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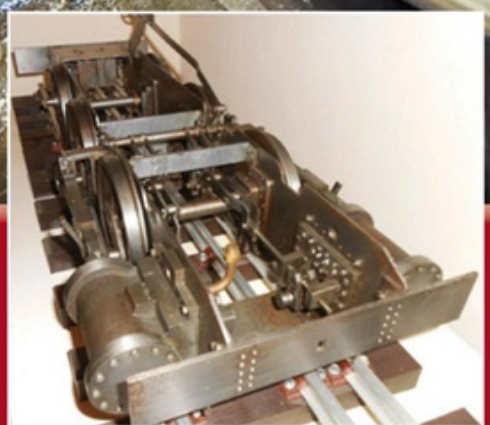

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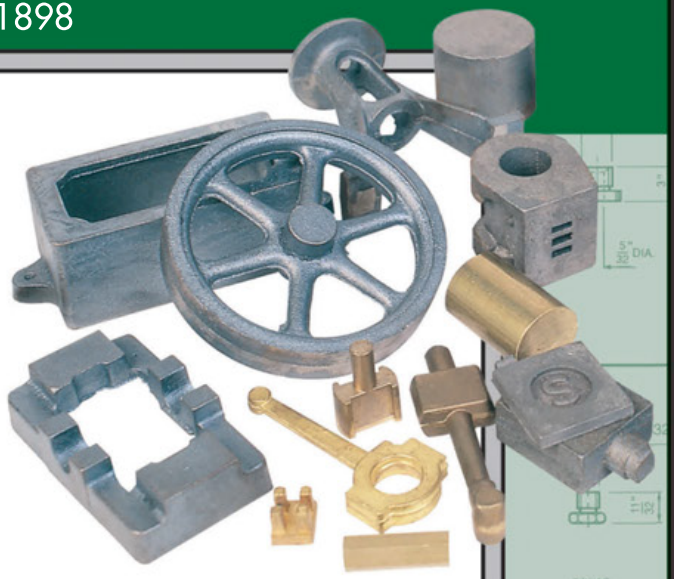

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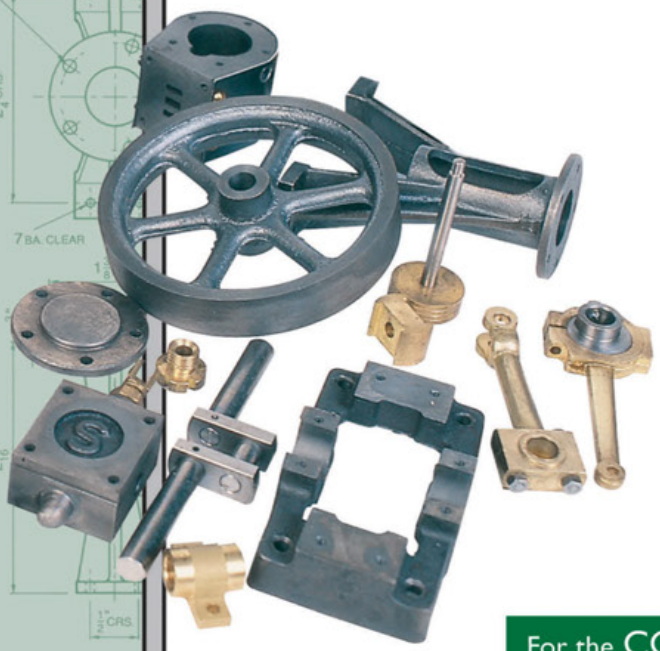

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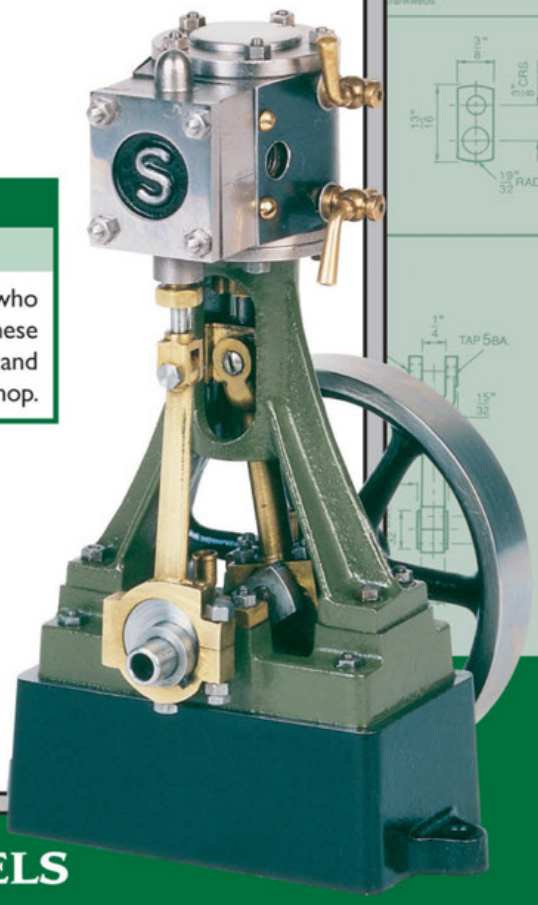

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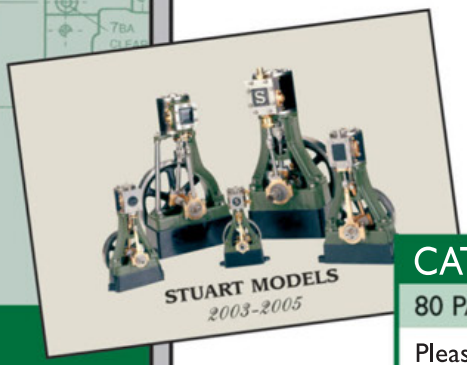

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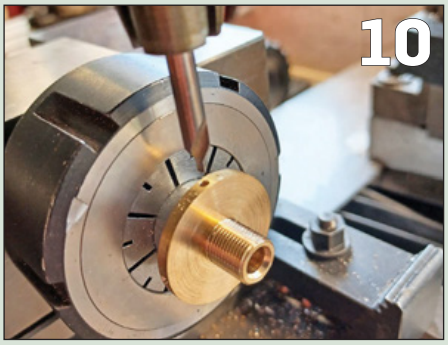
ENGINEERING in Miniature



FRONT COVER

Sparks fly and a tool is about to lose its tip on encountering a hard spot of weld during attempts to remachine a worn wheel – tech ed *Harry Billmore* describes such challenges in this issue. Meanwhile *Andrew Brock* has acquired a part-built example of a loco he's long wanted, a North London 0-4-0 tank. He starts work on it in this issue.

EDITORIAL

Reasons to publish, and look forward to, club dates

Welcome to the March edition of EIM and in this issue we reinstate a feature that has been missing from these pages for just about two years – the diary!

The welcome arrival of a series of public running dates from the North Wilts ME encouraged us to at last publish the diary once more, it having of course been rendered redundant by the Covid pandemic. The fact that we have been able to compile half a page of entries is a clear and hopeful indication that we really are on the road back to normal activities.

In normal times your editor at this time of year would be scouring club websites for lists of public running dates and meetings before compiling the diary but for now, we are only including dates that have been confirmed, either by being specifically sent to us or published in club magazines received at the EIM office.

Obviously a new public running season is just around the corner and we want to give the clubs as much publicity as possible. So please, to ensure inclusion in next month's listing please check with your club's programme secretary and get them to send in dates of public running sessions, events, members meetings and the like to us at the address below. Your meetings being published in our diary could encourage readers to visit and get your club some extra members!

Meanwhile in further support for our model engineering societies, we will be starting a new, hopefully regular feature next month taking a look inside clubs, produced by members of the club in question. And talking of events, this month sees the Midlands Garden Rail Show, sponsored by ourselves and our sister magazine *GardenRail*. Some readers might think such things are a bit small scale for them but why not give the show a look? After so long without any shows, who wants to turn down a day out?

Meanwhile, we've done our best to assemble another varied selection of features in this issue, from wheel turning to pump making to spark arresting and milling machine reviving! Enjoy your EIM.

Andrew Charman – Editor

The April issue of **Engineering in Miniature** publishes on 17th March.

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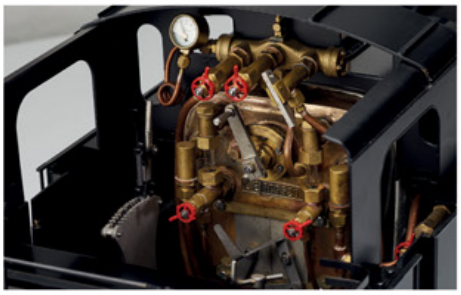

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A North London Tank in 5-inch gauge

Andrew begins the description of his latest project, fulfilling a long-held aim to have a model locomotive with local connections on his roster.

BY **ANDREW BROCK**

The date was 1st September 2020 and a DPD parcel arrived at home. I was working on the chassis for my Railmotor and Sam Ridley was getting the last bits on his 14xx ready for its first run (*both projects recently serialised in* **EIM** *– Ed*). I knew what the parcel contained but I let Sam open it so I could see his surprise.

Inside was what has to be described as an 'impulse purchase' from a well-known Internet auction site! The loosely assembled chassis for a 5-inch gauge 'North London Tank' 0-6-0 emerged from the well wrapped parcel (**Photo 1**) and for the next couple of hours the Railmotor was no longer centre stage! The same evening, I took a closer look and decided that with a few days' work I could test the chassis on air...

Digressing for a moment – the full-size North London Railway Class 75 locomotives were built at Bow Works, East London to a design by J D Park, from around 1879 onwards. They were designed for shunting at Poplar Dock and West India Quay, both of which are very close to the present-day Canary Wharf. Their 0-6-0 wheel arrangement and 45 ton weight made them perfect for heavy work and from testimonials I have read these engines were popular to work on. Commissioned by the North London Railway, the class later became part of the London North Western Railway (LNWR), then the London, Midland & Scottish (LMS) and lastly British Railways. Finally withdrawn around 1960, many had plied their trade for the best part of 80 years!

Sole survivor

The only surviving full-size 'NLT' resides at the Bluebell Railway in Sussex, albeit out of commission for the time being (**Photo 2**). One of my 'bucket list' items has long been to build a 5-inch gauge model of a locomotive based at the Bluebell line which is near to where I live, and although a part-constructed project this opportunity was just too good to turn down!

By a strange twist, I purchased the NLT from a model engineer who used to live close-by in town, but was now in the West Country, and who had acquired it in largely the same state in the mid-1980s. Unfortunately, we do not know the original builder but they were certainly very accomplished. The work done to date is of a very high standard and looking more closely it appeared they must have studied the preserved full-size locomotive.

A few days after receipt, I got to a

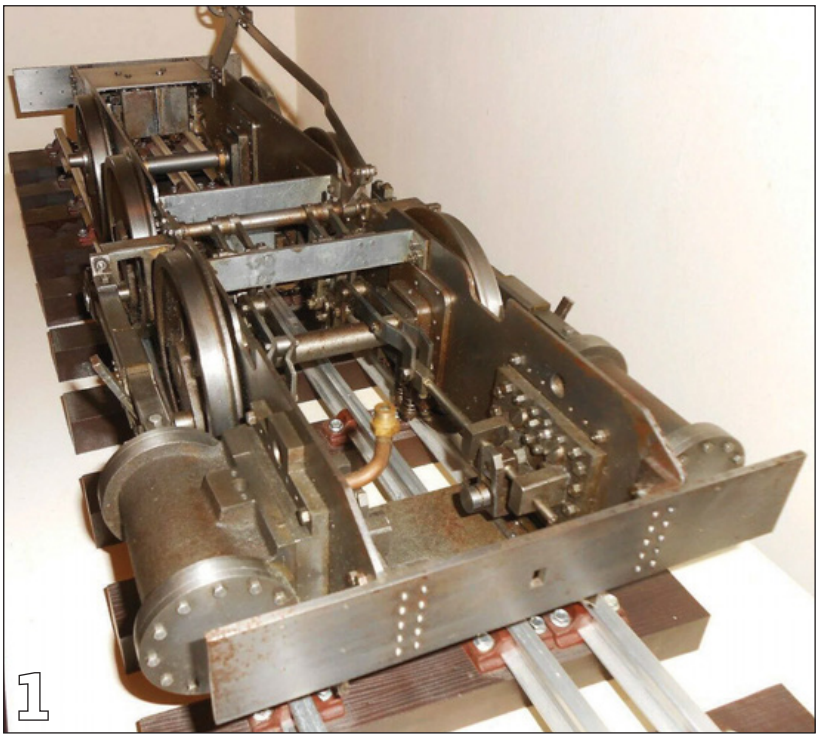


PHOTO 1: The chassis straight out of the box.

PHOTO 2: The preserved North London Tank at Horsted Keynes on the Bluebell Railway.

PHOTO 3: Individual chassis parts after a good clean-up.

PHOTO 4: The freshly pinned and painted wheels.

Photos by the author

point with the Railmotor project where I could briefly take a break and satisfy my curiosity as to whether the 'NLT' would run on air as well as the chassis suggested she would – I was not to be disappointed...

The model, like the full-size loco, has outside cylinders, which are not dissimilar in style to an LBSCR K-class. The inside valve gear is Stephenson's, which on the model actuates slide valves via a rocking arm.

First checks

With the chassis on the bench I checked each component and made a list of the items required to run the chassis on air. The valve gear itself was largely complete, although only cobbled together, and because it was necessary to loosen the cylinders from the frames to fit the air connections to the steam chests it seemed sensible to spend a little bit more time and disassemble the valve gear as much as possible to check it properly. Because the valve gear components were so well made, this task was really straightforward and upon reassembly I added the temporary connection to feed air to both cylinders.

"The same evening, I took a closer look and decided that with a few days' work I could test the chassis on air..."

The eccentrics and driven axle had already been quartered, and the connecting rod fabricated, so the centre axle would prove the air test, even though not connected to the front or rear axles by way of the coupling rods. I turned on the air to 10psi, no more, and she fired up sweetly in both forward and reverse, and notched up well in both directions – a very pleasing start!

Not wanting to make the same mistake I did with Railmotor, I immediately stripped the chassis back to its individual parts (**Photo 3**) and set to, intending to start painting before I had any urge to continue fabricating more of the locomotive! This would be a wise move, knowing the basic chassis and valve gear are ready to roll so to speak.

Through the autumn of 2020, and between jobs on the Railmotor project, I cleaned the NLT's frames, stretchers, buffer beams, motion brackets and wheels, primed with Bilt Hamber EtchWeld from a spray can and then started on the brush-applied ACE Coatings semi-gloss black and Precision Paints red top coats. I decided the finished locomotive would be based on its last guise, with British Railways lettering on a black livery and numbered 58850.

Prior to final painting, I also had to quarter the front and rear wheels, which had only been pushed on to the axles and I then pinned all six wheels to their axles. The quartering operation was undertaken on a home-made jig that I bought from a late Sussex Miniature Locomotive Society member many years ago and it saw its first use in my ownership. It worked rather well – thank you Allan.

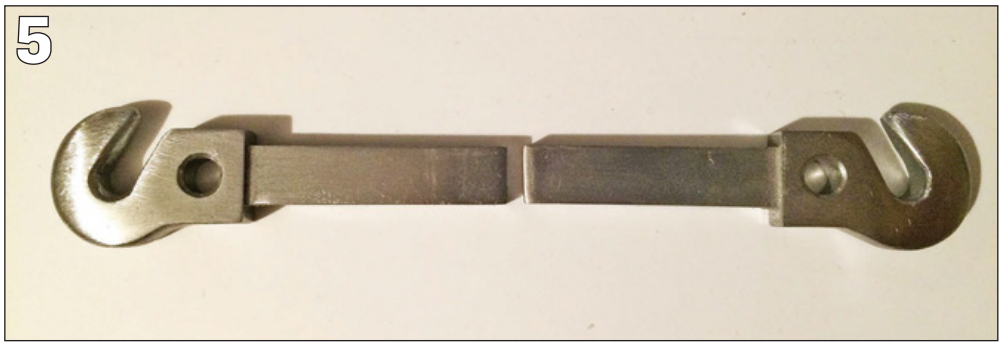
Novel wheels

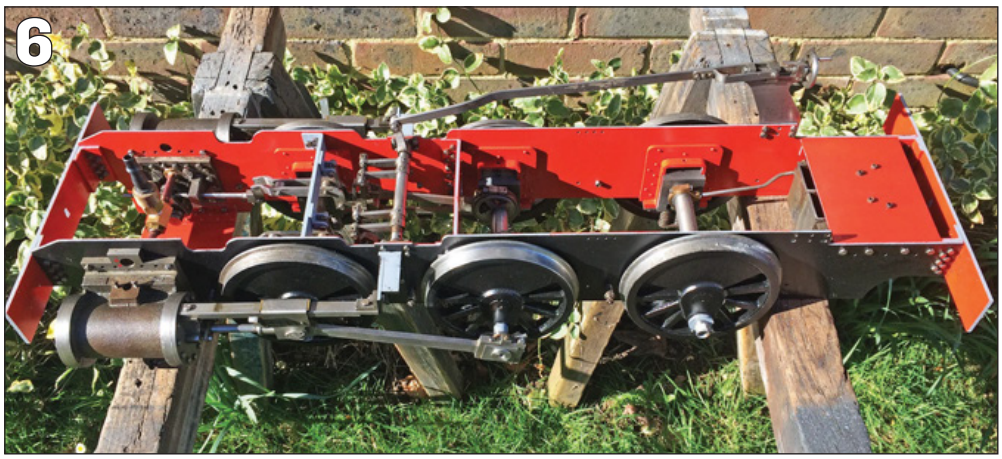
The wheels themselves are unusual with their square cast spokes and the original builder of the locomotive may well have fabricated one-off patterns for these castings. Fortunately, 'Operation Pinning' went without incident and all six wheels were now secured to their respective axles, including with a 6BA grub screw. Final top coat painting in black then commenced and within a week these had been added to the 'finished' box (**Photo 4**).

Trial re-assembly of the frames, buffer beams and stretchers was next on the to-do list and this took about a day to make sure everything was aligned and square. At this point I was still quite a few fitted bolts short for final re-assembly but enough to get the basic chassis back together. The motion was added next, together with the cylinders, and that took another day. By now, everything that had originally arrived from Cornwall was in one piece and I decided on just three final jobs before returning to the Railmotor project.

First of the three jobs was that I required four coupling hooks for two 5-inch gauge coal wagons that had been 'in between projects', so I decided to make a pair of hooks for the NLT at the same time. These were fiddly to drill, cut and file but a very satisfying task once complete! I fabricated them from an odd length of ¾-inch x ¼-inch mild steel, starting by marking out the rough shape based on the dimensions from the hooks on the Railmotor.

Next, I drilled two 3/16-inch holes, ▶





which are effectively the inside bottom of the hook and behind it the hole for the chain to mount through. With these as a datum, I then machined the 'tail' to finished dimensions, which for the NLT were 5/16-inch x 3/16-inch. The hook was then finished entirely by hand.

The slot for the hook was cut through from the top before forming the outside radii and 'fish-bellied sides' with flat and rat-tail files as required (**Photo 5**). A final hole would be added towards the end of the tail for a cross pin to act as a spring retainer but I planned to drill this when I finish the buffer beams and are ready to fit the hooks to the chassis.

"Jobs like these are quite satisfying but after the first couple of dozen can become quite tedious..."

Job number two involved the suspension – when the locomotive arrived, the springs were indifferent and one axle had no springing at all! Each axlebox had a very nice pair of pivoting spring hangers, so working on a rough 100lb finished weight, I decided to use some leftover springs from the Railmotor, which are 15lb per inch compression. A dozen of these were duly dusted off and then I set to, making the 12 guides and 12 lock nuts which hold them to the hangers. At 20mm, the springs were nearly the right length, possibly just a bit long, so I have fitted them for now pending a final set up once the majority of the loco is up together.

Full-size inspiration

Finally, job number three was to change the reverser stand from the left-hand side to the right-hand side, as per the preserved locomotive. As built, the NLT had a pole reverser but at some point following preservation a screw reverser has been fitted to the surviving engine.

The first day was spent marking and drilling the six holes in the right-hand frame to mirror those in the left-hand frame on which the stand was mounted. On day 2, and with the weighshaft locked, I straightened the offsets on both the stand and reach rod before offsetting the reach rod the other way to meet with the fork on the weighshaft. Very carefully, I then drilled and taper-reamed a hole through the weighshaft to pin the fork end to. Day 3 was spent lining up and finally fitting the reverser before an air test proved all was well with this new setup.

With the three jobs complete, there was time for a photo-call on a sunny spring morning (**Photo 6**) and then I put the chassis back on display before I had any inclination to carry on with the project – it was by now March 2021...

Roll on six months, and with the Railmotor largely complete, I dusted off the NLT, which through the summer of 2021 had been another lounge ornament! Having visited Horsted Keynes at the Bluebell Railway a few times during the summer and early autumn, and seen the real NLT, I had serious enthusiasm to get stuck into the project once again. The loco has somewhat jumped the queue in terms of my projects but I have always been a firm believer in following your enthusiasm rather than battling through a project because it was next in line!

A nice easy 'starter for 10' or in my case a 'starter for 60' were the 60-odd mild-steel fitted bolts required to complete the chassis and cylinders. The original builder had mainly used 6BA bolts, plain through the frame and threaded on the end. I decided to copy these exactly and managed to turn up a bolt about every 15 minutes, so 15 hours or so later I had a large pile of bolts ready for use plus a few that were in the scrap for the dustmen. Jobs like these are quite satisfying but after the first couple of dozen can become quite tedious too, particularly

if you get one or two scrap in a row! Another day was then spent fitting and thread-locking said bolts to the chassis – job almost done...

Before trying the loco on air again, I decided to fabricate the coupling rods and spacers. The NLT is unusual because there are no knuckle joints between the driven axle and the rear-most coupling rods. Instead, each pair of coupling rods are offset, with the front pair nearest to the wheels and rear pair set out from the wheels. Although this arrangement requires spacers to be made, it does mean that all four coupling rods are identical.

Choice of material

At first I could not decide whether to make these rods from gauge plate (for which I had a suitable piece in stock) or mild steel (also in stock). In the end I plumped for mild steel and duly marked out two rods on two separate pieces of 2-inch x 3/16-inch x 8-inch mild steel plate.

I first drilled the 6-inch centres to a trial size of 7/16-inch to check on the crank pins before carefully opening out to a reamed ½-inch to accept the bronze bushes. With the centres drilled, I spent all of a morning cutting off most of the excess metal and roughly finishing the profile with a file (Photo 7). I left about 15 thou' to be machined and with the end radiuses to be finished by hand.

Next, I dug out a piece of Railmotor history, which is a length of angle many of this engine's rods were machined on. I turned up two fitted bolts to hold each NLT coupling rod to this angle in order to finish them. I had intended to dust off the BCA jig borer for this task but in the end plumped for the vertical slide on the Myford lathe – the main reason being the Myford is slightly taller and a more comfortable height to work on given the considerable hours I would likely spend finishing the rods.

The first job was to machine the height of each rod to 5/16-inch between the ends, before thinning the thickness by 1/32-inch on each side to a finished size of 1/8-inch between the ends. The first rod took the longest time, but once I had the outline settings on the machine, the remaining three rods took under half as much time each, with me luckily making no mistakes.

I finished each rod by drilling the oil hole in the top of the end radii (Photo 8) before spending the best part of another day blending in the radii and polishing out the machine marks. They were now complete and so I carefully pushed in the bronze bushes, which are also held with Loctite 638 in a groove.

Time-consuming job

I decided at the outset to fabricate the square oil cups separately to the rods and eight of these were duly machined from 3/16-inch square mild steel to be pressed into the top of each radius. Although initially saving time because the radii on the rods were easier to finish, the oil cups were in themselves time-consuming because each had to be machined with a 3/8-inch radius on the base to match the same radius on the end of the rod. A separate 3/32-inch mild-steel rod with a 3/64-inch through hole then had to be inserted (and silver soldered) into the 3/16-inch square body to locate in the hole on the top of the rod.

Two days later and with a little more scrap for the dustmen, eight oil cups were pushed into the rods and gingerly I drilled the 3/64-inch oil holes through the bronze bearings. No mistakes now!

All being well, I trial-fitted the four rods to the chassis and was chuffed with the result. I was able to make a near perfect full rotation of the wheels and with no tight spots – mission accomplished! Well, nearly... I just had to turn and fit the 12 brass spacers that separate the rods on the crank pins. Another day later and with a little more weight added to my brass tub for the scrap man, I had finished the rods (Photo 9) – a nice way to round off a very productive 2021…

Before the end of the Christmas holidays, I conducted a number of air tests, which proved the chassis to be as good as before but which also highlighted a number of leaks through the bolts and gaskets on the cylinders themselves. These I had not previously taken apart but needless to say they required attention, which I shall describe along with the construction of the boiler in my next article... EIM

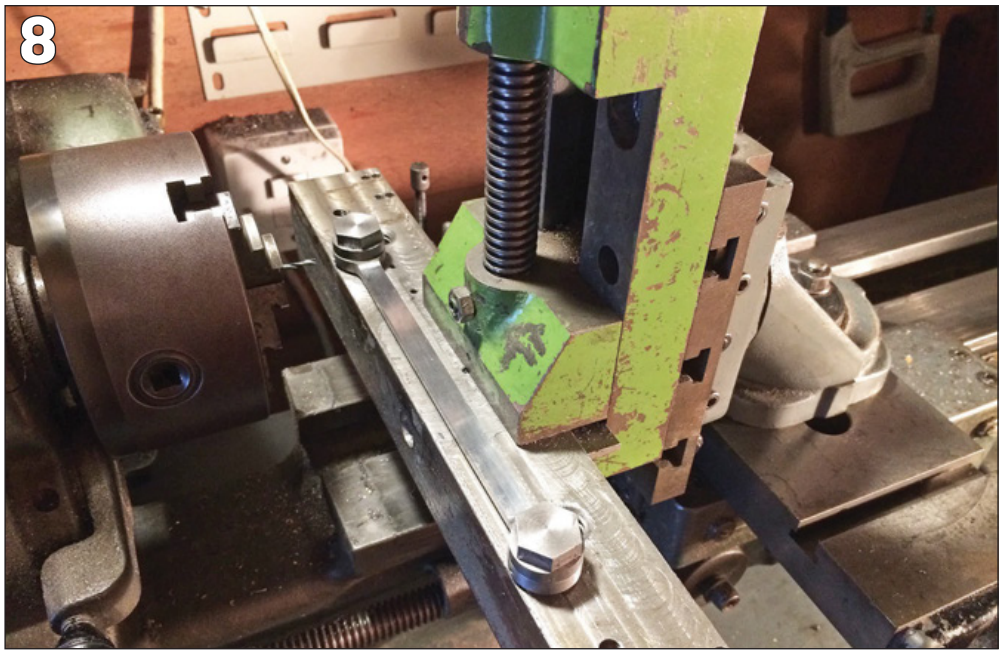


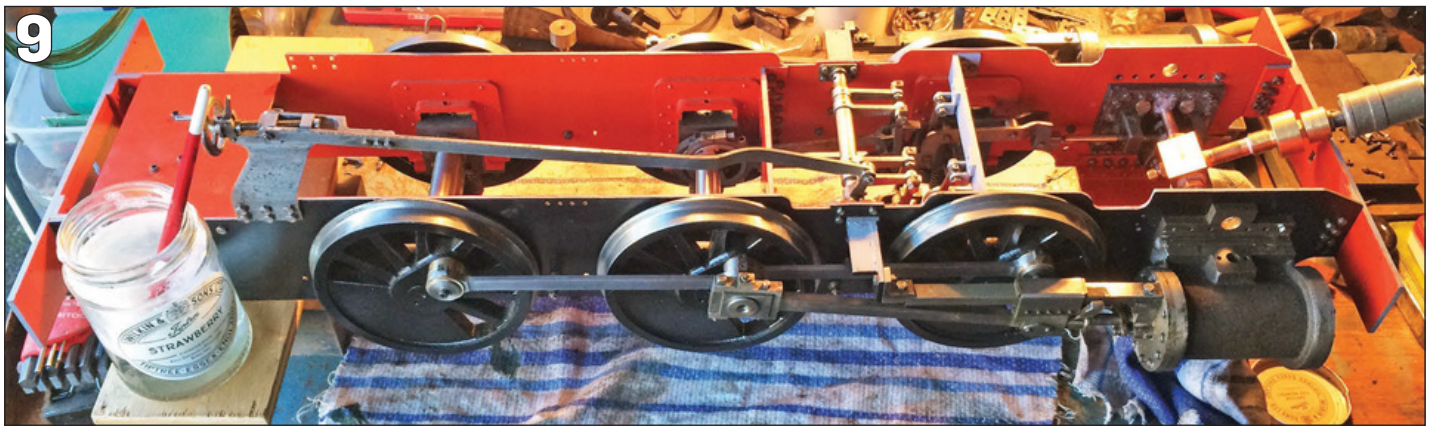
PHOTO 5: A pair of fabricated coupling hooks.

PHOTO 6: The chassis once it had been loosely assembled and painted.

PHOTO 7: Rough rods, bushes and some of the fitted chassis pins.

PHOTO 8: Drilling the oil cup mounting holes on an angle jig.

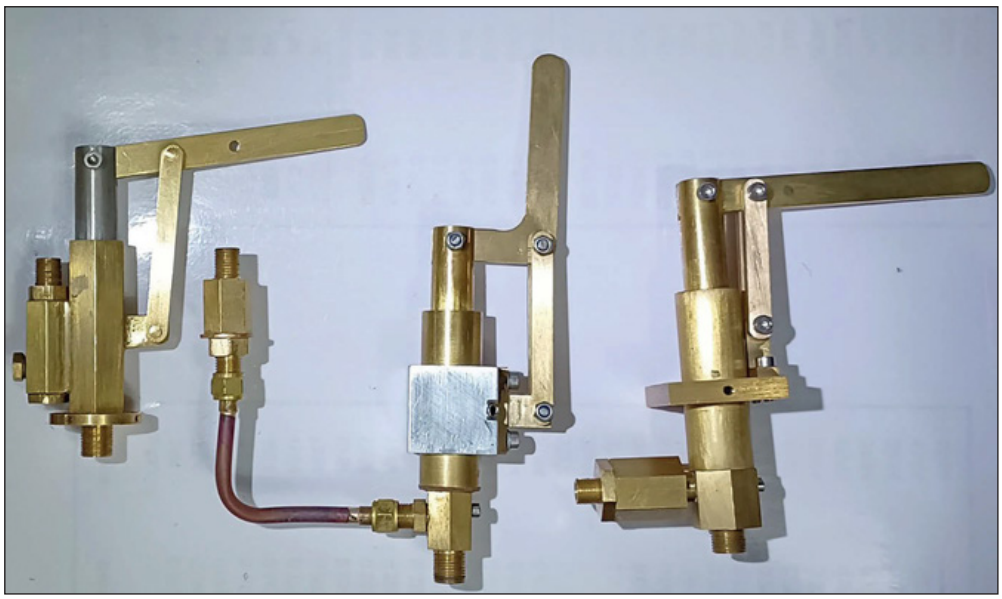
PHOTO 9: An air test with the coupling rods now attached.

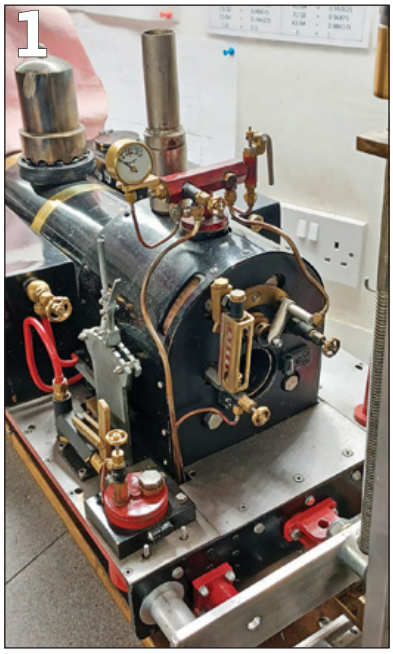


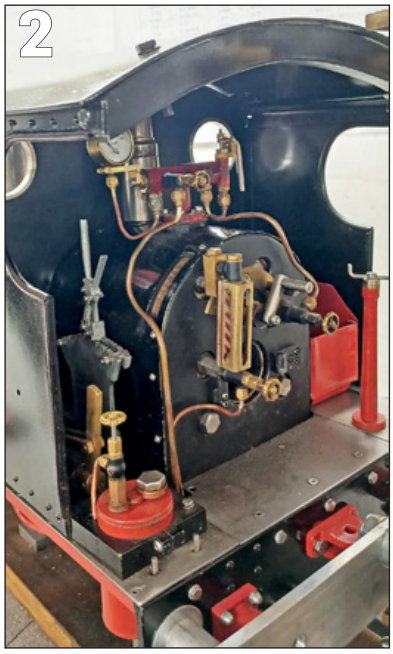
A Tale of Three Pumps

Rich describes how a crowded cab on his locomotive sent him in the direction of designing a vertical water pump to make better use of the space.

BY **RICH WIGHTMAN** Part one of a short series







HEADING: Three evolutions of the pump Rich describes in this short series.

PHOTO 1: Rich's 'Conway' loco with the cab removed...

PHOTO 2: ...with the cab on.

PHOTO 3: The first pump Rich made.

PHOTO 4: A typical pump commercially available to buy.

PHOTO 5: Conway's fitted axle pump.

PHOTO 6: And the equivalent version on Rich's next loco, 'Chub'.

Photos and drawings by the author

The cab of my locomotive, 'Conway' wass getting a little crowded – it was not too bad with the cab removed (**Photo 1**) but with the cab in place things were a little tight (**Photo 2**). I'm going to have the same problem with my latest loco build, 'Chub'.

Looking at the engine's hand water-feed pump I wondered if I could save a little space there. I have seen some locos with the hand pump mounted under the floor or running boards but after a cursory look it was apparent there was insufficient room to do this on my loco.

Another popular location for hand pumps is inside the water tank. have already made the tanks on Conway and I have designed them to be quick-release, in other words just two bolts per tank and one pipe connection. To relocate the pump here would mean cutting open one tank to fit it inside plus some additional bracing and pipe work. It was an option but not one I fancied.

Change of direction

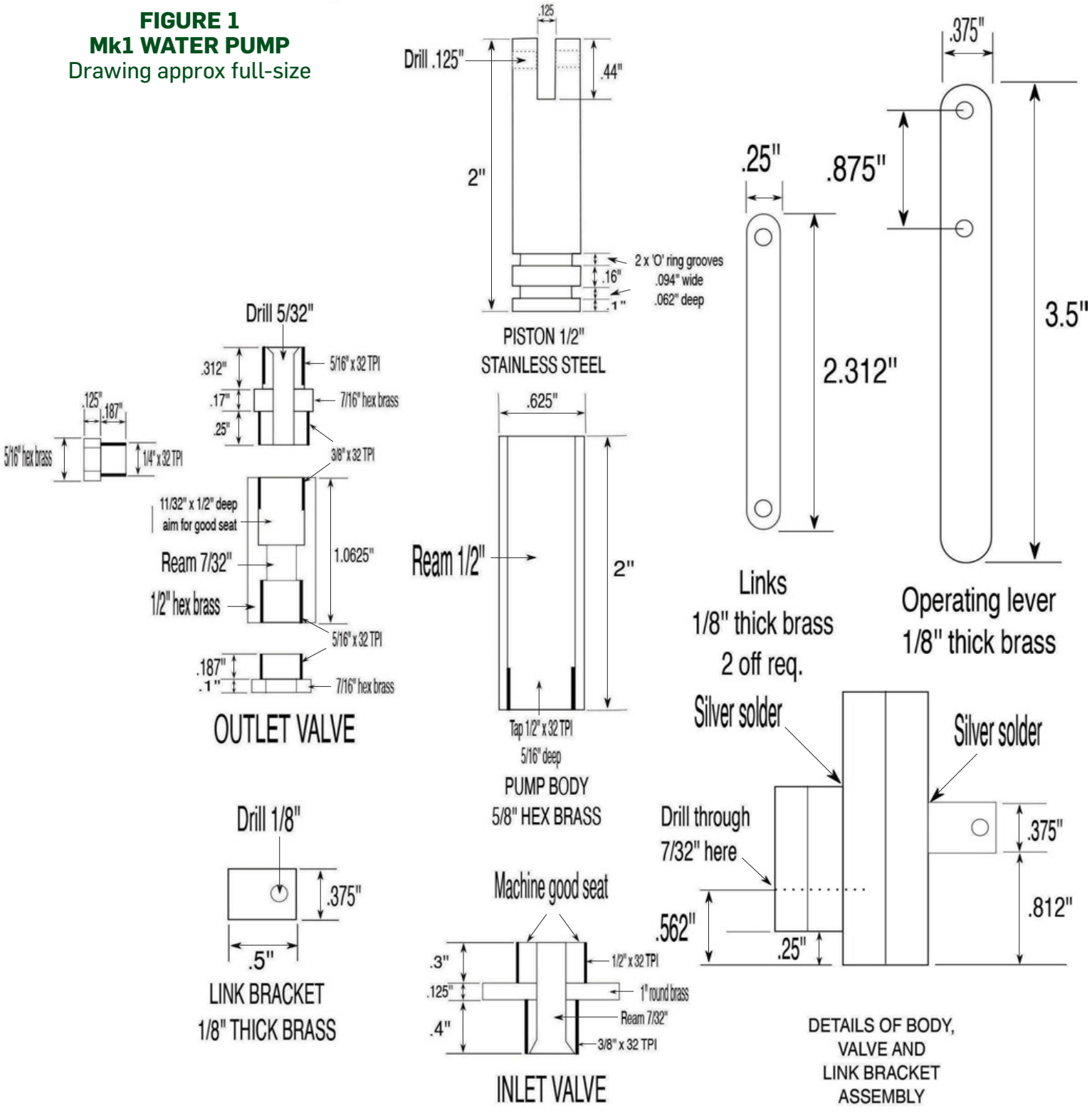
Now if I could mount the pump vertically, that would be the answer but alas they only work correctly in the horizontal plane. I wondered if vertical pumps were available so made a quick search of some of the suppliers and an auction site but to no avail.

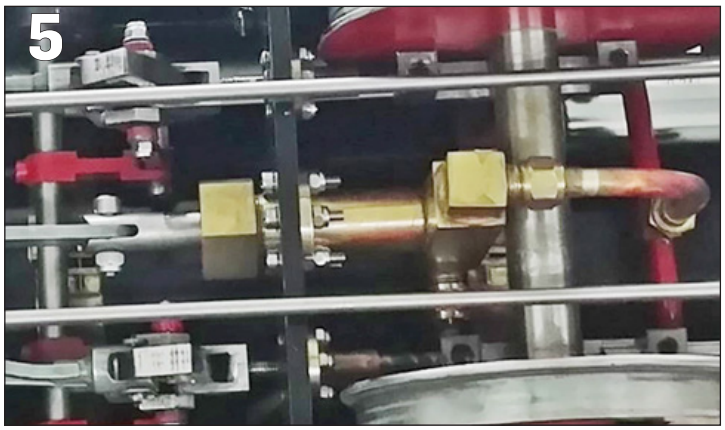
I had previously successfully made some pumps myself. The first was way back in 2009 when I needed one to hydraulic test a small boiler I had made (**Photo 3**). The pump worked well so I wrote an article which was published in this magazine, volume 30 issues 11-12, May-June 2009. Incidentally while searching the auction site for pumps I came across a Far-Eastern firm selling a pump that is uncannily similar to the one I designed (**Photo 4**). I wonder?

Anyway since then I have made a couple of axle pumps, one for Conway (**Photo 5**) and one for Chub (**Photo 6**), both from bar stock and which have worked perfectly.

My workshop time is somewhat sporadic, sometimes going weeks between visits, so I like to have a project or two lurking at the back of the bench that I can drop onto when I only have half hour or so to spare in the workshop. So here was a new

FIGURE 1
Mk1 WATER PUMP
Drawing approx full-size





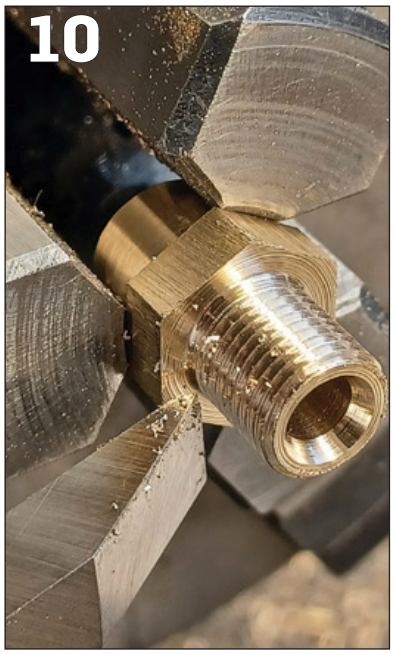


PHOTO 7: Completed Mk1 hand pump.

PHOTO 8: Boring and tapping the pump body.

PHOTO 9: Tapping the outlet valve body.

PHOTO 10: Screw cutting the outlet connector.

PHOTO 11: Pricking the pump body.

PHOTO 12: Silver soldering the two bodies together...

PHOTO 13: ...and a bracket to the pump body.

PHOTO 14: Re-reaming the pump body.

PHOTO 15: Preparing to cross drill the bodies.

PHOTO 16: Assorted O rings, always useful.

challenge, to design and build a vertical hand-pump.

Readers of any of my previous scribblings will already know that I happily use a mix of imperial and metric materials and measurements and rarely buy specific sizes but use whatever I have in stock – my apologies to any purists out there.

After a couple of evenings sketching out a few ideas what follows is what I came up with – I will call it the Mk 1 (Photo 7). The sketch, Figure 1, shows the sizes I used to make the pump which has a ½-inch piston. It would be fairly easy to scale it up or down depending on which size you need.

Drawn to suit the builder

I am completely self-taught when it comes to drawings so my version may not conform to recognised standards but I hope I have included enough details. Some of the parts may seem to be odd sizes but after successfully testing the pumps I stripped them down and measured all the parts and drew them as they were.

Starting with the pump body, I took a piece of ⅝-inch hex brass 2 inches long, drilled through 15/32-inch and then reamed ½-inch to a depth of 1 11/16-inch. The bottom end needs to be tapped ½-inch x 32 TPI x 5/16-inch deep (Photo 8). I have some taps that size but you could easily screw-cut it or use taps of a different TPI. The water inlet connection and inlet valve screw into this.

The outlet valve body is made from some ½-inch hex brass 1 1/16-inch long. I drilled through 3/16-inch and then reamed 7/32-inch. Using an 11/32-inch end mill I carefully machined out one end ½-inch deep aiming to get a good flat-bottomed seat.

This end was then tapped ⅜-inch x 32 TPI to a depth of ¼-inch (Photo 9). This end had the water outlet connection made from 7/16-inch hex brass threaded ⅜-inch x 32 TPI to fit the valve body and the outlet connection was threaded 5/16-inch x 32 TPI.

The other end of the outlet body was now drilled 9/32-inch to a depth of 5/16-inch and tapped 5/16-inch x 32 TPI (Photo 10). This end has a brass bung which is threaded 5/16-inch x 32 TPI. I drilled through the connector 5/32-inch and then cut a taper seat with a centre drill.

The valve body and pump body could now be silver soldered together. I used an automatic centre punch to prick the pump body where the valve body would go to leave a small gap between the two for the solder to flow through (Photo 11-12).

At the same time a small bracket for the link attachment was silver

soldered onto the opposite side (**Photo 13**). It's a bit tricky getting the pieces in the right place but I aimed to get them reasonably aligned. Afterwards I threw the assembly in the pickle for a while to clean it up.

After the clean-up the bore looked a little off and a piece of ½-inch round stainless steel that I intended to use as the piston wouldn't go in easily, so I carefully mounted the body back in the lathe using a centre in the tailstock to aid alignment. I then ran the reamer through again, turning the lathe chuck by hand (**Photo 14**).

The assembled body could now be mounted in the mill and cross-drilled right through the valve body and piston body 7/32-inch (**Photo 15**). I tapped the valve body ¼-inch x 32 TPI and made up a small brass bung threaded ¼-inch x 32 TPI to seal the side hole.

Just a point worth mentioning, I prefer to use 32 TPI instead of 40 TPI threads – I think I get a better thread as a result and my lathe is permanently set up for screw cutting at 32 TPI.

Sealing issues

The piston was a 2-inch length of ½-inch round stainless steel. I have one of those boxes of assorted O-rings (**Photo 16**) so sorted out a ½-inch example. A groove was cut in the piston, the O-ring fitted and tried in the bore. However it did not feel like a good seal so I cut another groove and fitted a second O-ring (**Photo 17**).

This was better but still didn't feel too good. Looking on the GLR Kennions web site (usual disclaimer) at the O-rings the firm offers (there is a very useful chart that gives not only O-ring sizes but also the groove size) I saw that their O-rings have a cross section slightly larger than the nominal bore so I duly ordered some.

The grooves on the pump were duly re-machined to 0.062-inch 62 thou deep and 0.094-inch 96 thou wide and two of the Kennions O-rings fitted, which proved much better (**Photo 18**). In fact it actually felt a little too tight so later on I removed one of the O-rings and the pump worked perfectly okay. On the drawing I have shown the original piston I made with two O-rings but my experience revealed that only one is actually needed.

The piston then needed to have a slot cut in the other end and was then cross drilled 3mm.

The inlet valve, which incorporates the pump mounting flange, is made from some 1-inch round brass bar as per the drawing. I drilled through 3/16-inch and then reamed 7/32-inch. It's important to ream this hole as it is the ball seat – simply drilling it 7/32-inch isn't good enough, as drills very rarely drill a perfectly round hole. The same goes for all holes where a ball sits.

One end was threaded ½-inch x 32 TPI and the other ⅜-inch x 32 TPI. The end that is threaded ½-inch must have a carefully machined face for the ball to seat on. Four mounting holes were then drilled around the flange. I also drilled some small holes around the rim with a centre drill – these can be used with a small bar for tightening (**Photo 19**).

I made up the operating lever and links as per the drawing. I used ⅛-inch round brass rod for the link pins, peened over each side. For the lever to piston pin I used a M3 socket-head cap screw that has a nice plain shank and a nyloc nut.

Now it was time to assemble the pump. The inlet valve is screwed into the body with a little Loctite thread seal. A sacrificial ¼-inch stainless steel ball was dropped in and given a tap with a punch to help with seating, then replaced with a new ball. On the original pump I didn't fit a pin to limit the ball lift – it seems to work okay without one.

The piston was inserted and the lever and links attached. The sacrificial ball was dropped into the outlet valve and given a tap with a punch and then again replaced with a new ball. The side and lower bungs were fitted with thread seal followed by the outlet connection, also with thread seal.

First test

It was now time to see if it worked. I set up a test rig (please excuse the Pot-Noodle pot water supply) with a gravity-feed water supply and a pressure gauge. The pump worked perfectly first time and easily pumped up to a pressure of 140psi. In the ▶

PHOTO 17: Mk1 piston with two O-rings.

PHOTO 18: Piston once fitted with better O-rings.

PHOTO 19: Drilling the rim for a tommy bar.

PHOTO 20: The extension lever – note the useful water container...

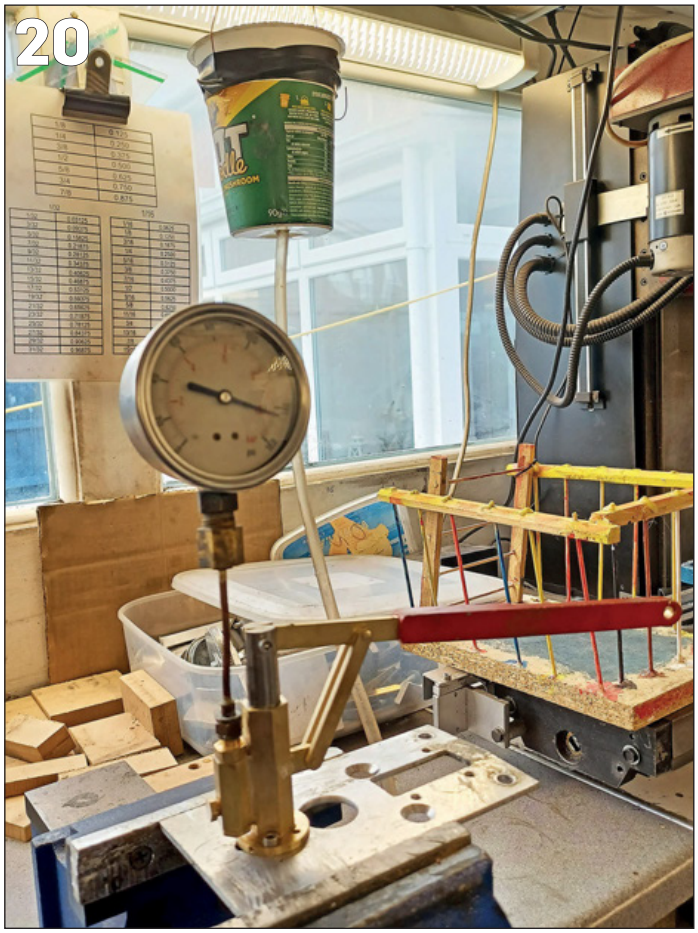
PHOTO 21: Comparing the Mk1 vertical pump to the horizontal pump.

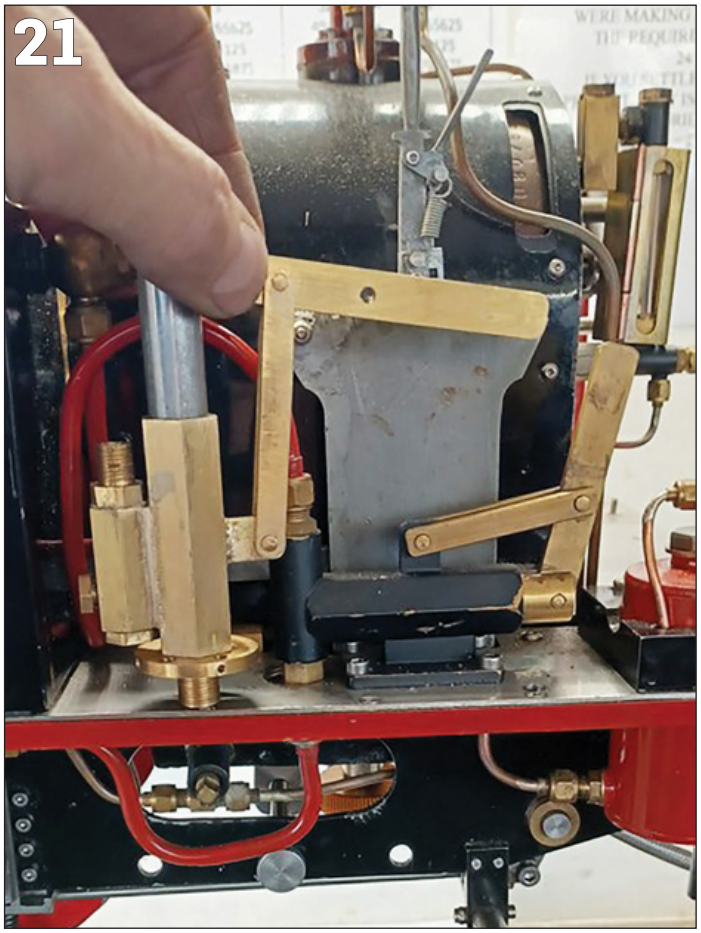
photo you can see I had the links set back a little along the operating lever but I later redrilled the lever so that the links were vertical. The extension for the operating lever I already had to hand, from the horizontal pump fitted to the loco (Photo 20).

The pump held the pressure quite well but there was a slow drop, only 20psi over about 10 minutes but still a drop. I replaced the stainless steel balls with some 8mm nitrile balls that I had to hand – these actually measure 7.6mm and that cured the pressure drop completely.

Photo 21 shows me holding the pump next to the horizontal one fitted to Conway. You can see the difference in occupied space – all in all a successful project. EIM

■ As you may have guessed from the title of this feature, Rich did not stop here! In next month's issue he describes an improved and simplified version of the pump.





Having a wheely good time...

Tech-ed Harry discusses the procedures and challenges involved in remachining worn wheels – techniques that can apply to a range of miniature railway applications...

BY **HARRY BILLMORE**

Recently it seems I have spent a lot of time on the Fairbourne Railway's lathe machining wheels for our 6-inch scale 12¼-inch gauge rolling stock – carriage wheels which are cast in steel as one piece (apart from the new replacements which are made from discs of EN8 steel) and the wheels of our bo-bo diesel locomotive 'Tony', which have a cast centre and a tyre of unknown material shrink-fitted to the outside of a cast centre.

Both methods of making wheels have their pros and cons. The single-piece cast wheels require less machining and fitting, but when they cannot be machined any more the whole wheel is at the end of its life and has to be scrapped. The tyre approach requires more machining in the first place, but once the initial machining is completed, replacing worn tyres is a much easier process than replacing an entire wheel.

One of the methods that has been used in the past at the railway to extend the life of cast steel wheels under the carriages has been to build up the root of the flange profile with weld and then to machine it back. This technique is absolutely not recommended without knowing precisely what the steel you are dealing is made up of and properly heat treating the wheel afterwards, as it is not unknown for bits of flange to fall off if the built-up weld has been less than perfect.

"It is not unknown for bits of flange to fall off if the built-up weld has been less than perfect..."

Hard weld

The welding process can also create very hard spots on the wheel which can in turn lead to strange wear patterns on the wheel profile too. As you can see in **Photos 1** and **2**, both of these wheels have been built up with stainless welding rods at some point in the past – apparently this was because there were boxes and boxes of such rods kicking around the railway's workshop for years.

The wheel in Photo 1 has worn in some very interesting places and there is almost a step in the root of the flange profile. Meanwhile the wheel in Photo 2 has slag inclusion holes in it, which are visible as the small dots on the edge of the weld. This is where cracks can begin to form from inside a casting. ▶

PHOTO 1: A carriage wheel with a welded-up root radius, note the strange wear patterns visible.

PHOTO 2: This carriage wheel has been welded with stainless rods, you can see the slag inclusion holes on the weld.

Photos by the author

PHOTO 3: The result of hitting a hard welded section of tyre, the tool tip also smashed off...

PHOTO 4: A hard spot in the casting, chatter marks are a first indicator, then lumps forming that knock the tool – this wheel was scrapped.

Photo 3 shows what happens when you are machining a welded wheel and start into the transition between the base cast steel and the weld – the heat of the weld hardens the cast steel and in the photo the carbide tip is gradually being smashed up as it tries to deal with hard spots on the wheel interrupting a normal cut. The sparks you see flying off are from the very hard bits.

Natural issues

Photo 4 shows hard spots in a cast wheel but from a different source. These are 'naturally' occurring areas within castings, they can happen as different sections cool at different rates – usually on the surface of a casting that is particularly hard, but they can form internally as well.

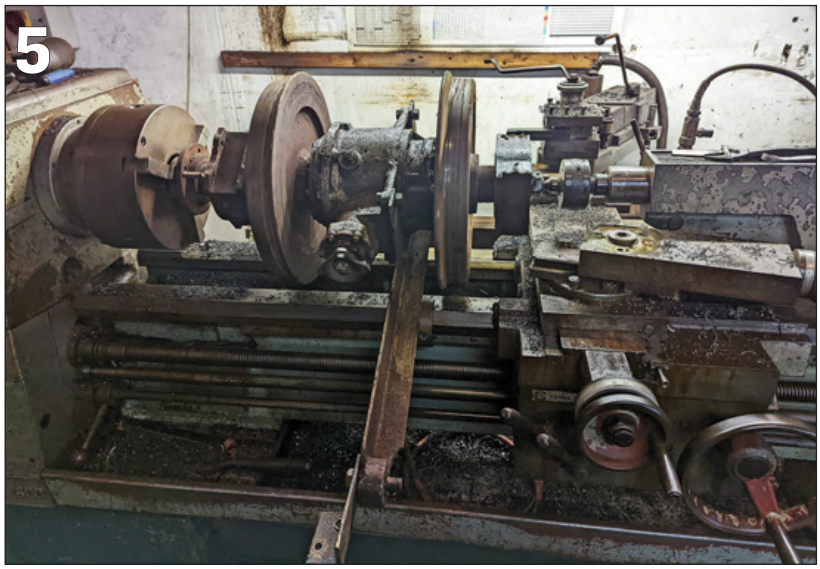
In this case I ended up scrapping the wheel set as there were several of these hard spots around the wheel and all the tricks I could come up with couldn't deal with them.

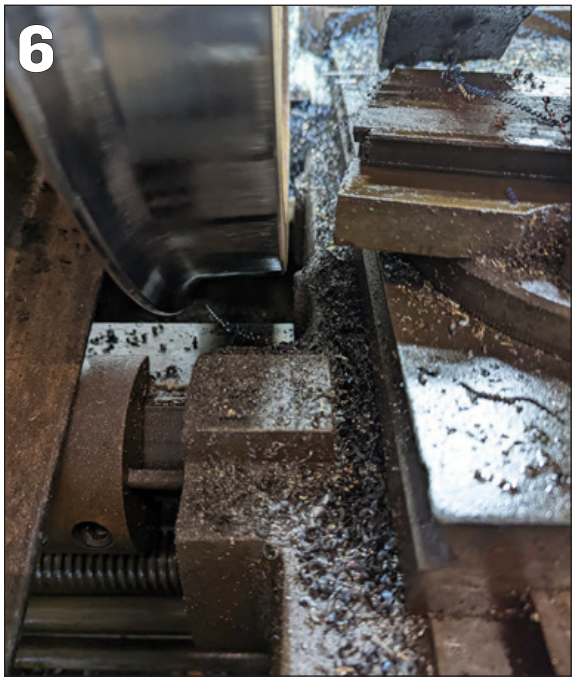
Note the chatter that was caused by the hard spots – the section on the right of the picture is cutting normally but as soon as the tool is hit by the hard spots it is set to bounce and causes chatter.

Photo 5 shows the setup I had to use for machining Tony's driven wheelsets – these have a large final-drive gearbox mounted between the wheels with a torque-reaction arm that attaches to the bogie frame hanging out too.

If the gearbox had been smaller I would have taken the torque arm off and left it free to turn with the wheels, but due to the propshaft coupling fouling the bed I used the torque arm to hold the flange away from the bed. After the photo was taken I did clamp the torque arm to the bed just to make sure it wasn't going anywhere.

When machining items in tight confines, I find the use of stops really handy – they can save a moment of inattention from ruining hours worth of work! In the case of Photo 6 you can see how close the lathe carriage is to the wheel. This is due to the position of the tool and how large the





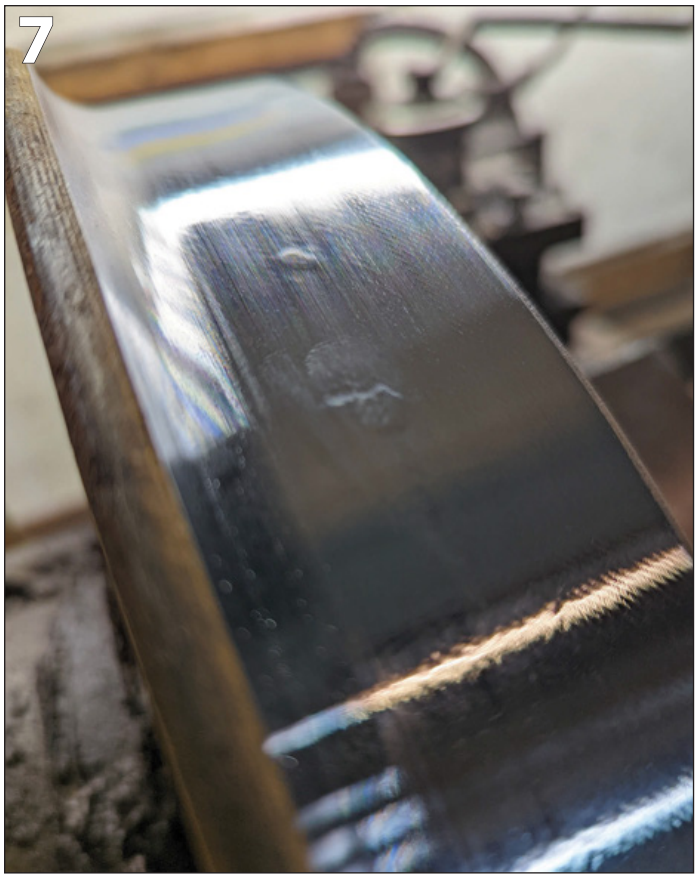


PHOTO 5: Creative setting up required to turn an axle with a drive attached. The torque arm was clamped to the bed after this photo was taken.

PHOTO 6: Setting up stops can ensure that a moment's lapse in concentration doesn't ruin hours of work!

PHOTO 7: A series of hard spots found in a tyre, the carbide tip was skating over the top of them.

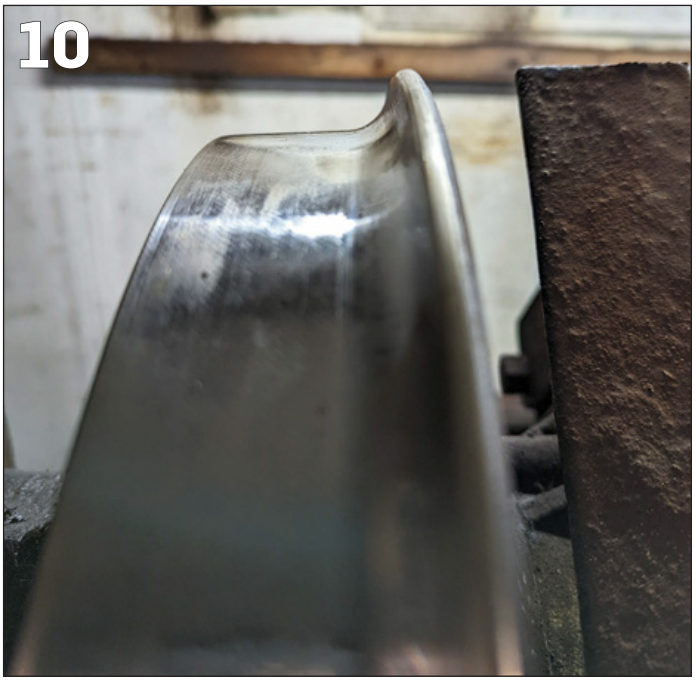
PHOTO 8: Attention with an angle grinder takes the hard high spots off and allows the tool to cut the correct profile.

PHOTO 9: A before shot of the wheel and its profile.

PHOTO 10: And an after-shot of the wheel after it had been turned it round, it now has the correct profile to the correct size, despite the hard spots.

wheels are – I have set up a bed stop clamped in place to stop the carriage running into the wheel.

Photos 7 and 8 show a series of hard spots appearing in the tyre material of Tony's wheels and how I dealt with them. The carbide tool tip was skating over the top of the hard spots so the easiest way to deal with them was to grind them down before taking another couple of cuts. This was particularly effective since I had quite a lot of material to remove from the wheel. You can see the final results in Photo 10. EIM



Renovating a 1953 Tom Senior M1 Mill

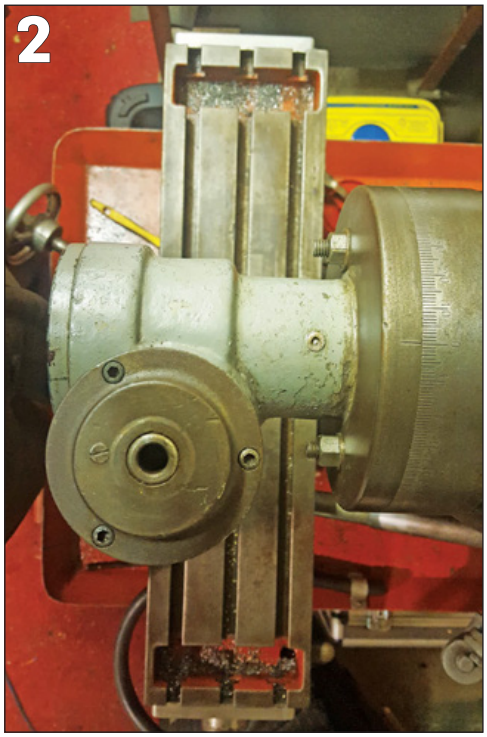
Howard and Isaac continue setting up the workshop for their Ransomes traction engine project with another purchase of a British machine tool.

BY **HOWARD** AND **ISAAC TRENDELL**

Regular EIM readers will know that this father-and-son team have taken on a first model engineering project, a Ransomes traction engine rebuild (EIM June 2021) and are using it as a learning experience, setting up a workshop. In the January issue I described how we purchased a secondhand Myford ML7 lathe and renovated it – we also needed a milling machine to compliment the Myford and, of course, it couldn't be a modern unit, so we started looking for another piece of Great British engineering.

Via an acquaintance I heard of a Tom Senior M1 mill for sale and after a couple of conversations I got a feel for the seller and a price was mentioned. As always, it's 'buyer beware' and quite often people want too much money for stuff, but this machine was within our budget, was being sold for the right reasons and above all it sounded 'right', so I decided to go and look and took the trailer with me just in case.

On arrival the mill was already out in the seller's yard waiting for an appraisal and he had it connected up to the mains to prove it was a runner. It had some wear in the usual places; backlash in the table and saddle feed mechanisms and the odd groove in the table from an over-adjusted cutter, but it also had a smooth and quiet operation, and everything worked. Not only that but it came with a quality Clarkson Autolock chuck in a vertical milling head attachment along with a huge selection of imperial milling cutters.

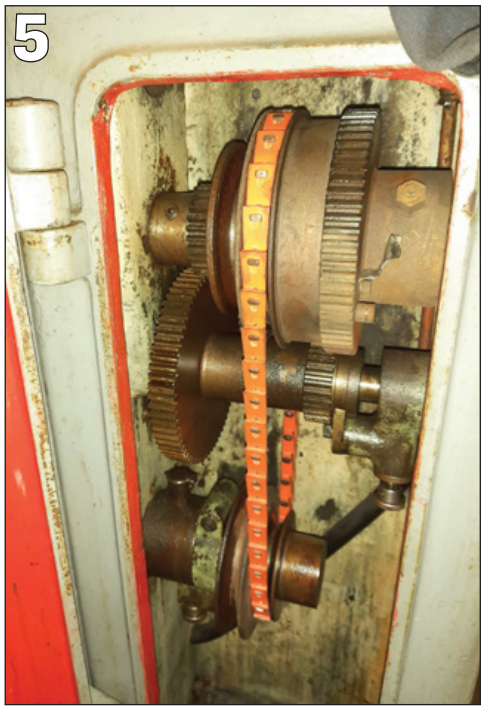


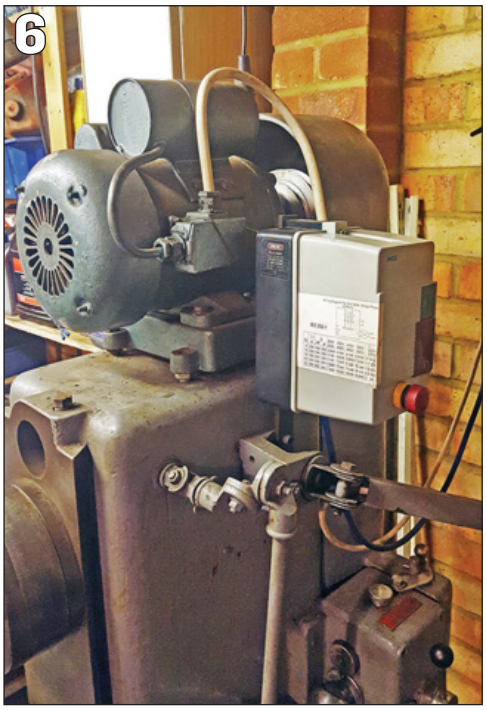
Heavyweight item

The price was definitely right and there appeared to be only a couple of jobs to do to get it up to scratch, so money changed hands and we loaded up the Senior and headed home. It's a good job that I had taken a big trailer as, reading the operating instructions downloaded from the internet, I found out that even though the M1 is a relatively small unit it weighs just over a third of a ton and is quite top heavy, so I had it well strapped down to prevent it toppling over on the A1!

Further research revealed our machine to be made in 1953 and, similar to the Myford, it was in remarkable condition for its age. On arrival home and once installed in the workshop we made a more in-depth appraisal of its condition. The main body of the mill was loose on its mountings where it is secured to the base and the coolant suds reservoir was full of very old sludge and muck, so this had to come off to be cleaned and the whole frame re-secured. The drive belt was completely worn out and would likely slip when under load but the rest of the mechanicals, with the exception of the backlash mentioned, were in great condition.

We elected not to completely strip the drive train, as we figured why fix it when it's not broken? The main unit was separated from its stand and the integral coolant tank by suspending it from the roof joists in the workshop on a chain block, hoping the joists would take the weight – which they did. The tank was cleaned and the threads on the securing studs were renovated, and new nuts and washers fitted on reassembly. A new link type





drive belt was purchased and adjusted to length to fit the pulley centres. We can live with the backlash on the table feeds for now until we can source new feed nuts.

Electrically, however, it was a very different story; the unit had a single phase three pin plug... and that was it – no switch, no lockout, no emergency stop. Not only that but the earth wire was hanging in mid-air out of the back of the drive-motor junction box which we hadn't seen before and so, after it gave Isaac a 'bit of a tingle', we didn't switch it on again until this had been rectified.

Clearly the earth had been disconnected because of a fault, presumably because it tripped out the RCD in the consumer unit when working hard or on start-up, this is **Very Dangerous** – one must always find the cause of an electrical fault, never bodge it...

We purchased a new control box complete with a no-volt release lockout relay, but it didn't have an emergency stop button. So I had a root through some of my spares and found a suitable component. A no-volt release unit incorporates a relay so that if the power fails during use the unit 'fails-to-safe' and doesn't switch on again when the power is restored – this is most important for controlling machine tools, as is an emergency stop switch.

After a bit of work on the new control box, some new wiring and making reference to other mills I mounted the control unit in a suitable position, taking care to ensure it was easily accessible in an emergency situation and during normal operation, so that the user is not put at risk from the cutters when switching the mill on and off.

Burning issue

Once this job was complete a test was in order, and this was when I found out why the earth wire had been cut; in a split second I had a fire on my hands when the motor wiring burst into flames!

Fearing the worst, I removed the motor and dismantled the whole thing for investigation. Expecting to need a complete motor rewind I found that the insulation had failed on the wiring in the motor junction box. Luckily it was repairable, so we set about fitting new cabling and making it all safe again and another test (carried out with some slight trepidation) which proved all was well.

The next issue to tackle was the Clarkson Autolock chuck. It is a fantastic piece of kit, beautifully engineered and accompanied by a large selection of cutters and collets. Trouble was it was stuck fast in the vertical milling head and I tried all the standard techniques to remove it.

The chuck has a MT2 Morse Taper secured with a drawbar; essentially a long screw which passes all the way through the milling head and tightens ▶

PHOTO 1: General View of the Tom Senior M1 mill once it was ready for use.

PHOTO 2: Vertical milling head included in sale.

PHOTO 3: Very mucky in the coolant suds reservoir...

PHOTO 4: Drive belt was clearly very old.

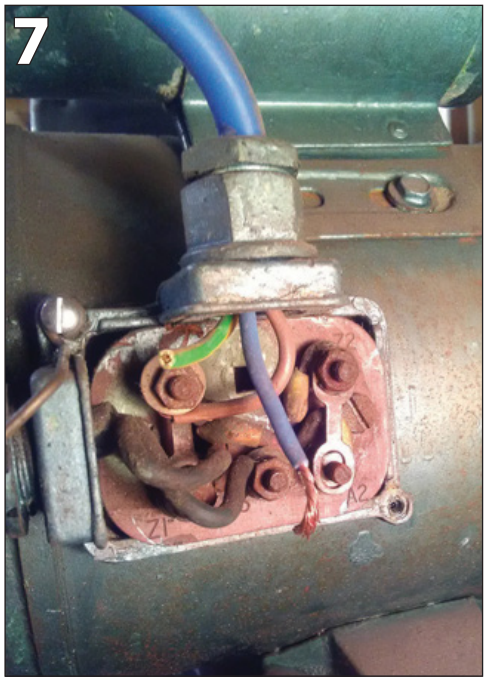
PHOTO 5: A new belt was acquired and fitted in place.

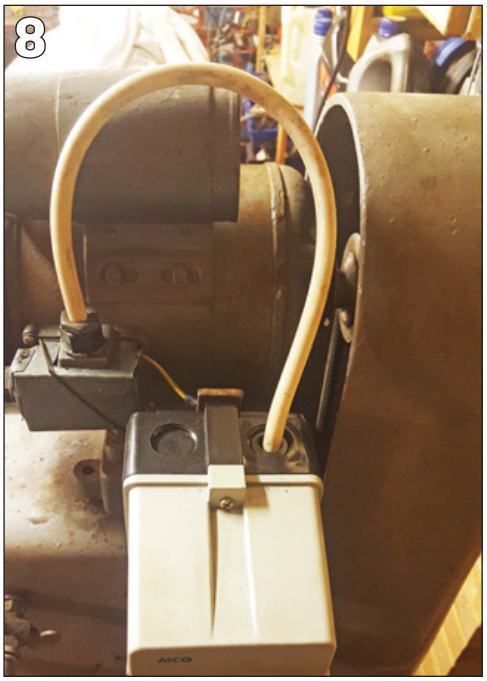
PHOTO 6: The electrics needed a lot of work – here the switch gear has been fitted.

PHOTO 7: Major danger – lack of a connected earth wire.

PHOTO 8: Safety restored with properly connected earth.

Photos by the authors





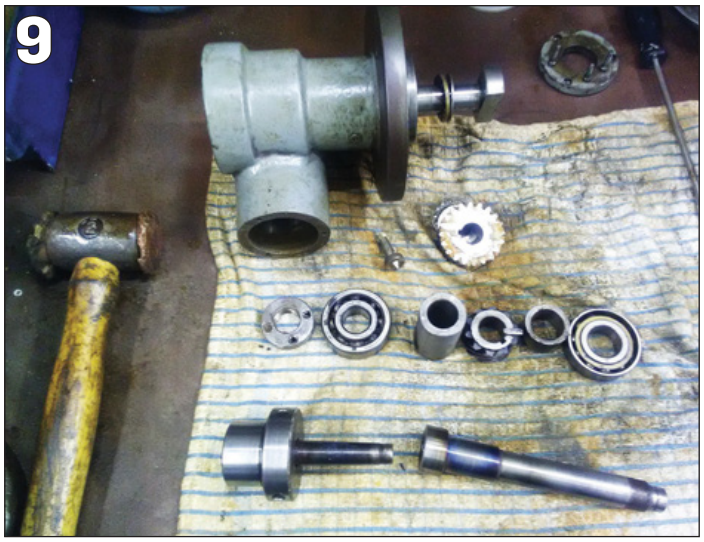


PHOTO 9: The component parts of the vertical head after dismantling.

PHOTO 10: The MT2 taper was finally released after a lot of heat was applied...

PHOTO 11: First stage of 'tramming' the milling head.

PHOTO 12: Tramming continues, with Isaac gentle on the mallet.

PHOTO 13: Ready for work, the installed lathe and milling machine.

the chuck into the corresponding taper. There is also a left-handed screw collar used to tighten up against the head to force the tapers apart to remove the chuck.

After a few attempts at loosening the drawbar, tightening the collar and knocking the end through with a soft hammer nothing budged. With the absence of any written instructions, a quick reference to the internet confirmed my method was good so a few heavier blows were administered but to no avail.

Not wishing to cause permanent damage to the unit I removed the milling head and stripped it down for further investigation. Once dismantled to its component parts I decided to gently heat the milling head drive shaft in an attempt to separate the tapers – following a little more heat with oxy-acetylene than I would have liked, the two were finally

parted and it was clear it had been a very long time since they were last apart. A thorough clean of both tapers and reassembly of the head and it all went back together ready for setting up and a test cut.

So we fitted a new link belt to replace the worn out item, adjusted it up, applied plenty of lubrication with 32 grade oil to all the relevant points and ran the mill for a test cut on a piece of scrap angle iron. It made a great job with no nasty noises or chatter – as a result we are very pleased with our purchase.

Degrees of accuracy

The last thing to do before using the mill on its first job was to 'tram' the head. To produce accurate machining the vertical milling head must be set at exactly 90 degrees to the horizontal table. This is done using a test arm fitted to the chuck with the ability to be rotated through 180 degrees.

I fabricated an arm using a piece of ⅝-inch silver steel (to fit a ⅝-inch collet in the Clarkson chuck) drilled and threaded 5/16-inch UNC to which was bolted a length of 1-inch x ¼-inch flat bar. At the free end of the arm I fitted a Dial Test Indicator (DTI) which contacts on the table. The whole setup needs to be rigid enough not to deflect during the test, and the table must also be rigid, in other words the gib strips must be properly adjusted to eliminate any horizontal play in the table.

The vertical head can be rotated 90 degrees either side of vertical so we first set the head in the zero (vertical) position using the graduated scale on the head and wound the table to the centre so there was an equal length each side of the head. With the DTI set above one end of the table, we raised the table until the plunger contacted with the end and zeroed the DTI. Now we rotated the test arm so that the DTI contacted with the other end of the table and took a reading on the indicator.

The securing bolts on the vertical head need to be pinched up just enough to allow a gentle tap with a copper hammer to rotate it so that the DTI indicates exactly the same reading at both ends of the table. Once the head had been set initially we went back and checked and adjusted as necessary until there was no further deviation in the readings on the DTI at either end of the table.

The mill is now ready for use and our first job is to mill the solid stays on the firebox of our Ransomes traction engine project to allow them to be drilled and tapped for fixing the firebox to the tender. We will bring you further reports on our project as we make progress... EIM

Clean machines...

Properly cleaning locos is important no matter what the scale...

BY **ANDREW CHARMAN**

Back in the days of main-line steam footplate crew started their careers as cleaners – in building a mantra for keeping their locos looking good they also got to know the various components intimately. Our miniature locos are built from the same materials as their full-size counterparts and so in principle the same techniques apply.

Cleaning is important both for appearance reasons and in checking the loco over – remove grime from a spring and you might find a broken leaf underneath. Properly mopping up the ash removed from a smokebox stops gritty bits getting in the motion and acting like an abrasive...

The best sort of rags are cotton, such as bed linen or old clothes with zips, buttons and the like removed to avoid scratching paintwork. Use the cleanest rags for final polishing and when they get dirty demote them to initial grime removal and when dirtier still keep them for firelighting.

Clean bits that get hot, such as brass safety valves, chimney caps and the like, first, preferably just before or after lighting up your loco.

For cleaning brass or copper a good quality metal polish is absolutely fine, combined with steel wool for stubborn marks. Tarnished pipework and the like needs more effort, usually a fine emery paper and thin oil, done very carefully to avoid the emery wearing the wall of the pipe. Soak the area in oil, wrap the emery around it and cover with oil, then pull it back and forth to remove the dirt in the oil.

Automotive aid

Paintwork, such as on the boiler sides, tanks and cab, is easiest to clean and car polish is highly suitable for this job. Make sure first any bits of ash, grit or such like have been brushed away to avoid scratching.

If it's particularly dirty (such as if your loco has primed and sent dirty water out of the chimney) it will benefit with a wash first using a sponge in hot water with a dash of car shampoo or washing-up liquid added. When you apply the polish, wetting your cloth first will make it go a lot further. Polish off with a second cloth.

Some locomotives with matt black platework respond well to being cleaned with a mixture of engine oil and red diesel or paraffin. When rubbed down it gives an attractive finish though it can easily attract dust and dirt particles.

"Clean bits that get hot, such as brass safety valves, chimney caps and the like, first, just before or after lighting up"

Cleaning below footplate level, the wheels, motion and frames, is equally important as the most 'visible bits', particualrly because they get much dirtier. Here diesel works wonders, applied with a paintbrush, then wiped off using cotton rags – with some good rubbing quite a nice shine can be achieved especially on unpainted bright steel motion parts.

DO NOT be tempted to clean such areas with a steam cleaner or power washer. All this does is produce cups full of water where you don't want water, such as in axleboxes and oil reservoirs. And as oil floats on water, you won't be able to see the problem...

You will often find rust spots on motion parts and these should definitely be removed. Again thin oil and emery paper does the job, carefully used. Any black residue that results fromt his technique should immediately be cleaned off – again you don't want this in places such as the motion where parts rub together.

Once steel parts are cleaned, one traditional technique is to make up a 70/30 mixture of cooking oil and paraffin, which once it is applied to the parts will help prevent the rust from returning.

If parts are seriously tarnished then more physical work with abrasive cleaners may be needed. But you should seek the advice of experienced model engineers before applying such methods to your pristine loco... EIM

BELOW: Car polish brings up a good shine whether on a full-size loco such as this or on a miniature one. *Photo: Andrew Charman*

A freelance traction engine in 3-inch scale

Jan-Eric takes a break from gears and drivetrains this month to focus on some home comforts for the operator and passengers of the traction engine.

BY **JAN-ERIC NYSTRÖM** Part Seven of a series

The late Juhani Saloranta, builder of the magnificent 7¼-inch gauge Baldwin 'Decapod' live steam locomotive featured in the November 2017 and February 2019 issues of EIM, once gave me a piece of important advice: "When building a live-steam engine, always finish the tender before the engine itself is completed!" In this way, you won't need any makeshift arrangements for providing water to the engine, or for incorporating a driver's seat.

Thus, the tender for my ten-wheeler, construction of which was recently serialised in these pages, was ready long before the loco was ready for the track! Of course, for a tank engine such as my little 0-6-0 shunter, any car will do for the driver, since the engine carries its own water supply – but, since it isn't fired on coal, it needs a propane tank, so even when building that engine, I finished the driver's car first...

Planning ahead

A full-size traction engine doesn't need a separate tender, since the driver sits or stands inside the cab, with a coal bunker (also called a 'tender') behind him. This is of course impossible in quarter-size, so following Juhani's advice, I decided to make a driver's wagon, as well as a passenger wagon, long before my traction engine was even close to being finished.

In Photo 70, on the collapsible workshop stands you can already see the basic 'stepped box' design for the driver's wagon – very similar to the utilitarian but ugly driver's car I built for my 0-6-0 shunter. Leaning against the workshop wall are additional pieces of phenolic-resin, waterproof marine plywood; they will form the passenger wagon that will measure more than four feet long.

As followers of this series will have seen in the previous articles, I have constructed the traction engine with differential gearing on the rear axle; this means that it can negotiate very sharp curves, in fact as sharp as the

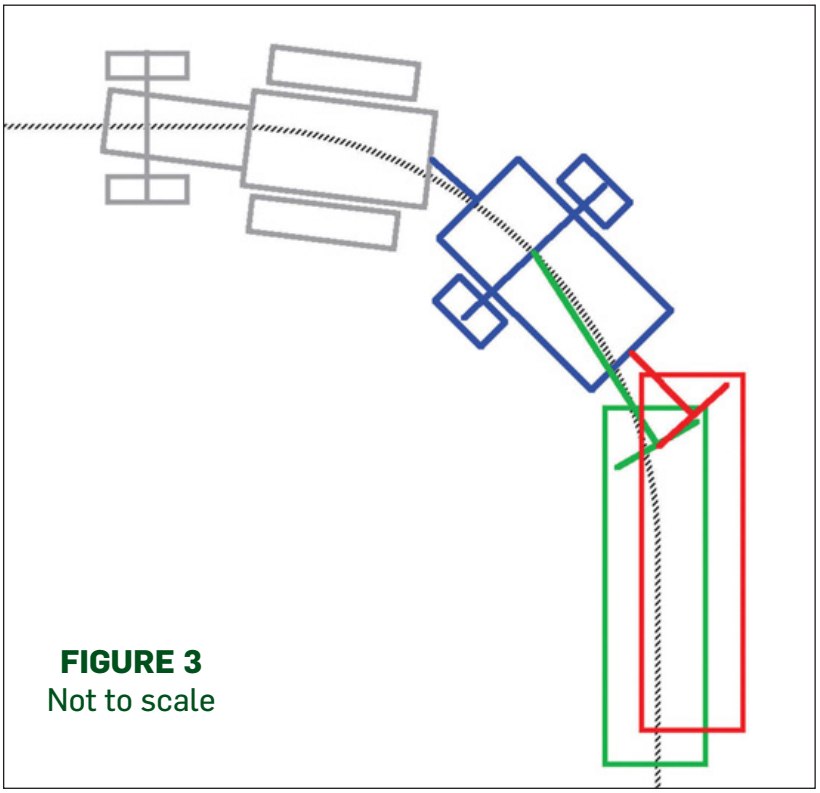


FIGURE 3
Not to scale

PHOTO 70: All the plywood needed for the building the wagons for driver and passengers.

FIGURE 3: Pivoting drawbar facilitates entry into those tighter curves.

PHOTO 71: Beginning the construction of the steering mechanism for the wagon for passengers.

PHOTO 72A-B: The flexibility of this arrangement is evident in these two views. Single axle of driver's wagon at right.

PHOTO 73: An elongated hole is necessary for the movable connection of the two axles.

Photos and diagrams by the author

steering of the front wheels will allow. The hind wheels will accommodate any curve without slipping, since the differential mechanism will divide the rotating torque between the left and right wheels accordingly. It would be rather ill-considered to hamper this ability by building wagons not capable of negotiating such curves!

Getting a steer

Therefore, I decided to build the driver's wagon with only one axle, and use a pivoting drawbar for connecting to the passenger car. In addition, the latter would incorporate steerable wheels.

Figure 3 shows an exaggerated computer simulation of my idea – the dotted line indicates the path of the engine-wagon combination. The engine is just about exiting the curve, while the driver's wagon is in the middle of it. Since this wagon has only one axle, it turns easily, pulled by the drawbar that is attached to the rear of the engine.

If the drawbar between the driver's and the passengers' wagons would be solidly attached to the former, it would force the latter well out of the intended path, as seen marked in red. However, if the drawbar is pivoted at the centre of the axle in the driver's wagon, you get a much smoother entry into the curve, marked in green.

Furthermore, if both axles of the passenger wagon are steerable (only the front axle is indicated in the drawing), the wagon will turn much more easily.

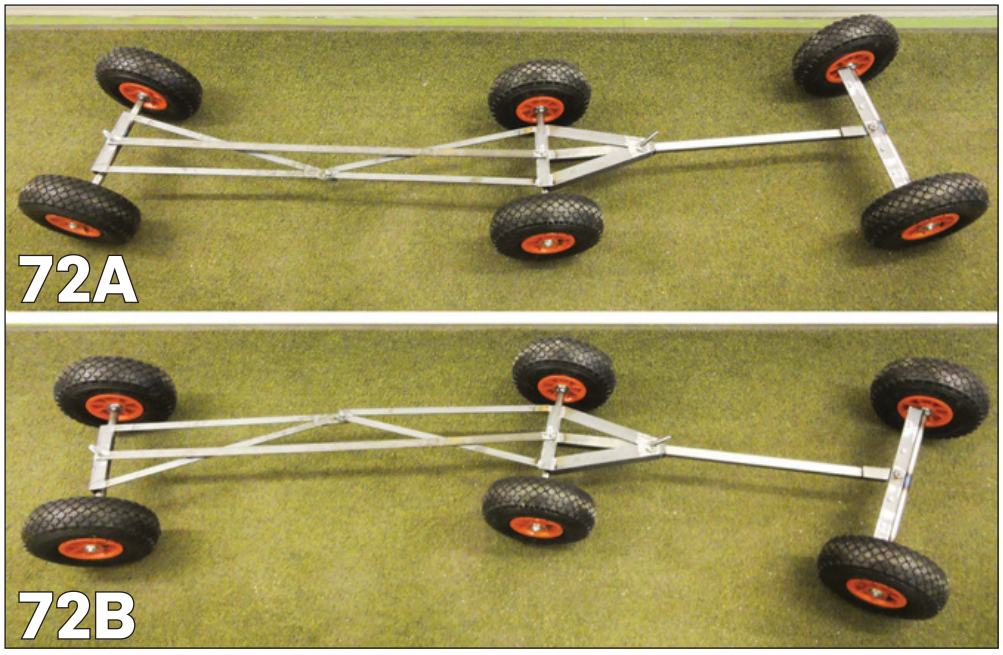
With all this in mind, I started the construction of the passenger wagon, (**Photo 71**). Cut-outs at all four corners of the 16mm (⅝-inch) thick plywood base, and 'fenders' made of strips of the same material will provide a semi-enclosed space for the wheels – I don't want my passengers to be able to put their feet on the wheels!

The photo also shows my 'ad-lib' planning of the steering mechanism for the passenger wagon: triangles made of flat and angle iron will pivot around the centre of both axles.

Photos 72A-B show a trial assembly of the parts, and the flexibility of the arrangement. The two wheels of the driver's wagon are on the right side, and the pivoting drawbar connects to the wagon's four interconnected wheels at left. There is a straight piece of flat iron to keep the two axles in place – it will not be used in the final assembly.

Flexible design

The triangles are connected with a bolt moving in an elongated hole, **Photo 73**. A round hole wouldn't allow for the necessary 'play', causing the assembly to become more or less rigid.



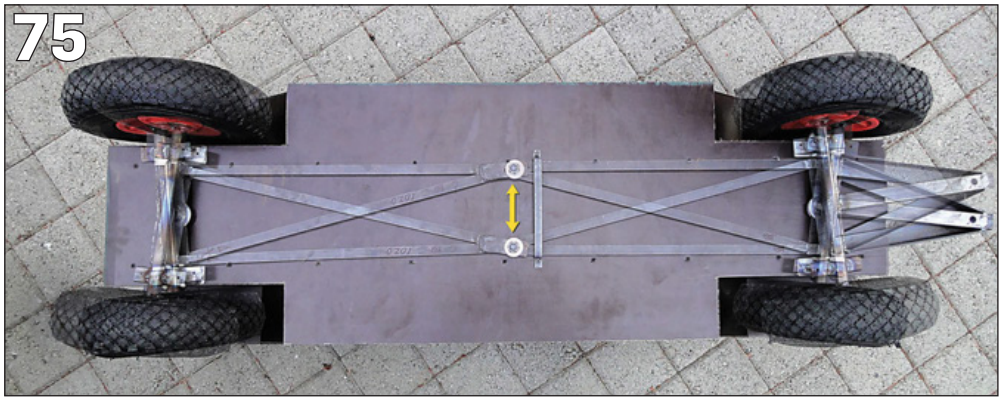


Photo 74 shows the underside of the passenger car, with the finalised steering mechanism. Note that in the middle of the wagon base, there is a brace preventing the two flat-iron triangles from drooping downwards to the ground.

The axles are pivoted around their kingpins, with ½-inch thick plastic thrust washers against the plywood bottom. In addition, just inside each wheel, a little metal plate is attached to the plywood bottom. This bears against a ball bearing attached to a short piece of U-shaped steel welded to the axle.

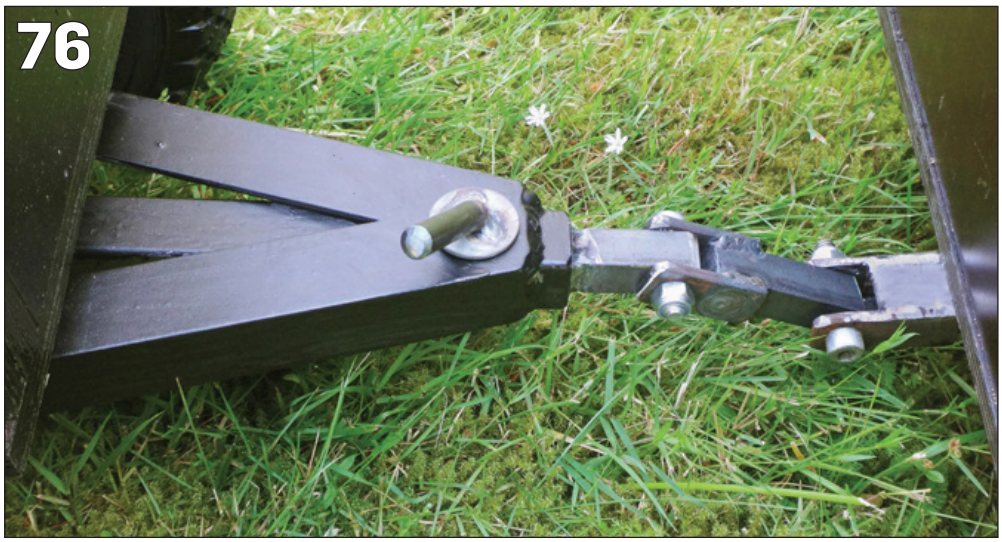
In this way, the axles will rotate freely even when the wagon is heavily loaded, and the wagon will not tilt at all relative to the axles. Without the ball bearings, the friction of a heavy load would prevent the axles from turning easily, causing problems in tight curves.

"My first tests indicated that the combination of engine, driver's and passengers' wagons can negotiate a curve radius of about three metres..."

PHOTO 74: The underside of the passenger car. To the right, a sturdy tubular coupling accepting the drawbar from the driver's wagon.

PHOTO 75: A superimposed view of the extreme positions of the steering mechanism – the arrow shows the variation. Note how the axles turn!

PHOTO 76: A flexible dual-knuckle joint adapts to any unevenness that may be in the ground.



Tight turn

Photo 75, a 'trick' image consisting of two superimposed photos, shows the extreme positions of the axles and their connecting mechanism. The arrow indicates the approximately 125mm (5-inch) of movement that is possible with this design. Note the changing angle of the superimposed wheel axles; in this way, the wagon can negotiate quite tight curves! Without such steering, the front wheels of the wagon would have to be dragged sideways into a curve.

My first tests indicated that the combination of engine, driver's and passengers' wagons can negotiate a curve radius of about three metres (10 feet), thus the complete turning circle required is only about six metres (20ft) in diameter.

The coupling between the one-axle driver's wagon and the two-axle passenger wagon needs a vertically flexible joint, to enable the combination of engine, driver's and passengers' wagon to run on uneven ground. This was quickly constructed, (Photo 76). With this little addition to the drawbar, the ride will be smooth. The drawbar from the driver's wagon is released by pulling away the pin from the tubular receptacle attached to the front of the passenger wagon. EIM

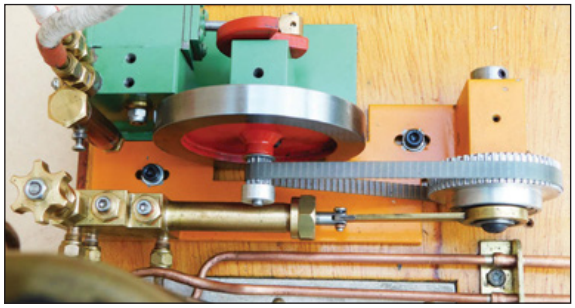
Next month: Jan-Eric builds seats for the wagon and returns to the engine's steering mechanism.

■ Parts one to six of this series appeared in the September 2021 to February 2022 issues of EIM – download digital back issues or order printed copies from www.world-of-railways.co.uk/store/back-issues/engineering-in-miniature or by calling 01778 392484.

A Feed Pump and double-clack for the EIM Steam Plant

Martin continues his addition to the popular stationary engine project, this month fabricating the connecting rod, crankshaft and other components.

BY **MARTIN GEARING** Part four of a short series



Last month we made the bypass valve for our feed pump and now we turn to a host of further components including the connecting rod and crankshaft.

Ball Valve Covers

Item FP11 – 10mmAF brass.
Refer to Drawing FP11

Again the only thing to note is that the undercut at the end of the thread must be sufficient to allow the hexagon to contact the valve body as it will be this surface that seals.

Pump Gland Nut

Item FP12 – 14mmAF brass.
Refer to Drawing FP12

All the comments related to the previous bypass valve gland nut FP10 apply here.

Pump Piston

Item FP13 – 5mm dia x 62mm 303 stainless steel. Refer to Drawing FP13

On the lathe or mill, face off both ends to length before clamping vertically in the milling machine.

Zero the spindle to the blank and then zero the z axis after touching the end of a sharp 2mm diameter slot drill against the end of the piston rod.

Taking 0.5mm depth of cut (either by raising the table or lowering the spindle) machine the 5.5mm deep slot.

Deburr the slot edges (**Photo 34**).

Using a suitable parallel to bring the pump rod just below the top of the vice jaws and a straight length of 2.5mm thick material slipped into the slot, rotate the pump rod to bring the slot to a point that it lays horizontal when referenced against a straight edge resting on top of the vice jaws. Clamp the pump rod (**Photo 35**).

In the centre of the rod's diameter and 2.5mm from the end, use a small centre drill to drill 2.3mm diameter carefully through both sides of the clevis followed by reaming 2.5mm diameter for the clevis pin.

Resting on a 2.5mm diameter drill shank passed through the hole in the clevis, hold the pump rod lightly between soft jaws to enable a radius be filed to the end of the rod.(**Photo 36**).

Pump Clevis Pin

Item FP14 – 5mm dia 303 stainless steel.
Refer to Drawing FP14

On the lathe and ideally holding in a collet with 12mm protruding, face off. Turn 2.5mm diameter x 7.5mm long, taking light cuts. Deburr the end face.

Either saw or part off 8mm long. Hold on the 2.5mm diameter and face off the head to 1mm thick, then deburring end face.

Transferring to the mill, clamp the pin with its head against and at the top of the vice fixed jaw, then bring the spindle to the centre of the pin and 6mm from the fixed jaw. Using a No 1 centre drill, drill 1.6mm diameter and deburr the hole. ▶

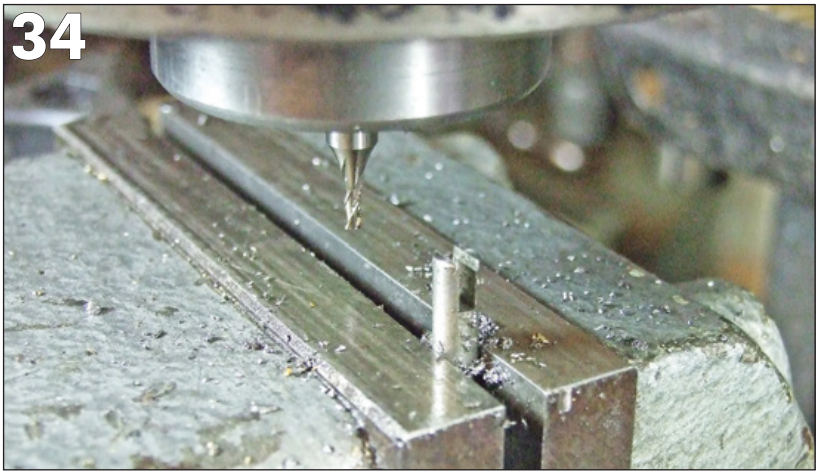
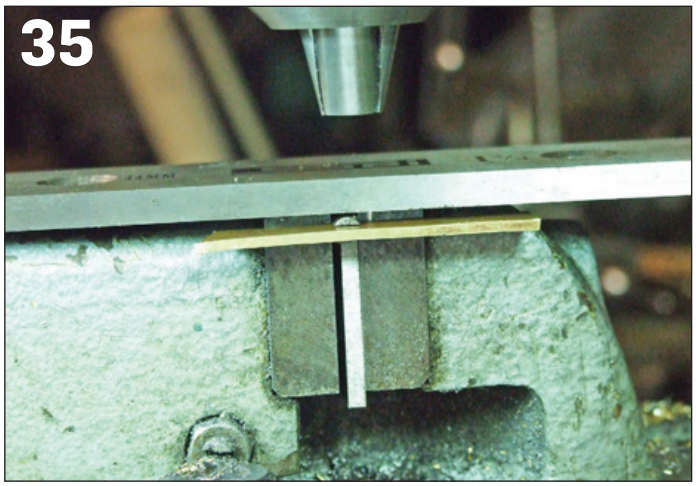


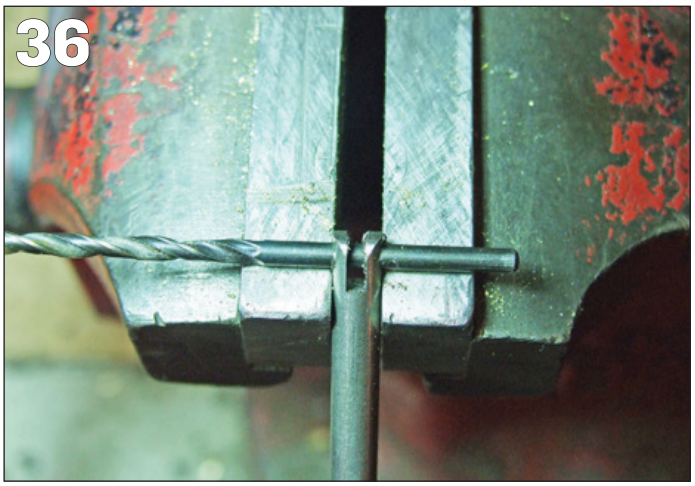
PHOTO 34: Cutting the slot in the pump piston.

PHOTO 35: Setting up for drilling end hole in pump rod.

PHOTO 36: Small drill helps hold rod so radius can be filed on its end.

Photos and drawings by the author





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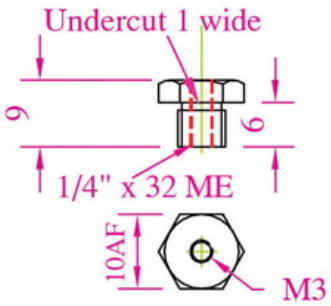
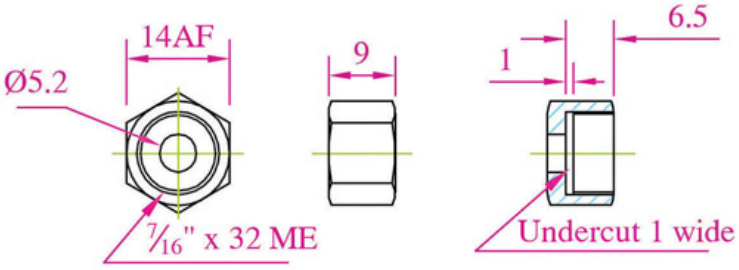
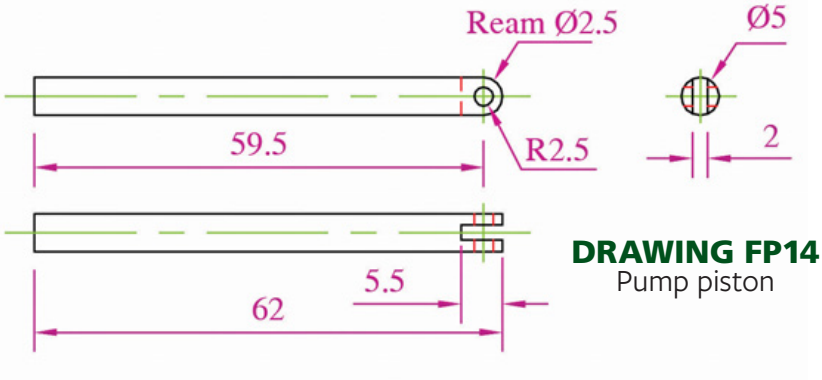
WHAT IS AVAXHOME?



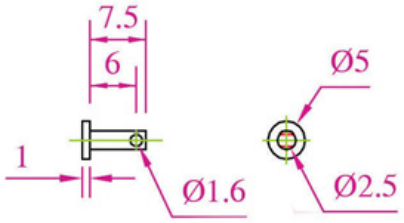
DRAWING FP11
Valve caps – two required



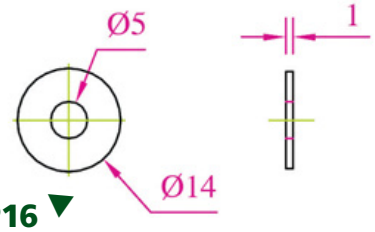
DRAWING FP12
Valve caps – two required



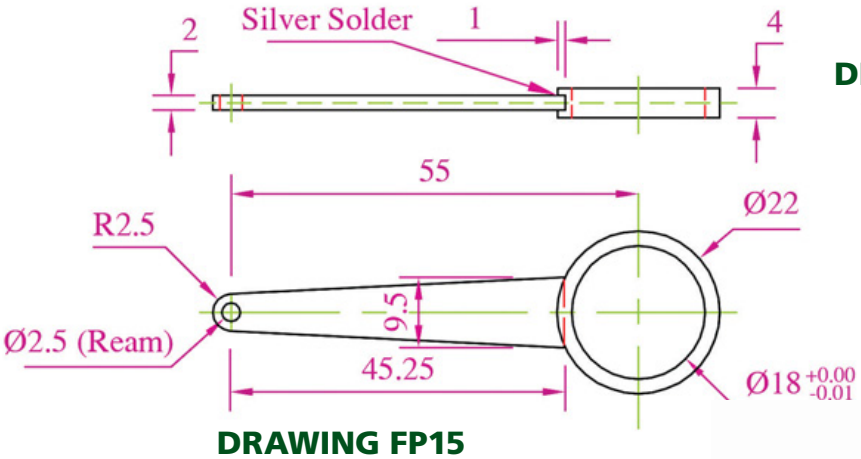
DRAWING FP14
Pump piston



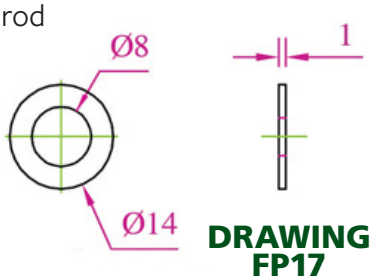
DRAWING FP14
Piston clevis pin



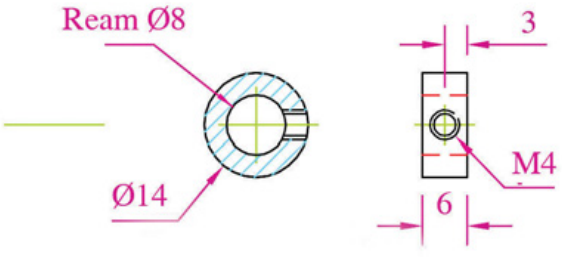
DRAWING FP16
Connecting rod retainer



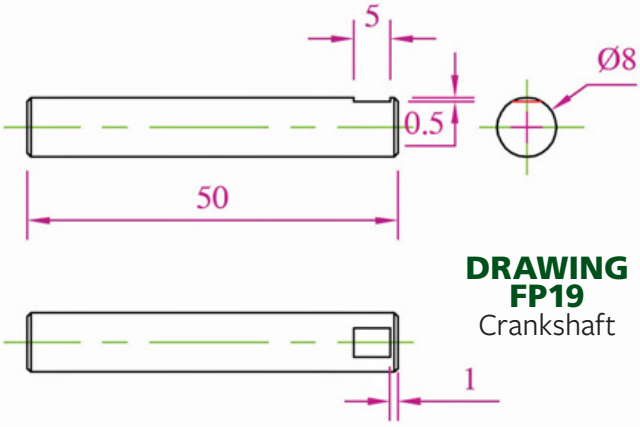
DRAWING FP15
Pump connecting rod



DRAWING FP17
Shaft spacer



DRAWING FP18
Shaft retaining collar



DRAWING FP19
Crankshaft

Pump Connecting Rod

Item FP15 – 25mm dia, 10mm x 50mm x 2mm brass. Refer to Drawing FP15.

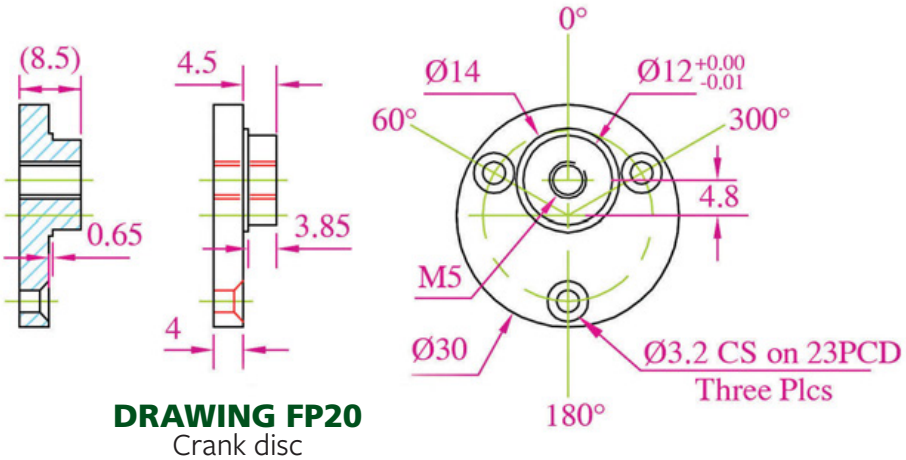
On the lathe hold the 25mm diameter stock for the bearing housing with 10mm protruding. Face off and turn 22mm diameter for 7mm. Centre drill and drill 13mm diameter, then part-off 4mm thick.

Clamp the bearing housing in a milling vice with approximately 5mm protruding above the jaws and centre spindle to the blank.

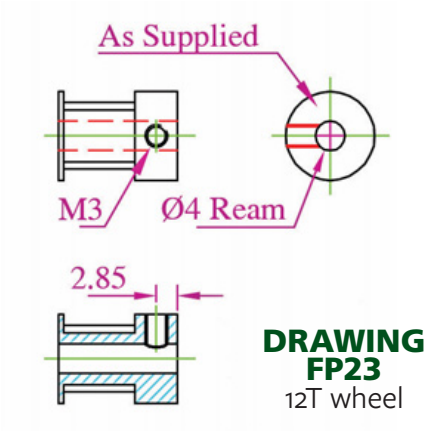
Using a sharp 2mm slot drill, machine a 1mm deep slot across the blank (**Photo 37**). Bring the rod blank of 2mm thick brass to 10mm x 50mm.

Next we silver-solder the bearing housing and rod blank together. First place both items in the pickling solution for 10 to 15 minutes, then rinse in clean water.

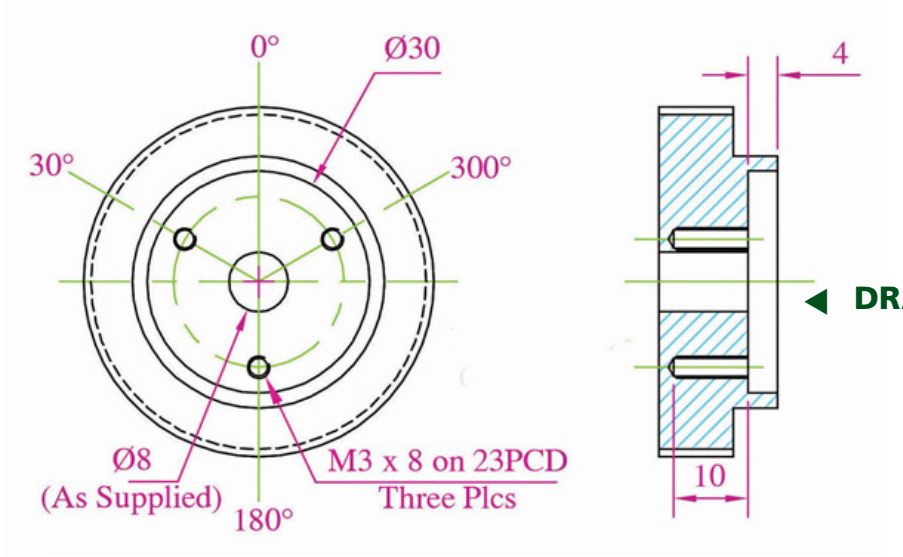
Flux the slot in the bearing housing and end of the rod blank,



DRAWING FP20
Crank disc



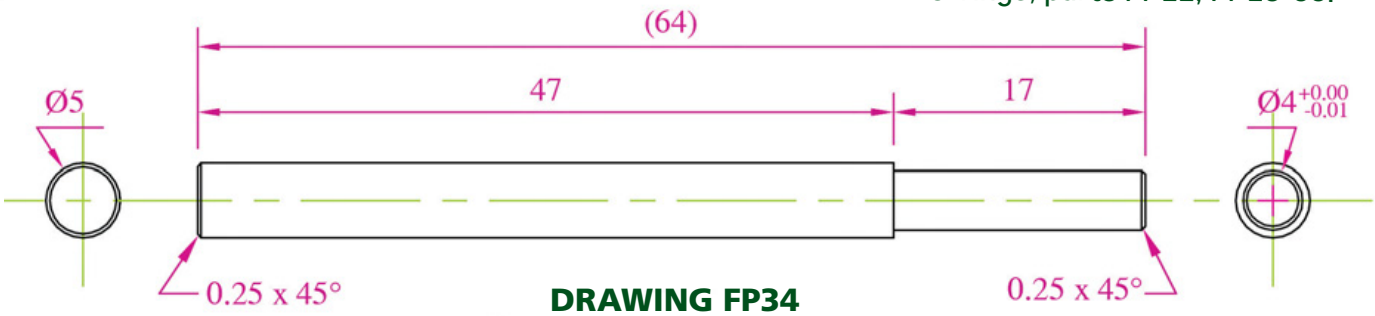
DRAWING FP23
12T wheel



DRAWING FP22
60T wheel

DRAWING FP27
Ball-lift adjuster – two required

All drawings reproduced full-size unless stated.
Please note that there are no drawings for bearing, fasteners and O-rings, parts FP21, FP28-33.



DRAWING FP34
Extended crankshaft – drawn twice full-size

before assembling the two parts together, achieving correct alignment with the aid of a 1mm thick 'shim' under the free end on top of a flat piece of steel at least 3mm thick. Place a 10mm length of 1.5mm diameter silver solder (55 per cent) on top of the junction between the two parts.

Using a small burner, alternately heat the bearing housing and rod blank but avoiding the actual silver solder. Shortly after the flux has become transparent the silver solder will 'slump' at which point the flame may be directed at the joint long enough to ensure that a fillet has formed (Photo 38). Allow to cool and pickle for 10-15 minutes before rinsing off in clean water. removing any remaining flux with a stiff brush.

Transferring the assembly to the lathe, hold the connecting rod by the bearing housing in a three-jaw self-centring chuck, truing the bearing housing up against the face of a tailstock drill chuck.

Bore the bearing housing to size as indicated, ideally using a telescope gauge and micrometer to achieve the accuracy required. If a telescope gauge isn't available, preset the nibs of the digital caliper against a micrometer as before when boring the O-ring recess for the pump cylinder, FP4 described ▶

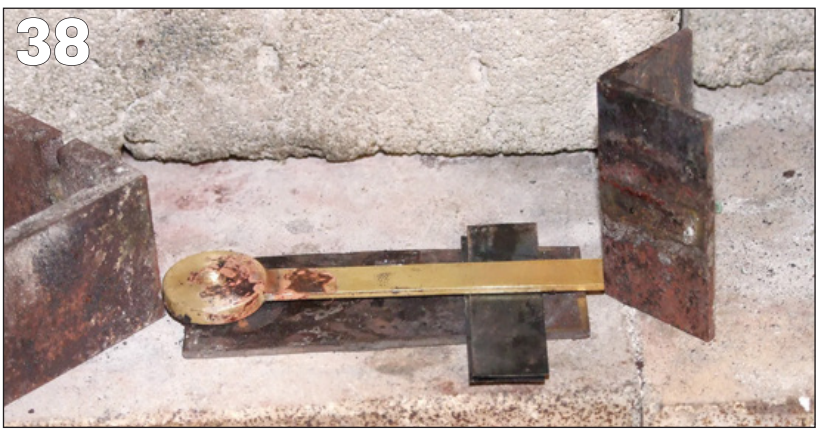


PHOTO 37: Machining slot for rod part of connecting rod.

PHOTO 38: Soldering the two parts of the connecting rod together.

in part 2 of this series (**Photo 39**).

With the aid of suitable parallels hold the rod blank in the mill vice and set the spindle central to the bearing housing, zeroing the X-axis.

Move 55mm from the bearing housing centre along the rod blank – centre drill and drill 2.2mm diameter, then reaming to 2.5mm (**Photo 40**).

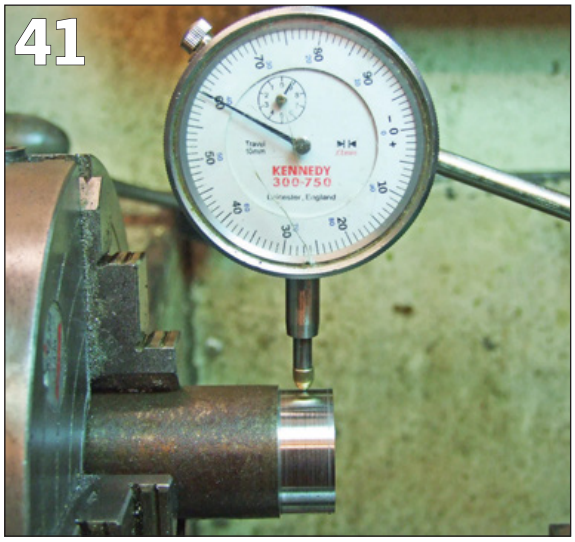
Fit the clevis pin into the reamed hole and using the pin head as a guide, scribe a line tangential to the head to the point where the rod blank joins the bearing housing on each side of the centreline. Saw away the waste and file to the scribed line with a fine flat file, blending into the radius around the pin hole, using the head of a pin as a guide.

PHOTO 39: Boring O-ring recesses in connecting rod.

PHOTO 40: Hole drilled for clevis pin.

PHOTO 41: Dial test indicator used when making crank disc.

PHOTO 42: One side of disc complete.



Before we continue, a note concerning parts FP16, 17 and 18 – if a sharp parting tool is set up on height and exactly at 90 degrees to the lathe axis and feed rate is maintained at a slow steady rate with the addition of a little cutting oil, the surface finish achieved on the component being parted off should not require any further attention.

Connecting Rod Retainer

Item FP16 – From 16mm dia mild steel. Refer to Drawing FP16

Hold the piece on the lathe with 20mm protruding. Face off, centre drill and drill 5mm diameter x 2mm deep from the point where the drill cuts its full diameter.

Turn 14mm diameter x 19mm deep and part off (feeding slowly) 1mm thick. Continue to FP17

Shaft Spacer

Item FP17 – 16mm dia mild steel. Refer to Drawing FP17

Face off, centre drill and drill 7.8mm diameter x 15mm deep from when the drill cuts its full diameter. Ream 8mm diameter and part off (feeding slowly) 1mm thick. Continue to FP18.

Shaft Retaining Collar

Item FP18 – 16mm dia mild steel. Refer to Drawing FP18

Face off and part off (feeding slowly) 6mm thick. Transfer to the mill, clamp in the vice, centre the spindle to the midway point on diameter and width. Centre drill and drill 3.3mm diameter into the bore, then tapping the hole M4.

Crankshaft

Item FP19 – 8mm dia x 50mm silver steel. Refer to Drawing FP19

Face off and chamfer 0.5mm x 45 degrees each end whilst bringing to a length of 50mm. On the mill and using suitable parallels so that the diameter is between 2 and 3mm above the vice jaws, mill 5mm x 0.5mm flat as indicated.

Crank Disk

Item FP20 – 1½-inch dia mild steel. Refer to Drawing FP20

Hold in the lathe with a minimum of 15mm protruding. Face off and turn 30mm diameter x 12mm.

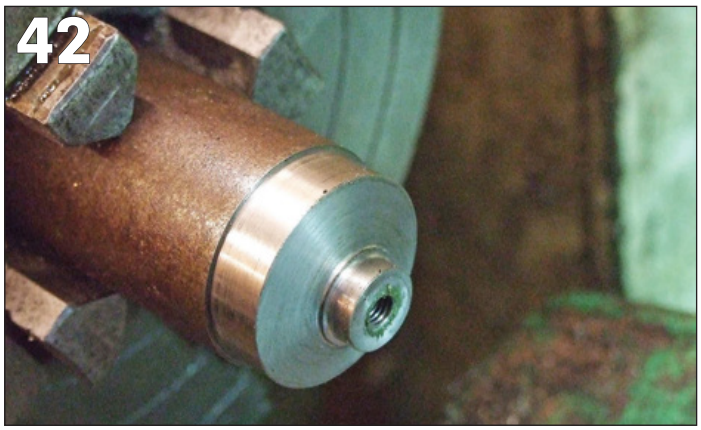
Hold in the four-jaw chuck and offset 4.8mm – a total indicator reading of 9.6mm (**Photo 41**).

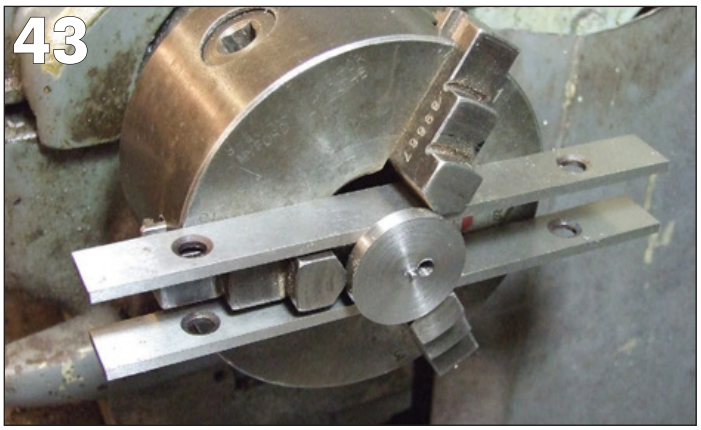
Turn 14mm diameter x 4.5mm and then turn 12mm diameter x 3.85mm. Centre drill and drill 4.7mm diameter x 12mm. Tap M5 (**Photo 42**).

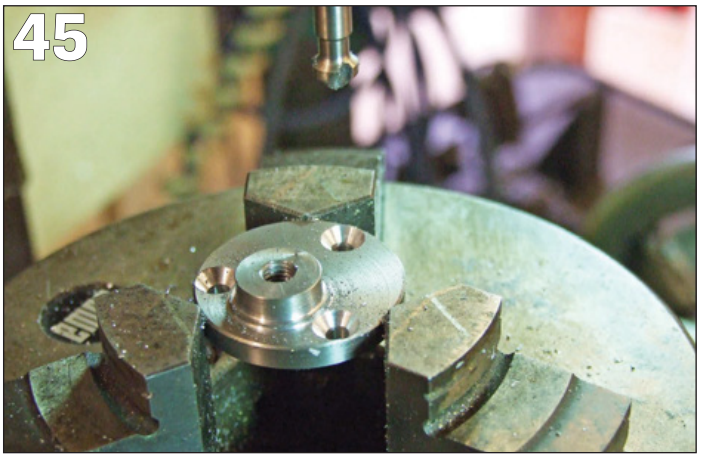
Set to run true (or re-chuck in a self-centring chuck) and chamfer the diameter to a 30mm edge. Part off to produce a 4.5mm thickness of 30mm diameter.

Use parallels to set the part out from the chuck face to enable facing 30mm diameter to 4mm thickness (**Photo 43**).

Set up a rotary table on the mill with a self-centring chuck attached to







run true with the rotary table axis in line with the machine's spindle. Zero the rotary table.

Clamp the Y axis and zero the X-axis. Then move 4.8mm on the X-axis and clamp the table.

Screw a short length (about 50mm) of M5 studding into the crank pin and hold in a drill chuck mounted in the spindle (**Photo 44**).

Carefully adjust the radial position of the crank disk until as the jaws of the chuck mounted on the rotary table are finally tightened, movement of the crank disk diminishes to zero.

Unclamp the X-axis, move a further 6.7mm (making 11.5mm total) on the X axis and reclamp the table.

Centre drill and drill 3.2mm diameter before countersinking at 60, 180 and 300 degrees (**Photo 45**). Leave the table clamped at this position.

60T Wheel

Item FP22 – purchased Item.
Refer to Drawing FP22

On the lathe set a depth gauge to 4mm. Loctite (in order of preference I would use 603, 638 or 620 or equivalent) the plain end of the FP19 crankshaft so that it contacts the depth gauge, resting against the face of the boss on the 60-tooth wheel. Leave for at least 40 minutes.

Hold the 60T wheel on the 8mm diameter crankshaft (ideally in a collet) and bore a 30mm diameter x 4mm recess(**Photo 46**). Transfer to the rotary table on the mill and hold on the 8mm diameter crankshaft.

Centre drill and drill 2.5mm diameter x 8mm. Tap M3 at the three places indicated (**Photo 47**).

12T Wheel

Item FP23 – Purchased Item.
Refer to Drawing FP23

On the lathe hold on the plain portion of the wheel and check that it is running true. Centre drill then drill 3.8mm diameter, then reaming to 4mm diameter.

Transfer the wheel to the mill, this time holding the plain portion of the part against the fixed jaw. Set the spindle central to the diameter and width of the plain portion. Centre drill and drill 2.5mm diameter, then tapping the hole M3.

Extended Crankshaft

Item FP34 – 5mm dia silver steel.
Refer to Drawing FP34

The original crankshaft will most likely have to be replaced due to the need for an extended 4mm diameter section to mount the 12T wheel on.

The original may be pushed out of the crank disk using a suitable tubular spacer and vice. This can be aided by application of a hot-air gun. Ideally using a collet chuck on the lathe, make the extended crankshaft as detailed.

Clean any traces of Loctite from the bore then assemble the extended crankshaft into the crank disk, again using Loctite (**Photo 48**). EIM

■ Next month, Martin describes the assembly of his feed pump.

PHOTO 43: Parallels used to bring part away from chuck face.

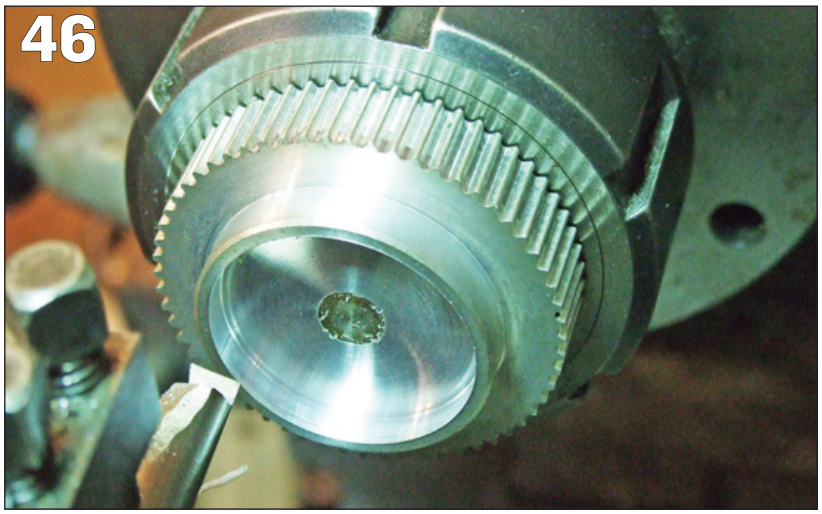
PHOTO 44: Studding used to hold part.

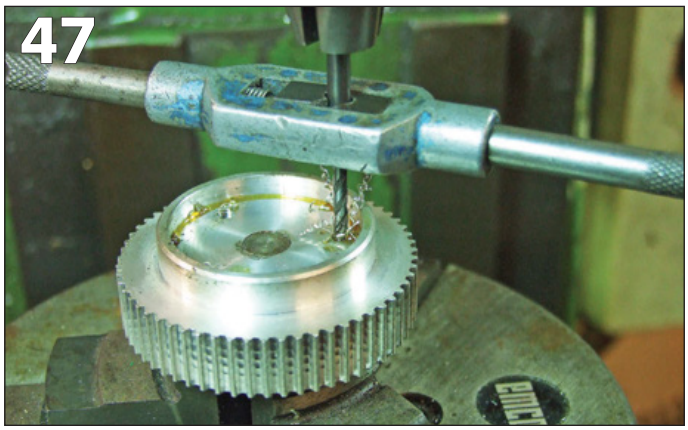
PHOTO 45: Countersinking holes around the diameter.

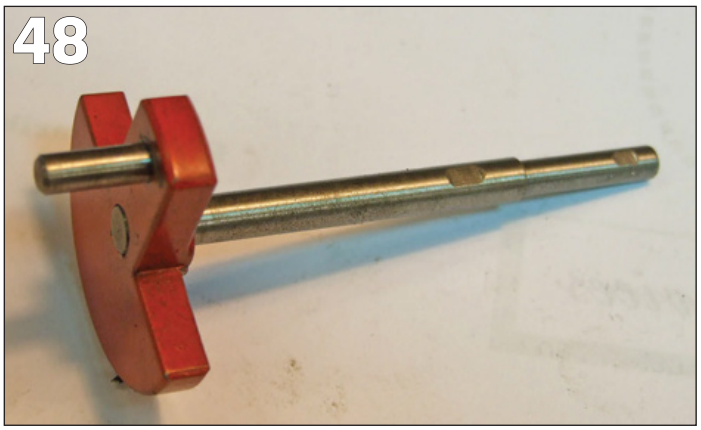
PHOTO 46: Recess bored in 60-tooth gear wheel.

PHOTO 47: Mounting holes drilled and tapped in gear wheel.

PHOTO 48: The completed crankshaft ready for fitting.







From a spark to a claim

Peter and Matthew continue their experiments with spark arrestors, looking for the best combination between effective performance and safe, litigation-free running for the public.

BY **PETER and MATTHEW KENINGTON**

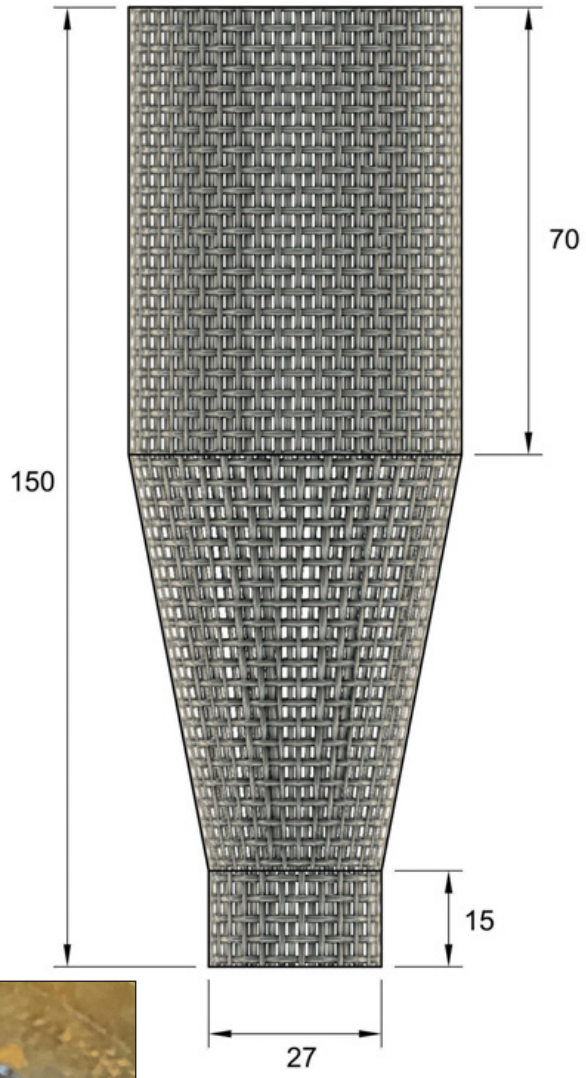
Last month we introduced our experiments with spark arrestors, and offered three options – this time we offer two more options, and some conclusions.

4) A blastpipe shroud

This is a fairly commonly-used option, as it is fairly easy to fit to most locos and easy to make. The idea is to surround the blastpipe with a porous mesh, extending up to the lower part of the chimney. Sparks and ash will be drawn toward the mesh by the normal draught of the loco's fire and its 'chuff', but will (ideally) not be able to pass through and up the chimney.

We tried two variants of this option – one used the bronze mesh discussed in option 2 and the other used a stainless-steel mesh with a similar hole size, but woven from much thicker wire.

The basic form of the arrestor is shown in **Figure 6**, which includes the approximate dimensions used for our loco – clearly the design needs to be customised to suit a particular smokebox arrangement, so these figures are only for illustration purposes. The shape shown is also not critical – as will be seen, something more approaching a cone is easier to make and is just as effective.



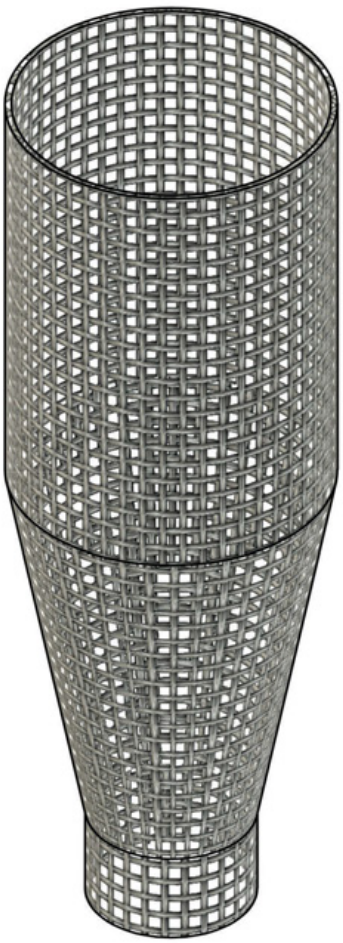


FIGURE 6
Not to scale

Version 1: Bronze Mesh: The bronze mesh we used was the same as that in option 2. It is quite thin and 'flimsy', but we (well, Matthew actually) thought that forming it into a cylinder/cone would give it added strength and this would be adequate to allow it to work effectively. It was easy to try, so he made and fitted the part shown in **Photo 11**.

The shape needed a little 'tweaking', once the chimney had been re-fitted and this was achieved with a length of steel rod (**Photo 12**). The resulting part doesn't need to look pretty, it just needs to sit well out of the way of the blast from the blastpipe!

With our freshly-minted spark arrestor fitted, we headed to Hereford SME for a bit of serious passenger-hauling. The first afternoon's running was curtailed by other issues with the loco and the spark arrestor functioned well, however we only ran for an hour or so before we had other problems, so it wasn't a 'proper' test.

On the second occasion, we ran solidly all afternoon – just under four hours in total, with full loads every time – it was the busiest day of the running season so far.

It was on this occasion that problems arose, toward the end of running. The mesh needed periodic cleaning (about once per hour) and this involved opening the smokebox door, lightly tapping the mesh with a screwdriver to dislodge the ash, and then closing the door – all achievable whilst the train was loading and the passengers were being briefed.

Towards the end of the day, however, we opened the door to be greeted with the sight in **Photo 13** (photographed back at Kenington HQ). The mesh had completely

FIGURE 6: Blastpipe shroud style of spark arrester, for 7¼-inch gauge Sweet William or Romulus-sized locomotive.

PHOTO 11: Experimental blastpipe shroud made from bronze mesh.

PHOTO 12: 'Adjusting' the shape in-situ, to ensure the blast from the blastpipe and blower are not constricted.

PHOTO 13: Matthew's bronze-mesh based solution after intensive passenger-hauling. The draught was almost totally blocked by the mesh!

PHOTO 14: Stainless-steel mesh version of the spark-arrestor, showing the 'stitching' on the bottom part.

PHOTO 15: Stitching can then be added to the side to form a cone shape.

PHOTO 16: The structure should ideally have no restrictions within its bore.

collapsed and was choking off the blast (and blower) – needless to say, raising steam was a challenge and we came off the track (fortunately things were quietening down by this stage). Conclusion: the bronze mesh was not quite rigid enough to be applicable with this solution either.

Version 2: Stainless-steel Mesh: It was obvious that we needed something a bit more substantial in the mesh area, although the hole size (of the bronze mesh) seemed to be pretty good – it didn't clog too easily or let through any sparks or significantly-sized ash. I therefore sourced some 304 stainless mesh, woven using 0.56mm diameter wire, with 1mm holes. This was both inexpensive and (relatively) rigid.

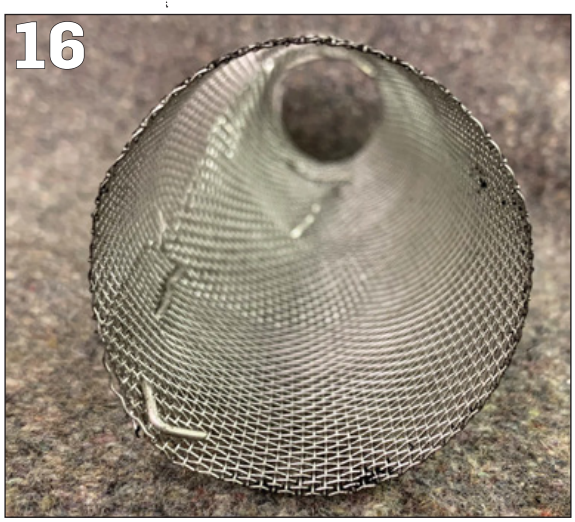
The shape and dimensions shown in Figure 6 were (approximately) followed and the mesh 'sewn' together using 18 swg tinned copper wire (I had a reel of this on the shelf). This is a tight fit through the holes, around 0.2mm oversize, but worked well.

I thought about using stainless-steel wire – I have some of 1mm diameter which I use as filler when TIG welding – but this is very stiff and the 18 swg copper wire was more than adequate for the purpose, whilst being much easier to 'stitch' with.

The bottom section was sewn around its circumference (**Photo 14**) and the side was then sewn-up (**Photo 15**) – the top section didn't require any work as the shape was already sufficiently constrained by the other sewing operations (**Photo 16**).

The resulting conical mesh can then be attached to the blastpipe – we used a jubilee-clip (**Photo 17**), perhaps 'over-the-top' given the minimal forces involved.

Don't forget to include the blower nozzle(s) within the 'cone' as this also needs unrestricted access to the ▶



chimney and steam flowing from the blower can also eject ash and sparks emanating from the boiler tubes. Likewise, if a vacuum-ejector is fitted to the loco, and the outflow from this appears anywhere in the smokebox, this probably should be incorporated as well, if possible. In our case, the vacuum ejector discharges directly into the chimney – the end of the pipe is visible in **Photo 18** – so we didn't need to be concerned with this aspect.

So, does it work? The answer is an emphatic 'yes'. It removes all sparks and (significant) ash and maintains its shape even after a full running day. It still needs the occasional clean (giving the mesh a light 'tap', periodically) – if this is a problem, a mesh with a larger hole diameter could be used. There is no suggestion that the size we chose is 'ideal', but it is certainly effective!

"Poorer-quality 'steam' coals may require more frequent intervention, as their impurities will create more ash..."

PHOTO 17: Arrestor fixed to the blastpipe by means of a jubilee-clip.

PHOTO 18: With chimney refitted, again check for restrictions. Note that the horizontal protuberance in this photo is the pipe from the steam-ejector for the vacuum system on the loco. It sits (just) above the top of the spark-arrestor, close to the bottom of the chimney.

FIGURE 7: A rear-mesh concept which is mounted in the firebox.

Photos and diagrams by the authors

We use genuine Welsh steam coal in our 7¼-inch gauge loco (sourced from Ffos-y-Fran – one of the advantages of living in South Wales!). Other fuels may require more or less frequent cleaning of the mesh – anthracite may require less as it tends to produce relatively little ash and what it does produce tends to form larger, heavier, angular pieces, which should hit the mesh and fall to the floor of the smokebox; poorer-quality 'steam' coals may require more frequent intervention, as their impurities will create more ash.

This is only speculation, however, and I've not done any experiments to back up these theories! It should be possible to find a mesh size which is acceptable for whatever form of coal you burn.

In time, the mesh may become contaminated with steam oil falling from the chimney, but it is not too difficult to remove and clean (ultrasonic cleaning is, again, probably the simplest option).

5) An Ashpan Mask

This is an option we haven't tried and haven't seen used anywhere, but which should, theoretically, be viable (especially with a marine boiler, which we have on our 7¼-inch loco). The idea is to fit a mesh filter, similar to that used in the smokebox in option 2, but in this case to fit it to the rear of the firebox (**Figure 7**), thereby preventing sparks from entering the boiler tubes in the first place.

Clearly, if sparks and ash can't enter the boiler tubes, then they can't exit via the smokebox and chimney – problem solved! A further advantage is that the boiler tubes can't become blocked in use, thus ensuring consistent steaming throughout a running day.

The mesh would need to be a reasonably good 'fit' to the rear of the firebox opening in the boiler, to mitigate against sparks and ash finding their way around the filter – it is likely that they would prefer this route, as it is less-constrained and at least some undesirable particles would choose to go this way.

There are some obvious drawbacks with this method, not least the difficulty in fitting the arrestor to a conventional firebox/boiler arrangement, however it is potentially worth considering with a marine boiler and firebox. It could be fitted to the rear of the (removable) firebox, in such a loco, in place of (or in addition to) the rear half-plate usually fitted to prevent the fire from being pushed into the tubes when stoking.

Replacing the plate may be an

issue, as a mesh may struggle to cope with the heat from the fire, being likely to melt, be eroded, or at least distort significantly, but adding a stainless-steel mesh upper-section (as illustrated in Figure 7) may work.

A further possible drawback is the likelihood of the mesh becoming choked with ash after a period of running. Cleaning this mesh would be a little more awkward than was the case with option 4, but it should still be possible, the firebox being easily removable in the case of a marine boiler, even in the middle of running.

Has anyone ever tried this type of spark-arrestor? If so both us and the editor would be pleased to hear details of your experiences!

"A mesh may struggle to cope with the heat from the fire, being likely to melt, be eroded, or at least distort significantly..."

The Pros and Cons

1(a): Deflectors

The pros:

- Simple to construct
- No special mounting needed
- Easy to remove and clean
- Will probably have an impact upon steaming, but this shouldn't get worse over the course of a running session

The Cons:

- Difficult to find a deflection direction which doesn't inconvenience someone (either passengers, spectators or fellow club members)
- Will probably have some impact on steaming (some back-pressure will result from the enforced change of direction of the blast)

1(b): Reflectors

These have similar advantages and disadvantages to deflectors, although a reflector will typically need some form of special mounting and may have a lower impact upon steaming, as it is more 'open'.

2: Internal (firebox) Mesh or Plate

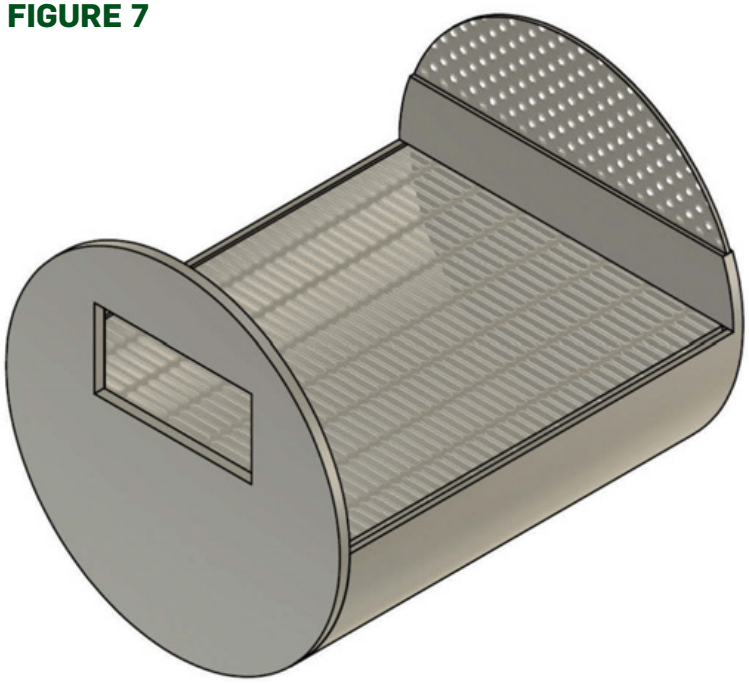
The Pros:

- Simple to construct, but will require loco-specific design/measurement
- No special mounting arrangements needed, although may be awkward to fit in some locos
- Shouldn't need replacing during a running session, as it will avoid contamination by steam oil (it can therefore be vacuumed clean, when cleaning out the smokebox at the end of a day's running)
- Should, if properly designed, have a minimal impact on steaming

The Cons:

- Needs to be constructed from stiff mesh (or plate), which may make it difficult to fit and remove
- May get increasingly clogged (with ash) over the course of a running session, depending upon its construction (such as mesh hole size) and the coal used. If this happens, it's slightly more awkward to clean (than option 4) with a 'tap' from a rigid object, as it is large and deep in the smokebox. This issue is not applicable to the 'plate' option, although that variant may have a greater impact upon steaming in the first place.

FIGURE 7



3: External (chimney-fitted) Mesh Cap

The Pros:

- Fairly simple to construct, especially if a tea-strainer based design is used!
- Lower impact upon steaming (at least initially) than either the deflector or reflector options
- No special mounting arrangements needed (again, if the design we proposed here is used)
- Easy to remove for cleaning

The Cons:

- Will have an increasing impact upon steaming, as the mesh gets clogged-up with steam oil
- No easy on-site or in-situ cleaning option – it will probably be necessary to make a number of examples and swap these out to cover a decent running session.

4: Internal Mesh Blastpipe Shroud

The Pros:

- Simple to construct
- No special mounting arrangements needed (unless you count a jubilee-clip as 'special')
- Easy to clean during running if it gets clogged by ash (a light 'tap' with a rigid object is usually sufficient)
- Should have a minimal impact upon steaming (until clogged – and this is easy/quick to fix)

The Cons:

- Can be difficult to remove for 'proper' cleaning
- May eventually get clogged by steam oil falling back down the chimney (or from the internal bore of the chimney)

5: Firebox-end Mesh Filter

The Pros:

- Easy to remove and clean (assuming that the firebox itself is removable, such as on locos with marine boilers)
- Will keep the boiler tubes free of ash, thus aiding steaming
- Won't get clogged by steam oil(!)

The Cons:

- More complex to construct (or at least attach to the firebox)
- May need a very thick mesh, to avoid melting/deforming/erosion by the intense heat of the fire
- May get clogged easily by the fire itself being inadvertently pushed up against it, during stoking

The above is, of course, speculation, as we haven't built/tried this option. Maybe one day we'll give it a go – or one for the Society of Model and Experimental Engineers (SMEE) to try perhaps?

Conclusions

In this article, we have tried to outline the main solutions to the spark-arresting problem inherent with steam locos. The only option that we know of which we didn't cover was that of selling your steamer and investing in a nice clean (and very attractive to the environmentally-aware passenger) battery-electric loco. I'm not sure that this counts as a solution, more a way of side-stepping the problem.

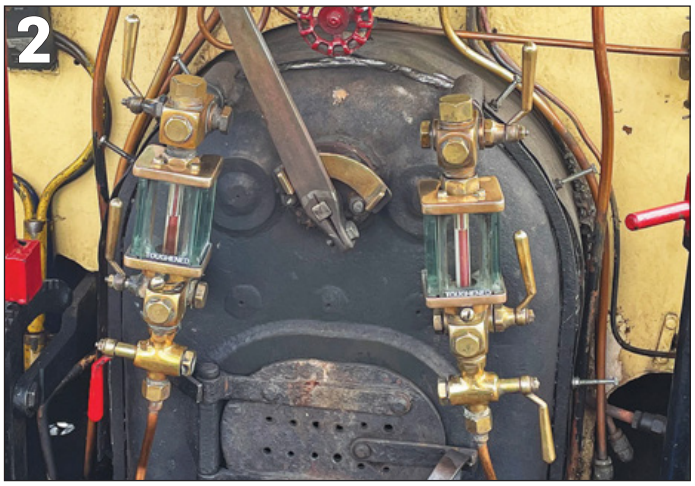
I'm sure that my relative inexperience and limited number of visits to other club tracks means that I have missed out on one or two additional options – hopefully this article will prompt further suggestions and the result will be a thorough treatise on the subject. The editor's postbag awaits the deluge... EIM

■ Part one of this feature appeared in last month's February 2022 issue of EIM – you can download a digital back issue or order printed copies from www.world-of-railways.co.uk/store/back-issues/engineering-in-miniature or by calling 01778 392484.

Trials of Tony – the sequel

It's a new year on the Welsh coast but things are not getting any easier for our tech ed as he tries to return a 6-inch scale diesel locomotive to operational status...

BY **HARRY BILLMORE**



Last month I described the challenges of trying to get the Fairbourne Railway's long out-of-service bo-bo diesel 'Tony' back into action, to the point where I left for the Christmas break with a running loco but facing significant issues with its fluid flywheels.

I had already made the decision to remove the fluid flywheels and replace them with a plain shaft, and I had started the turning operation before leaving for some time off and completed it on my return.

Photos by the author except for photos 1 and 2, by Andrew Charman

In the coffee break after finishing the turning, I gave our boiler inspector a call to find out when he would like to come and examine 'Yeo' (our 6-inch scale Lynton & Barnstaple style 2-6-2T) and 'Sherpa' (our similar-scaled Darjeeling B class 0-4-0) – steam locomotive boilers have to be examined both cold and in steam before each season for insurance purposes. He said he was visiting the Talyllyn Railway (15 minutes drive down the coast) the following day and could also come to us if the engines would be ready...

Stripping at speed

What followed was some of the fastest boiler strip-downs and washouts I have ever done and in the process I discovered a couple of washout plugs on Yeo had started to neck on the threads – this is where the threads start to wear and become parallel in places due to being removed and replaced at each washout. These were replaced with spares we had in stock.

I also found that one of the gauge glasses on Sherpa had started to etch away, so this was also replaced with one from stock and a new one cut to length a couple of days later to replace it in case of failure.

It is worth checking gauge glasses on a regular basis as the glass does wear away with the passage of steam – it also gives you the chance to closely examine the gauge frames themselves, and in this case my inspection revealed a bent top-cock handle which means when the handle was pointing in the normal direction, in other words in line with the glass, the valve was actually part closed which could cause a false reading in the glass.

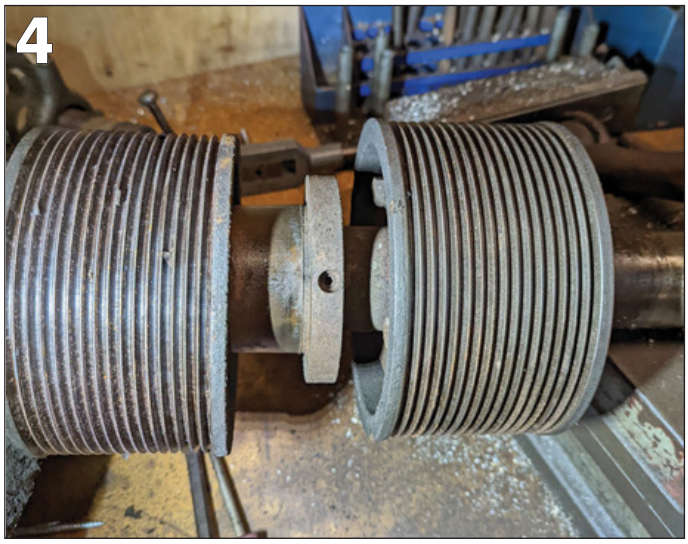
As a slight side note – if either of the ports into the boiler from a gauge glass are blocked it will always read high. If the bottom is blocked, then the steam at the top of the glass will condense and gradually fill the glass and if the top fitting is blocked, the trapped steam at the top of the glass will condense, creating a lower pressure area and pulling the water level up in the sight glass. Thus if you have two sight glasses and one reads higher than the other, always treat the lower one as the correct reading.

Through the following day there was a flurry of activity to finish off the last bits of the washout and clean off the surfaces that needed to be thickness tested, then on with the cold exam before the examiner headed off to Tywyn to do their boiler exams, leaving me to put the engines back together and get them in steam.

Once he had returned, the locos were brought up to full boiler pressure, the safety valves tested and the injectors tested. A final look around the locos and the boilers were given a clean bill of health for the next 12 months. Just before putting the engines to bed, I took the opportunity to get some oil around the cylinders and drove both of them around the station yards as the sun went down which made for a very nice end to a hard couple of days!

Key to removal

After this brief interlude, it was back to working on Tony. Before I could cut



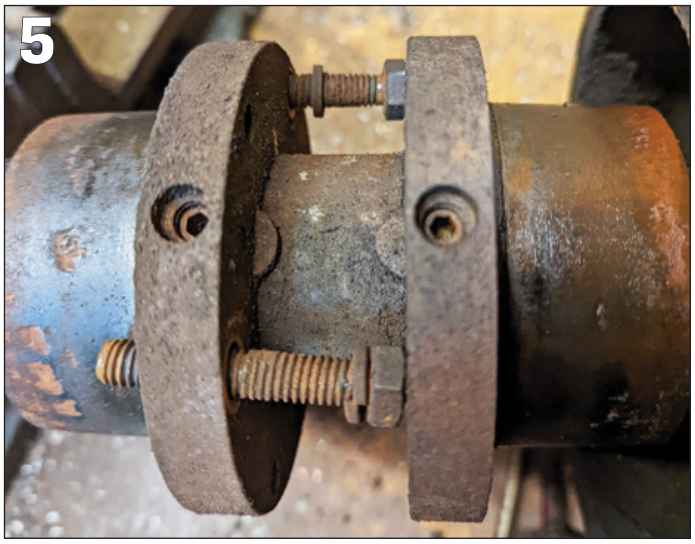


PHOTO 1: Harry is far too busy during boiler tests to take photos so this image from last year's gives a flavour of the event.

PHOTO 2: The two water gauges of 'Sherpa' – the position of the cock handles is a vital indicator.

PHOTO 3: Following a successful steam test, Harry ran Yeo around the station to pump oil around the loco's system as the sun went down and the moon rose.

PHOTO 4: Removing Tony's fluid flywheel pulleys from their carriers on the old shaft.

PHOTO 5: The old carriers with the separate keyways – note the bolts cannot be fully removed without one of the carriers being removed.

PHOTO 6: A carrier after removal, despite an intentional split opposite the keyway, they failed on old fracture lines around the grub screw hole.

PHOTO 7: You can see the brown mark where there was an old crack through the thickest part of the carrier.

PHOTO 8: Machining the keyways into the new shaft

the keyways into the new layshaft, I needed to check the size and position of the original ones. I started removing the bolts that hold the pulleys onto the carriers in the centre of the shaft to discover that one of them had been bolted up from the inside, so you had to take the other pulley off first, which of course was easier said than done – I suspect they had not been removed since the loco was built 60 years ago.

After getting the pulleys off the carriers I had the pleasant surprise of

PHOTO 9: Using a slotting head attachment on the milling machine to cut the keyways in the new carriers.

PHOTO 10: Pressing the new carriers into place.

PHOTO 11: The male side of the flexible shaft coupling, having failed when pressing it onto the new shaft.

PHOTO 12: You can just see the wear on the pins, there should be a rubber boot around each pin and four more pins altogether.

PHOTO 13: The female side of the flexible coupling, you can see four of the holes are now oval.

PHOTO 14: Harry's mother volunteered to strip one of the bogies to allow the wheels to be machined to the same size.

finding out that the carriers were split, which in my head immediately meant they would be easy to remove. Not a chance – the grub screws were removed and a small wedge gently tapped into the split but they were having none of it. I eventually resorted to pressing them off which then led to both of the carriers failing along old crack lines running through the weakest part of the casting, this being the flange that had the grub screw hole in it.

Following a small amount of cursing, I drew them up and set about machining new ones, which was a simple turning and drilling job apart from the keyway. These have a full depth of a little under two inches and are ⅜-inch wide – thankfully I had just acquired a refurbished Bridgeport mill with a slotting head on the opposite end of the top ram from the vertical head.

To make things easier on the slotting head, I first used a 6mm end mill to machine most of the material for the keyway away before positioning the slotting head and gently squaring up the keyway. Note that if you don't have such machinery available but are proficient with a file, you can produce decent keyways with a bit of care. I also modified the carriers so that the bolting holes were threaded, allowing me to remove each pulley individually if I needed to at a later date.

Give us a break

The new carriers were pressed on, followed by the drive flange for the propshaft at one end of the shaft. Disaster then struck as I pressed the flexible coupling male portion onto the shaft, it cracked through two of its holes. There was no evidence of an existing crack so I must have got it slightly wonky as I started to press it on and that caused it to break.

This did, however, encourage me to examine this component significantly more closely than before, and it turned out I should not have even bothered trying to reuse it. My original plan had been to buy replacement rubber boots that fit over the pins on the male half and into the holes in the female half, as the pins for these were completely missing. On close examination, the pins were extremely worn on one face, and when I checked the female half, the holes had been worn oval. Combined with only having half as many pins as it should have, this probably over-stressed the casting and didn't help matters as I was trying to press it on.

I contacted our bearing and shafting supplier to obtain quotes for a replacement, which involved a certain amount of maths to work out

the speed the shaft rotates at when the loco is running at 12mph (Our maximum line speed is 8mph, but adding a 50 per cent extra margin of safety allows for slippage and other operational issues).

The maths is as follows:

The final-drive gearbox ratio is 5½ turns of the propshaft to one turn of the wheel – this and the wheel circumference were measured by using paint marks on the wheel and rail and another on the propshaft drive flange, then turning the wheel a full revolution counting the propshaft flange turns and then measuring from the paint mark on the rail to the new position of the one on the wheel.

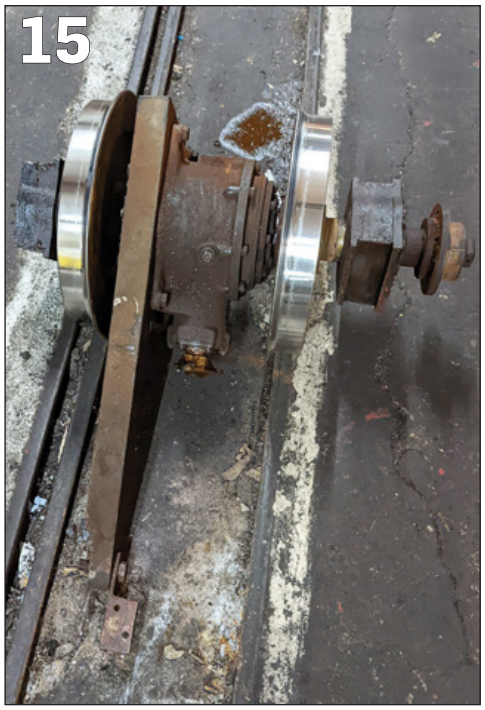
- The wheel circumference is 1.275m
- 1 mile is 1609 metres
- 12 miles are 19,308 (1609 x 12)
- $^{19308}/_{1.275}$ (12 miles divided by the wheel circumference) = 15,143 wheel revolutions per hour at 12mph
- $^{15143}/_{60}$ = 252 wheel revolutions per minute at 12mph
- 252 x 5½ (final drive gear ratio) = 1386rpm at the layshaft.

With an engine producing about 113bhp that information was enough for the supplier to work up a quote for £1050 plus VAT which I received a few days later after I had discovered a couple of other problems that I will come to later and machined the wheels. The machining of the wheels is described elsewhere in this issue along with some of the problems I came across as well as some from machining carriage wheels.

While waiting for the flexible coupling quote, I decided to service the gearboxes, as I was beginning to think that some bits could have benefited from a closer inspection when the loco was initially stripped back in 2008. What I discovered in the final-drive gearboxes was a brown sludge that was nowhere near enough in volume and had a few gritty bits floating in it.

This required flushing several times with a lighter oil to get as much out as possible and during this process I discovered that all the shaft seals leaked to a greater or lesser extent if the correct amount of oil was put in the gearboxes. Since you have to press the wheels off to change the axle shaft seals, I decided that running them with as much as they would take without leaking and putting in place a regular oil change regime was the best course of action.

I then turned my attention to the ex-Dingo Scout Car forwards/reverse gearbox. With the belt drive to the layshaft disconnected I turned each of the shafts independently. I then used a screwdriver through the universal joint to stop one of the output shafts rotating while I turned the input shaft manually, so I could feel what the differential and gear train was like on each half of the gearbox (the Dingo having an individual shaft drive to each wheel required a differential in the gearbox to allow it to turn through tight corners).



Out of gear

The left-hand side gear train was beautifully smooth and quiet, the right-hand side however sounded like someone gargling rocks and felt distinctly notchy. Upon draining the oil out of the gearbox again it came out as a brown sludge, this time with reasonably large chunks in it (see Photo 16). Unfortunately spare parts for Dingo gearboxes are not readily available these days and to get the gearbox out I will need to remove the engine bay cover along with a significant amount of the framework.

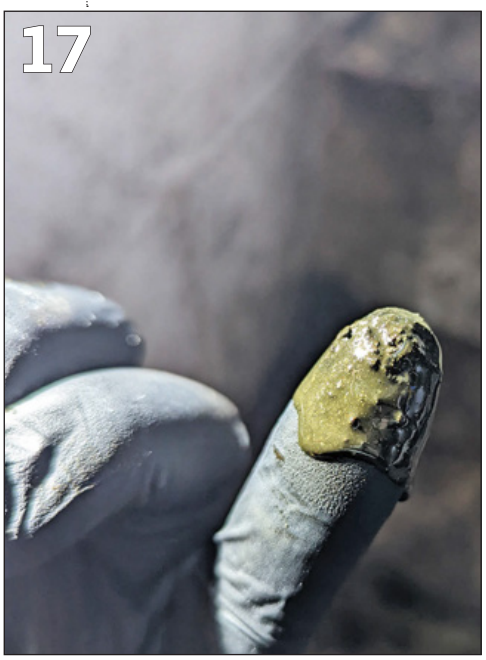
It was this issue and the rather large bill for the flexible shaft coupling, along with a large amount of looming annual carriage maintenance and replacing the driving axles on Sherpa, that has led to the decision to put Tony to the back of the shed once again and hire in a loco from our friends at the Littlehampton Miniature Railway, which will allow me to carry out a much-needed overhaul on our current service diesel 'Gwril'. So unfortunately this is the last you will read about Tony in these pages for a little while, which is very frustrating given how close the loco should have been to operational! EIM

■ The Fairbourne Railway reopens on 19th February for half term - details are at www.fairbournerailway.com

PHOTO 15: One of the driven axles after machining, note a puddle that was left behind by its incontinent shaft seals.

PHOTO 16: What came out of the forwards reverse gearbox, which should hold about eight pints and no crunchy bits.

PHOTO 17: Bits of what Harry suspects is the differential or a bearing from inside the forwards reverse gearbox.



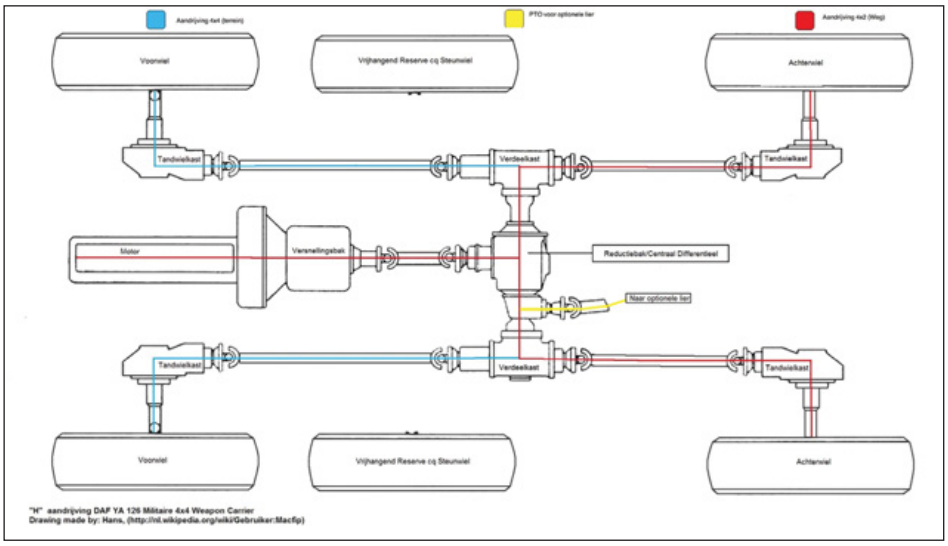
Of Dingos and Ferrets...

Your comments on the editorial page of the January issue (*regarding my garage 'workshop' being used as a family dump for furniture and the like – Ed*) drew a wry and sympathetic smile. I have a constant struggle to keep one of our two garage bays clear. It is, like your garage, a convenient spot to drop off all sorts of clutter.

On the other hand my workshop is at the end of the basement and access is not conducive to things being taken there.

When I became aware of the axing of the National Railway Museum workshop a nasty lump formed in my stomach at the thought of the inexperienced, simple-minded and over-educated having struck again. Consequently I looked up the leadership of the three Canadian technical museums, science and technology, aviation and agricultural. The three directors and the director-general do not claim any experience, education, training, or background in the disciplines with which their museums deal. The appointments reek of political correctness.

Since I definitely have more free time than Harry Billmore and because I have found that looking at mechanical puzzles intrigues me, I went into the matter of the fluid flywheel, also known as a fluid coupling. It is clear from a diagram that I found online, that the device is unidirectional (lack of symmetry) and one would also expect this from hydrodynamic considerations, a pump driving a turbine. I did however, find a patent for a bi-directional coupling, but it involved resettable vanes.



From the above reasoning I came to the conclusion that a reversible drive could logically only have such unit in a position where the drive is unidirectional, in other words in front of the gearbox of a vehicle. The Dingo led me to the Ferret and a diagram of the H-drive used in these vehicles, reproduced here.

As can be seen there is only one place for a one-way coupling, the place where the clutch would normally be.

The culprit in this case would seem to be the final drive shaft with couplings on both ends, as Harry points out. As installed, one coupling has to be driving backward at any time since it needs to be turned end-for-end relative to the to the one on the other end.

I am happy to have been introduced to the Dingo, like the 17-pounder anti-tank gun, one of the less well-known mechanical heroes of the war. The story of the fitting of the 17-pounder in the Sherman to turn it into that very effective tank killer, the Firefly, would ring a bell with any model engineer.

John Bauer

The Editor replies; Harry continues his battle with Dingo mechanicals in this issue.

Inspired by the builders of the past

With regard to your editorial in the December issue and 'instruction manual' construction features. I fully agree with your correspondent's preference for these – if it had not been for Doug Hewson's wagon-building series I would not have taken out a subscription to **EIM**.

I found his drawings and building instructions first class – not only did he show how to build the wagons, he also showed how to build the jigs to make the parts.

I purchased a set of drawings and his materials and started construction of a BR 20-ton brake van. A petrol tank wagon came next followed by two wooden wagons. All the floors and sides are single planks of American white oak (cut from kitchen cupboard doors). The three-hole wheels and axleboxes are machined from cast-iron bar stock, the strapping came from a college scrap bin.

At present I am building an iron mink gunpowder van – I have enough wood left to make at least four more wagons, possibly a ventilated fish van.

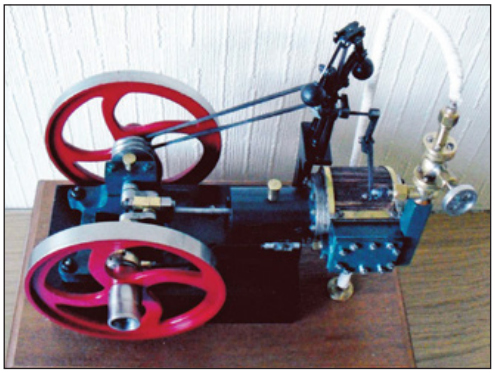
Building Anthony Mount's Verto steam engine and boiler gave me the confidence to construct a freelance horizontal twin-wheel steam engine entirely from scrap – nothing was purchased for this engine, just leftovers.

With Doug Hewson's series having appeared 25-plus years ago and Anthony Mount's series of the Verto 12-plus years ago, why not repeat their work for the young engineers that were not born when model engineering was at its best?

Graham Hughes

The Editor replies; Thanks for sending in pictures of some superb models Graham. Reprinting old series has been considered but it is not that easy to accomplish – the means by which features were produced in the early days of **EIM** was very different to today and even if the original material is available it may not always come up to modern reproduction standards.

What do other readers feel about period build series being reprinted? Would they welcome their presence or feel short-changed? Meanwhile I repeat what I said last time – if someone is ready to produce an 'instruction manual' build series, I would be more than happy to print it...



Final preparations for Garden show

THE MODEL RAIL SHOW FOR LARGER GAUGES
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- Brunel Models
- Brushes 4 Models
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- Chuffed 2 Bits
- Coach & Wagon Works
- Garden Railway Specialists
- HJH Tooling
- IP Engineering
- John Sutton Books and Models
- Just the Ticket Engineering Supplies
- Live Steam UK
- Loco Boxes
- Malcs Models
- Mamod
- Model Engineers Laser
- Modeltown
- North Road Trains
- Rails of Sheffield
- SMTF Model Shop
- Sparklebright
- Steve Currin Books
- Tony Green Steam Models
- Totem Signs

March 20th-21st will see the return of the Midlands Garden Railway Show after its enforced absence in 2021 due to Covid-19, and sponsored by **Engineering in Miniature** and our sister magazine *GardenRail*, this will likely be the first major model and model engineering event to take place post-pandemic.

"It will be an opportunity for us all to try to get back to normal, enjoy our hobbies, renew old acquaintances and make new friends," a spokesperson for show organiser Meridienne events told **EIM**.

Held at the Warwickshire Event Centre near Leamington Spa, the event is known as 'the model rail show for larger gauges', which for modellers it is, while for us model engineers it caters for the smallest gauges such as Gauge 1, O, G-scale and 16mm narrow gauge. Small they may be but there are many advocates producing excellent model engineering in these scales, with the current trend for downsizing very evident – **EIM** readers should find plenty to interest them at the show.

Organisers promise a varied range of large-scale and garden model railways; "This year we once again welcome the superb Newchapel Junction Gauge 0 layout which has new features since we last saw it. We also welcome back several popular layouts including the Buckinghamshire Garden Railway Society's Whiteleaf Light Railway and, as ever, the nostalgic Gauge 1 tinplate display.

"As usual there are numerous specialist suppliers offering a vast array of products so enabling purchasers to actually view locomotives, rolling stock and trackside accessories and judge offerings actually 'in the flesh' rather than just relying on illustrations on line. So do make sure you take the opportunity to look at the wide range of products on offer."

The venue includes on-site catering facilities with a restaurant enabling visitors to enjoy a full day out.

The show preview is now at www.midlandsgardenrailshow.co.uk and tickets can be pre-booked on the site. Orgnanisers hope to be able to sell tickets on the door but will be guided by Covid restrictions and they strongly advise pre-booking to avoid disappointment.

The show is open from 10am to 4pm on each day and admission is £9 adults, £8.50 senior citizens and £4.50 children (5-14).

The Ed will be going – like we suspect many of our readers, he's desperate for a model engineering day out!

More good news for 2022 is the return of the Steam in Miniature Weekend at the Statfold Barn Railway in Staffordshire.

Anyone who has been to the steam centre near Tamworth will know what a mecca it is for fans of narrow gauge steam, the largest collection in the UK. The 2ft gauge railway operates through the weekend along with the 3ft gauge Burton Ashby tramcar, while the grounds of Statfold are occupied by miniature rod steam vehicles, making for great entertainment.

The Steam in Miniature weekend is on 7th-8th May and tickets cost £15.00 on the gate or £13.00 in advance from /www.statfold.com/statfold-steam-in-miniature

Gearing up for a new season

Outwardly it's the quietest time of the year for our clubs, but behind the scenes much is going on ahead of hopefully much busier running seasons...

COMPILED BY **ANDREW CHARMAN**

This month's Club and track round-up is being put together right at the end of what for many traditionally feels like the longest and most depressing month of the year, January. And on the surface it appears that the month is also a quiet one, with far fewer than the usual host of club journals reaching us at **EIM** Towers over the past few weeks.

However one item we did receive did make us happy – as I write in my editorial this month, we finally have a reason to bring back a much-missed page, the diary.

It was the **North Wilts SME** which encouraged us to at long last reinstate the diary page by sending us a list of the club's public running dates for the year – as mentioned in the editorial we are only printing dates we can confirm at present for obvious reasons, so if your club has a programme of track days and meetings back in operation, please send details in!

In another sign of the increasing return to normality North Wilts has also scheduled its annual Club Rally for 2022, which is set to take place on Saturday 11th and Sunday 12th June.

The plan is to have free running on the Saturday and voluntary public running on the Sunday and visitors will be welcome – the club has almost a mile of dual 5/7¼-inch gauge track running in the woods, through three tunnels and an up-and-over bridge. 12V power and air is available for loco owners in the steaming bay and tea and biscuits in the clubhouse, while nearby are a cafe, two pubs and hotels.

Details of the annual rally can be had from organiser Ken Parker on email at kenneth.parker1@ntlworld.com or by phone on 07710 515507.

Still uncertain

Not everyone is seeing a return to normal circumstances quite so quickly, however. In the latest *Leeds Lines* from the **Leeds SME**, which arrived just as we closed for press, chairman John Hunt reports that it had been hoped to restart evening society meetings in January but he admits to a little reluctance; "current levels of Covid infection would understandably result in poor attendance numbers and I feel that getting a speaker to turn out in front of people would be difficult."

We sympathise, it is very difficult to accurately gauge when it is the right point to declare that the crisis is behind us and we can go back to normal lives – but we are glad to see that members of the currently trackless Leeds club are still keeping in touch by means of informal Monday breakfast get-togethers at a local golf club and Wednesday evening 'natters' at a social club.

John also comments on driver competency, which he describes as "one of the biggest new issues for 2022." A test has been devised to comply with the recent Health & Safety Executive guidance 'Managing Health & Safety at Passenger-Carrying Miniature Railways'.

Apparently those drivers who successfully take the test are given a card which can be shown to officers of any club to confirm competency. Are other clubs facing the same

ABOVE: Some welcome action at the Lincoln ME with member Lawrence Tatton warming a frosty day with the steam effects from his Fowler 4F loco following its steam test.

RIGHT: The Lincoln members have been busy recently making the track tunnel look 'more railway like'.

Both photos by Neil Grayston, Lincoln ME

issues? If so we would like to hear how you are going about meeting these new requirements.

It is good to read also that the Leeds club is a step closer to regaining a track site at its former Eggborough location, and that the Leeds portable track had its first public outing for two years at the end of November at a local school. It's next set to appear at the standard-gauge Wensleydale Railway's Gala on 30th April to 2nd May.

Show scarcity

Even closer to our close-of-press time the February edition of the **SMEE** *Journal* drops into the editorial inbox, with chairman Alan Wragg commenting that whatever happens this year it will not be a complete return to normalilty, with model engineering shows badly affected and only the Midlands event in October currently confirmed to be going ahead.

"It would be very nice if we could be sure that 'Ally Pally' and Doncaster will be reinstated in 2023 as neither will run in 2022," Alan states, revealing that as we had feared and recent rumours had suggested, the big May show at Doncaster is off for another year, though no official word from the organisers has yet reached this office...

Good to see that the SMEE's traditional full programme of meetings is scheduled for 2022, and that they will be 'live' at the Society's Marshall House, London base but also broadcast on Zoom, a great idea that opens up such events to a far greater number of the membership.

Interesting correspondence in the SMEE *Journal* concerns some small stationary steam engines recently displayed at a Society meeting and made around the end of World War 2 by Aerostyle Ltd, a specialist in paint spraying equipment based in London. Member Eric Offen wonders why such a concern would diversify into such models – does any **EIM** reader have any clues?

Notable too that the *Journal* editor comments that the lack of events in recent times has left him short of interesting photos to put in his pages – the **EIM** editor very much sympathises! Readers have probably got very bored with my constant pleas for more features to be sent in over recent months but the fact remains that with no shows, rallies or gatherings being held over the past two years, I've had to use virtually all of the 'making things' features I have in stock!

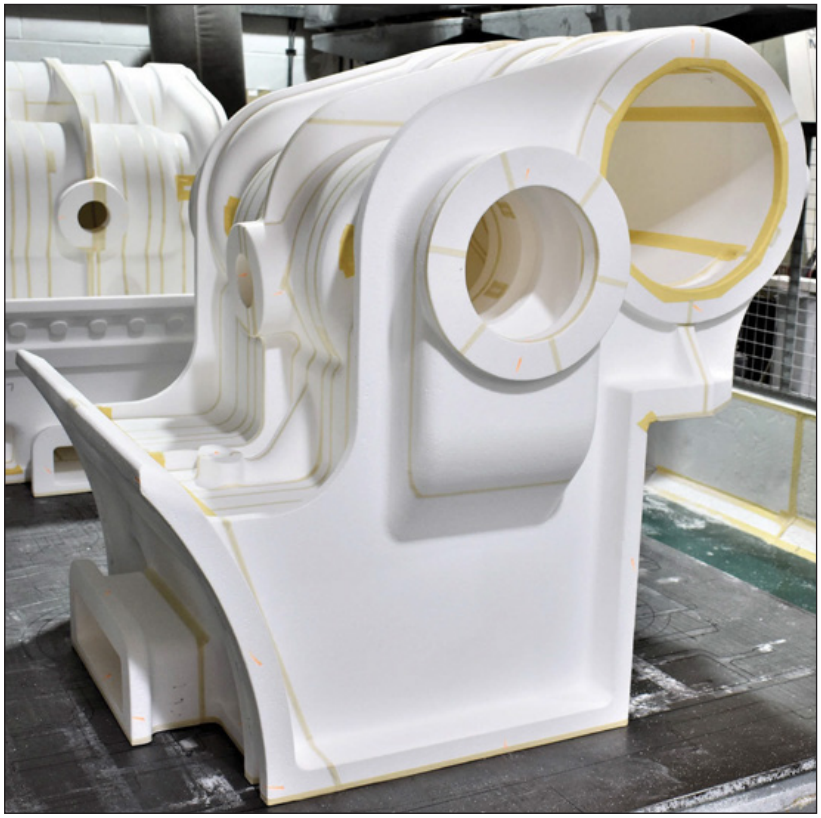
Lots of activity evident from the latest edition of the **Lincoln & District ME** newsletter, though the club is still struggling to find a venue to hold its members meetings. This hasn't prevented lots of work at the North Scarle track site, Thursday working parties having recently completed impressive abutments for the tunnel which newsletter editor Neil Grayston comments "make it look more railway-like."

Members have also been taking the chance to put their locos through pre-season steam tests, among them Lawrence Tatton with his well-built Fowler 4F 0-6-0. As the picture shows in the cold conditions of winter the steam effects certainly warned everyone up!

The latest edition of the **Bradford ME** newsletter reports how some end of 2021 and early 2022 meetings fell victim to Omnicrom, including the annual exhibition, but the club is hopeful of a much busier 2022 programme. President Jim Jennings raises a smile from this jaded journalist in his column with a sidelong swipe at national events with his comments on fading memories of New Year celebrations and parties. "If you did go out to meet a few friends, I hope you were wearing your overalls and had a spanner in your hands, just to prove you were working and not partying," Jim says, adding; "I'm sure your tool bag would be full of tools, leaving no room for bottles of wine..."

The busy **Centurion SME**, based in Pretoria, South Africa regularly appears in these pages and the latest ▶

"I'm sure your tool bag would be full of tools, leaving no room for bottles of wine..."



ABOVE RIGHT AND RIGHT: Okay these are full-size, but you clubs aren't sending in enough pictures of your activities for these pages! The two images, taken by regular EIM correspondent *John Arrowsmith*, show the casting pattern and resulting casting for the Great Western Society's 'Night Owl' project to recreate a lost class of locomotive, in this case a Churchward 2-8-0. As can be seen, the processes involved are just the same as when making miniature locos, it's just that you need somewhat of a larger lathe for the machining... There are hopes that the loco could steam within two years – more details can be found online at www.4709.org.uk

LEFT: That will be a sizable structure... Much effort on a frosty day by Rugby ME members saw the concrete base for the new facilities building poured. *Photo: Rugby ME*

edition of its *Smokebox* newsletter reports on the end-of-year function at the track, which editor Jon Shaw described as a more subdued affair due particularly to Covid influences, but one that was nonetheless enjoyable for all those attending.

Trophy winner

A new trophy, donated by the Shaw family, was presented to the club's model maker of the year and this was won by Leon Kamffer for his recently completed 7¼-inch gauge SAR class 5 loco 'Karoo'. Construction of this engine is detailed in the newsletter and it is certainly a highly impressive build, started in 2015 when Leon made a large pattern for the driving wheels. The actual build only commenced in 2018 so he has made rapid progress.

March traditionally sees the holding of the Southern Federation AGM, except that now of course it's no longer Southern, having voted to change its name at the 2021 meeting to simply the **Federation of Model Engineering Societies** to accurately reflect the wider membership from across the UK and Northern Ireland model engineering scene.

More details of the AGM and other activities are on the Federation's recently revamped website, www.fmes.org.uk, and of course we will be bringing you a report on proceedings at the AGM.

Another packed newsletter from the **Rugby ME** – it constantly amazes this correspondent the amount of heavy civil engineering that always seems to be going on at this most busy of clubs.

The Rugby club has started 2022 in similar form to how it finished 2021 – the first month of the new year seeing big progress on a major project with the laying of the concrete 'raft' for the new facilities building being constructed at the Onley Lane track site.

Not put off by overnight frost, a dedicated team of members worked with a local contractor, starting at 7.30am on what the newsletter editor described as a "mammoth project", and which was completed by the end of the day – very impressive.

Also in the Rugby newsletter Ed Parrott, a regular **EIM** correspondent when he's not running Model Engineer's Laser, demonstrates why downsizing is very much a valid thing amongst today's model engineering fraternity.

Small capacity

Ed's activities are familiar to many readers as he works with large 7¼-inch gauge locos, including a massive South African Garratt, but currently he is making solid progress on his latest project, a Great Western 14XX tank locomotive in Gauge 1, on 45mm track. He's just finished the silver soldering of the loco's boiler and comments that it "holds all of a teacup full (of water) – it's a bit of a change from the Garratt!"

Recent years have seen some high-profile casualties on the track front, including most recently the demise of the 10¼-inch gauge Wells Harbour Railway in Norfolk. This line closed on 21st September and its stock has since resurfaced at the Lappa Valley Railway in Cornwall.

NOTICE BOARD

When the current editor first took over **EIM** back in the March 2018 issue he was asked several times if the readers' *Notice Board* section would be reintroduced, printing free of charge private for sale or wanted ads, queries and such like. We replied if the ads were sent to us we'd print them.

In the time since we have been able to print *Notice Board* requests on occasions, but rare occasions. Below is the latest and gives us an opportunity to emphasise that this is a free service that readers are welcome to take advantage of. If you have something for private sale, are searching for that elusive casting or drawing, or just want to alert your fellow model engineers to something of interest, simply send in details to the address on page 3, marked 'Notice Board' and we'll put it in! We would like run this column every month...

FOR SALE: A 5-inch gauge portable miniature railway. Reader Mark Hill-Tout is selling his line which has appeared at several events including the annual Gala of the Welshpool & Llanfair Light Railway, where it has operated at Welshpool Raven Square station.

Included in the sale is enough raised track to complete an elliptical or straight circuit along with two passenger trolleys and a trailer to carry it all in. (Note that the loco is not included). Anyone interested can obtain full details and photos from Mark at m-m.h-t@hotmail.co.uk or by phone on 01938 500234.

It's good to hear, however that new miniature lines are coming into existence and we've very recently heard that planning permission has been granted for a new 7¼-inch gauge line at the standard-gauge Bluebell Railway in Sussex. We have a roving reporter on the case and hope to bring you more news of this project soon....

Finally these pages send congratulations to James Mander, president of the **Guildford ME**, who has been named the new engineering manager of the Welshpool & Llanfair Light Railway. As someone who 15 years ago relocated from almost the same bit of Surrey to very much the same bit of Wales due to a great extent to his involvement with the very same railway, **EIM**'s editor looks forward to getting to know James a little better! **EIM**

■ Send any news updates or journals from your club to the editor at editor@engineeringinminiature.co.uk or at 12 Maes Gwyn, Llanfair Caereinion, Powys, SY21 0BD. We are always short of photos to use on these pages so if you want to see images from your club in *Club & Track News*, send them in to the same address.

"It holds all of a teacup full of water – it's a bit of a change from the Garratt..."

BELOW LEFT: More full-size, but connected! Late January saw the boiler of the Welshpool & Llanfair Light Railway's Franco-Belge 0-8-0 'Sir Drefaldwyn' reunited with its frames. Completing this job will be among the duties of the line's new engineering manager, who has also served in recent times as Guildford ME's president... *Photo: Julian Smith*

DIARY

The diary returns after a two-year absence – please note that we are only publishing dates that have been confirmed, and with the continuing uncertainty over the decline of the Covid pandemic we strongly recommend that readers check with the club or track concerned just before travelling to any events or meetings.

EVERY SUNDAY
(Weather permitting)

North Wilts ME public running, Coate Water Country Pk, East Swindon, SN3 6FG, 11am-5pm

MARCH

2 Bradford ME AGM, Saltaire Methodist Church Hall, 7.45pm

2 Lincoln & District ME Meeting, bits & pieces, venue tba, contact club (www.lincolnmes.co.uk)

5 SMEE Meeting, 'Counter-Intuitive +CM Experiments you can do at Home' by Hugh Hunt, Marshall House, London, 2.30pm

10 Worthing & District SME meeting, 'SS Shieldhall' by Geoff Bashall, Field Place, Worthing, BN13 1NP, 7.30pm

12 Federation of MES Annual General Meeting, Avoncroft Museum of Historic Buildings, Stoke Heath, Bromsgrove – details from www.fmes.org.uk

12-13 Midlands Garden Rail Show, sponsored by EIM. Warwickshire Event Centre, nr Leamington Spa, CV31 1XN. Pre-book tickets from www.midlandsgardenrailshow.co.uk 10am-4pm each day

16 Leeds SME Trophy Night, Darrington Golf Club, 7pm

19-20 Centurion SME members weekend, public running on the Sunday, Pretoria, South Africa (www.centuriontrains.com)

20 Guildford ME Public Running, Stoke Park, Guildford, 2pm-5pm

26 SMEE Meeting, 'Adventures with Frederick the 4-inch Showman's road Loco' by Tim Watson, Marshall House, London, 2.30pm

26 Wolverhampton ME Seminar for Boiler Inspectors, pre-booking essential, details from club at www.wolverhampton-dmes.co.uk

APRIL

2 Bradford ME Annual Exhibition, Competition & Social, Saltaire Methodist Church Hall, 12.30-4.30pm

2 SMEE AGM, Marshall House, London, 2.30pm

2 Worthing & District SME Members' Cobweb Steam-up, Field Place, Worthing, BN13 1NP

3 Guildford ME Members Running/SMSEG Meeting, Stoke Park, Guildford

6 Lincoln & District ME AGM, venue tba, contact club for details (www.lincolnmes.co.uk)

10 Guildford ME Public Running, Stoke Park, Guildford, 2pm-5pm

14 Worthing & District SME meeting, Field Place, Worthing, BN13 1NP, 7.30pm

16-17 Centurion SME members weekend, public running on Sunday, Pretoria, South Africa (details at www.centuriontrains.com)

17 Bradford ME Public Running, Northcliffe Railway, Bradford BD18 3DD, members from 11.30am, public from 1.30pm

18 North Wilts ME public running, Coate Water Country Pk, East Swindon, SN3 6FG, 11am-5pm

MAY

07-08 Statfold Barn Railway Steam in Miniature Show, miniature road steam – details at www.statfold.com

Details for inclusion in this diary must be received at the editorial office (see page 3) at least EIGHT weeks prior to publication. Please ensure that full information is given, including the full address of every event being held.

Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors or omissions

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STATION ROAD STEAM

ENGINEERS · LINCOLN
LOCOMOTIVE BUILDERS · BOILERMAKERS

Full-size and miniature engines of all types bought, sold and part-exchanged

We keep a large, constantly-changing stock of second-hand in all scales and gauges.
We are always interested in buying engines - from part-built through to exhibition-winning models.

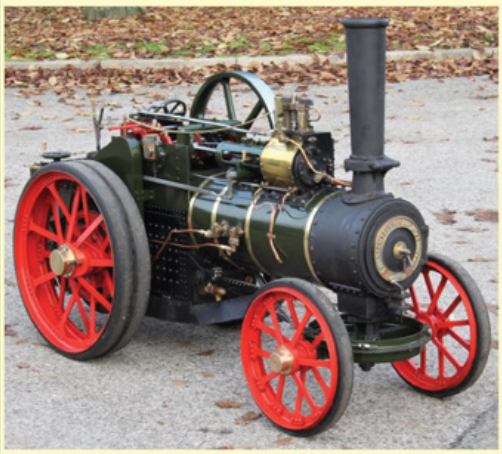
5 INCH GAUGE LNER B1 "MAYFLOWER"
In running order, fitted with a commercially-built CE-marked boiler built in 2012. Fit of the motionwork and valve gear is good, finish is unspecial. The safety valves, injectors and hand pump all work effectively, paintwork is in good condition. The boiler has had recent hydraulic and steam tests with new certification issued. **ref 10060 £5,950**

5 INCH GAUGE LNWR "SUPER D" 0-8-0
Rarely modelled in this gauge, an LNWR "Super D", the work of an experienced model engineer. A well-built, highly detailed model , it's spent the last four years in storage having apparently had little use from new. Fitted with steam brakes and piston valves actuated by Joy gear. The superheated boiler has club history as well as recent hydraulic and steam tests with new certification issued; the engine runs well. **ref 10193 JUST ARRIVED**

3 1/2 INCH GAUGE GWR 4-6-0 "SHUGBOROUGH HALL"
The engine appears to have been test steamed - possible once at the factory when new - since when it's been kept for display in its case. We've tested the boiler at twice working pressure - it's sound throughout. Mechanically as-new, the paintwork and lining remain in very good order **ref 9823 £6,500**

5 INCH GAUGE "SWEET PEA"
The boiler is a commercially made CE-marked by Blackgates Engineering. The engine steams freely and runs well in forwards gear, slightly choppy in reverse. **ref 9958 £3,250**

5 INCH GAUGE MIDLAND 4-4-0
A recently completed 5 inch gauge Midland 4P; the work of a highly experienced builder.There are lots of small details designed to make operating and maintaining the engine easy. In as-new condition, the engine has been steamed three times. Comes complete with new certification along with original club paperwork. **ref 9879 £7,950**



3 INCH ALLCHIN AGRICULTURAL ENGINE
A well-built 3 inch scale Foster agricultural engine, it's a free-steaming, attractively proportioned engine. Boiler is by the estimable Tony Baldwin of AJB Boilers, it's had recent hydraulic and steam tests with certification issued for same. Complete with a set of driver's footrests and a nicely made driving truck with large plastic auxiliary water tank and space for coal and tools within. **ref 8830 £11,500**

1907 STANLEY MODEL EX FOUR SEATER RUNABOUT
In good running order, the car is believed to be in largely original condition. On display for many years in a museum in the Netherlands, it came to the UK in the 1980s. In recent times it has had a complete engine overhaul and replacement boiler. It goes very well, easy to drive and remarkably capable, climbing hills with ease. **ref 10157 JUST ARRIVED**

3 INCH ALLCHIN AGRICULTURAL ENGINE
A well-advanced 3 inch scale Allchin agricultural engine by an experienced model engineer, not common in this scale. Work to date is to a high standard, around 90% complete. Rear wheels have been fitted with strakes, with steel bands over. Fitted with a John Rex boiler with original paperwork.
ref 10184 £8,450

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!

For full details, high resolution photographs and video see our website
Unit 16-17 Moorlands Trading Estate, Metheringham, Lincolnshire LN4 3HX
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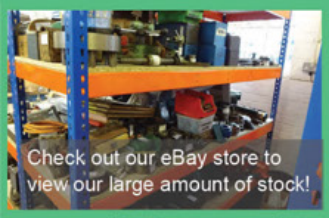

Check out our eBay store to view our large amount of stock!


Colchester Bantam 2000 lathe (long bed) metric leadscrew, Dickson post £4950

Stanier precision vice 55mm jaw New / New Zealand £195


Startrite Robland K210 £2450


Myford gearbox unused £1000


3 1/2" Britannia 4-6-2 rolling chassis and castings; see Website for more pictures £1150


Lista 'selection available' (German quality manufacturing) 7 drawer cabinet used by the MOD £750


X-Y 12" x 6" table £525


Bridgeport 42" x 9" turret milling machine / R8 Preferred belt change head type! £3250


Harrison / Colchester change wheels

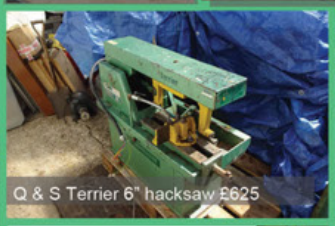

Pacific poss. 5" locomotive 4-6-2 Boiler kit, casting set and frames see Website for more pictures £1800


Toggle press £145


Minnie 1" traction engine castings etc. £425


Bridgeport / Versatool cabinet £400


Elliot 12" rotary table 4 1/4" height £500


Q & S Terrier 6" hacksaw £625

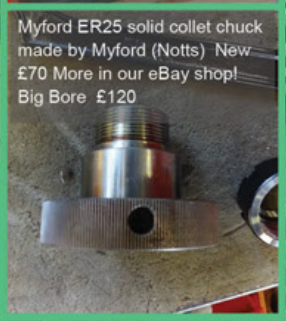

Boxford AUD 5" x30" IMPERIAL Ex. Hospital workshop £2950


DP / MOD gear cutters £20 each, please enquire for availability


Chester Cub 630 6" x 30" centres chucks, steadies hardly used £2950


Harrison Graduate wood lathe 240V & 440V models available £1375


Springbok B1 4-6-0 rolling chassis & tender etc. £1500 More pics. On Website!


Myford ER25 solid collet chuck made by Myford (Notts) New £70 More in our eBay shop! Big Bore £120

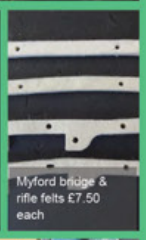

Trugrip collets metric £35 Imperial £30, Marlco 2820 £15

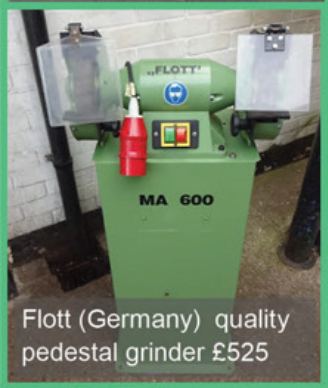

Harrison L6 40" long bed, Newall DRO, steadies, ex. Hospital £3750


RJH Morrisflex Antelope 6" vertical linisher / bandfacer + built in extractor runs well! £1450


Chester metal cutting Bandsaw £240


Tripus 240v switch £90


Myford bridge & rifle felts £7.50 each



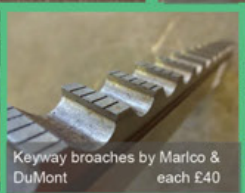
Flott (Germany) quality pedestal grinder £525


Harrison M250 lathe 5" x 20" 240 VOLTS FROM NEW £5450


Excel swing die grinder 10" x 5" magnetic chuck rare £1250
Fly press tooling in our eBay shop!


Clarkson / March radius Attachment £600


Neat cut and soluble cutting oils £10 each


Keyway broaches by Marlco & DuMont each £40


Myford ML7 lathe £1250


Hofmann 200mm table £425


Harrison M300 lathe £3950


Keetona Box-Form 1 100" x 14g , 2.5 metre x 2mm box and pan folder £2950

Please phone 0208 300 9070 to check availability.
Distance no problem – Definitely worth a visit – prices exclusive of VAT
Just a small selection of our current stock photographed!

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