



# Goodwin Park News

## Spring 2021

## Club Details

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The newsletter of Plymouth Miniature Steam. Published quarterly (normally March, June, September & December) and issued free to members. **Cut-off date for submissions is 24<sup>th</sup> of the preceding month (i.e. Feb, May, Aug & Nov).**

We operate a ground level track of approximately half a mile in length at our site at Pendeen Crescent, Southway, Plymouth, with facilities for 3½, 5 and 7¼ inch gauges. Public running occurs on the first and third Sundays of each month, from April until the end of October.

For further details and membership information, please contact Ian Jefferson (01752-788862) or Rob Hitchcock (01822-852479).

Current Membership Rates - Adult £25, Junior £10.

Workshop facilities available to members at 'Tor Bridge High' (was Estover Community College), Plymouth, £25 per term (10 weeks) or £3 per session.

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We also operate an email message service within the membership; if you wish to join, please contact 'the membership secretary'

Please note that contributions reflect the views of the writer and are not necessarily endorsed by the Company.

Members' advertisements for models and other related items are published free.

Non-members and Trade, by arrangement. All items for inclusion to be sent to the Editor.

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### Your committee for 2021

Ian Jefferson	Chairman
Nick Hill	Vice Chairman
Ursula Brown	Secretary
James Atkinson	Treasurer
Selwyn Brown	Track Marshal
Alan Smith	
Bob Sims	
Ti Daley	
Rob Hitchcock	

Please make sure that any change of address, email or mailing preference are notified to the membership secretary promptly in order that we can keep you informed. If you do not wish to receive communication by phone or email, please ask the membership secretary to delete that information.

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**Front Cover:** *Sundial by David Bishop (see full article page 28)*

### Editor’s Ramblings:

*Well . . . a bumper edition! 36 pages and yet again a wide variety of articles. Many thanks to all who have contributed. It is so much more satisfying to squeeze things down to 36 pages, than pad it out to 8 pages (which I have had to do on several occasions in the past!). There are also some very good quality photos.*

*Please don’t forget me when we are finally allowed out of the house & shed again and you have a chance to play with your new toys!*

### From the Chair

Well, we have finally said farewell to 2020, but not so the dreaded Covid-19! As 2020 neared its close, we were hoping that the end was in sight, but alas, hopes got well and truly dashed, so once again we find ourselves locked down and almost everything at a standstill. The big question is; 'What will the future look like?', not just the next few weeks, but the coming year and even beyond. I know that many people are pinning their hopes on the vaccines that are now available, and due to the age profile of the club membership, many will, or will soon have received theirs. However, I believe that anyone who tries to predict the future with any degree of certainty is running a very significant risk. So, rather than saying that we will do something, I believe that we have to say that we will endeavour to do it as soon as circumstances permit! So, before we get out that crystal ball, let's have a quick look back over recent time.

Normally we would have had a members' day on January 1<sup>st</sup> to enable us to get together and pay our subscriptions, unfortunately this did not happen, so we have had to rely on other methods of payment and I must thank those of you who renewed promptly. Thankfully the majority have now renewed and I would hope that the small number of you who have not yet paid will do so very soon. Similarly, we were unable to get together for our AGM, so this was held as a virtual meeting, using zoom. Although it was not quite as easy as a normal meeting, we did manage to carry out the necessary business, which included the approval of the accounts and the re-appointment of the committee and other officers. We are therefore all set to go forward into 2021 and face whatever comes our way.

We have continued to work through as much maintenance on the track as we can, whilst the major work has been looking towards completing the track base on the approach to the bridge, effort has also been put to addressing areas of the lower circuit that were in a less than acceptable condition. This has been done to ensure that when we are able to open, we do have at least half the track available for use. The poor weather and inability to get sufficient people to work on the site, means that progress on all fronts has been impacted and progress is slower than we would have liked. One major step forward was taken on December 31<sup>st</sup>, when the long-awaited tunnel gates arrived and were fitted, all in a downpour of hail. We are now able to close off the

## From the Chair

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tunnel once again. Meanwhile, work has also continued on the locomotives and stock, such that the annual inspections on the locomotives have now been completed and Hernia saw the light of day for long enough to pass her boiler tests. Attention has now turned back to the passenger sets and another pair are receiving attention, with (thankfully) little repair being required, but a new coat of paint will make them look better for when they finally see action again.



*Track - spot repairs in progress*



*Another spot repair in progress*

## From the Chair

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*Tunnel gates being fitted in a hailstorm*



*Completed tunnel gates - there is another set at the other end!*



*Track base approaching the bridge being prepared*



*A new section is required to bridge this gap*

## From the Chair

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*Signs of Spring at Goodwin Park*



*Hernia cooling down after her boiler tests*



*More spot repair action*

## From the Chair

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So, looking to the future, it is impossible to say at this stage when we will be able to open either for members or public, but we do need to get prepared so that whenever we are able, we can do so as quickly as possible. It is important that we open this year and there are 2 principal reasons, one being that we do need to raise income from public running, but we also need to maintain contact with the public as having already lost a full year, there is a real risk of losing their loyalty, which would take significant time to re-establish. As I say, it is impossible to predict when we will be able to open, but as the current approach is that schools should be the first to resume and the date for that is not until mid-March, it is clear that our chance of opening in April is now extremely unlikely. So as soon as we are reasonably able, we will need to come together and do some final tidying and especially some cutting back of undergrowth. Then we will need to learn a new way of working in order that we can comply with the constraints that will be upon us. Perhaps even further into the future is the question of when we may be able to return to Torbridge: again this is impossible to predict at this stage, but the likelihood of this occurring in the near future is also slipping away, be assured that we will keep in touch to get back as soon as we can!

As for myself, the past 3 months have just seemed to vanish into the mists of history and I have difficulty accounting for what has happened. Sufficient to say that I have been spending some time trying to plan for the future, but without knowing where things are going, this is extremely difficult. So, I have spent a bit of time on one of my own projects which had been languishing at the back of the bench for several years. It has challenged me on how to do some things, but at least it is beginning to take shape in the way I would like. Hopefully, I will find enough time during this year, to allow me to complete this project, get it painted and onto the track. But you will have to wait to see what it is!

Normally at this time of year, I would be encouraging you to get ready for the running season, just weeks away. On this occasion however, I encourage you to stay safe, but still get ready for whenever we can open and then to come and lend your support so that we can start moving to whatever the 'new normal' beholds.

Take care and see you all soon.

Ian.



## BOLTS, SCREWS and STUDS

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### BOLTS, SCREWS and STUDS

*Alan G. Smith*

What have we all been up to since March 2020 during the Covid 19 shut down some 36 weeks ago (as of 4th.Nov2020) and the effects to our lives and to all members of PMS?

Way back in March I made a list of jobs I could and wanted to finish, but NO new work to be started before starting a new project.

The list contained many model engineering items that I wanted to get on with and this included:-

1. Diagonal Paddle Engine
2. Chaldrons Wagons
3. The B1s. cylinder covers, and to No.4  
Clean & polish "Black Diamond" and get the following article to Dave Biss.

Bolts, screw and studs are important fasteners which are used in a variety of model engineering and industrial applications. These fasteners depend a great deal on the manufacturing process and the material used. Some old blueprint used in the 1950/60 had the specifications on them; the engineer only had to look at the bottom right corner to see the way in using stainless steel, carbon steel and brass, that a draftsman had specified there use.

The two most used fasteners that model engineers use are bolts and studs. Studs are thread at both ends and plain in the middle. It is permanently screwed into one piece to which another is then secured by a nut.

Double end studs, to quote (Chambers Technical Dictionary); these are manufactured to have equal length threads in each end to accommodate a nut. Both ends have chamfered points, but round points may be furnished on either or both ends at the manufactures option.

## BOLTS, SCREWS and STUDS

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With the above as a background, I was first faced with the problem when I started my working life in the early 1950's for the first time. As a young lad my engineering started at Plessey & Co in Ilford, North London. After six months I left and worked for Haskins Ltd, a lift and roller-door Manufacturers at that time in Blackhorse Road, East London. There I worked in the Drill shop and Capstan shops and the main construction shop. I stayed at Haskins until September 1956 after which I spent the next 35 years in the Royal Air Force.

In the RAF the use of bolt, screws and studs, I found to be an ever day a part of one working day, in the engine rooms of RAF Marine Craft, as a Marine Engineer. You may ask what has this to do with bolts and studs and model engineering; well they make use of all types of fasteners that come to hand, in the engineering world. Well, at Haskins Ltd., I worked either on a Ward or a Herbert Capstan lathe manufacturing bolts and studs that were required for use in the factory, and even the nuts.

As I was under 18 at the time I was not allowed to set up machine tools, this was undertaken by a time served tool maker from the tool shop. (This is my first time even I came upon H&S) The machine would be set up for the task to be made and I would be showed the way to do it also, a started to obtain my engineering knowledge. When parting of studs and bolts the parting tool had a radius set to give a small raids on the end of the stud, this was to allow for the ease of putting the stud box onto cutting the thread and putting the nut on. Also to the putting a stud into the taped hole, say a base plate for some type motor etc. At first, one would be making studs of the 1/4" to 1/2" BSF or BSW, but later you could be in the 1/2" and much larger sizes. I do remember making some large studs that we used to make, that had thread relived across the thread, I was told, was to relive the air out of a blind thread hole as the stud was put in.

Now back to model engineering and making studs in B.A. I have always made studs to be studs. No steel/brass studding for me. I obtain BMS round to suite the B.A. Sizes and make the studs that I require. Today it is getting harder to find the B.A size you require but some of this is to be found in metric sizes now.

## BOLTS, SCREWS and STUDS

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Over the years I have made many hand tools to handle B.A. nuts, studs and bolts from 10B.A. to 2B.A. One of the best tools I have made are stud boxes, I use them all the time to assist in handing the manufacture of studs and assisting in fitting a stud into a component, and even hand tools to put nuts on those difficult positions I find sometimes.

1. The main way I make my studs is to cut bar stock to size first. This I do using a fine parting tool that parts off clean and square on one side, also chamfer the side for the next stud.
2. Move the bar stock out and thread.
3. Part off.
4. Repeat the above until you have the required amount of studs.
5. Re-chuck the stock and cut the thread the other end.

It sounds a long old way to go, but once you get into the routine the job will end up being right and also looking right. The Diagonal Paddle Engine had over 80 studs of various lengths and I believed I used about qty 4, 2 "foot lengths of 0.107/2.75 dia. BMS round.

In 2007 I exhibited my loco "Black Diamond" and met up with the Reeves designer David Piddington and he told me the judge had put my model down as the wood was out of scale and all the studs did not look like studs but bolts. I did find a judge that day to know the reason for this and was told; there was a not cut/marks made on the heads of the bolts and studs. I will not say what I said to him, only I will never put another model in their show again. I know they are studs as I made them.

If any member of PMD would like to see the way I make studs I will be willing to show them when we are back to normal. But, please, please, please, no more cutting from steel/brass studding, cut with a hacksaw and a quick run round with a file.

Alan G. Smith

### The Highlander saga, another of my good ideas was...

*Tom Pawley*

To build the boiler from steel! Well, it's obviously a good idea, isn't it? After all, steel is very strong and fairly easy to work, plus, it's cheap. And so I set to work to redraw / redesign the Martin Evans boiler for steel construction. This drawing as it appeared in M.E was as full of errors as all the rest, something that I am still suffering from even now.

I soon discovered that in the years since I first conceived the idea, steel boiler design and construction had become almost submerged in rules and regulations, to the point that I almost gave up, but being stubborn by nature and not inclined to give up something that I've started, I searched through all the published information on steel boilers, there's quite a lot! I finally took the AMBC code, together with the John Haining book "Countryman Steam" as my reference works. The redesign proceeded, following the general outline of the Evans drawing with scantlings that complied with all the current Regs, I must say that I thought that the Australian (AMBC) codes were rather "over the top", using their stay sizing guide the firebox stays would have been so large that there would not have been room for water!

Despite my complete inability to draw, as an apprentice (electrical engineering) my tenure in the drawing office was very short when the Chief Draughtsman discovered that I couldn't draw a straight line even with a rule! However, the boiler drawings looked acceptable, at least to me,

The structural calculations were fairly straightforward, even though I never was any good at sums, since all the necessary formulae were in the reference works, however, I came to a full stop when it transpired that I would have to have my calculations checked by a "Qualified Person". That caused a hiatus, as

## Highlander

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no one seemed interested in doing this. I finally found, through the Model Engineer Forum site, a Chartered Aerospace design Engineer who kindly did the job for me. With this done I found a company in the Midlands who specialized in rolling cylinders, and they were happy to roll the tapered cylinder for the boiler barrel, later I found a local firm who could have done it!!



With the boiler barrel to hand, I prevailed on my son to redraw my efforts in CAD so as to get all the Plates laser cut, no more horrible hacksawing for me! The firebox wrappers are quite a complicated shape, they had to have a central seam in order to produce the very curvy shape, I was lucky to find the local engineering business who were quite confident in doing the job, by happy coincidence, the Manager had built a 5" gauge loco some years before, so knew exactly what I wanted.

Another happy event and one that made the project possible, was that my son had some work done by an Engineer who did welding. I went to meet him and found that he was no ordinary welder, but had worked with hydraulic pressure vessels and had been coded for this sort of work before setting up on his



## Highlander

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own account, he was also amenable to cash working!! And so, off we went, I fitted, assembled and lightly tacked the components together, taking them to John the welder for finishing, he is at Lostwithiel, so no too far to go, although as the build progressed, the car's rear wheels disappeared up into the arches and the exhaust started scraping on the road, It's astonishing how heavy a big steel boiler weighs, towards the end I had to use an engine crane to move the beastly thing!!



The firebox stays were a fairly interesting exercise, as they are threaded and nutted on the inner firebox and welded on their outer end, it was desirable to get the inner end as square to the firebox as could be, to give the nuts as flat a face as possible, which called for some accurate drilling. EBay yielded a suitable extra-long tap and all went without any snags.

While the boiler was with John, I had been making various parts that were going to be needed before the Hydraulic test, the regulator, main steam pipe and sundry plugs and blanking plates. And so, with all the bits fitted, the boiler filled with treated water and a pressure test set (eBay again!) connected, it was with no little trepidation that I started to pump. At 40 psi there was a steady drip of water from the inner firebox! Examination revealed two of the upper stays had a slight weep, but bearing in mind advice from a number of sources that it was not a problem and would self-seal, I carried on increasing the pressure. At 60 psi the weeps had sealed and there were no further signs

## Highlander

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of water. Up to 150 psi, still no trouble, so on to 200, still good so up to 250 psi and all was well, no signs of leaks or distortion. I shut off the pump and departed for a cup of tea. Returning, with some trepidation, half an hour later there were no leaks and the pressure was still 250.

The next stage in the project was to arrange the official hydraulic test, and so I fixed an appointment with Rob Hitchcock, borrowed an interested friend and his car and trailer and managed to load the Beast on, then off to the Club track. I was fairly apprehensive, even though the test at home had been satisfactory, and my concerns were not reduced when Rob produced a video scope device and started inspecting the welds from the inside! But John, the super welder had done thing well and there were no faults.

And so, after a whole load of trouble and heartache, there was a boiler! I'm glad that I went for steel, just the thought of brazing a boiler of that size is more than enough, had I gone for copper, then I would certainly have had it TIG welded. And so now it's back to the boring bits, sheet metalwork, ugh.



I should have mentioned that I have had the loco running. I converted the building stand to a rolling road, pressurised the boiler with the workshop compressor and opened the regulator and it went!! with quite even exhaust beats which was a surprise, as Mr. Evans description of setting valve events was more than perfunctory, still, as he said, "this is not a suitable project for a tyro". Here's one tyro who is bloody but unbowed. Here's to the next one!!

## Wren Progress

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### Wren Progress

*John Briggs*

I offered to make the Wren cylinders in February last year, little knowing of the impending confinement that kicked off in March. I suppose you could see these castings as ‘Fruits of the lockdown’ and, together with the huge



*Drilling the drain cocks*

progress made at the track, PMS will eventually emerge from this misery of a pandemic showing useful improvement in every department. Two of the cylinders are destined for a completely new Wren locomotive being built and



*Fruits of a Lockdown*

the other two will be available as spares.

The four cylinders are now complete until ready to receive the steam chests; the castings for those are available and work commences next week.



## 7¼" gauge open wagon

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### The building of a 7¼" gauge open wagon

*Pete Manners*

When I have been watching my two grandsons at play, I've noticed that they take delight in moving "stuff" around, transporting things from one location to another. Loading and unloading. It doesn't seem to matter what the "stuff" comprises of whether it be toy bricks, gravel or even grass cuttings!

So with this in mind I got to thinking that it might be a good idea to make an open wagon for the railway.

Whilst scouting around at work some weeks previous I had noticed standing up in a corner of the workshop store a few lengths of "Dexion" angle and it didn't seem to be serving any useful purpose, so after making some inquiries, then obtaining a "scrap ticked" I was able to take them home with the intention of pressing them into more useful employment!

These I thought might be just what is needed for the basic frame work for my wagon.

The first decision to be made was the size, I wanted it to be reasonably to scale but on the other hand to be useful and practical.

After a great deal of thought I settled on a length of 36 inches and for the width I decided should be about the same as our present rolling stock which was 14 1/2 inches.

The height of the sides was a tricky one because to scale the dimension would have been far too shallow to be of any practical use. So I settled for eleven inches. The final dimensions however were dictated by the spacing of the holes

## 7¼" gauge open wagon

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in the Dexion angle because each component part had to be the mirror image of its opposite counterpart.

The first task was to cut out the four pieces that were to be the base and the ends had to be 45 degrees. Once cut I set them out on a flat surface holding them together with magnetic blocks and tacks them at the four corners , then turning the whole thing over welded a good seam down each of them. Because of the holes in the Dexion the resultant weld was quite untidy but after I had got to work on them with the trusty angle grinder they didn't end up too bad!

The next task was to fix the four corner uprights, these again were held in place with magnetic blocks checked for squareness and tacked, and once satisfied that all was well a generous welding operation was carried out.

Now I planned to utilise our existing bogie sets we already had which would simplify the construction considerably so on the underside of the frame I would have to provide stretchers with 22mm holes in the centre to accommodate the bogie spigots. These I fashioned from 5mm steel plate 100mm in width and just resting them in place with a bogie adjusted the position until I felt there was sufficient clearance and again tacked them both in place and carried out a final weld.

The next task was to make the buffer beams and for these I again used the 100 x 5mm plate. In the centre of these were bolted coupling hook plates 60mm square and then a hole pierced through them both to accommodate the coupling hook itself. For the buffers I utilised hardwood blocks 60mm wide and 100mm high and faced them with 10 mm aluminium. The completed buffer beam was attached to the main frame with 8mm hex head bolts. With the metal work now complete the whole arrangement was given a generous coat of black paint.

## 7¼" gauge open wagon

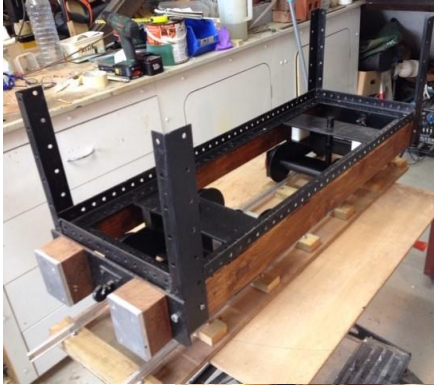
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All that remained now was to attach the slatted wooden sides and I have to admit that I found this part of the project a trifle troublesome. Basically they would not seem to fit neatly to the metal frame and when fixed in place the result looked untidy and unsatisfactory. Then I hit on the idea of making the wooden lining a completely separate entity altogether like an open top box that could if need be lifted out and the remaining frame used for some other purpose, for example , in conjunction with an extended coupling , a log carrier! So that was the final decision, all that remained to be done was to give the "lining" a good coat of wood preserver, settle the frame on a pair of bogies and the project was complete. Maybe I'll bring it along to a members running day sometime just to show that we can work "mixed traffic"!



## 7¼" gauge open wagon

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## For Sale

From the work-shop of Bob Masters.

- Myford Lathe ML7 on stand + tooling, includes collets (boxed)
- Dore Westbury Miller/Driller + tooling
- Taps & dies:- M/E 40 tpi, 32 tpi, BSF & BSW (+ some metric)
- Measuring Instruments

If anyone is interested please e-mail me on [black.diamond@btinternet.com](mailto:black.diamond@btinternet.com) as the first point of contact.

Let's hope we will be steaming soon.

**Alan G. Smith**

## Doing a Jig

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### Doing a Jig

*Ian Jefferson*

Jigs, or fixtures (the terms tend to be used interchangeably) are extensively used in industry, but are only occasionally referenced in model making. You may believe that they are only used in volume production, but there are also situations where one may be required, for a 'one off', because it is the only viable way to do a job. This does not mean that they require special skills to make, indeed I expect that most of you will have used one at some time or other without actually realising it. At the simplest, a jig need only be a stop block clamped in place to position work or limit tool travel such as when drilling, or a threaded bush to hold a part machined fitting in the lathe chuck. So much for the principles, how does this translate to practice? As many of you will know, amongst other things, I make 5" gauge model railway wagons and these abound with common components, indeed during the heyday of railways, companies existed purely to make the components for the wagon builders, this being helped by the existence of the Railways Clearing House (RCH), who produced standards for the designs. So with standardisation, came the need for special tools and jigs, to enable the repeatability and rapidity of production. And so it is with model wagons, volume production techniques can be employed, meaning that many parts can usefully be laser cut and jigs can be used for their machining and assembly; so to two examples that I have used recently.



*1. A pair of axleboxes*

The first was not a new challenge, as I had cause to do a similar job some years ago and made a jig then; thankfully I had kept it, so I simply had to locate it and use it. This job was to drill and bore a number of wagon axlebox castings. These are not simple rectangular ones, but very complex shapes, with no obvious way of holding them.

## Doing a Jig

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The difficult bit of this was establishing how to hold these axleboxes. After a little thought, it became clear that the best solution would be to use the cast in slots that would locate the 'box in the axleguard (W iron). With the axleguard being laser cut, dimensions are extremely consistent and the castings only needed a slight touch up to be a good fit, so a spare soon formed the basis of the machining jig. With a baseplate and 2 heavy sides, the axleguard could be mounted and the excess material trimmed back. To locate the axlebox at a consistent position it was found that the spring locator at the top could be the reference point, so the third side of the jig acquired a screw against which the axlebox could register and finally to hold it in place a piece of angle with a heavy spring, to allow for any slight variations.



*2. Axlebox machining jig*

In use, the jig was mounted on the lathe faceplate and a DTI used to centre the slide surfaces. Then with the first axlebox installed, the position of the top locating screw was adjusted to position the axlebox in the appropriate position. Once set, such a jig allows many pieces to be machined and all will come out the same. In practice it is possible to remove a part completed item from the jig and return it with the certainty that it will go back to the same position. So it is convenient with a jig like this to do the same operation to every item in the batch before moving on to the next operation, in my case I had some 20 axleboxes to machine!



*3. Axlebox jig mounted to centre the first box*

With the jig set up, the first axlebox was set up for the first operation, which was to face off the back of the axlebox and once again, the simple use of the lathe feed dials meant that all would be faced off to the same dimension. It was then a simple matter to remove the first 'box, replace it with the second and repeat until all have been faced off. Little needs to be said about the remaining work, as it is a simple matter of centring drilling and boring to the desired dimensions. Thus little further thought was required,

## Doing a Jig

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knowing that all would be to the same dimensions and so I ended up with the 20 axleboxes I needed (for this batch at least). The one word of caution with such a jig, as with any other irregular item mounted in the lathe, you must be aware of the corners and keep your hands well away! Finally, think whether you are likely to use this jig in the future. You could save yourself a lot of time and effort as I did.



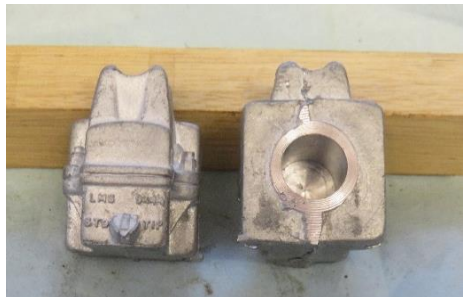
4. First axlebox faced off



5. Opening up the bore



6. Final boring of a box



7. Finished boxes

So that was an example of a jig to hold an awkward item whilst it is machined, as it happens, it also allows for more rapid and repeatable work. However, there are other jobs where a job is actually quite simple, but doing it consistently is not always as straightforward as demonstrated by this second

## Doing a Jig

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example. Quite prominent on most 4 wheeled wagons is the V hanger that supports part of the brake gear, located more or less centrally on each side of the underframe. On a wooden framed wagon, these are flat and bolted through the timber solebar, but on a steel framed wagon, one hanger is flat, whilst the other is cranked to fit into the channel section solebar, which are then bolted through to sandwich the 3 pieces together. In model form these V hangers are available as laser cut pieces, but inevitably flat, so it is necessary to crank one of each pair and drill all consistently such that they can be bolted together, so the following photograph shows the laser cut blank with a pair of finished hangers.



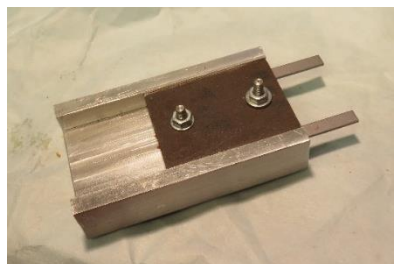
8. A pair of finished hangers with laser cut blank

To bend 1mm thick steel through a right angle presents no great difficulty, but to do so consistently is another matter. The first bend is just above the change from the V part of the legs to the parallel part, so aligning this bend could be a little bit tricky. But how to cover all of these challenges? Looking carefully at the laser cut blank, I had 2 reference points, the parallel legs and the main pivot hole at the tip of the vee. From this, a concept was devised, at least for the first bend;

start with a channel to hold the parallel legs and a hole and pin to register the pivot hole. Then a clamp plate to ensure the blank was consistently held. A piece of aluminium was available, so was milled out to produce the channel, the 2 pins to hold the clamp plate were carefully placed on the centre line of the channel, as were the holes in the clamp plate, which was arranged to align with the end of the channel.



9. Bending jig stage 1



10. Ready for first bend



## Doing a Jig

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With the clamp plate in place, the legs were carefully bent over the clamp plate and gently tapped down against it, in order to keep the bend tight. Then it was a simple matter of removing the plate, exchanging the bent part with another, replacing and securing the clamp plate and repeat.

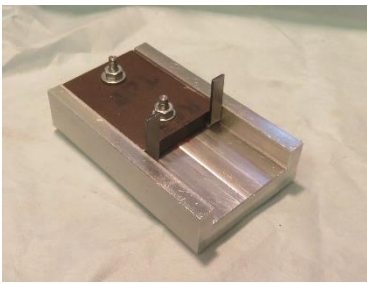


11. Done!



12. Consistent bends

Having got the first bend in place, thoughts turned to the second. This one had to be positioned such that the resultant section would lie in the channel of the underframe, with the pair of bends bringing the lower portion of the hanger over the edge of the channel section. By placing the V hanger the opposite way in the jig, space was available for another loose piece, over which the legs could be bent. This had to be the same thickness as the depth of the underframe channel and the correct width to locate in the jig and secured with another clamp screw. Then it was a relatively simple matter of gently bending the legs down over the plate and ensuring that they align with the edge of the channel of the jig.



13. Planning for second ben



14. Legs bent down over the second plate

## Doing a Jig

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For the final stage it was necessary to drill 2 holes in each leg, not only to match with the unbent V hanger, but also the existing holes in the underframe channel. So another plate was made up to act as a drill guide; for light duties as here, there is no need for special steels or heat treatment, that is only required once you are considering appreciable numbers. Obviously having to match existing holes, this required some very careful measurement and marking out before drilling. Also in order to be able to support the bent components, a small spacer was made to match the offset, it was also used as part of the clamp arrangements for the flat ones. The only significant comment here is that the hole in the bed of the jig needs to be slightly larger than the drill to be used, in order that the material being drilled is supported, but there is clearance for the swarf not to jam in the hole when the drill breaks through.



15. Set to drill the bent hangers



16. And the flat hangers



17. A fully bent and drilled hanger with an original



18. A pair of hangers assembled

## Doing a Jig

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And so the bulk of the work was completed, all that remained being to clean up the holes, trim a little off the plain hangers to match the top of the underframe channel and eventually paint, but obviously satisfaction required that they were tried in place!



Obviously quite a bit of time was involved in machining the sections for this jig, but they will be readily available next time. But above all it has ensured that the hangers go together correctly and fit consistently, risk of mis fit and many rude words is reduced, so it can be said to be time well spent.

*19. And the proof as they say!*

I hope this may have given you some inspiration for the next 'awkward job' that you may face, be it large or small. And do not forget that many such jigs can have a second application either for the same item or something very similar in the future. The only challenge being to store them safely and remember you have them!

Ian



*20. All the parts that make up the jig*

# Sundial

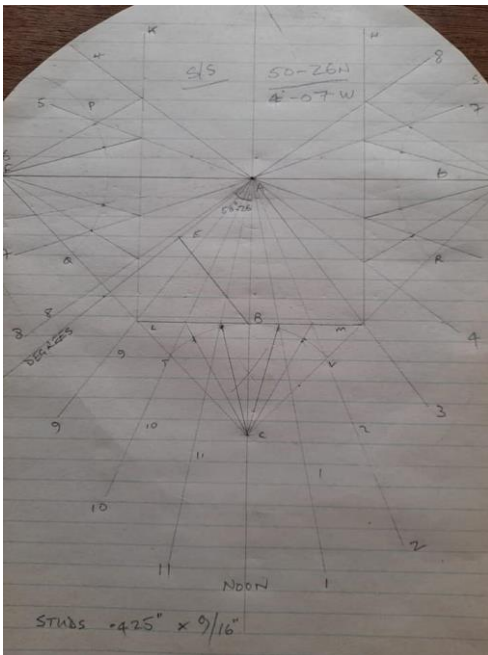
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## Time in the Workshop

David Bishop

Due to an unexpected increase in my spare time (Covid lockdown 2), my wife thought it would be a good idea if I made a sundial for each of our two children as they had admired the one that I had made for our garden. “Nothing fancy” she said, “just an ordinary flat one”.

I knew just what she meant, a horizontal dial.



The planning geometry is fairly straight forward. As I still have my drawing instruments, all I needed to do was to find a good sharp pencil. The method used to construct the hour lines etc I obtained from a book that I already had. **See note one.**

The design was to be simple, just the hour lines and the Roman numerals for each hour. Perhaps it should be personalised I thought, and then maybe the relevant longitude and latitude of their respective houses and just to finish off, the year of manufacture. Oh

well, more work but I've got plenty of time!

## Sundial

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The gnomon, the bit that casts the shadow, could be made of brass and to my own design. I thought the base could be slate and as my engraving skills are non-existent, I reasoned that slate would be soft enough to work with my Dremel, using the flexible drive with a small diamond bit. A normal roof tile was too thin and too small so I then found a supply of slate floor tiles, 300mm square x 10mm thick, reasonably priced and available from a roofing company in Saltash.



I decided on an octagonal shape, which required the four corners to be cut off to leave a regular shape. The four inch disk cutter made an easy job of it – but there was some edge flaking on the top surface. I think next time I would use a hacksaw and an old file to clean up where necessary.

Process. Having looked on the relevant O.S. map, I found the latitude of each of their houses. That is needed to file the correct angle on the gnomon. For example, Marsh Mills roundabout is 50 degrees and 23.5 minutes north of the equator so that is the angle required on the gnomon. The gnomon is fitted so that its upper end is pointing towards the pole star when the dial is finally placed in position. Note, if you want a 'ready-made' dial, check the angle before parting with your money.

## Sundial

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After some adjustments, I drew up the hour lines etc so that they would fit on the octagonal slate (see photo). The lines were then transferred to the slate, having centred up the hour lines sheet of paper and held it in place with masking tape. Next, I had to make a jig to hold the engraving tool as I'd decided to draw the hour lines inside a circular shape, and radiating from the centre vertical hour line, see attached photo. That did require a small hole in the centre of the slate, which would be partially covered by the brass work when finished. The Roman numerals

were printed out in Georgia text in 28 font. Each number was then cut out with just a small border of paper round it so that it could be stuck on to the slate at the outer end of each line, e.g. IX or VIII etc. When the Prittstick glue had dried I was able to cut out each number with a craft knife blade so that it did not clog up the diamond cutter. After some practice on a scrap of slate, I marked out each letter with the diamond bit. The scraps of paper were then scraped off and the numerals/letters were finished off. The same method was used for the date (MMXX) and their initials and long. and lat. of each house.

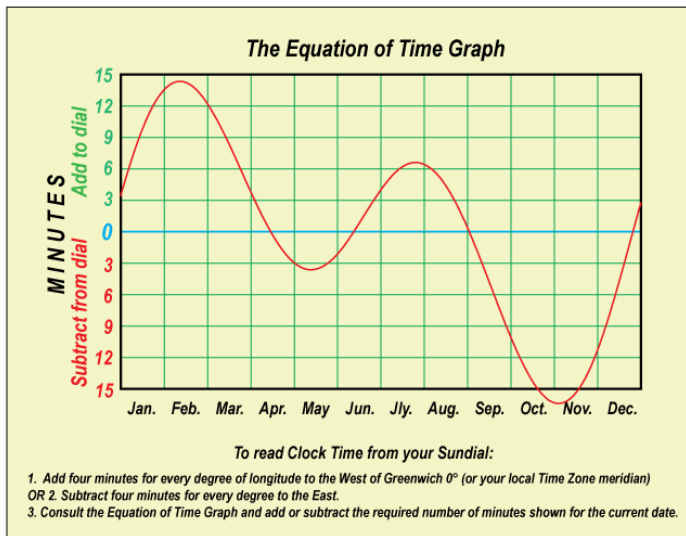
The lower end of the gnomon has to be fitted exactly on the intersection of the noon line (12 o'clock/6 o'clock) and the 9 o'clock/3 o'clock line which would also be the intersection of all the hour lines if they were to meet up at that one point. The brass gnomon has to be supported so I turned up a couple of brass studs 11.5mm x 15mm and, having cut a slot in each one the same

## Sundial

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width/thickness as the gnomon, I silver soldered them to the bottom of the gnomon. Once all the brass work had been cleaned up and lacquered, a small engineers square was placed upright on the line intersection and the assembly was placed up to it and a line drawn round each stud. Two 11.5mm holes were then drilled in the slate. Superglue was applied to each stud then placed in position, ensuring the brass was at right angles to the slate base.

Now comes the interesting part. As Plymouth is four and a bit degrees west of Greenwich (where the meridian line is) you must add those four minutes and a few seconds per degree west to the time shown on your dial. That adds up to let's say 16 ½ minutes. In other words, when the sun 'comes up' in Greenwich, Plymouth has to wait another 16 ½ minutes for sun rise. That gives you the Local Apparent Time.



One other thing to consider is the Equation of Time. The earth's route round the sun is not circular and it also 'wobbles' on its axis so the movement is not regular or uniform. Because of that, the earth is said

to be 'fast' of the sun or 'slow' of the sun. Where the time is said to be slow, you must add the figures to the dial shadow time. Where the time is said to be

## Sundial

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fast those figures must be subtracted from the dial shadow time. However, throughout the year the variation is constant. For example, on March 25<sup>th</sup> the sun is slow by 6 mins and 16 seconds. November 11<sup>th</sup> the sun is fast by 16 mins – and will be the same next year and the year after. That being so, a table has been drawn up for easy consultation. **See note two.**

On a light hearted note, on November 3<sup>rd</sup> the Eq'n of time is 16 mins 23 secs fast (so subtract) and the L.A.T. is 16 ½ mins (to be added), the two cancel out, thus your sun dial is telling the correct time for just once a year. During the summer BST must also be taken in to consideration, add one hour accordingly. One worked example – for July 22<sup>nd</sup>. Add 1 hour BST to the dial shadow time, add L.A.T 16 ½ mins and add Eq'n of T which for that day is 6 mins 18 secs , a total of 1 hour 22 mins which should be added to whatever time is shown by the dial shadow. That should be the same as your clock, be generous with your estimating!



### **Bibliography**

#### **Note one.**

*Sundials. Their construction and Use.*  
Written by R. Newton Mayall and  
Margaret W. Mayall. Pub Dover  
Publications Inc, Mineola, New York,  
USA.

#### **Note two.**

*Time and the Sundial.* Written by Carole  
Vincent. Pub Caroline Vincent. 1988.



## Lockdown Projects Part 1

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### Lockdown Projects Part 1

*Michael Malleson*

During the early days of the first 2020 lockdown, I embarked on a series of small projects in my workshop. The first of these was a tailstock turret for my Myford lathes. I was reading a report on making pressure pipe union nuts in ME magazine No. 4635 in which Brian Baker described how he used a turret to make these nuts quickly without constant tool changing in a tailstock chuck. Having made these items the laborious way I decided to make the turret. A web search brought up drawings by Alex du Pre with a



reference to his constructional article in Model Engineer's Workshop of April 2017. With a back number obtained from [www.magazineexchange.co.uk](http://www.magazineexchange.co.uk) and print outs of Alan's drawings, I bought the backplate and turret discs blanks from m-machine and worked my way through. It all went quite smoothly, and I am now waiting for a job that will enable me to use it!

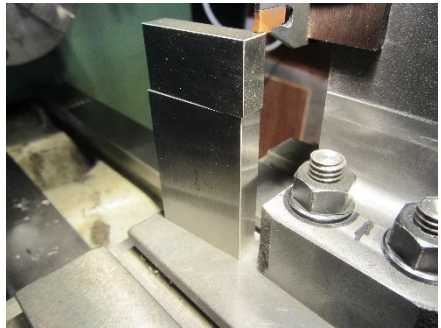
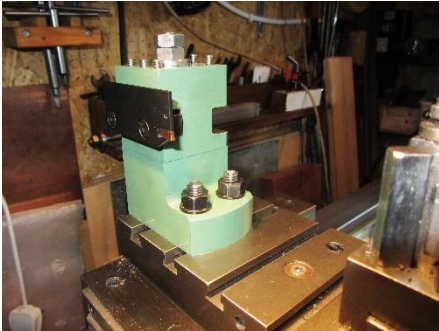
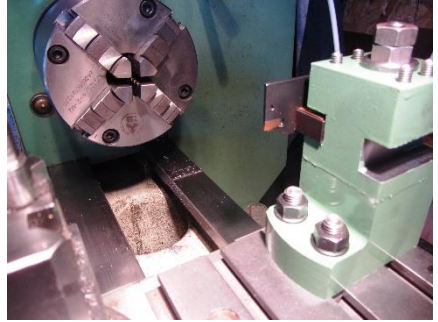


My next project was a back toolpost for my Myford 254 lathe. I find that having to swap tools for parting off is a bit of a chore, and having found a long cross slide for my Myford ML7 I mounted an 'upside down' parting tool in an existing back toolpost which has proved to be a great asset and time saver. I use a Greenwood parting tool on the bigger lathe but that involves removing my quick-change toolpost for the traditional clamping type. A quick search found a Hemingway kit and so I went ahead

## Lockdown Projects Part 1

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with it. It turned out to be a bit too good as it had provision for two tools with accompanying 180 degree rotation and spring pin registration which I didn't need. So the result is a simple arrangement for the Greenwood tool. I used slip gauges to achieve the correct upside down centre height off the cross slide thus avoiding messing about with packing strips, and the result can be seen in the photo.



I was also giving attention to my two American Wall clocks. One is an 8-day running type which runs very well, but the strike had become erratic as the wooden wheel carrying the weight cord had become worn and ridged through its centre due to the spindle being very thin, thus creating differential wear on the axial grain, leading to the ridges preventing smooth running. To restore this involved removing the movement, taking off the back of the casing, (lots of very rusty nails), cutting through the existing spindle as it could not be pulled out, drilling out the wheel centre and fitting a phosphor bronze bush and re-installing on a 1/8" o/d stainless axle. The whole casing was very dilapidated through age and, I suspect, storage in damp conditions, so

## Lockdown Projects Part 1

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*8-day wall clock*

The other clock is a 30-hour running version that my late Grandmother gave me which had been languishing un-used in a box for over 18 years. This needed a good clean up but otherwise there was not much work to do beyond hanging it on the wall and setting its timing. These clocks were manufactured by the thousand, and it's amazing how such unsophisticated engineering functions so well and for so long.

Anne and I really miss our visits to Goodwin Park and seeing all our friends there and hope we will be able to come down this year, Virus and its management permitting.

a lot of work was needed to strengthen it to make it ready for re-installing the movement. It all runs well now, and it's nice to hear it's mellow strike if I wake up in the small wee hours!!



*8-day wall clock movement*



*Grandma's wall clock with Grandpa's barometer & medicine cabinet*

## Litter Picking

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### Litter Picking

*Kevin Short*

Last weekend (end of January) Alex chose litter picking around the PMS track as his activity for the weekend! I'm very proud of him!

