is removed.

PHOTO 39: Weld can be inspected after cleaning off tape residue.

PHOTO 40: The longitudinal seam of the boiler is examined using a digital dental X-ray machine.

PHOTO 41: X-ray of the longitudinal seam, a composite of over 20 small images.

computer screen. However, the X-ray energy levels and the exposure times used to penetrate the metal were something I wouldn't want to experience in a dentist's chair!

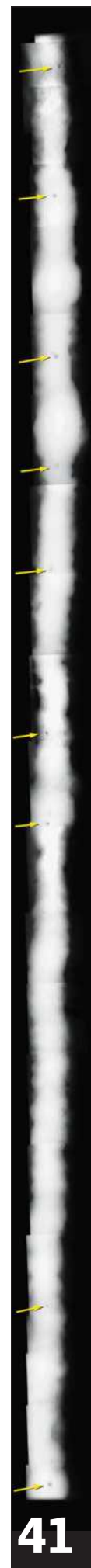
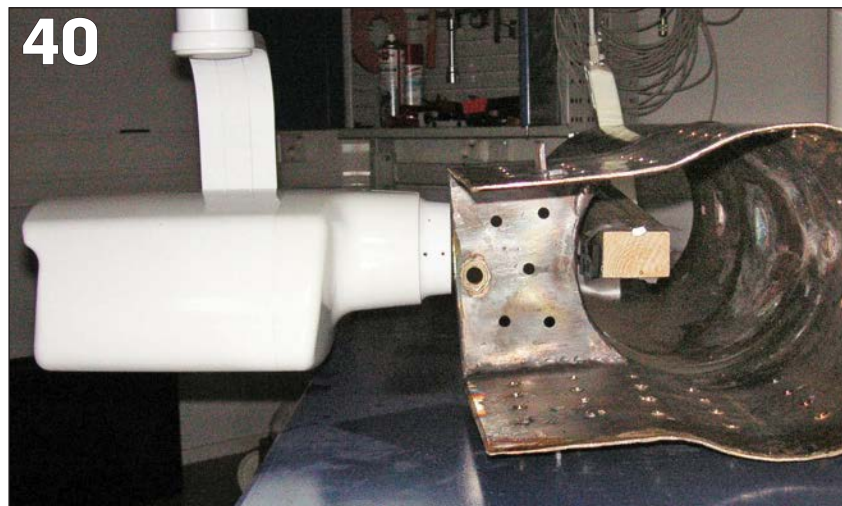
Since the digital sensor is small (in order to be put inside a patient's mouth, imaging only one or two teeth at a time), we had to shoot more than 20 separate images to get a composite picture of the entire seam.

Photo 41 shows the whole length of my longitudinal weld. It may not be as smooth and straight as one made by a professional, but the X-ray reveals only a few tiny, widely spaced porosity errors

in the weld (at arrows). Such minute defects are permitted even in the most stringent industrial standards, so thanks to the X-rays, I was confident that my welds were safe.

The rest of the welding work was straightforward, very similar to that done on the small vertical boiler. **Photo 42** shows the inside of the firebox, with all tubes welded to the tubeplate. In **Photo 43** you can see the reverse side, with the weld between the inner firebox and the tubeplate.

The tubeplate at the smokebox end was the one intended for, but not yet used in the failed boiler, so it was



Safety first...

While most model engineers are highly safety conscious in the workshop an occasional reminder never goes amiss, particularly for newer recruits...

Most of us who have model engineering as a hobby have experienced cuts and bruises, 'close calls' and maybe even accidents with machinery. Most of these can easily be avoided. Here are a few 'Dos and Don'ts' worth repeating:

1) Do use eye and ear protection whenever the work requires it! In addition to being very uncomfortable, prolonged exposure to high sound levels may cause hearing loss. Use safety goggles that also provide protection from the side.

Milling, grinding, sawing or turning at high speed may cause very small pieces of metal to fly around in a cloud, totally unpredictably. Keep a tiny, strong magnet at hand for first-aid purposes – a small sliver of steel lodged in an eye can be removed with it. If the particle is non-magnetic or the irritation continues, see a doctor.

2) Don't overload your equipment! It may prove expensive, and may also be a fire hazard. I've personally burned up the motors in an angle grinder and a band saw, so take my advice!

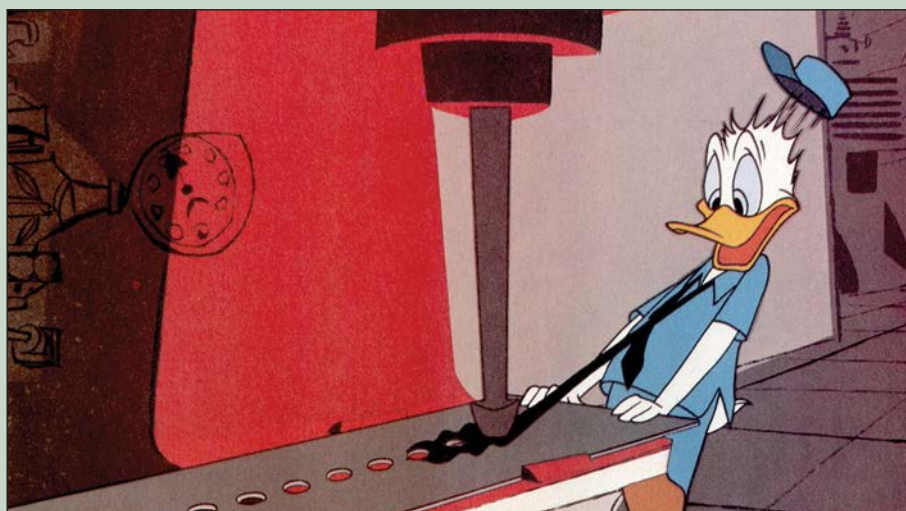
3) Don't remove guards, or disable safety features on your equipment! Doing this on even small power tools can cause great harm. The fast-moving, sharp cutting edges of mill and drill bits, circular saws, band saws and all woodworking power tools can inflict serious damage in a fraction of a second. Interlock switches, covers as well as chuck and saw guards are there for a reason.

4) Don't wear loose clothing, flip-flops or sandals in the workshop.

5) Do wear appropriate clothing, and suitable, sturdy shoes. Metal filings and chips will cling to your workshop clothes. If you don't want those little sharp nasties in your bedroom or kitchen, change clothes and shoes before you return to your living quarters! (My girlfriend keeps reminding me – she needed a laser procedure to remove a deeply lodged chip from her sole...)

6) Don't let sparks from welding or grinding, or hot chips from the lathe or mill land close to anything combustible. Have a fire extinguisher at hand at all times.

7) Don't spill liquids! Spilled water will make the floor slippery, and will rust your precious tools. Clean up any spills immediately. If you handle chemicals (such



Donald Duck demonstrates the risk associated with loose clothing in the workshop! From the 1959 educational film *How to have an Accident at Work*, Photo © Disney, used with permission.

as acids for pickling or fluxes for brazing), avoid skin contact. The water in diluted sulphuric acid will evaporate, leaving the strong, corrosive acid to burn any surface it is left on, so splashes on skin, work surfaces or clothes should be rinsed with plenty of water.

8) Do keep your workshop tidy. For some people, yours truly included, this is the most difficult and most neglected of all safety measures. Heaps of swarf and chips among tools will prick you!

9) Don't keep raw materials loose. Store it in racks, or at the very least, stand long lengths of tube or round stock in a bucket. Pieces of pipe or round stock on the workshop floor invite disaster!

10) Do be careful with gases. A leaking tank of propane (LPG) or acetylene gas poses a grave explosion risk. Since propane is heavier than air, it will collect on the floor. At a high enough concentration, a spark will ignite it. Argon gas (as used in MIG and

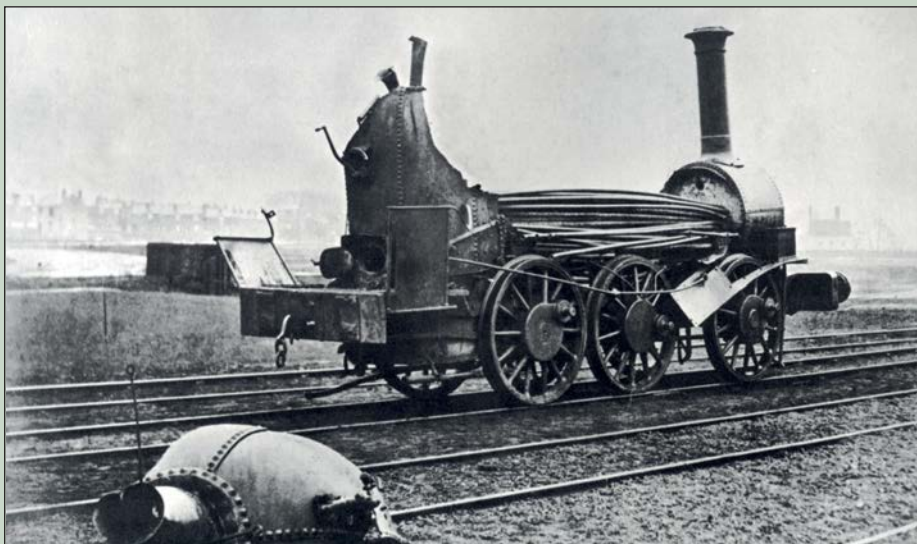
TIG welding) is not combustible, but it is suffocating, and heavier than air. Take this into account during welding.

Oxygen is a dangerous catalyst and just about anything soaked in it will burn.. Combustion gases (especially from incomplete combustion) include carbon monoxide, toxic already in extremely small concentrations. Even plain carbon dioxide (the fizz in soft drinks) is poisonous in large concentrations (5% or more in inhaled air).

11) Don't fire up a boiler before it has been hydro-tested, and make sure your safety valves are in working order and open at the intended pressure. Always keep an eye on the water glass!

12) Whatever you do, **don't** qualify for the 'Darwin Awards' – these are given (usually posthumously) to people who, through their stupidity, "do a service to mankind by removing themselves from the gene pool"... But of course, **EIM** readers wouldn't even think of doing anything that might qualify for an award...

Neglecting safety measures can cause severe damage to you and your equipment - even in small scale! This is a full-size example from around 1850.





actually flanged. No problem, a nice fillet weld is just as good as a silver soldered seam – in this case, using Cu-Ni instead of copper, it is actually far better! The smaller tubes are ordinary copper water pipe, while the superheater flues are Cu-Ni.

In **Photo 44**, the front end is completed, except for two stay tubes and a bushing for the dry pipe. Note that the front tubeplate is recessed about 25mm inside the boiler shell. This allows for drilling and threading holes for the bolts that will attach the smokebox to the front of the boiler.

Firebox stays

With the firebox now inside the boiler, it was time to install all the stays. The metal around the holes were cleaned with a small 'electric file' (which is actually a very narrow belt sander attached to an angle grinder), and lengths of 8mm round, pure, oxygen-free copper rod were inserted. With the aid of the TIG arc, I could melt the ends of the copper bolts,

PHOTO 42:

Inside the firebox. All tubes are TIG welded in place.

PHOTO 43:

Front end of the inner firebox.

PHOTO 44:

Smokebox end. Two stay tubes and a bushing are missing.

PHOTO 45:

Stays are welded inside the firebox.

PHOTO 46:

Outside of the firebox, stays in place.



forming a 'rivet head' that fused into the metal of the firebox (**Photo 45**). Previous experiments (pulling on a stay until either the weld failed, or the stay broke) had shown that these welds were as strong as the stay itself – the bolt was severely deformed and elongated before the weld parted from the plate! So, with that test, I was again assured of safe welds.

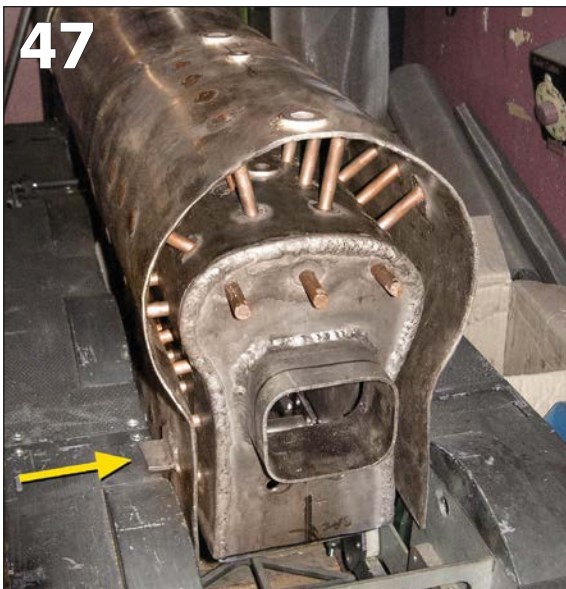
Photo 46 shows the outside of the firebox, with all the stays in place. The backhead is still to be installed. In **Photo 47** you can see the firehole ring,

as well as one of the 'expansion brackets' that let the boiler rest on the frame, but still allow it to move slightly during thermal expansion. A similar bracket is welded to the other side of the firebox. The multitude of stays inside the boiler can also be seen.

Leak tests

When the backhead and the foundation ring were welded in place, and all bushings plugged, I could, for the first time make a test of all the welds. Attaching the hose from my air





compressor to one of the bushings, I applied about 10psi of air pressure, closed the valve and waited. Sure, the expected happened, there were some leaks, and the pressure dropped slowly – fortunately very slowly.

Using a brush and soapy water, I was able to locate the leaks quickly – any froth immediately reveals a leak! **Photo 48** shows one of the three leaks found in my tube joints. These were quickly fixed with the TIG arc. Two more leaks around the bushings (which I made from Cu-Ni, since you cannot TIG-weld bronze) were also fixed. After this, the boiler was tight – at least at 10psi. **Note** – Do not pressurize an untested boiler to more than 10psi or so – if there is a faulty seam, it could burst! The only correct way to test a boiler to full pressure is using cold water – in other words a ‘hydro test’. This has been described elsewhere, so I won’t go into the details here.

My hydro test revealed a couple of pinhole leaks around the bushes – leaks so small that it took minutes for

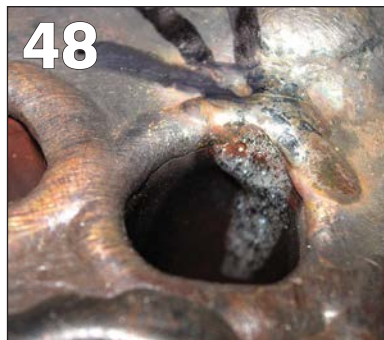
PHOTO 47: Braces welded to firebox allow back of boiler to move slightly.

PHOTO 48: A leak is detected with soapy water.

FIGURE 22: A counterflow superheater. Black dots are small ‘warts’ welded to tubes.

PHOTO 49: Superheater in position. Inset shows ‘warts’ welded to tube.

PHOTO 50: Smoke stack made from piece of tube, with a wedge cut away.



a single drop of water to emerge. The easiest way to fix such leaks is using the old trick of putting a teaspoon of finely ground ginger into the boiler water, and pressurizing it again. It works like magic!

Boiler fittings

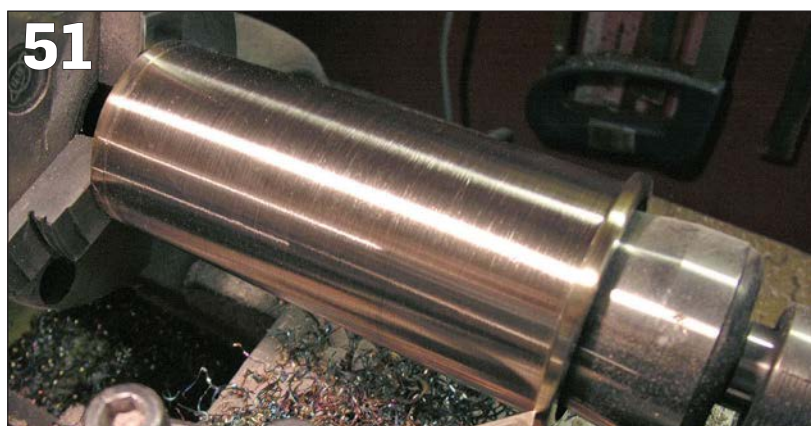
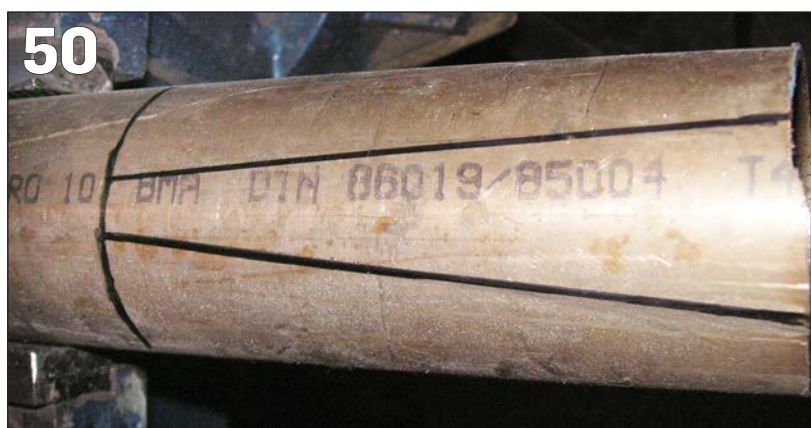
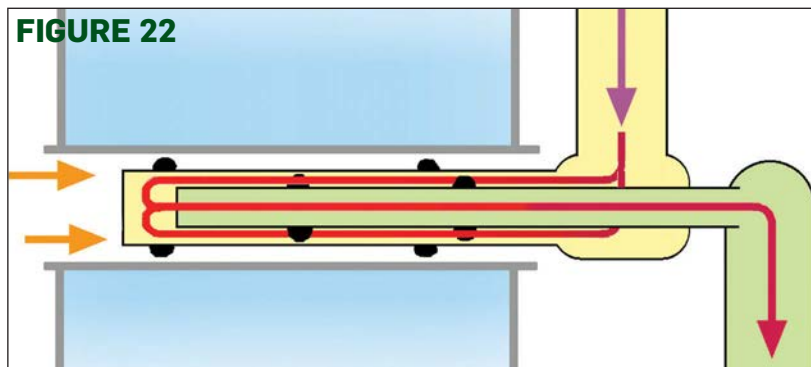
I will still have to make quite a few accessories for the boiler: two water glasses with fittings, a blowdown valve, a steam whistle, two safety valves, a regulator, and all the other

little things needed to operate a steam locomotive. These will all be attached to the bushes that have already been welded to the boiler.

Figure 22 shows the principle of a ‘counterflow’ superheater, consisting of concentric tubes. The superheater is made from copper tubing, so it cannot extend into the firebox – such ‘radiant’ superheaters must be made of stainless steel, copper would soon fail at the very high temperatures right above the fire.

In **Photo 49**, you can see the superheater tentatively installed – the connection to the dry pipe is still missing. Note that the smokebox is split, only the lower half is attached to the saddle – this makes the installation of all gadgets much easier.

Photos 50 and **51** show how I made the smoke stack from a piece of tubing, slit open and formed to a conical shape. The smokebox cover, ready to be painted in **Photo 52**, is attached to the smokebox with only



seven bolts – all the others are dummies, welded to the cover!

Next month

Jan-Eric makes the steam-operated boiler feed pump.

■ Parts 1 to 4 of this series were published in the February to May 2020 editions of **EIM**. Readers can download digital back issues or order printed versions from www.world-of-railways.co.uk/engineering-in-miniature/store/back-issues/ or by phoning 01778 392484.

PHOTO 51: Tube formed to conical shape, seam welded, and ring added to the top.

PHOTO 52: Stack bolted to smokebox, which has a front end made from laser-cut plates.



START HERE

Tender or tank?

Andrew continues his beginner's guide to the steam locomotive.

BY ANDREW CHARMAN

Experienced loco men, of whatever your scale and gauge, turn the page as this is not for you. To those of us who know our locos inside out the phrases tender and tank are obvious, but for newcomers to the hobby they can be just another of the many mysteries of the steam engine, and worth explaining.

Every engine needs a fuel tank and in the steam loco that means space for both coal and water. In many this is provided by means of a permanently attached wagon, the **tender**, usually of four to eight wheels and on which is placed a large tank.

The tank's capacity is split by a horizontal plate running diagonally, its highest point near the rear of the tender, its lowest at the front end. Coal sits on top of this plate, so it naturally works its way towards the front for the fireman to shovel into the firebox.

Under the plate is the water tank, filled through an opening usually on top of the rear of the tender. The tank is connected by pipework to the locomotive, the fireman activating the feed by turning on the injectors.

The usually smaller locomotives that do not have tenders have to carry their fuel supply on board, the coal in

a **bunker** and the water in tanks – hence the phrase **tank locomotive**.

What type of tank locomotive we are referring to depends on the design of its water tanks. Most common is the **side tank**, two tanks either side of the boiler just ahead of the cab and such locomotives carrying a simple 'T' designation (as in 0-6-0T).

The **saddle tank**, ST, as its name suggests carries its water in a large semi-circular tank that wraps around the top of the boiler, normally (but not exclusively) over its full length.

The **well tank** (WT) has its water capacity carried very low down between the frames, while the **Pannier Tank** (PT) is similar to the side tank in having two tanks, but instead of them being mounted on the footplate they are slung either side of the boiler, like panniers on horses. The Great Western Railway was of course a great user of Pannier tanks.

Most coal bunkers are located directly behind the fireman, attached to the cab back-sheet, but on some smaller locomotives, especially narrow gauge ones, coal can also be accessed from bunkers at the rear of the side tanks, sometimes even piled in front of the cab spectacle plate. **EIM**



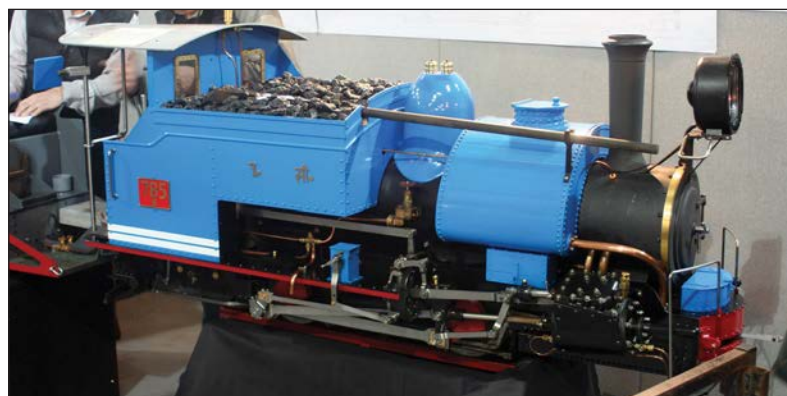
PHOTO 1: Tank or tender doesn't have to be mutually exclusive, and in models a tender has another use...

PHOTO 2: You can have both side and saddle tanks too – note the piled-up coal ahead of the cab.

PHOTO 3: The deep-sided frames of Barclay 0-4-0 'Cegin' are typical of a well tank loco, its water tank housed between the frames.

PHOTO 4: Not all Pannier tanks are Great Western. This is a Hunslet built for India...

All photos by Andrew Charman



A Gasket case

Peter and his son Matthew turn their smart-cutting experiments towards making an essential element of any steam – or internal-combustion – engine.

BY PETER & MATTHEW KENINGTON Part three of three

In Parts 1 and 2 of this series, we discussed using a 'smart-cutting machine' as a means of generating stencils and graphics to allow high-quality lettering and logos to be produced, without requiring professional sign-writing skills, a steady hand and lots of patience – since Matthew is 14 years old, the latter is obviously in short supply... In this final part, we change tack somewhat and apply the same basic technology to the production of a cylinder end-cap gasket, to effect a repair on a 4-4-0 loco owned by a friend and mentor.

We will again not go back through the details of the machines available and the pros and cons of each – these were discussed in detail in Part 1 (EIM April 2020), however we will provide a quick summary of what is meant by the term: 'smart-cutting machine' in case you missed the previous two parts.

A smart-cutting machine is, as its name suggests, a means of cutting a wide range of planar materials under computer control. The artwork required can be generated in a variety of ways or can be purchased pre-prepared for everything from greetings cards, through jam-jar labels to fabric patterns.

You can think of the machine as a computer-controlled (tiny) scalpel, fret-saw or rotary fabric-cutter, depending upon the material – in the former and latter cases, the analogy is almost perfect, as this is exactly the way that the cutter operates for vinyl/paper/card and cloth, respectively.

The machine we used was a 'Cricut Maker' (Photo 48) and the detailed comments on using cutting machine software, below, will inevitably concentrate on this machine and its associated software package. The principles are, however, universal and hence should be useful whichever machine you choose.

Scratching an Itch

Almost as soon as we got our smart-cutting machine, we thought that it might be possible to use it to make gaskets. Our limited experience with such things either comes from using ready-made parts (for example as a part of Matthew's Stuart S50 castings kit) or a few crude attempts at making them by hand with a former and a

PHOTO 47:

The object of our exercise, an effective smart-cut gasket.

PHOTO 48:

The 'Cricut' 'Maker' smart cutting machine.

PHOTO 49:

Matthew having a drive of Bill's 4-4-0 3521 class loco before it developed the steam-leak from one of its cylinder caps. Before we get letters, yes, it should have a tender. This was suffering from a water-valve issue, which has since been fixed.

PHOTO 50:

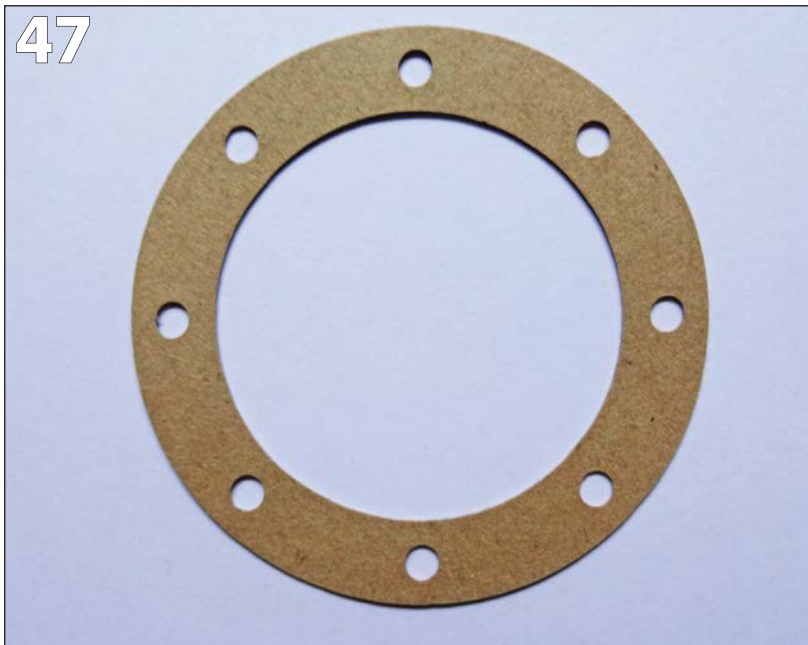
Checking for leaks using 'bubble-mixture' (a solution of washing-up liquid). The (severe) leak was obvious from the large volume of bubbles (most obvious at the top-left of the left-hand cylinder end).

FIGURE 20:

Drawing of the gasket to be made.

All photos and diagrams in this feature by the authors

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scalpel. The small bolt-holes needed in most model engineering projects proved a challenge here – from what we understand, punches are typically used for this purpose, but we haven't tried this. Gaskets, therefore, went onto the (rather long), "We'll need to learn how to do this properly one day," list and have languished there for some while.

I'm sure that there are places which will custom-make such parts, although this is likely to be at prices which will make me weep (with cries of "how much? It's only a tiny piece of paper"). Anyway, it's a problem we've not yet been forced to solve and so remains just that; a problem.

Once we received and got to grips with our smart-cutting machine, however, it immediately became obvious that a potential solution was staring us in the face. If it can cut paper, card, vinyl, fabric and even thin wood, surely it must be able to cut gasket material?

Since that point, we have been itching for an opportunity to try it out for this purpose and fortunately (although not for our friend Bill) an opportunity presented itself – a leaking cylinder end-cap gasket on his loco. It's a 4-4-0 3521 class broad gauge convertible, since you ask. Both Matthew and I have had the privilege of driving this loco on a couple of

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occasions (Photo 49) and it steams beautifully ("like a witch" is, I believe the standard expression, although not knowing any members of, or even of the existence of, a local coven, I don't really feel qualified to comment). We jumped at the chance to 'help out' by making him a replacement gasket.

We were invited to see the problem for ourselves, at least using compressed-air, as the loco had been dismantled by this point in order to gain access to the (inside) cylinders (Photo 50). A 'bubble mixture' was used to check for leaks, when the cylinder was pressurised with compressed air. Whilst in the photo the bubbles are most obvious in the top left-hand quadrant (of the left-hand cylinder), in truth much of this end-cap seal exhibited at least some leakage.

PHOTO 51: Test-gasket, cut in thin card. Bolt-holes in particular are rendered exceptionally well.

PHOTO 52: Gasket material attached to a 'strong tack' mat – 'tack' area visible between bottom of the gasket paper and top of the numbers printed on mat (it looks a little like a layer of dirt!).

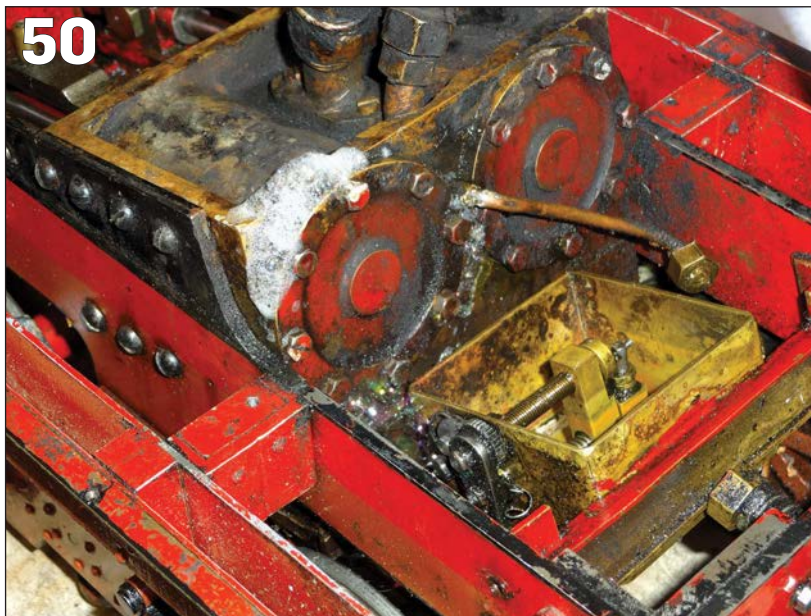
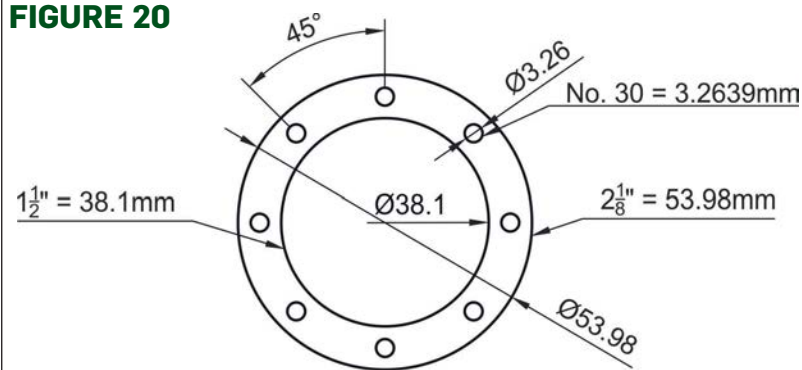


FIGURE 20



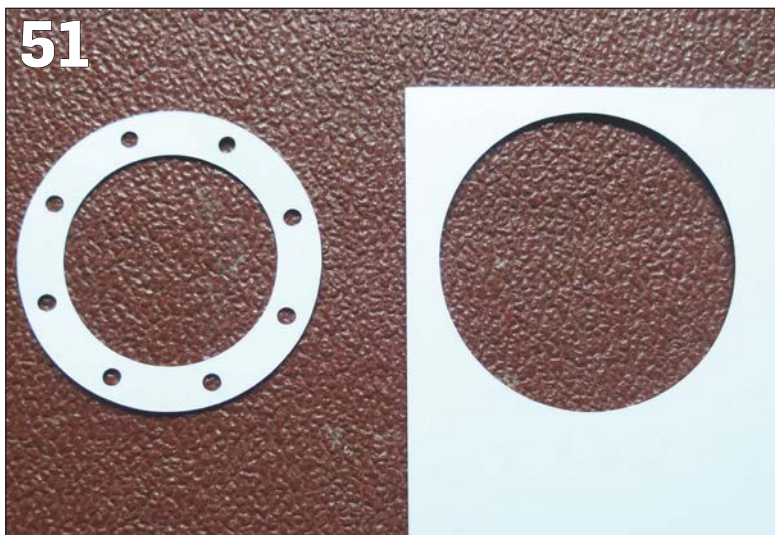
Specification/Drawings

The specification for the replacement part was fairly simple: a circular gasket of outer diameter $2\frac{1}{8}$ -inch and inner diameter (for the cylinder bore) of $1\frac{1}{2}$ -inch, with eight equally-spaced no.30 holes patterned centrally between the two. The required thickness for the gasket material, according to the teachings of LBSC, is $\frac{1}{64}$ -inch (approximately 0.4mm) – fortunately we had some of this thickness 'in stock'.

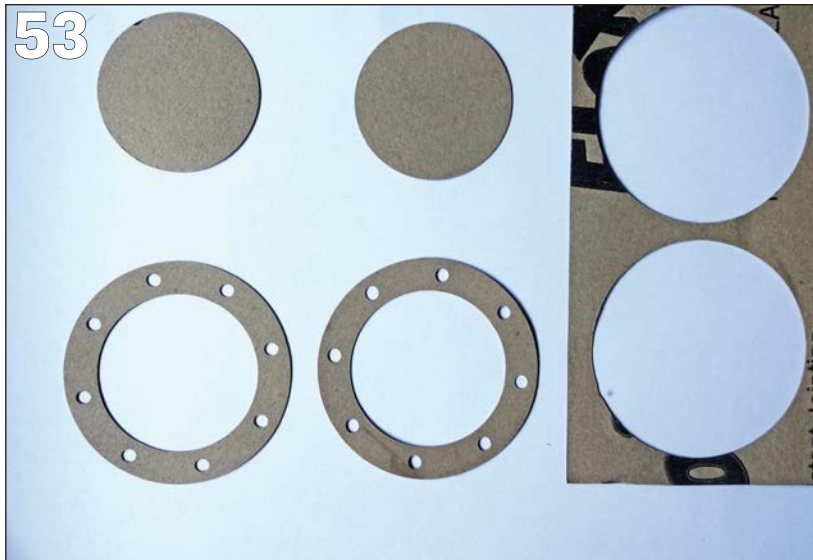
The resulting drawing (using Fusion 360) is shown in Figure 20.

A Trial Separation

My marriage is fine, but thanks for asking. The heading stems from a concern we had that separating the wanted gasket from the unwanted cut-out parts might lead to accidental tears in the gasket material – the separation isn't always perfect when cutting vinyl (although it is easy to 'encourage' correct separation,



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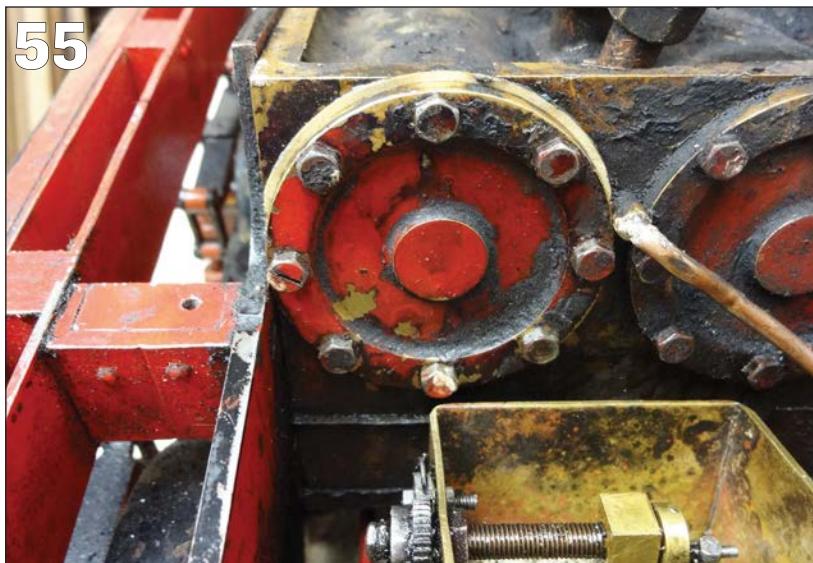
without any damage, in that material).

We decided that we had better try cutting-out the gasket's shape in (representative) thin card, to check for this problem and also to check its accuracy, before committing to using gasket material. The cutter is certainly capable of cutting card of the required

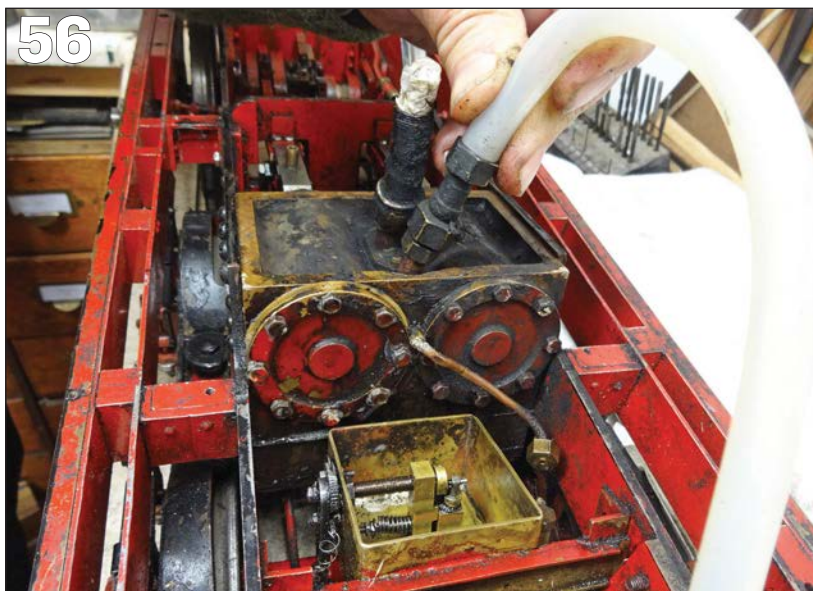
thickness, so any issues appearing when using card would be down to the inherent limitations of the cutter and not added by the use of a non-standard material (i.e. the gasket material).

In particular, we were a little nervous of its abilities in cutting such small circles accurately, as would be

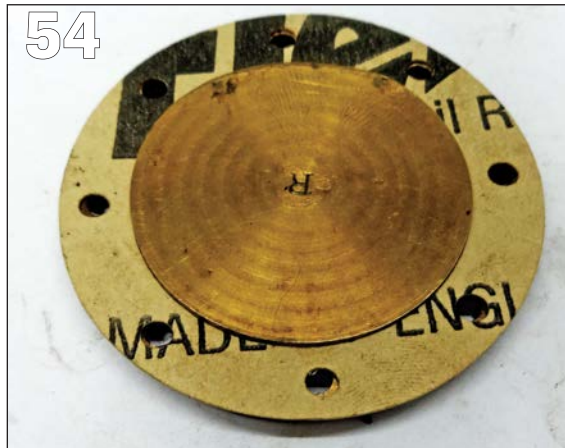
55



56



54



required for the bolt-holes – largely due to a lack of experience with the machine. But we needn't have worried as it was more than capable in this regard (Photo 51).

Based upon the excellent results obtained with card, we decided it was safe to move on to proper gasket material. We used some 'Flexoid Gasket Paper' for this purpose, in the 0.4mm thickness specified above. This material is a little tougher than card and so we had to use a stronger 'tack' mat in the Cricut cutter (Photo 52), in order to prevent it from rucking-up when cut (we had this problem on our first attempt, for which we used a 'light tack' mat). We didn't try a 'medium tack' mat, but this may well have proved adequate. Further discussion of the use of mats with the cutter can be found in Part 1 of this series.

We used a 60-degree cutting blade to cut the gasket paper, although the standard 45-degree blade may well have worked just as well; again, we didn't try this option.

Easy spares

The results of our efforts can be seen in Photo 53 (and also Photo 47). We made two gaskets, originally so that a spare was available in case of problems (for example tears) when fitting the first one. As we had no problems when fitting the first (Photo 54 and 55), the second can be used for a little 'preventative maintenance' on the other cylinder cap, as it has the same (decades-old) gasket material as the first and hence is likely to fail soon, if it hasn't begun to already.

Finally, the re-assembled cylinder was tested in the same way as the original (failed) gasket (Photo 56) and it exhibited a satisfying lack of bubbles. It should now hopefully provide a steam-tight seal and allow the loco to resume running. We might even be invited to have another drive, fingers-crossed... **EIM**

■ To obtain a copy of parts 1 and 2 of this series see the back-number ordering details on page 17.

PHOTO 53:

Finished gaskets, with material from which they were cut and the pieces removed – the extremely high quality of the cutting process is evident.

PHOTO 54:

Gasket fitted to cylinder end-cap, prior to its re-installation in the loco.

PHOTO 55:

New gasket fitted – it can be seen protruding slightly from around the circumference of the end-cap.

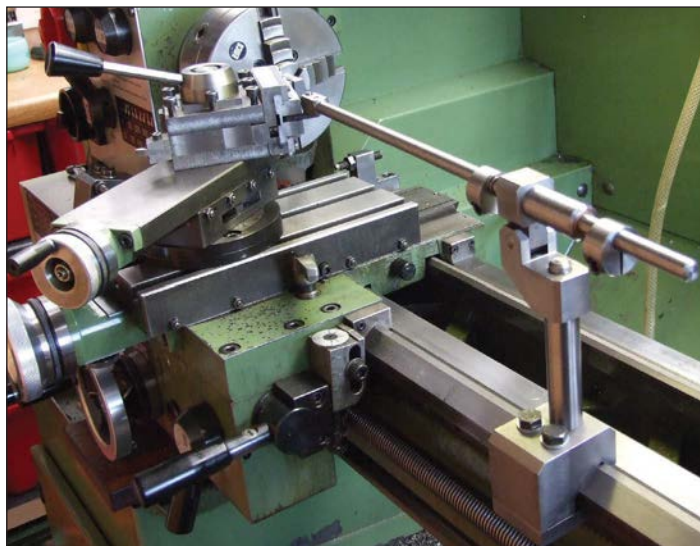
PHOTO 56:

Testing new gasket using compressed-air and bubble-mixture (our hands were now very soft by this point...). A satisfying lack of bubbles indicates that no significant leaks and the loco can be re-assembled for testing.

Modifications to a speed-up thread-cutting attachment

Graham provides his solution to the issues of losing the pitch that can be involved when single-point screwcutting on the lathe.

BY GRAHAM MEEK



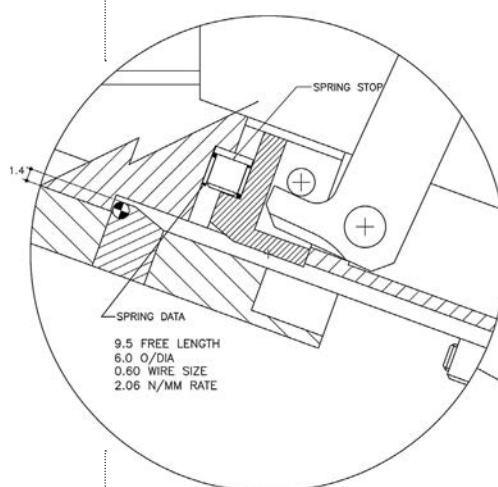
Having done some research into the Seco Snap-Tap threading system during the winter of 2012, prior to the Jacques Maurel articles 'Speed-up Thread Cutting Attachment' that appeared in the September and October 2013 issues of *EIM*, I did have one or two reservations about the solution Jacques arrived at.

I was aware that I had some very tricky screwcutting coming up on my Fiat 702 tractor, namely the threads on the valve bonnets that seal the combustion chambers above the side valves, as well as the threads on the spark plugs. In both cases these parts demand that the thread stops at the base of the conical sealing face in each instance, with no margin for error.

No dismantling

It soon became apparent that I needed to either finish making and fit the screwcutting clutch to my Emco Maximat Super 11, or make my own version of Jacques' design. Ongoing health issues made me fight shy of the first route, as in order to fit the screwcutting clutch to the Maximat I would have to dismantle a major part of the geared headstock, as the clutch is fitted internally on this lathe. I therefore did not want to find myself with my lathe in pieces and then not be well enough to put it back together for several months.

Several things were not to my



ABOVE:

View of the self-retracting attachment from the operating side. Note that the stop rod attachment has been amended since this photo was taken.

ABOVE RIGHT:

View from the tailstock end of the lathe.

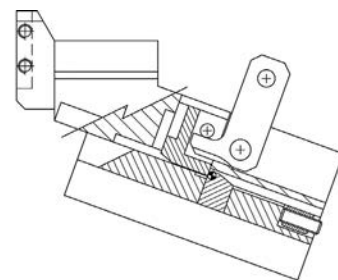
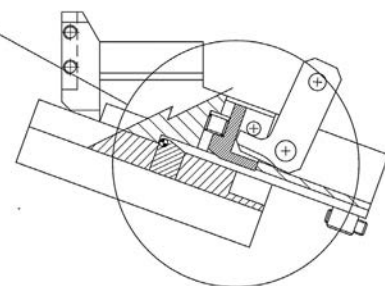


FIGURE 1



liking with Jacques' original design – we have discussed these issues between ourselves and I did make him a promise that I would try the attachment but with my modifications.

As many of you will have noticed I favour a four-tool turret rather than the quick-change type of toolholder that was described in the original article. Firstly the original overall bulk of this design was just too big to fit my lathe turret while missing the top slide. This necessitated the reduction in the overall height to bring the screwcutting tool onto the lathe centre-line and whilst I was doing this I decided to make the length of the unit the same as my four-tool turret.

Secondly the exposed locking

mechanism and the shape of the locking planes' was to my mind not going to give me the repeatability that I was looking for. Plus I could foresee that there would come a time when the ingress of swarf into these locking planes would in itself cause a problem with the repeatability.

Thirdly the overhang of the thread cutting tools was too great, and this was where Jacques' design also differed from the original Snap-Tap design. I wanted to return the cutting tools to a position where they were as close to

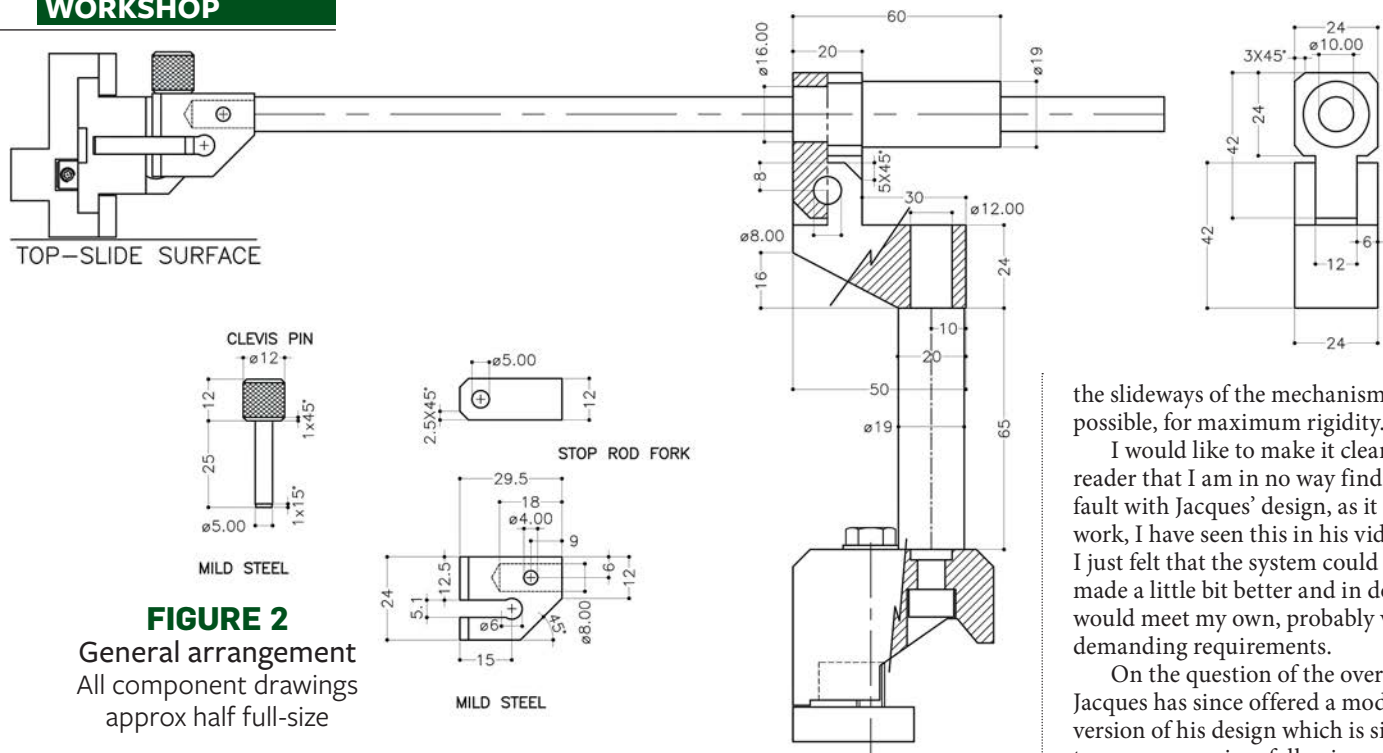


FIGURE 2

General arrangement
All component drawings
approx half full-size

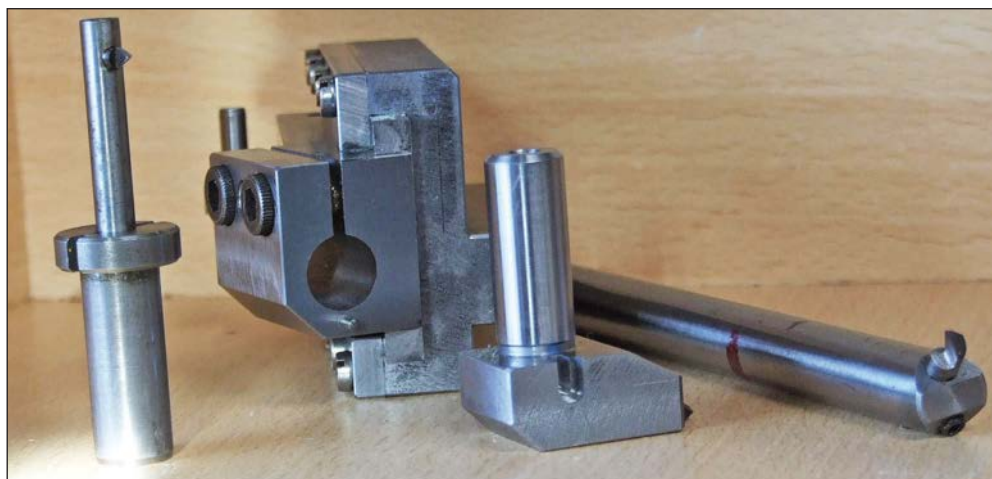
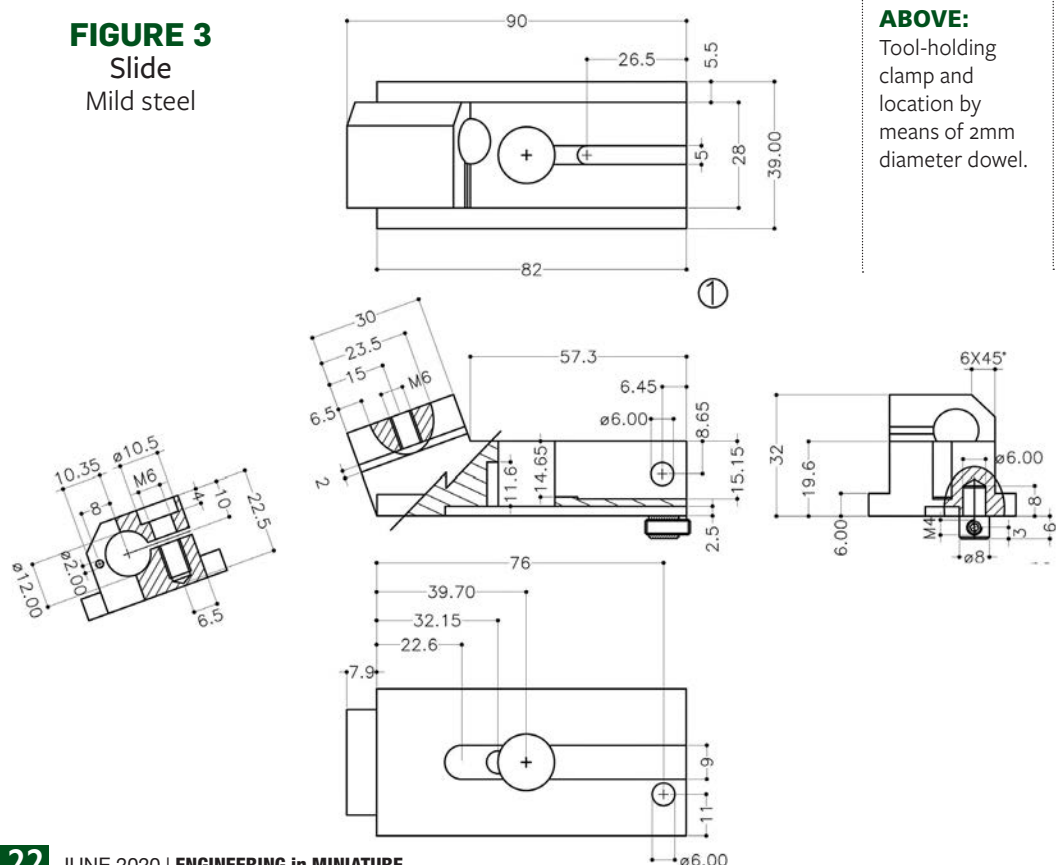


FIGURE 3

Slide
Mild steel



ABOVE:

Tool-holding
clamp and
location by
means of 2mm
diameter dowel.

the slideways of the mechanism as possible, for maximum rigidity.

I would like to make it clear to the reader that I am in no way finding fault with Jacques' design, as it does work, I have seen this in his video clip. I just felt that the system could be made a little bit better and in doing so would meet my own, probably very demanding requirements.

On the question of the overhang Jacques has since offered a modified version of his design which is similar to my own version, following an exchange of photographs between us in November 2013 and this was published in the Readers' Letters column in *EIM*, pages 356 & 357, of the April 2014 issue. This was in response to a letter by Michael Meredith, Gloucestershire in which Michael gives us some more valuable views of the original Snap Tap system and an insight into its usage.

As is usual with me of late the problem was mulled over for several months, and eventually in the Autumn of 2013 I decided that if I worked out how to mount the internal threading tools first, then holding the external tool attachment would become a simple matter. I therefore decided to adopt the same holding technique for the internal threading tools as I use for my lathe boring tools. This takes the form of a holder with a 12mm diameter hole bored on the lathe centre line which is slit using a 2mm wide slitting saw.

The resultant split clamp has directly opposite it a 2mm diameter location dowel. The headed split bushes that are used in conjunction with this attachment and my boring tool holder are also all split with a 2mm wide slitting saw.

Directly opposite this slit is a further 2mm wide slot cut just in the head of the bush down to the 12mm diameter. This additional slit is machined primarily to allow the head of the bush to flex, but it also has the added advantage of providing a location to align the bush. If this additional slot in the head of the bush was not present then the only gripping action would be on the extreme end of the bush furthest from the head. This is because the clamp would not have sufficient force to overcome the rigidity of the headed bush.

Maximum grip

The point of having the dowel location is that this always ensures the bush split is aligned automatically with the toolholder split and thereby maximises the gripping force of the two M6 cap screws. If the slits are not lined up when assembled then it requires a much greater force to collapse the bush to grip the tool.

This 2mm dowel also lends itself to locate the external threading tool on centre-line. This is basically the head taken from my Retracting Screwcutting Tool holder, (EIM June 2012, Pages 421-425 & 429), but with the addition of a 12mm diameter spigot on the rear face. By adopting this approach the tool-holding mechanism is buried well within the slideways of the mechanism, the only overhang being the cutting tool. There is also no distortion of the slider due to the design of the clamping action.

To ensure the 12mm bore is on the lathe centre-line this is drilled and bored in situ on the lathe before returning the slider to the milling machine to drill and tap the M6 holes and finally produce the 2mm slit.

Readers may notice that there is an additional tapped hole in the clamping arrangement. The central M6 tapped hole is for a 'dog-point' Allen grubscrew. This grubscrew has two functions, one is to stop the clamp being over tightened and distorting the bore. The other is to allow tools to be removed should the clamp take on a permanent set whereby the 12mm diameter closes in.

To set the clamp initially the two M6 capscrews are tightened

evenly onto a piece of 12mm diameter silver steel, the central M6 dog point grubscrew is then wound in until it goes solid. If the procedure has been carried out correctly upon releasing the two M6 capscrews the silver steel should be easy to remove.

In the original Snap-Tap design I could see that the operating lever was an 'L-shaped' affair, albeit a rather reclining 'L', the part of the arm connected to the stop rod being the short part of the L and about half the length of the main arm that tripped the mechanism. I knew from experience that this latching mechanism would not be truly square with the mating part of the trip mechanism. An email from Jacques confirmed this to be the case, but as he had said in his original article there was little room in the Snap-Tap design for any adjustment.

I too opted for an L-shaped lever with a 2:1 ratio of the arms, this means that if I set the trip mechanism engagement at 1mm on the retracting device, then the carriage would only have to move a further 0.5mm once the stop on the stop rod had made contact with the abutment face before retraction of the slide actually starts.

To keep the location faces of the trip mechanism as simple as I could I originally opted for two vertical parallel pins. This basic approach allowed for near line contact of the vertical locking plane, but these two vertical pins also offer the worst possible locking condition for the job in hand. The cutting forces that are transferred through the slide are

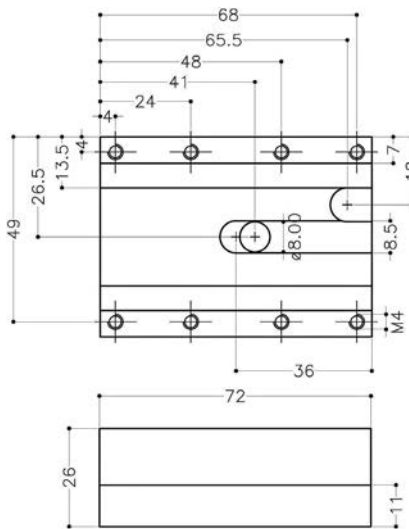


FIGURE 4
Body
Cast iron

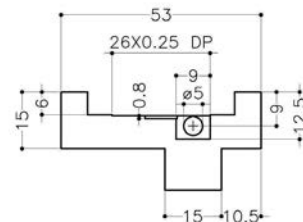


FIGURE 5
Further components

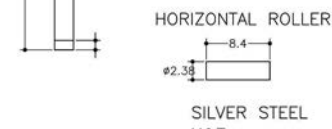
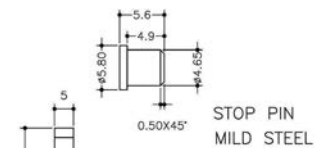
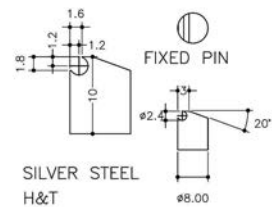
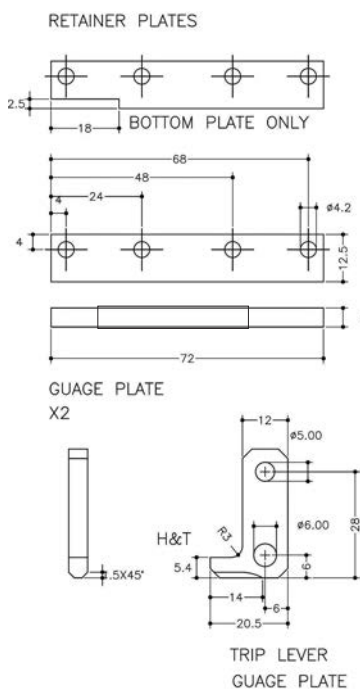
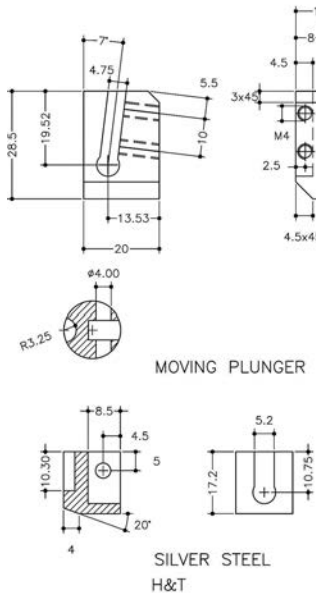
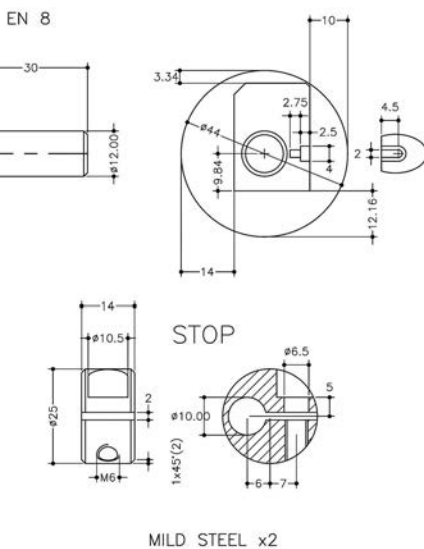
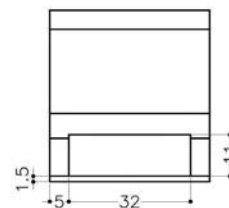
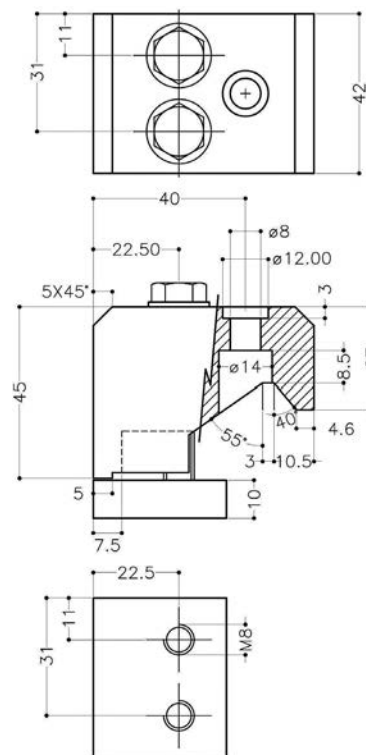


FIGURE 7
Bed Clamp
Cast iron





such that these two contact points could become impossible to separate due to the cutting load on them – with a consequential pile-up resulting as the threading tool hammers into a shoulder, or worse, the lathe chuck jaws before the pull on the stop rod became greater than the loading on the pins.

As mentioned earlier to ensure this does not happen the edge of any such locking plane is usually sloping, in the case of the Snap-Tap design this is about 25 degrees, with the other locking plane being a square edge. This results in the Snap-Tap design having a horizontal line of contact. These two edges are kept in contact by disc springs or 'Belleville washers', these washers can pack a high loading into a very small space.

However if I had adopted this type of angular setup on my design I would have ended up with a point contact, as this angle equates to a cone on the moving plunger contacting the square edge or corner of the fixed pin. It will not take much for the reader to realise that before long wear on these two

components is going to be quite rapid, even in hardened steel.

At this point I was still not convinced that this would give me the repeatability I was looking for. In the end I returned to my first solution of a vertical face, but instead of the moving plunger vertical face engaging with another vertical face I substituted a freely rotating horizontal roller in the fixed pin. This would ease the movement of the two locking elements during the initial retraction phase.

If time is taken to consider the lines of force acting upon this roller it will soon be realised that the high cutting force is acting along the slide, while a smaller vertical force is being applied to move the plunger out of engagement. The resulting force vector is working in a direction which very loosely approximates to a tangent acting upon the roller.

To further take advantage of this vector force the edge of the moving plunger is set to engage the horizontal roller at about 8-10 degrees above the horizontal which is very approximately the 09.50 position.

“A pile-up resulting as the threading tool hammers into a shoulder, or worse, the lathe chuck jaws...”



ABOVE: A front view of the completed self retracting attachment.

LEFT: The associated Maximat tooling showing lathe boring bars, bushes and a holder.

All photos and drawings in this feature by the author

Adjustment as regards the depth of this engagement is easily taken care of by setting the height of the fixed pin and horizontal roller in the main body. On the drawing this is shown as 1.4 mm over the top of the roller.

The moving plunger is restricted as to how far it protrudes through the slider by the L-shaped arm resting on an upstand in the slide. The moving plunger should be 0.4 mm below the working face of the slide when the plunger is at the lowest position. The combination of these two dimensions give the 1mm of engagement.

The moving plunger is operated by a polished hardened flat on the L-shaped lever working on a hardened 4mm diameter dowel contained within the moving plunger itself so once again there is just line contact with the minimum amount of friction. A short compression spring is pocketed half in the slider and half in the moving plunger, this returns the moving plunger to its home position. Ramps machined onto the fixed pin and the moving plunger allow the two parts to slide over one another during the resetting phase.

The L-shaped lever operates in a slot in the slider itself, the slot only being a fairly good fit adjacent to the moving plunger bore. The rest of the slot is widened to further reduce the contact area, this extra clearance will also provide for any 'out of squareness' of the pivot dowel where it passes through the lever.

Further should any distortion take place in the lever during the hardening of the end face where this makes contact with the 4mm diameter dowel in the moving plunger, then this additional clearance in the slot will cater for this condition as well.

In the resetting phase of the slide the underside of this lever presses on the small upstand in the base of the slot while the moving plunger is free to float over the fixed pin.

To ensure the horizontal roller is not knocked out of its seating during this return phase a small 1 mm thick D-shaped brass disc, 8.5mm in diameter, is fitted into an 8.5mm wide slot and retained by an M2 or 8BA countersunk screw. The dimension across the 'D' needs to be about 0.1mm less than the actual measured dimension. The part is not detailed on the drawing for this reason as it needs to be made to fit the job in hand, but I have included a photograph of my set-up to show the basic requirements.

Restrictive movement

The upward movement of the plunger is further restricted by a stop pin fitted inside the plunger return spring, an enlarged view on the general arrangement drawing shows this

along with the spring details.

The stop inside the spring is a necessary item as it provides a positive consistent point for the retraction to start. If the retraction point was left to the spring alone, then this would vary with the load being imposed on the slide. This in turn would be dependent on the thread pitch and thread depth being cut at any particular time and would be an unsatisfactory state of affairs. A fine pitch thread would retract sooner than a coarse pitch to put this in the simplest form.

The spring however does to a small extent assist in the retraction of the slide. Once the moving plunger is on the ramp side of the fixed pin the spring assists retraction by sliding the moving plunger down the ramp. Whilst this was not considered during the initial design stages it is something that can be clearly observed happening during the retraction cycle as the slide accelerates and then slows down again as the slide retracts. The upward motion only needs to clear the top of the fixed pin and this equates to about 0.6 mm of actual carriage travel on my particular device and it will probably vary from one device to another. This 0.6 mm has to be accounted for during the setting up of the device but more on this later.

An M4 dog point grub screw working in a slot in the main body provides a positive stop for the return of the slider to its initial position. The end face of this slot is spot faced with a slot drill in order to provide a flat face for the dog point to abut against.

The M4 screw is adjusted until there is no further detectable movement fore and aft in the slider when the trips are latched. If it is too tight the slider will not latch and lock, too loose and there is play in the system which will eat into the repeatability. In order to retain this setting it is advisable to use some thread locking compound.

Cast-iron body

For the main body I followed Jacques' lead and used a piece of cast iron, the lug on the back of the body will need to be relocated for a lathe with a different centre height. This in turn will also affect the position of the slide if the same holding arrangement is followed. If the reader has an interchangeable tooling system then the body is best made integral to accommodate this, thereby reducing overhang and additional interfaces. However most interchangeable systems involve tensioning the holder into the toolpost, and cast iron is not good in tension.

An alternative needs to be sought, if it were my choice I would opt for EN8M as this wears well with mild

"Parts turned to size and heat treated could be lightly stoned with an India Oilstone to improve the finish..."



ABOVE RIGHT: Brass retainer to stop horizontal roller from coming adrift during the resetting phase.

BELOW: Cutting an M8 thread up close to the jaws, but it could be closer if needed.

steel, and will easily take the stresses and strains imposed on an interchangeable tool holder.

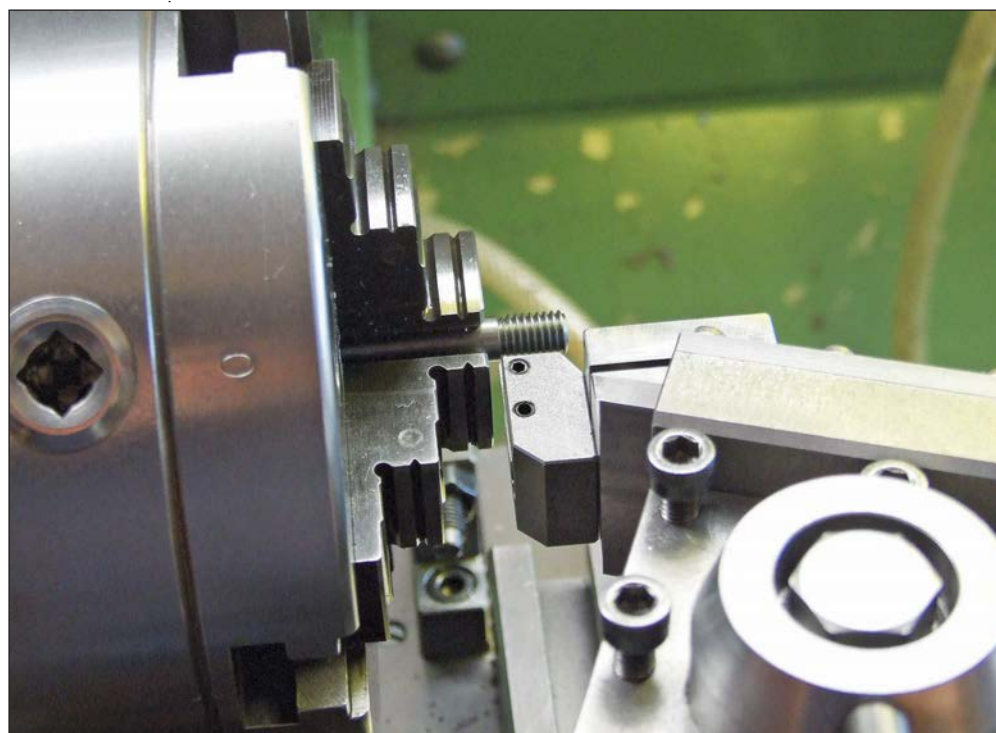
The slider was made from mild steel and I found I needed about 0.04mm clearance between this and the main body for a good sliding action. The two retaining plates were made from gauge plate or ground flat stock, which were left soft. The lower retaining plate needs a short portion removed at the front of the tool in order to clear the external threading holder when this is in position.

The moving plunger and fixed pin were turned from silver steel, the parts then being milled and finally heat treated. While I ground my parts this is not essential, as parts turned to size and heat treated could be lightly stoned with an India Oilstone to improve the finish. I would not recommend polishing with Emery

Cloth or Wet & Dry, the cut-outs in the moving plunger and the horizontal roller pocket in the fixed pin are going to make short work of either of these materials. These abrasives will also quickly round the edges of the cut-outs long before they start to polish the main diameters.

When it came to make the external threading tool holder, this was machined from a round billet of EN8M. Once the profile of the toolholder is complete a slot is machined in the rear face to locate on the 2mm dowel. The drawing gives details of how to machine the head of the holder from round stock after turning the 12mm location spigot, all the work on this part being carried out in the machine vice.

In order to machine the 2mm wide slot it was necessary to remove a certain amount of the material above



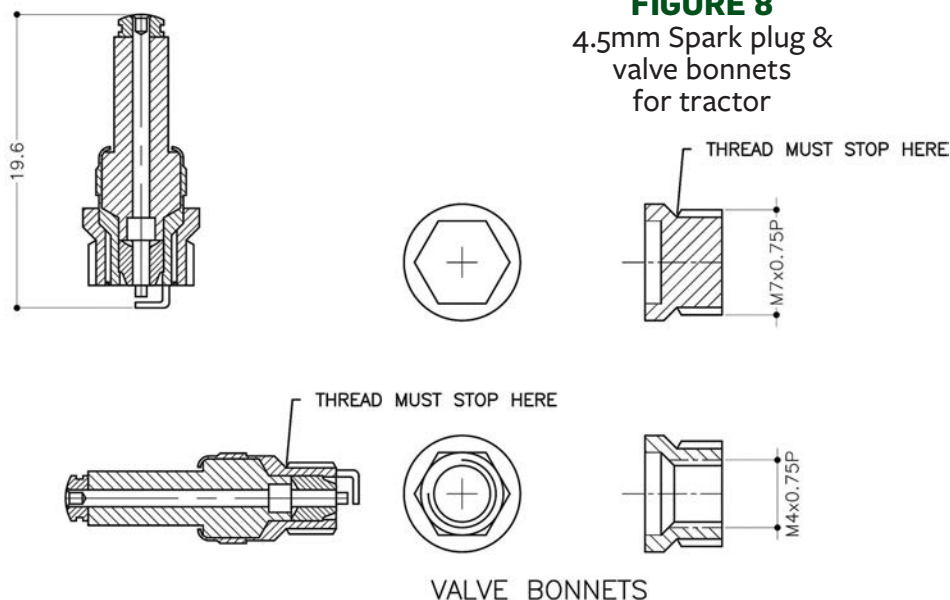


FIGURE 8
4.5mm Spark plug &
valve bonnets
for tractor

the slot with a 4mm slot drill. There is no need to make life difficult by machining a 2mm wide slot over this entire depth. This would also mean using a Long Series 2mm slot drill, an additional unnecessary expense, and this cutter would be probably of no use after machining EN8M.

While the slot could have been a 2mm drilled and reamed hole this does require some very careful machining in order to get the two parts to slide together easily. The hole is also very close to the 12mm diameter spigot, making positioning such a hole even more difficult. The slot is by far the easiest solution.

As with my retracting screwcutting tool holder the threading tool is inclined at 7 degrees to give the threading tool an inbuilt top rake and also to allow for adjustment to bring the tool to centre height. The tool slot geometry is such that the threading tool is on centre height with a nominal 6mm projection of the cutting edge

BELOW:

The items for the author's tractor that the attachment was made in order to produce.



from the threading tool holder.

When it came to attach the stop rod assembly to the bed, the original Snap-Tap design had a universal clamp to suit various shaped inverted 'Vee' bedways. As my lathe has an inverted vee I decided this was going to be my favoured method of fitting, as this still allowed the unobstructed use of the tailstock. This feature is something that might come in handy if there are several duplicate components to make as the bed clamp can remain in place.

Looking on the Super 11 Users group I found a drawing for the standard Emco fixed bed-stop that I had on my lathe. The basic design work was therefore done for me. The only work on the design I had to do was to increase the overall height to accommodate the spigot on the fixed post and the associated M8 retaining cap screw. Locating the position of the fixed post fore and aft also required a little consideration as I did not want the post to foul access to the clamping bolts, especially when it came to tightening or undoing them with a ring spanner.

I also took the opportunity to machine another bedstop for use on the lathe when I need to set a stop at the tailstock end as well as at the headstock end, so I killed two birds with one stone.

The original Snap-Tap design uses a couple of castings on top of the fixed post to mount the trip rod. I decided to machine my parts from the solid rather than to fabricate as in Jacques' design. My first choice was to use aluminium for these parts but a subsequent rummage through the scrap box provided two nice EN1A off-cuts, hence these are now made from mild steel. In my experience nine times out of ten there is little time lost in machining from solid over

fabricating and the sections can usually be better proportioned than would otherwise be possible when using stock sizes.

Two 10mm diameter Oilite bushes were added for the trip rod to slide in, here again it is an attempt to reduce the drag associated with what would have been a 10mm reamed hole 60mm long. Any stiction here could cause premature retraction of the threading tool which is something I did not want. The bushes also mean I do not have to regularly oil the parts before use as these are self lubricating.

The stops follow Jacques' originals but the stop return spring is considerably shorter than those used by Jacques or the original Snap-Tap design, but I have found that in use this spring is just about right.

Usage considerations

In use all that is required to remember is that the finishing point of the tool is going to be in theory 0.5mm 'further on' due to the latching mechanism. In actual fact my own unit is more like 0.6mm, so to err on the side of caution I set the trip stop at 0.8mm short of the required dimension.

Whilst I have found the device will work fine with the top-slide parallel to the lathe centre-line, the loading on the mechanism is far less when the top-slide is turned to approximately half the thread angle and the tool is cutting on the leading edge only. There is also an improvement where the thread finishes as it is much neater with the top-slide set to half the thread angle.

I have also found, however, that with the larger pitches above 1.5mm that there is less strain on the mechanism if the tool is plunged in at the finishing point to thread depth. Doing this produces a much neater finish to the thread than when the attachment is left to work this out for itself. This type of thread ending is exactly the same as that produced when screwcutting on a Hardinge HLV lathe, which is considered by many to be the Rolls-Royce of screw cutting perfection.

I have included a photograph of the completed valve bonnets, M7x1 P thread and the 4.5 mm Spark plugs for the Fiat Tractor. This attachment worked faultlessly throughout. **EIM**

■ You can access the Jacques Maurel articles, and a lot more, by subscribing to our digital archive – www.world-of-railways.co.uk/store/digital-archive/engineering-in-miniature

Printed copies of the September and October 2014 issues are available from www.teepublishing.co.uk/eim/about-back-issues

Bolton Steam Museum

Last month Mark began a ‘virtual day out’ recalling a visit to a collection of stationary engines at a former textile mill. Now he concludes his tour with some more fascinating exhibits.

BY MARK SMITHERS

PHOTO 21: The ‘Uniflow’ engine, in which the steam admitted at each end of the cylinder always moves in one exhaust direction towards exit ports in the centre of the cylinder, is best represented in the Bolton museum’s collection by this 1926 single-cylinder (13½ x 16-inch) Robey product. The working of the engine, which is designed to run at high speed, is accomplished by having steam inlet valves (in this case of similar pattern to those on the 1935 Robey Cross Compound) arranged to open and close within a short interval allied to a long cylinder (bored very slightly larger in the middle than at each end to cope with differential expansion) and a long piston which covers and uncovers the exhaust ports at the correct moment.

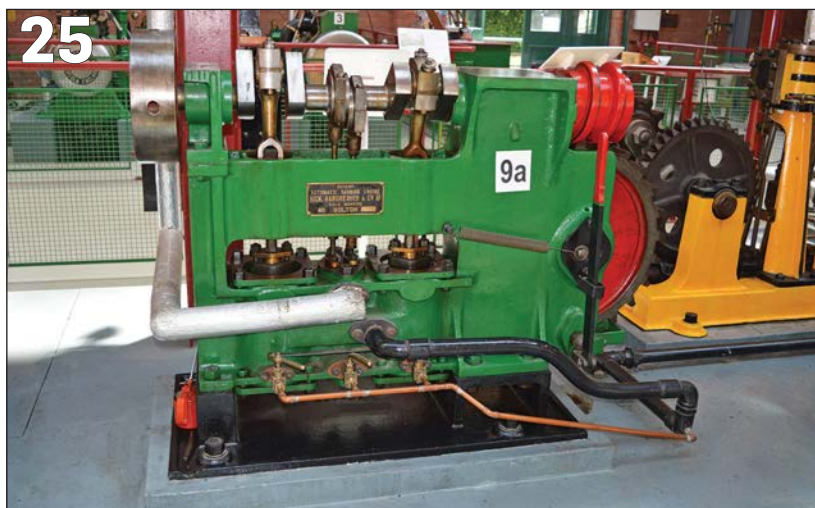
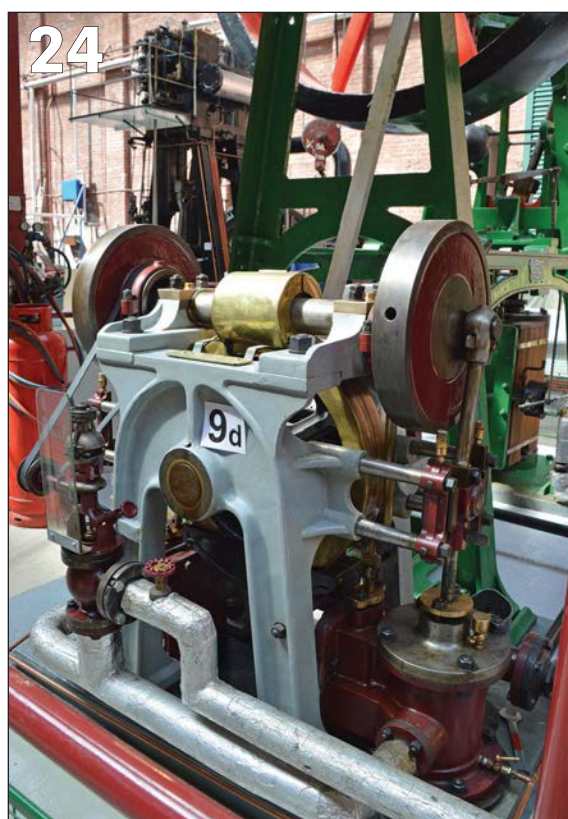
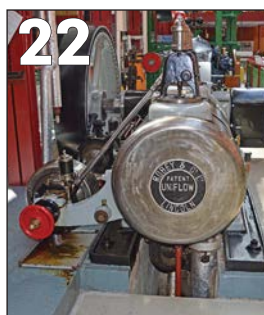
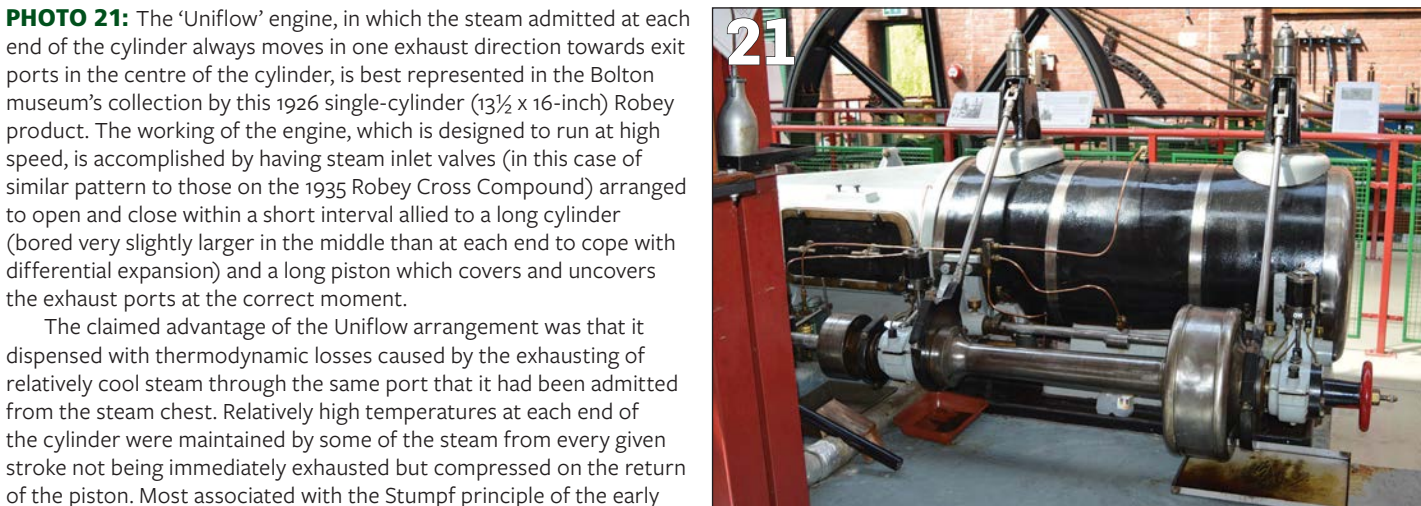
The claimed advantage of the Uniflow arrangement was that it dispensed with thermodynamic losses caused by the exhausting of relatively cool steam through the same port that it had been admitted from the steam chest. Relatively high temperatures at each end of the cylinder were maintained by some of the steam from every given stroke not being immediately exhausted but compressed on the return of the piston. Most associated with the Stumpf principle of the early 20th century, a Uniflow engine was patented as early as 1885 and used (rather impracticably) on an 18-inch gauge railway locomotive built by Beyer Peacock & Co. Ltd. This view shows the cylinder and steam inlet drop valves of the 1926 Robey Engine.

PHOTO 22: Head-on view of the Robey engine showing the leading cylinder end cover. The engine’s location makes it rather difficult to photograph satisfactorily.

PHOTO 23: The 1926 Robey’s trailing cylinder cover is cast integrally with the ‘trunk’ pattern crosshead guides.

PHOTO 24: In order to move the flywheel/crankshaft assembly of a large stationary engine off ‘dead centre’ for starting or maintenance purposes (assuming the engine was not of the multi-cylinder ‘simple’ variety), small starting or ‘barring’ engines were often employed. Once their purpose had been achieved in action, their drive mechanism would disengage from the main engine, which would then continue in motion on its own account if required. The museum has a representative selection of barring engines and this example is an 1888-vintage John Musgrave two-cylinder simple specimen used to bar the flywheel of the 1700hp engine (built by the same maker) at Bolton’s Atlas No. 6 Mill. Sadly, this latter engine was scrapped in 1964, but the Barring Engine was donated to the Society (after a period in store) in 2007.

PHOTO 25: Another two-cylinder simple barring engine specimen on display is this Hick Hargreaves example, built to the maker’s patent of 1885.





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PHOTO 26: The Uniflow principle was applied to a relatively small number of barring engines and the museum is fortunate to have this John Musgrave example, from East Lancashire Paper Mill Ltd, Radcliffe, in its collection. During its working life, it barred a 2000hp Uniflo' engine.

PHOTO 27: This single-cylinder A-Frame Engine was built by Thomas Crook of Stanley Ironworks, Bolton for the maker's own use in a joinery shop. Of relatively simple design (note the belt-driven governor, non-reversing valve motion and the arrangement of piston rod guide), it passed to the museum on loan in 2013 after three years in storage.

PHOTO 28: This single-cylinder (12 x 24-inch) A-Frame Engine, built by Joseph Barraclough of Barnsley in around 1860, came into the Society's ownership as early as 1969. Note the classic vertical cylinder arrangement, with slide bars secured to the A-frame and circular-section connecting rod.



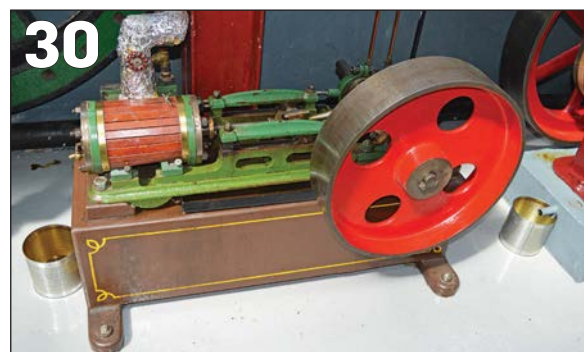
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PHOTO 29: A close-up view of the Barraclough engine's cylinder. Originally a supplementary Meyer valve was fitted to the slide valve (to improve efficiency of working) but this has long since been removed, whilst the current flywheel is a replacement for the larger original, lost in an accident.

PHOTO 30: This single-cylinder portable engine, little bigger than many model engineering projects, was used for maintenance work on larger engines (such as cylinder re-boring) and is the smallest engine in the museum's collection. It sits on a cast-iron bed and has a slip-eccentric arrangement for reversing purposes. Note the design of crosshead employed, guided in the horizontal rather than vertical plane.

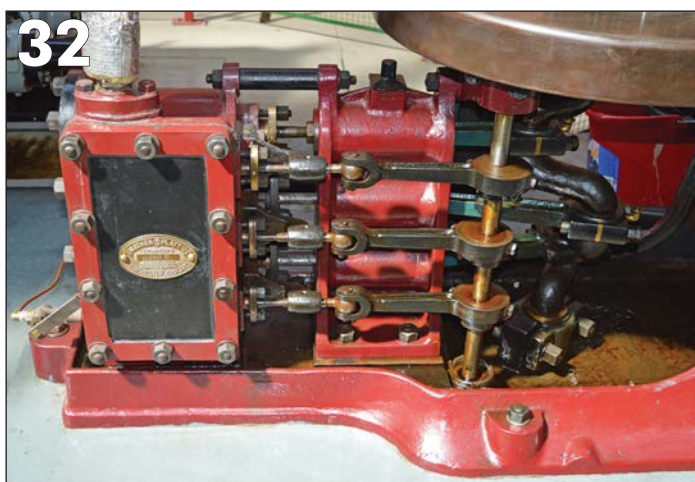


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PHOTO 31, 32: One of the more specialised exhibits in the museum's Collection is this three-cylinder (4 x 6-inch) simple 'Stenter' engine constructed by Mather & Platt Ltd. During the 1920s. This was used in the finishing process for dyed cloth, in which the wet cloth was dried and stretched to straighten its fibres after the dyeing process. This example came to the museum from Brightmet bleach works via the late Fred Dibnah.



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PHOTO 33: Highly representative of the type of engine employed in the mills of Lancashire is the 1902-vintage two-cylinder (13 and 24 x 36-inch) Tandem Compound Engine 'Elsie' built by J W McNaught Ltd. of Rochdale. This engine began its working career with the Barchant Spinning Company, moving to Wasp Mill, Wardle, near Rochdale in 1917 where it remained in use until acquired by the Society half a century later. In this overhead view, the 12-foot diameter 8-ton flywheel can be seen to advantage, along with the common piston rod for both cylinders and the Corliss valve gear associated with the high-pressure (leading) cylinder.



PHOTO 34: A close-up view of Elsie's semi-rotary Corliss valve gear. A shaft connection (centre left in the picture) to the governor facilitates control of the valve events for the inlet of steam to the high-pressure cylinder.



PHOTO 35: This view shows the low pressure crosshead, the rear cylinder cover and steam chest of Elsie.



PHOTO 36: The largest exhibit in the museum is this beam engine of unknown make, believed to date from around 1870 and of single-cylinder design (albeit operating in 'compound' mode in tandem with another engine by 1888, and also connected to a waterwheel). It has been much altered over the years: in 1909 a second (high-pressure) cylinder was added by Woodhouse and Mitchell of Brighouse adjacent to the crankshaft and built on the principles of J W McNaught Ltd. It required a new beam and flywheel alterations, whilst further updates six years later included adding a new crankshaft; an 18-foot 30-ton flywheel and a James Lumb-pattern governor for the Corliss valve gear mounted on the high-pressure cylinder.



PHOTO 37: This view shows the current cylinder arrangement, including Corliss valves for the 20 x 36-inch high-pressure cylinder and a slide valve for the original 28 x 72-inch low-pressure one. The modified cylinder arrangement has given the engine its current nickname of the 'McNaughted Beam Engine'.

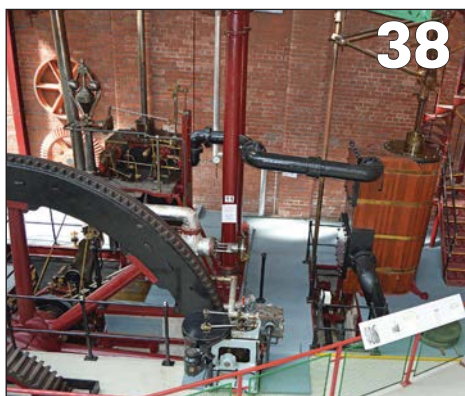


PHOTO 38: Close-up of the original low pressure cylinder.



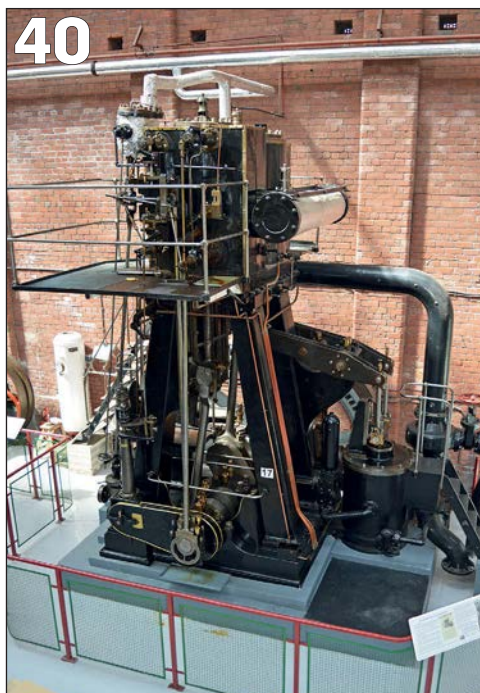


PHOTO 39: This two-cylinder (14 and 30 x 30-inch) Inverted Compound Engine is believed to be a product of Scott & Hodgson Ltd. of Guide Bridge, Greater Manchester, circa 1915 and was built for Hardman and Ingham Ltd's Diamond Ropeworks of Royton, where it remained in situ until 1994. It was rescued in damaged condition from a scrapyard for £5000 with the aid of a Science Museum PRISM Grant. This view shows the high-pressure side of the engine – the Corliss valves associated with the high-pressure cylinder are clearly visible. Restoration work, completed by December 1996, included 'metal stitching' the cast access platform above the main pillars (which had been broken into four pieces) and straightening one of the eccentric rods.

PHOTO 40: This view shows the receiver located between the steam chests of the high-pressure and (piston valve-fitted) low-pressure cylinders. Also visible is the water pump for the condenser.



PHOTO 41, 42: Another unusual exhibit in the Bolton collection is this single-cylinder (17 x 30-inch) water-pump engine, built By Samuel Walker & Sons Ltd of Eagle Ironworks, Radcliffe and used to feed the sprinkler header tank from the water main at Fern cotton spinning mill in Shaw, Oldham. The left-hand view shows the twin-flywheel arrangement, each linked by its own connecting rod to a common crosshead for the engine and the pump, which is equipped with a 9-inch piston. Note also the pump's air chamber (an early piece of fire pump technology), used to smooth out the flow of water from the pump into the header tank. The close-up at right highlights the common engine/pump crosshead.

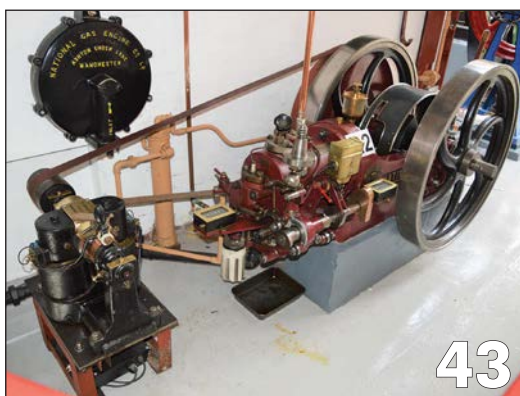


PHOTO 43: Internal combustion power made an appearance in Lancashire's mills before electricity became the main power source for the manufacturing processes. Gas engines were used on occasions during this period, though the example on display in the museum's collection (and coupled to a dynamo made by Henry Royce of Manchester prior to the formation of the famous car manufacturer) was made by the National Gas & Oil Engine Co Ltd for educational purposes and supplied to Harris College, Preston.



PHOTO 45: A small number of oil engines were used as a power source in the textile industry, but the typical single-cylinder format, coupled with the four-stroke cycle, produced a very uneven power output, requiring a large heavy flywheel to 'smooth out' the transmission to keep the looms working at a uniform speed. This example, also from the National Gas & Oil Engine Co Ltd, was built in 1926.



PHOTO 44: High-speed inverted compound engines were often used for electricity generation and this one, with 7 and 11 x 6-inch cylinders, was built in 1900 by Browett Lindley Ltd of Sandon Works, Patricroft for Thomas Nuttall and Sons Ltd. It was designed to run at 560rpm and is fitted with an enclosed crank-case and high-pressure lubrication system. It is displayed coupled to a 110V 250A DC dynamo made by J H Holmes of Newcastle-upon-Tyne.

■ For Bolton Steam Museum opening and steaming times go to www.nmes.org

Black Knight rides again

Edward and his fellow Rugby ME members continue their major improvement of a Romulus locomotive after replacing the boiler.

BY EDWARD PARROTT Part Two of Three



Once the boiler bottom was attended to, it was time to turn to the front end of our Romulus, and cover the mounting of the boiler to the frames. Here I did take my eye off the ball and almost made a costly error, but as luck would have it we managed to make it work.

What I forgot about was the change from saturated to superheated steam, and the need to fit in headers and manifolds that weren't there before. What I should have done is push the front tubeplate further back and employ a longer smokebox, but I completely missed the issue and the tubeplate went in where the old one was. A great example of using this as a practice run – I have subsequently remembered to make this change to my own boiler!

Superheaters

The superheaters combine the input of Steam Technology of Cranbrook, which built our new boiler, and in-house manufacture, done to save money but also because I needed to make sure they fitted in the very cramped space, and I felt it was easier to have that under my own control. I'm very grateful to Ryan at Steam Technology for being okay with this, it would be very easy for him to say no to not doing the whole job.

The design isn't my best, but it comes from working in the very cramped space. We use a five-bolt flange on the boiler front (Photo 8) to which the wet header attaches, and the main steam pipe screws into the water side of this. By doing it this way we're never going to be in the historical situation of trying to unscrew two pipe ends of the same thread a

"I forgot about the change from saturated to superheated steam, and the need to fit in headers and manifolds that weren't there before..."

PHOTO 8: Five-bolt flange on the boiler front provides superheater attachment.

PHOTO 9: Main steam pipe fitting made robust to avoid any twisting.

PHOTO 10: Connection between elements and wet header provided by elbows machined from the solid.

All photos by the author



distance apart, which haven't moved for 20 years and aren't about to start moving for anyone now thank you very much!

The main steam pipe is 15mm copper and soldered into a bronze fitting with a hexagon (Photo 9), so the tube won't be subjected to any twisting either. Sealing to the boiler is achieved by a pair of silicone O-rings in the boiler bush.

Two elements are used and these are fully radiant. They do go all the way to the firebox doorplate, and are fully exposed to the fire for a good length, this is essential for proper superheating. One leg of each is connected to the wet header as it leaves the boiler via a 90-degree elbow

which I machined from solid stainless (Photo 10). I would have liked a proper swept bend but the lack of room put an end to that.

The hot leg is then fed to a tubular manifold by more elbows (Photo 11) connecting both elements together to ensure even pressure is distributed to the cylinders, and from here a pair of four-bolt flanges connect to the feeds for the cylinders (Photo 12). These also make use of an O-ring to seal the joint. All the parts are made from 316 stainless steel, the elements and hot header being made from tube, and all other parts made from solid bar stock.

The connection from the hot header out to the smokebox sides was made to be easily removable (Photo



10



13). It connects to the four-bolt flange on the head with four M4 caphead screws, and traps an O-ring in a groove giving just the right compression to seal. A standard 15mm copper elbow is directly on the back of this flange, and a short stub of 15mm copper pipe feeds away from this.

To connect to the smokebox pass-through tube, an ordinary 15mm adapter is used, with a compression ring, so it all comes apart without a struggle. In hindsight I could have machined the details for the top compression directly into the steel stub instead of using a separate fitting, I'm not really sure why I went the way I did!

PHOTO 11:

More elbows to feed hot leg to tubular manifold.

PHOTO 12:

Four-bolt flanges provide connections to cylinder feeds.

PHOTO 13:

Hot header connection made easily removable.

13



11



Regulator to be proud of

The regulator is I think one of my best achievements. The original steel boiler was very crude, and had a steel half-pipe clamp welded to the inside of the dome opening. This clamped around the pipe dropping down from the valve, and held everything in place. It was effective, but it wasn't pretty, and could be improved on.

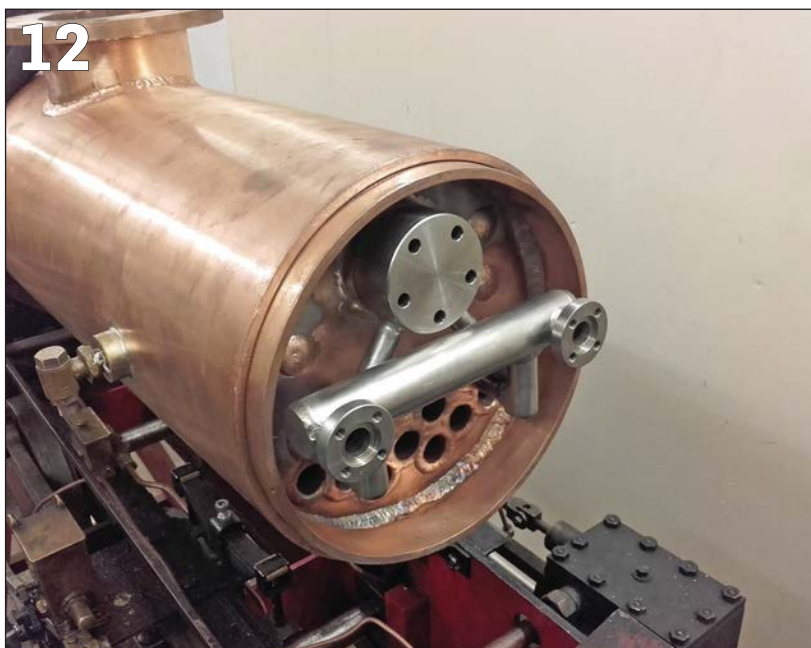
The valve itself is the typical 90-degree ball valve which finds a home in so many models these days. The already fitted valve was $\frac{3}{8}$ -inch BSP (*British Standard Pipe*) and we retained it for service in the new boiler. It was fitted to some thick-wall pipe that took some removing, and at the bottom had a 90-degree elbow that looked like it had been made out of an Enots valve body. This had a spigot on the back to support the regulator rod, and the main steam pipe was screwed into the front, and it point blank refused to come out at both this end

and the front tubeplate... A $\frac{1}{2}$ -inch angle grinder dealt with that!

We retained the elbow after machining out the pipe remains, and made a new stainless steel fitting to connect it and the valve (**Photo 14**), and I made the fitting such that the whole assembly could be locked around a bronze sandwich plate inserted into the dome joint. This plate is made such that it is bolted to the boiler separately to the actual dome, and then the bolts for that pass through as well. This means that if maintenance is required at some point in the future, the dome can be removed and the regulator worked on without it flapping around on the pipework (**Photo 15**).

Incidentally, on the photograph, ignore what appears to be the two-bolt flange under the bottom elbow, it's only now that I come to write this article that I realise it is there and looks like a part of it. It's actually a

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Land Rover door striker that I grabbed to hold the assembly upright for taking a quick snap, but I'm not taking the regulator out of the boiler for a new picture!

The valve is operated by all the original cranks and connecting arm as the overall height and position hasn't changed, so there wasn't any need to make anything new. This engine only has a single connecting rod, rather than the twins usually seen (but not exclusively) on a Stroudley-type regulator.

The final item to deal with on the regulator assembly was connecting to the main steam pipe at the bottom. Continuing the theme of being able to easily dismantle in the future should the need arise, screw threads were again ruled out. We've used a bronze slug silver soldered to the other end of the main steam pipe, machined in grooves (Photo 16), and used a pair of silicone O-rings to provide a seal. The bottom elbow had a piece of bronze

silver soldered to its outlet side, which I then bored out to suit the O-rings.

With the superheaters and regulator wrapped up, they could be fitted to the boiler once and for all. The superheaters and regulator were all sealed to each other with silicone O-rings as I said, while the sandwich plate holding the regulator was bolted down to the dome using an ordinary Klingersil gasket, suitably greased. The joint strip between boiler and smokebox had already been drilled, so that was then assembled and sealed up with Loctite 5990, which is a high-temperature copper silicone liquid gasket.

Next month

Edward concludes the rebuild, finishing the smokebox and dealing with all the plumbing.

■ To obtain a copy of part 1 of this series see the back-number ordering details on page 17.

PHOTO 14:

The regulator valve required a new fitting in stainless steel.

PHOTO 15:

Plate allows easy work on regulator with dome cover off – ignore the Land Rover part it's resting on!

PHOTO 16:

Main steam pipe connection was also designed for easy dismantling should this be needed in the future.



TIPS FOR MODEL ENGINEERS

Measuring by the numbers

BY DAVID CONEY

Here is a quick method I use to measure the size of small-diameter holes in metal. I merely employ a set of number drills, which are tested in the hole to be measured, to find the biggest that will enter the hole.

Use the shank and not the cutting part of the drill bit, and check that there are no burrs on said shank. I find the drill that most closely fits the hole, and then I measure/check the shank of the drill with a micrometer.

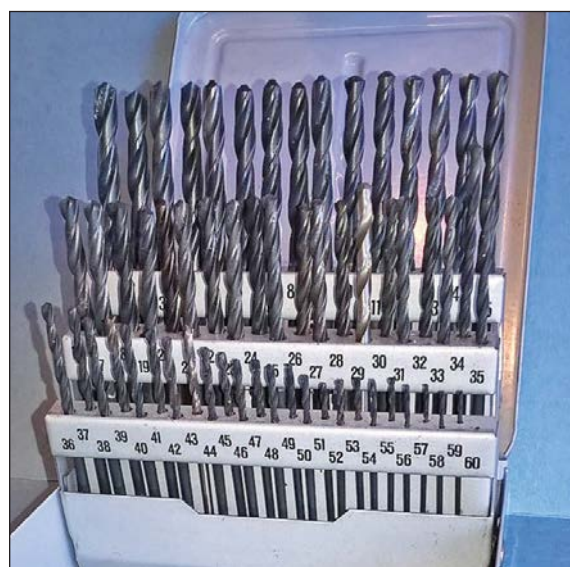
This works well for the very small diameters, where the number drills increment by up to a thou at a time, but it is less accurate for the bigger sizes where the increment between drills is greater.

Number drill sizes range from 1 (0.2280-inch) to 80 (0.0135-inch). As mentioned the smallest drills, between number 57 and number 80, increment in diameter approximately a thou at a time, so in that range the method is a pretty useful and quick way of finding small hole diameters.

Below number 57 the increment begins to be too large for the method to be accurate enough for most tasks, though of course it depends on what accuracy you need to work to.

Photo: Simon Mayor

■ Have you come up with a clever tip or dodge that might be of use to your fellow model engineers? If so please send in your suggestion to andrewcharman@warnersgroup.co.uk



Issue of uneven lubrication

Mike discovers, analyses and solves a challenging problem on his loco.

BY MIKE BODDY

The question I am posing this month is, does your lubricator lubricate both pistons correctly?

Recently I had to adjust the timing on my Maisie (a Great Northern Atlantic 4-4-2 originally designed by LBSC – Ed) and found one piston O-ring was damaged or worn badly. I replaced both O-rings adjusted the timing, primed the lubricator and ran the engine on air.

The first thing I checked was ‘is there oil coming out of the blast nozzle?’ After a few cycles the oil started to appear. I ran the engine for approximately 10 minutes watching the blast nozzle for oil and then opened the drain cocks. This was when I noticed there was no oil coming from the drain cocks on the left side – the same side on which the O-ring had worn badly. I kept the loco running for another 10 minutes but still there was no oil from the drain cocks on the left side.

The lubricator is mounted at the front of the engine behind the buffer beam. The oil pipe from the lubricator is connected through a check valve to the steam pipe T-junction going to

“I kept the loco running for another 10 minutes but still there was no oil from the drain cocks on the left side...”

All diagrams supplied by the author

both steam chests as per LBSC’s original design (Figure 1).

The reach rod for the lubricator ratchet lever is driven from the valve rod on one cylinder again as per LBSC’s design.

Looking at the design I came to the conclusion that when the lubricator pumps out one drop of oil and at the same time a valve opens to let steam into the cylinder, that drop of oil is vaporized and fed into that cylinder leaving virtually nothing for the other side. If this cycle repeats for the next drop of oil again it leaves no oil for the other side.

I know this sounds a bit far-fetched but how can you explain that on the right side of my engine there was plenty of oil coming from the drain cocks, but the left side was completely dry?

I discussed this with a fellow member of my local club, and he agreed that it is possible, when a mechanical lubricator cycle is in sync with the piston valve cycle it could feed the oil to one side only. To overcome this, the lubricator needs to be out of sync with the piston valve.

There are several types of mechanical lubricator actuators, such as ratchet and pawl, sprag clutch, rocker arm, sooty spring clutch and others. Some of these when pumping expel one drop of oil per step, but others will expel one drop per two steps or more.

The sooty seems to expel one full drop per step thus synchronised with the timing of the piston being transferred to one cylinder only. It sounds implausible but it can be proven on my Maisie engine.

Also there are several different ways of connecting the oil feed into the steam chest, as per the LBSC design shown here, or connected further up the steam pipe before it gets to the T-junction, or two separate connections attached to the steam pipes as they go into the steam chests. But you need to check that the oil is in fact feeding to both pistons.

Various solutions

After further discussion with my colleague, he suggested I change the stroke length of the lubricator pump to make it out of phase with the piston stroke. This can be done by simply moving the ratchet arm pivot point lower down. I tried this and it did improve the oil feed to the other side, but I felt this was only a temporary fix.

Discussing this with another friend who built a Maisie several years ago as per LBSC’s design, he had also noticed this problem. To overcome it, he modified the nipple by first blocking off the top of it and then drilling a hole across the end in line with the steam pipes, as shown in the drawing (Figure 2). This would then pump the oil out both sides into the steam lines.

I carried out a few tests with this and yes it made a difference, but the oil to the cylinders still wasn’t even. As the lubricator can pump the oil at high pressure, possibly two to three hundred psi, I reduced the hole across the end to a number 70 drill and noticed the oil was feeding to both sides more evenly.

As for other oil connection methods – as shown in Figure 3, I suggest the lubricator fittings that are attached to the steam chests are also drilled with a number 70 drill, this should then ensure that the oil is pumped into the steam chest under pressure producing a better and more

FIGURE 1

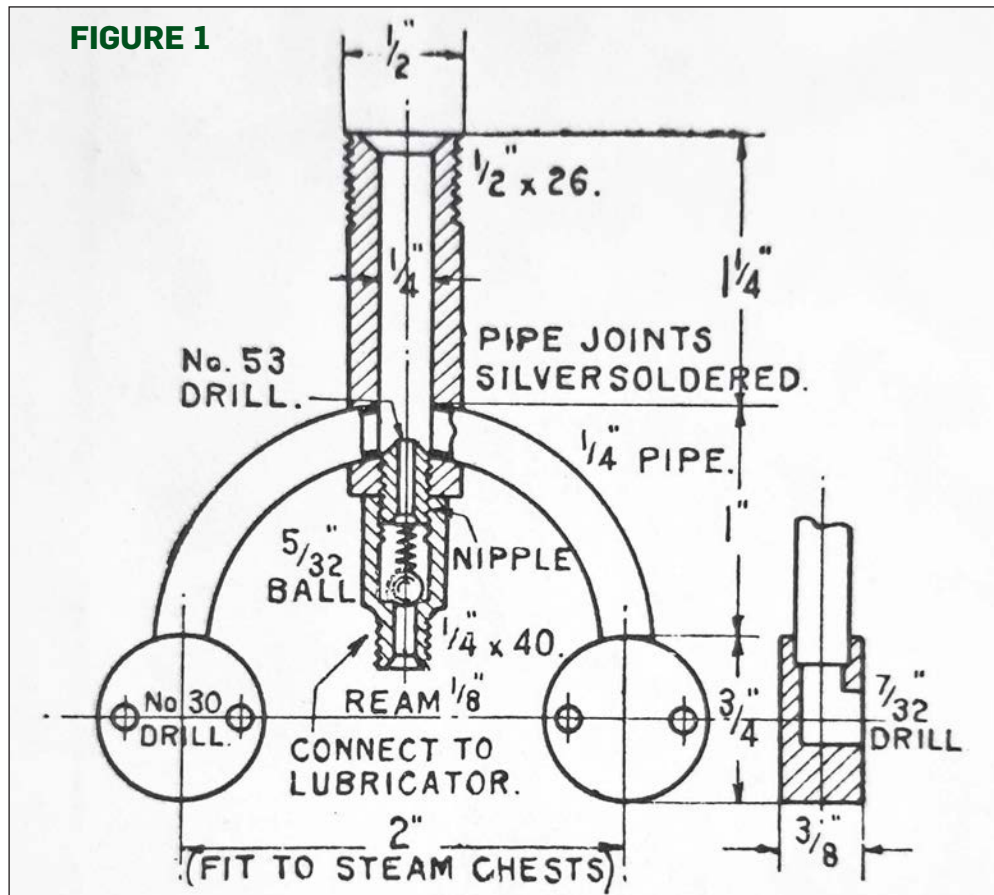
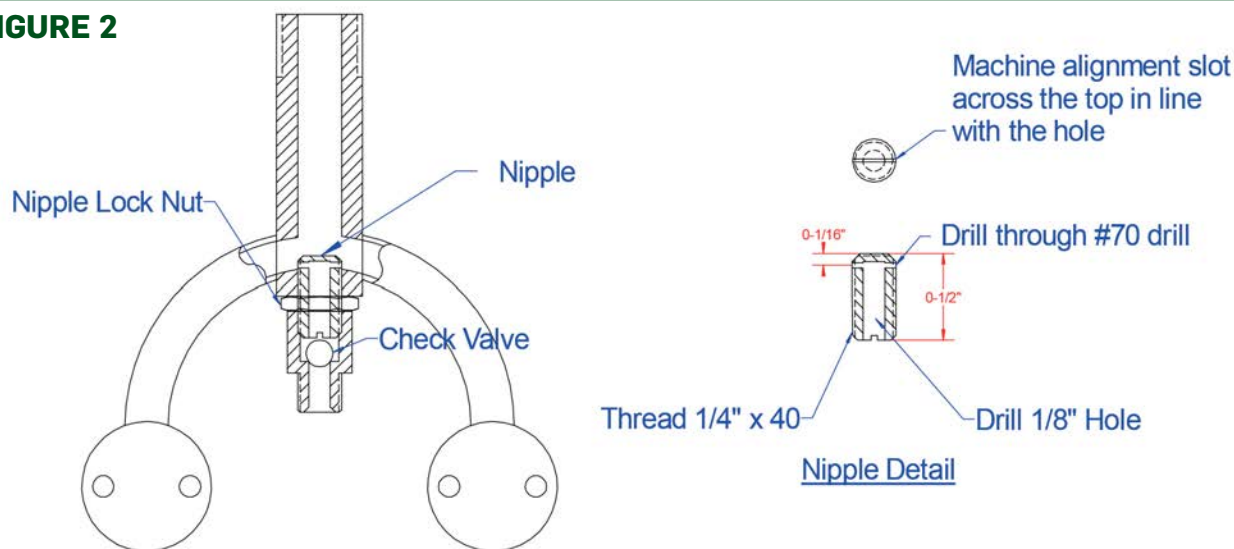


FIGURE 2



even distribution to the cylinders.

Another method is to add check valves to each of the oil lines before they go to the steam chest, but space would be limited.

What is important is keep the two

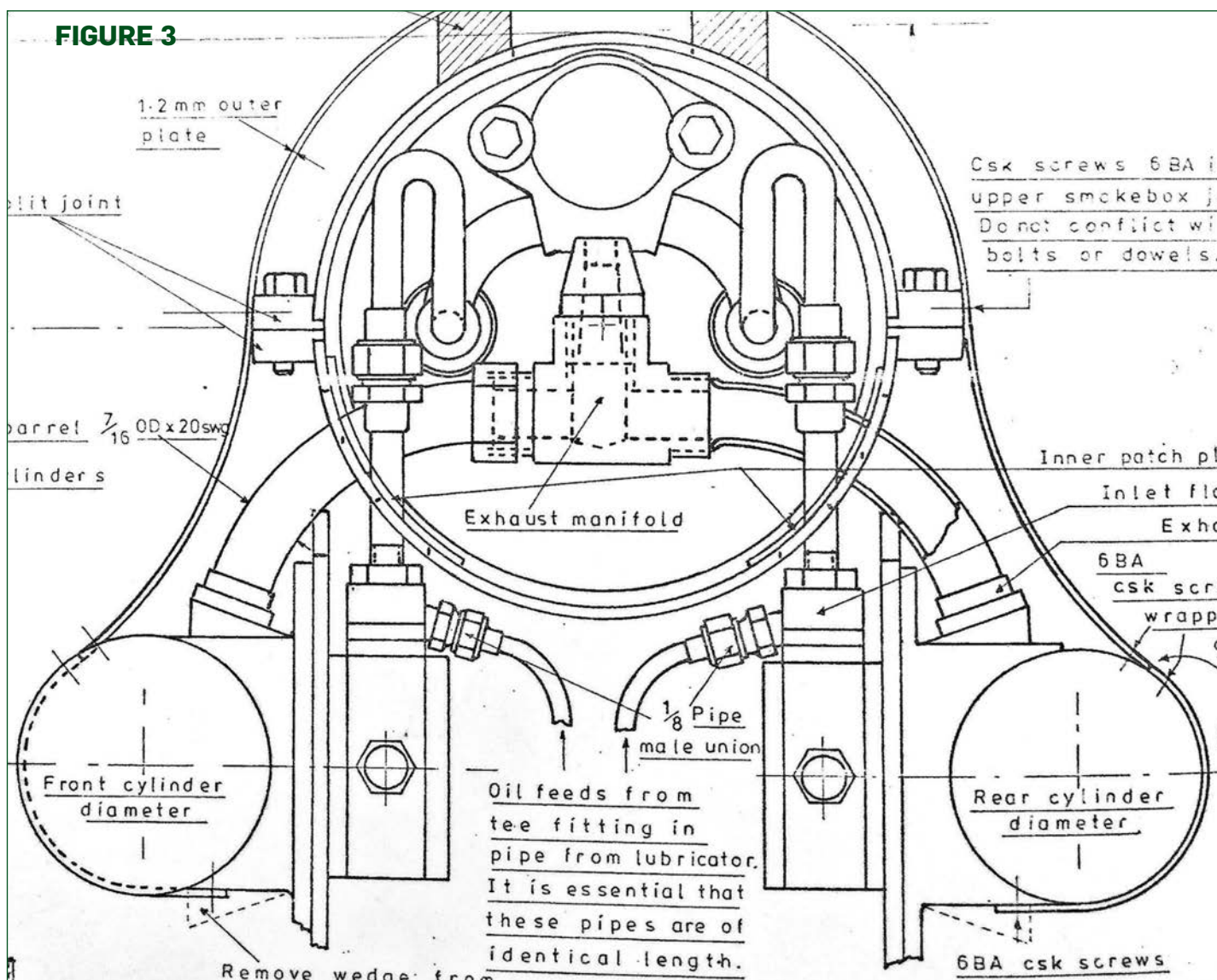
oil lines the same length from the lubricator, as the oil will take the line of least resistance and cause uneven distribution to the steam chests.

Remember the only way you can see if the oil is being distributed

evenly is by running the engine on air and monitoring the oil coming out of the drain cocks.

Any comments on my thoughts would be appreciated, via the editor who will forward to me. **EIM**

FIGURE 3



Have you come up with a solution to a perplexing problem on our locomotive? Why not write it up for the benefit of your fellow model engineers? Send to the address on page 3.

Don Ashton – an appreciation

Gerry provides a tribute to Don Ashton, one of model engineering's unsung greats and a contributor to **EIM** over the years with his intimate knowledge of locomotive motion. Don passed away on 12th April, the day before his 81st birthday.

BY GERRY CLARKE

After leaving school Don had various jobs which included wagon driving, working part-time at a garage, a trainee on the Manchester Ship Canal tugs, repairing musical instruments for the band he played in, teaching at Urmston Grammar School and finally working with his younger brother for their own company Woodwind.

Working in the garage was a part-time job but Don would recall many funny things about the day to day activities. He told the story of the antifreeze available on the forecourt for 2/3d, 2/6d or 2/9d and how the car owners would react, most going for the price of 2/6d, the odd proud Jag owner requesting the 2/9d, and the Ford Pop owner selecting the 2/3d. Don would take the tundish to the rear of the garage and fill it using the stirrup pump from the one and only tank and return to the car, put it into the radiator and the satisfied customer would then drive away happy and oblivious to the garage owner's Del Boy activities. Don had so many stories to tell of life at the garage – too numerous to mention here.

As a young man, Don admitted feeling the part when driving his wagons. It was at a time that, according to Don, lorries were interesting. Foden and Commer had two-stroke diesel engines and Ford introduced the Thames Trader. He took his job seriously but he had many funny stories from his days as a trucker especially when working with

the tipping wagons. Don reckoned he had gained a lot of life experience working as a truck driver, which stood him in good stead later in life.

Don's favourite job from his early years was working on the tugs at a time when the ship canal was very important to the prosperity of Manchester, transporting goods to and from the heart of the city to all parts of the globe. The job, at times, required fast actions, good teamwork and an acute understanding of how to manoeuvre large ships in windy conditions in such confined spaces, Don soon picked up what was required and became a very proficient crew member.

The tugs would work the 36-mile route between Salford Docks and Liverpool negotiating five sets of locks. Various cargos were exported including the output from Vulcan Foundry and Beyer Peacock which were loaded in Manchester. Bulk grain and fuel were imported but not always delivered into Manchester, sometimes the cargo would be offloaded at wharfs along the canal, the tugs being required to work together helping berth some of the larger grain carriers. Don loved the complex manoeuvres that were required, he never lost any enthusiasm and looked back on his work with great affection.

Don loved music, his genre in his teens was the big band sound. After learning to play the saxophone he eventually played in the Norman Clair Band. Norman realised Don had an



ABOVE: A picture of Don taken in the Park in Ormskirk in January 2016.

LEFT: The Manchester Locomotive Company in 1977. From left to right Alan Green, Philip Kennerley, Gerry Clarke and Don. The picture marks the completion of four modified 'Bridgets' before their delivery to Steam Age.

Both photos courtesy Gerry Clarke

understanding of the workings of the instruments and got him to service and repair those belonging to the band members for a small sum. Don gained experience which would prove to be invaluable later in life.

The next phase of Don's life took him to the teacher training college at Coopers Hill in Surrey, where he learnt to teach craft skills, engineering drawing and metalwork. He had spent little time on the Southern Region other than on Manchester Locomotive Society trips, so in his spare time he visited many places to watch the trains. He particularly liked Bullied locos, especially the mighty Q1.

Don later secured a teaching post at Urmston Grammar School, where he wrote a textbook for the education authority to be used as part of the course curriculum explaining rudimentary basic principles of engineering drawing. He enjoyed his time at the school but eventually left to set up Woodwind, a musical instrument repair business, with his brother Eddie. Don remained at Woodwind, based in Cadishead, for the rest of his working life.

Don and steam locos

Early in life, Don had a fascination with steam locomotives. He loved the syncopated exhaust beat and, before they came into view, could distinguish between two or three-cylinder locos. He developed a thirst for knowledge of how these machines worked and soon realised that the valve gear would



explain a large part of their mechanical function.

As time passed his interest in valve gears became a sort of quest as he found inconsistency and lack of clarity in much of the writings on the subject. Whilst working as a teacher Don spent his nights helping Syd Roland, a friend and fellow model engineer who had started a business manufacturing miniature locomotives. Don would outline his ideas on paper for Syd to reproduce in metal. The information proved sufficient for Syd to produce a really good working engine.

Between them, they produced some fine working models starting with an LSWR class N15, then two Caledonian Railway Pickersgill 72 class Callie bogies, two Robinson class D10 'Director' locos, two LMS Stanier Moguls, a GWR Saint, a BR Britannia and many more, all in 5-inch gauge.

Most of these models were commissions for Steam Age in London and working with Syd gave Don an insight to how his ideas worked out in practice. He also became a lot more involved in the manufacturing of the locos. There was much interest in the night-time activities at No 6 Primrose Avenue and before long a merry band of helpers joined in, myself included.

During this time Don had been appointed chairman of the local Urmston & District Model Engineering Society, at a time when the Northern Association experienced difficulties, the upshot of which was for the member societies to each take a three-year turn to run NAME affairs.

During the Urmston term Peter Tomlinson, D Ashton, I R Law and A Throp, formed the NAME sub-committee that in February 1972 issued the first definitive memorandum entitled 'Code of Practice to Ensure the Safe Working of Steam Boilers'. This document has been updated over the years in the light of new legislation and is now universally accepted and forms the basis of NAME insurance policies.

Don spent a lot of time with Alan Green, a fellow member of U&DMES, who was a draughtsman at Metropolitan Vickers. Between them, they produced drawings and patterns for a 5inch gauge Stanier Mogul from Don's original sketches.

During the 1960s there was an affinity between the Sussex Miniature Locomotive Society and U&DMES, visits took place between the two clubs which enabled Don to meet some influential people within the realms of model engineering: K N Harris, Bill Carter, Les Clarke, Edgar Westbury, Jim Ewins and Alan Gettings.

Don had spent time over the years talking to Jim Ewins, finding the

topics very enlightening. He admired the work of Bill Carter and Les Clarke and struck up a long-term friendship with Alan Gettings. Alan at that time worked for Hawker Siddeley Aviation which was developing the Harrier VTOL (Vertical Take-Off & Landing) aircraft.

Soon after its completion, Alan retired and spent a considerable time corresponding with Don from his home in Musbury, Devon; he was a great help in verifying the mathematics used in valve gear design. Don also spent much time in correspondence with H S Gowan (ex Canadian National Railways) E S Cox (ex British Railways Design) Jim Ewins, Professor Bill Hall (Manchester University) Dr Ted Gowan (Bangor University) and F M Burrows. This correspondence was in pursuit of verifying the inaccuracy in valve gear information.

Into publishing

Eventually, Don was persuaded to arrange his notes and sketches into a formal script and to then publish a couple of books. He approached Dave Roberts, a member of the U&DMES, who agreed to print the two books, *Walschaerts Valve Gear for Model Engineers* and *Stephenson's Valve Gear for Model Engineers*. The first copies were published in December 1976.

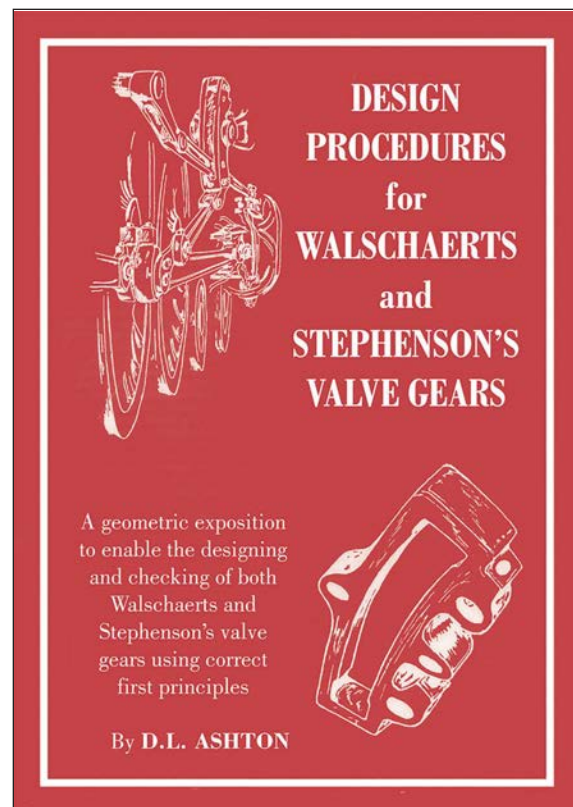
Don kept these copies at home and distributed them as and when required. For many people, the books became the definitive works for understanding the two valve gears.

In 1976 Don formed the Manchester Locomotive Company with three friends and over the next three years, they produced several locos. As all members of the group were in full employment the affairs were conducted on a part-time basis.

During this time Don continued his constant probing for information relating to valve gears, and often visited Widnes Library where some institute papers were archived. He corresponded with E S Cox who at the time was living on the south coast enjoying his eighties. Don enjoyed his correspondence with Cox who had a wealth of knowledge gained during his life in steam. I remember Don explaining E S Cox views on valve travel and how he believed increasing the valve travel on locomotives had made a significant improvement in their performance.

During visits to the library, Don found some interesting articles written by Harold Holcroft, another person who in Don's own words "had things weighed up".

Although Don never spoke about having a preference for one particular CME or railway company, he did tend



"The loco was obviously in need of attention as all the exhaust output appeared to be dispensed in one half of a revolution..."

ABOVE:

Don's seminal work, which has been newly reprinted and is available today from Camden Miniature Steam Services (www.camdenmin.co.uk)

to follow the output of technical innovation and development from the GWR. He also admired the unorthodox approach of O S V Bullied, having a particular affection for his 0-6-0 Q1, so much so that he started to make a 5-inch gauge model.

On occasions, after spending most of the evening in the workshop, Don and I would settle in the living room with a hot refreshing cuppa and freshly buttered toast listening to Transacord train sounds. One of his favourites was the recording of a Gresley V2 working the Aberdeen Fish past Usan Signal Box, the loco was obviously in need of attention as all the exhaust output appeared to be dispensed in one half of a revolution. As previously stated Don had a great ear for the syncopation of exhaust beats and many times could detect "a good front end" as he called it. I am sure his keen ear and love of syncopation had some connection with his love of music.

In 2010, he brought all his ingenuity to the full-size loco world when he became the brains behind the 'Night Owl' project (www.4709.org.uk). His quiet brilliance shone for all to see and he enjoyed himself! Everyone learned from Don – he even improved Swindon valve gears!

When Don received the first valve gear computer simulation programme from Prof Bill Hall he was delighted that you could now look at the gear from a whole new perspective. Even though he had spent many hours discussing valve gear with Bill Hall the latter had gone his own way and

DETAILS OF WALSCHAERTS' VALVE GEAR

By Don Ashton

Walschaerts' valve gear is often regarded as a modern gear in spite of its very early invention. As holders of miniature locomotives, we claim familiarity with the gear largely because we see it in operation. However, the 'mysterious' Stephenson's link motion generally lurking in the depths of the framework. The object of this discourse, however, is to reveal the true nature of its detailed working and to show why it is anything but a simple link to design a good set of Walschaerts to provide a distribution of steam comparable to that obtainable by Stephenson's link motion - its elder brother by only a year or so.

As with any gear it must conform to the equivalent eccentric, detailed in figure 1. This shows the details required in a simple and easily digested form, directly related to the valve that it will operate. Therefore this particular diagram is for full gear, and the valve travel will normally be twice r . The lap and lead (a) is produced by advancing the eccentric such that the valve will have twice r in one direction, ready to push the piston down the bore. Component x , varying with the reverser's position, constitutes the 50 degree out-of-phase element, whereas a is either in phase or at 180 degrees to the piston travel, according to our choice of inside or outside admission to the ports.

It is a common mistake to regard these two phase elements as separate units, as we might do in order to explain functions of each part of the gear, because this can lead to a misunderstanding of what happens in practice when they are combined in the valve spindle. Throughout discussion of the gear we must remember that each element affects the excursions of the other, even in mid gear, where we might expect that the x component is normally zero. Also, radial gears like Walschaerts are usually described as having constant lead, but this again is normal and not actual.

The combining lever, usually regarded as a producer of the in-phase or 180 degrees

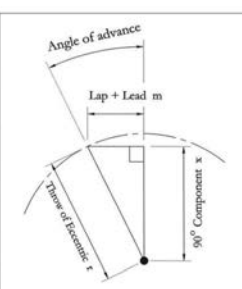


FIGURE 1: EQUIVALENT ECCENTRIC FOR FULL GEAR

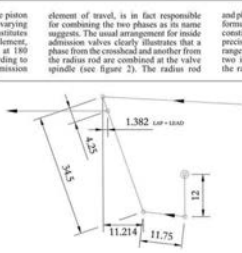


FIGURE 2: INFLUENCES ON THE COMBINATION LEVER

ENGINEERING IN MINIATURE

unfortunately his programme covered just a few suspension arrangements.

Not long after receiving the Hall programme, Don explained that he was communicating with a guy in Australia, Professor Alan Wallace who was also producing a simulator. Charles Dockstadter had also produced one and Don was very impressed with this new way of studying valve gears. He sent me a copy of both the Hall and Wallace simulators and spent considerable time explaining to me how to use them.

Don realised that whilst using the simulator he could see how alterations, albeit minuscule, to certain areas of the gear could have a drastic effect on valve movement. It was after this involvement with simulators that he returned to his valve gear publications, combining Walschaert's and Stephenson's into one book and also updating them to incorporate computer simulation. He would always reflect on how the engineers in the heyday of steam would have loved these computer simulator programmes.

Don Ashton the man

My first meeting with Don was in 1959 at a building in the goods yard at Manchester Central Station, the then headquarters for the Manchester Locomotive Society. I joined as a junior member and at that time Don would have just turned 20. The Society was by then well-established, the meetings and trips out were a joy to attend. The Chairman Harold D Bowtell and member Neville Fields were well known in the railway world

and were prolific photographers.

In that period I witnessed Don help so many people in so many ways. He would give his time to individuals or projects without a second thought. He had a unique way of looking at life and would not accept impositions without challenge, I remember his bank manager being corrected when bank charges were first introduced; he thought his meeting was with just another customer but, unfortunately for him, it turned out to be a meeting where honesty, integrity and customer loyalty were discussed - the upshot being the scrapping of the charges for that account.

Without being rude Don would try and point authors contributing to the model magazines in the right direction if points relating to valve gear were misleading. He would spend hours on the phone or by letter, trying to help people who had fallen foul of incorrect information.

He loved music and spent time encouraging people who were struggling, and he attended teaching seminars all over the country. He arranged music for people, mainly saxophone quartets, and arrangements of his music became very popular. I think it was Ken Bruce I was listening to one morning when he announced they were devoting the next 20 minutes to the English Saxophone Quartet playing arrangements by Don Ashton of Manchester. Some nights Don would leave stating "I won't see you tomorrow, I will be writing dots and spots", his way of saying he would be composing.

Don was a member of the Scale Ships Society, he spent time attending meetings and he involved himself in organising and attending exhibitions. His main love being tugs, Don would travel up to Scotland to spend a week or so with his friend, a tug skipper. Sometimes they would travel by tug all the way from beneath the Forth Bridge to Ardrossan. On several occasions, Don was asked to write articles for various magazines explaining aspects of tug manoeuvres, operational safety, and his experiences on the Salford Docks.

Don will be sadly missed by so many people. He is another sad loss to the railway fraternity and to the hobby of model engineering. His contribution made him a legend, and we are fortunate in the fact Don decided to chronicle his work, so a future generation can look back to a time before computers when a lot of hitherto unwritten knowledge was laboriously unearthed. Don was a person who would become a lifelong friend to some fortunate people, a person of selfless nature giving much and asking for little.

Abando

Club members seem to be

COMPILED BY ANDREW CHARMAN

Last month the *Club News* pages were somewhat downbeat as the full effects of Coronavirus took hold and the resultant lockdown cut a swathe through every club's 2020 programmes and special events, and sadly as I start to compile this column very little appears to have changed in the intervening month.

For a second month no diary pages follow this feature as there are no events to put in them, whether it be club public running sessions or major shows. In fact the likelihood of a dearth of summer outings was emphasised for your editor by a resigned post on Facebook a couple of days ago, reacting to the news that the UK's biggest traction engine gathering, the Great Dorset Steam Fair scheduled for the August bank holiday week, had been called off for this year. "That's it, 2020 is officially cancelled," wrote the clearly frustrated enthusiast.

The current times bring many worries for our clubs, including a financial one with the loss of revenue from weekend public running which is so important to many a club's resources. However one club line that has closed in the last month has succumbed not it seems to the current pressures but a longer-standing one that will resonate throughout the model engineering community.

Fylde finale

Fylde SME announced that it could no longer operate its line at Thornton, near Blackpool, and immediately started to dismantle it. "This decision

HIGH WYCOMBE
MODEL ENGINEERING
CLUB



THE FIRST
100 YEARS

ned projects revitalised...

making good use of the enforced downtime and some long-forgotten builds are resurfacing...

N

was taken due to decreasing membership numbers leaving only a few remaining active members who were unable to administer, maintain and operate the railway safely," read a statement on the club's website, adding that while the finances had been in the red for several years, this was not a factor in the closure. "We regret that our hobby has failed to retain enough enthusiastic support amongst a 21st century absorbed in other, more modern pastimes."

Sad to read, and certainly the sudden nature of the closure shocked many including the ward councillor who expressed his shock in the local paper. We at **EIM** have sympathy with the Fylde members and the situation they find themselves in but on the evidence we see in our pages we don't think model engineering as a hobby is ready to be written off just yet, with a goodly selection of new, young and enthusiastic engineers coming through. However we do have to work harder than ever these days to keep them coming, and for some clubs that may well be a step too far.

A club worthy of a lot of sympathy this year is the **High Wycombe ME**, celebrating its centenary in 2020 and the March edition of its newsletter outlining details of a three-pronged celebration. These include a centenary publication describing the history of the club and with around half of its 56 pages being pictorial. To save funds (a prophetic decision) it is only available by download from the club's website.

Members, their families and friends were also looking forward to enjoying a special day out at the Buckinghamshire Railway Centre, and a celebration weekend at the club's track on 13th-14th June including welcoming invited guests on the Saturday. Special laminated loco headboards had also been produced to use on public running days, but sadly we suspect most of this has now gone by the board due to Coronavirus. We hope the club can enjoy a delayed celebration later in the year.

Garratt nearly there

One club that was certainly busy just prior to lockdown was the **Rugby SME**, with on 1st March a lot of on-site activity including the reassembly of the last of the brake gear and rods on the newly rebuilt Garratt loco 'Mount Kilimanjaro'. "This



ABOVE: The Garratt 'Mount Kilimanjaro' will be a powerful addition to Rugby's roster when public running can resume again. Photo: Edward Parrott/Rugby ME

LEFT: Special year for the members of the High Wycombe ME.

RIGHT: Three locos up for their boiler tests at Rugby. Photo: Edward Parrott/Rugby ME

marks the completion of the work to re-profile the wheel treads on both power bogies," stated **EIM** contributor Edward Parrott, who has been on this project. "There is some plumbing to redo in the steam circuit which we were unhappy with following its steam test and first unofficial run, and the vacuum and air brake equipment to reassemble, but then we should be able to begin running trials."

The same day saw a boiler testing session which demonstrated just how busy a member Edward is! Locos up for testing included the Romulus 'Myglyd' built by John Groom and now owned by Edward, and which has had a new boiler fitted, a second Romulus and a Darjeeling A Class 'No.10' part-built by former Rugby member Brian Gittins and now being

finished for the family by, you guessed it, Edward Parrott...

A definite bright spot amongst the current suspension of activities on the club circuit is the continued selection of magazines and newsletters that continue to arrive at **EIM** – both electronically in the email inbox and in some cases printed editions in the post – very praiseworthy during these difficult times.

Double publication

One we want to highlight straight away is the normally monthly newsletter of the St Albans SME, which we received along with the note; "During the pandemic our society will be publishing a newsletter every fortnight in order to provide more stuff for our members to read and to





help them retain a sense of belonging. Several members have risen to the challenge of increasing their written output through this period.

"As a result, this issue is fairly substantial by our standards and more importantly is focused firmly on model engineering matters..."

What an encouraging note and an excellent attitude. Certainly there is much to read in both editions received and we particularly like the piece by Mike Collins the editor encouraging members to dig out and complete their abandoned projects – illustrated by a picture of the Buran, Russia's version (copy?) of the US Space Shuttle, lying abandoned and derelict in a hangar!

It's also notable that the chairman's annual report in the newsletter describes a club that is, in the words of Mike "increasing in membership and energy." That's the kind of news we like to hear...

Certainly we are hearing evidence of **EIM** readers making the most of their time at home and either restarting paused projects or getting stuck into new ones. I told you last month of my fellow members in the **Cambrian ME**, who have now set up a formalised email group to keep in touch with each other.

One, Bob Cannon, has been describing his progress on making the double-acting Muncaster engine that Geoff Walker described in our March



ABOVE: Some abandoned projects are bigger than others! Photo courtesy *St Albans ME*

LEFT: Cambrian ME member Bob Cannon's part-complete Muncaster, with its fabricated, not cast, cylinder.

BELOW: To end on a bright note – this was sent in by Eric Bussingham and shows young engineers Ross Bussingham, George Dear and Thomas Selby on the **Melton Mowbray ME**'s Whissendine track. Lots of steam and smiling faces, that's what we like!

and April issues. Bob is certainly not alone, Geoff having received several requests for the cast cylinders he offered to potential builders, which is good to hear. But Bob has decided instead to fabricate his own cylinder and as the picture shows is doing well. "I have fabricated the cylinder from bronze and gunmetal, all silver soldered in two heats," he reports, adding; "I will treat the fabrication much like a casting now – the tricky bit of machining is to get the pivots coaxial on both sides of the cylinder, but I have a cunning plan..."

Window on life

We know many a model engineer also has a firm involvement in full-size heritage and this is highly evident in the latest edition of *The Blower*, published by the **Grimsby & Cleethorpes ME**. Included is the first part of an update on progress made by a group members were encouraged to join, making two new drop window units for 'Bluebird' – a 1930 London tramcar under restoration at the National Tramway Museum. The project has been highly successful and is now drawing to a close.

The newsletter of the **Ryedale SME** is always very light-hearted and the March edition puts the Coronavirus in its place with a couple of groan-here jokes, and a suggestion by the editor that he would include some blank pages in the next edition to help alleviate the toilet roll shortage caused by panic buying! But there are also several photos of a whole lot of March work carried out upgrading the Gilling track site until the pandemic caused everything to come to a halt.

By the way, with regard to making use of our workshops even the Editor has been doing a little bit, at last... Admittedly the first job was to dig out my garage workshop, the result of two offspring making multiple moves of home and saying "could we just stick this in the garage for a while dad..." But so far I've riveted up a mild steel frame for a Ruston narrow gauge loco in 7/8ths scale (1:13.7) and I have an unmachined Stuart 10V that I acquired some time ago, so I might even be firing up the lathe soon. Watch this space! **EIM**



Young engineer's Virtual Steam Rally



Just after the May issue of **EIM** went to press a young engineer had a bright idea to enthuse steam enthusiasts stuck at home with no rallies or gatherings to go to, by making use of social media.

Charlotte Coulls, aged 14, is the youngest daughter of Anthony Coulls, a senior curator at the National Railway Museum in York and also a well-known traction engine enthusiast and prolific author. Anthony told **EIM** the full story;

"As the Coronavirus situation continues, so many of our regular steam and vintage events have been curtailed. Charlotte saw the decimation of the events she loved and was looking forward to, and came up with the idea of a virtual steam rally, initially on Twitter," Anthony said.

"Not everyone is on Twitter, so we created a Facebook group to allow more people to share their engines and vintage kit online across the internet, large and small on 9th May."

The idea was to fill Twitter and Facebook with steam; "We're all missing our friends and the unique rally atmosphere, and the appetite for the event was such that more than 2300 people had joined the group within two days of its inception and at the time of going to press nearly 7000 people had joined."

Viral virtual steam

The concept certainly took off – a prolific user of Facebook, the **EIM** Editor was amazed by the response, hundreds of posts bearing the hashtag #TwitterSteamRally appearing on social media from all over the steam community, full-size, miniature and model, road, rail and more.

Supporters include Mechanical Music Radio which planned to broadcast the sounds of a rally online on the evening of the event, "including some beer tent singing", while other partners were lining up in the hope of producing a unique experience

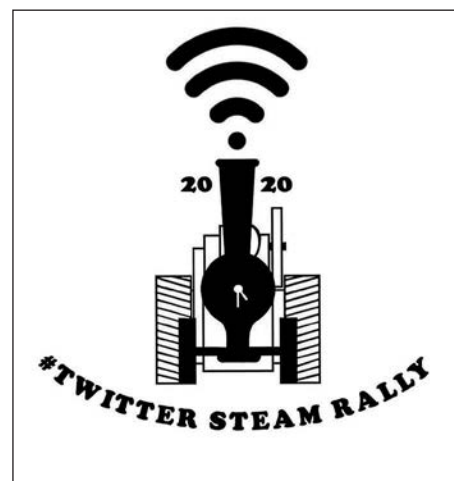
uniting the vintage fraternity internationally.

"Photos, videos, live streaming, all are welcome – bring your own beer, chips and doughnuts and we shall enjoy our wonderful hobby hopefully across the world in safety from our gardens, yards, fields and sheds!" Anthony added.

By now of course you may well be thinking "But this issue didn't come out until after the event, so we've missed it." Well yes and no. Yes it sadly happened too late for you to enjoy the event live, but the beauty of social media is once it's there it's there, so if you search on Facebook or Twitter for #TwitterSteamRally you should find a whole lot of interesting content to enjoy while stuck at home.

TOP: Young Charlotte, instigator of the idea, with a seriously impressive collection of Mamod miniature steam. How many of us had a Mamod for a first steam engine?

ABOVE: The virtual rally has its own logo (a rather clever one if you know your digital graphics...). Anthony says the rally was a one-off – surely it needs to become an annual event?



Remembering road specialist Alan Barnes

All of us at **EIM** were saddened to learn recently of the passing in November of Alan Barnes.

Alan was a regular contributor to the magazine, primarily on the subject of large miniature road locomotives, and he was a familiar and much-liked figure on the rally scene as he chatted to owners and collected material for his features.

Alan's last piece written for **EIM** was published as recently as the January issue, he focusing on a 4-inch Burrell traction engine and also providing the cover picture for that issue.

Yet while he may have become well known in more recent years for his road engine features, all accompanied by quality photographs, Alan could write on a very wide range of subjects and indeed had a great interest in rail matters too, at one time

serving as editor of the Bluebell Railway's *Bluebell News*.

Friends described him as having a great interest in anything transport related. He was also a photographer long before he became a writer, his photographic talents extending to landscapes and wildlife, the latter regarded as his first love.

EIM sends condolences to Alan's family and many friends – he played an important role in our magazine and his input to our pages will be much missed.

Are you holding an event, launching a new product or have some other news that **EIM**'s readers will want to read about?

Send all the details into andrew.charman@warnersgroup.co.uk and it will appear on this page...

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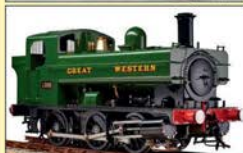


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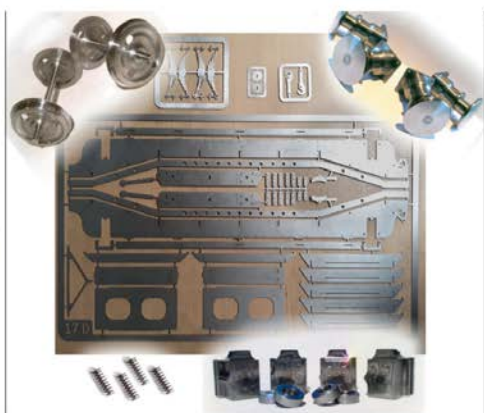
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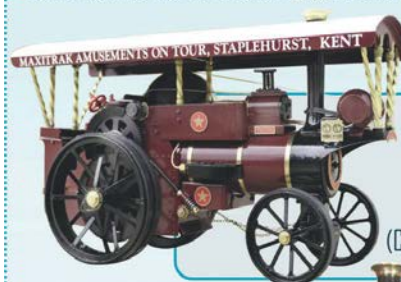


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A 7 1/4 inch gauge Baldwin 2-4-2T "Lyn", the original built for the Lynton & Barnstaple Railway in 1898. Assembled from a Winsor kit, this engine has been in use until recently on a miniature railway at a preserved line in Wiltshire. While cosmetically tired and needing various minor jobs doing, we were surprised at just how well it goes under steam. A repaint lined into Southern livery would make for a large, attractive engine. **£9,450**



5 INCH GAUGE LNER V3 2-6-2T

The work of a highly capable engineer with several excellent engines to his name built over a thirty year period, including a well-known A4 Pacific, veteran of several IMLEC competitions. Finely detailed, fit and finish is excellent, the engine runs just as well as it looks - free steaming with good valve events, notching up in either direction. We like these big tank engines—all the performance of an express locomotive with no tender to get in your way when driving! **£8,450**



5 INCH GAUGE STEAM OUTLINE LNER B1

A 5 inch gauge steam outline battery electric B1 with Parkside controller, in running order with batteries. The batteries supplied by the previous owner are new, and stand proud of the tender—with some lower profile replacements, it would make for a handsome and easy to run model. Complete with remote handset controller. **£3,950**



3 1/2 INCH GAUGE GWR COUNTY 4-4-0

A 3 1/2 inch gauge GWR 38XX "County of Hereford", the 4-4-0 version of Churchward's four cylinder 4-6-0 "Saint". A nicely made model, it had a new Western Steam boiler fitted some years ago - Comes with new hydraulic certification. **£3,750**



5 INCH GAUGE BENGAL NAGPUR 2-8-2T

A rare model of a 1920s Bengal Nagpur tank engine, finished in 2005. Not run in recent years, the boiler has a leak on the wet header, but comes with previous club certification. **£2,850**



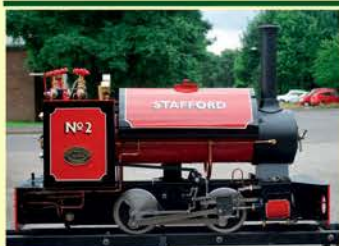
5 INCH GAUGE RAIL MOTOR 0-6-0

From the same prolific builder as the tank tank, right. Boiler has had a twice working pressure hydraulic test, the engine runs on air. **£1,350**



5 INCH GAUGE 17D CLASS 20 BATTERY ELECTRIC

A 5 inch gauge Class 20 battery electric by 17D Miniatures. In excellent condition having had little use from new. There is a soundcard fitted along with decent sized speaker under the removable roof. Complete with custom built storage/transport crate. **£2,850**



NEW BUILD LOCOMOTIVES "STAFFORD" & "FELDBAHN"

We build a range of narrow gauge inspired locomotives in a variety of styles and sizes - from 5 inch gauge engines that fit into an estate car up to 10 1/4 inch gauge engines weighing over half a ton - suitable for all applications, from small garden railways to large commercial operations. Designed and built at our works in Lincolnshire, see our website for full specifications of the entire range, along with pictures and videos of the engines at work.



We are always interested in acquiring engines of the type that we sell. If you know of a steam engine for sale, in absolutely any condition, please let us know. Engines bought outright, or we are happy to take them on a commission sale basis, or pay you a finder's fee if you put us in touch with an engine which we later purchase. All engines listed are on our premises, available for inspection by appointment. Please do contact us, even if all you have is a rumour of an engine being available!

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Boxford 260 VMC mill less software £1950



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hardened bed £5450



Hunton hand corner knotcher
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Harrison M250 5" x 20" £2750 each



RJH Gryphon 8" grinder complete
with built in extractor £750



Startrite 14-S-5 bandsaw
electronic brake added £1250



Myford Super 7B gearbox (PCF) cabinet
stand very nice £4450



RJH 8" bench grinder £345



Morgan Rushworth BP50 / 16
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