

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

Vol. 218 No. 4562 • 9 - 22 June 2017

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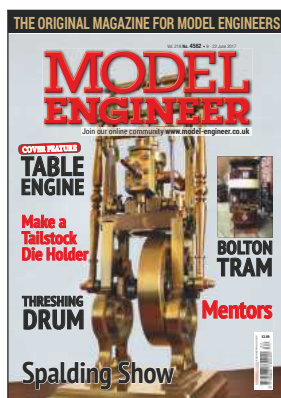
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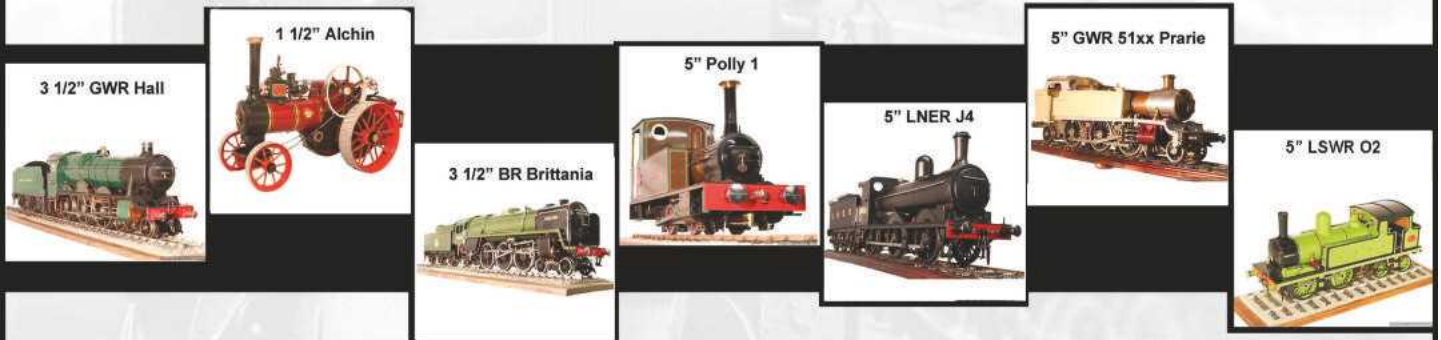
ON THE COVER...

Peter Russell has made several stationary steam engines and has a liking for the designs of Swiss Engineer, Willy Schneeberger. On page 840 Peter begins the description of his Maudslay type table engine for which castings are available.

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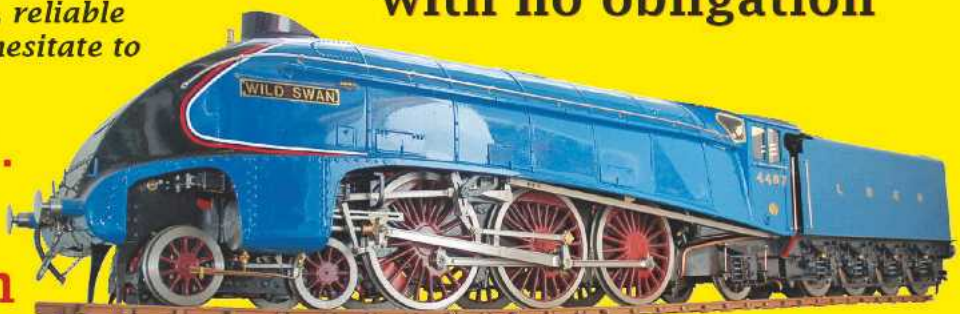
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New website and brochure for Warco

One of our readers' suppliers of choice, Warco, has launched a new website which includes an ever expanding range of machinery and associated tooling. Of special interest are the 21st Century versions of their iconic VMC and Super Major milling machines which are now offered with inverter drive through an AC induction motor; these machines have an infinitely variable speed. Warco will continue to offer the original VMC and Super Major.

The Warco website has always been informative and user friendly but the new site is even better and worth a look. Warco appreciate the importance of an easy to negotiate website so no expense has been spared to make the buying experience stress free.

Warco are also pleased to announce the launch of their newly produced, 128 page brochure, packed with

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Warco will continue to organise three Open Days throughout the year and are planning to attend both the Midlands and London Model Engineering exhibitions.

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3 inch scale Threshing Drum

The ten part series by Ian Couchman draws to a close this issue and I would like to thank Ian for an extremely enjoyable piece of nicely

illustrated writing. In his construction of the threshing machine, the article has covered so many model engineering disciplines, many of which are a little 'out of the ordinary' for most engineering model builders, but also potentially useful. I have often, through this series, been struck by Ian's confident approach to making many of the components; he rarely seems to have been daunted by the task but considers, plans, has a go and tends (usually) to succeed. There's a lot to be said for clean, tidy, methodical workmanship.

If you have picked up this issue as a chance purchase and find the article (on page 836 this time) of interest, I would strongly recommend ordering the relevant back issues and enjoy the whole series. The resulting model is both beautiful and functional and is a credit to Ian. I hope to see it 'in the flesh' some day!

The good news is that I have a follow up article from Ian - Threshing, One Year On! Watch this space, as they say...!

Northern Association Model Engineering Exhibition: Date correction

It has just been brought to my attention that I incorrectly stated that the next NAME exhibition would take place in Spring 2018. I should, of course, have said **Spring 2019** as, after this year, the exhibitions will be staged biennially in future.

The Doncaster Show

I am not long back from attending the Doncaster Model Engineering and Modelling Show and I shall be bringing you a round-up of the award winners and a look at some of the exhibits that caught my eye on the many club stands in the next issue. I would like to thank Lou and Gavin Rex for putting on a great show, giving us the opportunity to meet with our friends in the hobby, both exhibitors and traders.



St Mungo approaching Galashiels, c. 1932. Photo courtesy D. Sqaunce collection.

North British Atlantic seen in Edinburgh!

In a round-about way I recently learned of the existence of a 5 inch gauge North British Railway Atlantic on display in a glass case in the Virgin Trains First Class Reception/ Waiting Room at Edinburgh Waverley Station. Never having held a First Class ticket, I have never had cause to be in this particular waiting room but I was intrigued as to the origin of the model. I have a poor photograph to hand but I'm afraid it would not stand reproducing here, partly because of the fact that the locomotive is inside a glass case. It is in LNER livery, which suited the Atlantics rather well, and is No. 9510, *The Lord Provost*. Can any reader provide any further information?



My brother-in-law (left) and I on the first outing of the steam launch, Brahminy. 4 June 2016, Lake Tinaroo, Queensland.

PART 4

Robert Walker's design for a single cylinder engine for a 15 foot steam launch.

Continued from p.833
M.E. 4558, 14 April 2017

An Engine for Brahminy

This project originated at my son's wedding in China. For those of you who have not been to a Chinese wedding, the banquet ends promptly at 9pm - at least in the Fujian province it does - after which the family decamps to the bar to catch up on our news. This was when my brother-in-law said he wanted to build a wooden, steam powered launch and I, of course, as an engineer, said I could make the engine. The small fly in the ointment was that the boat was to be built by my brother-in-law in Cairns, Australia and I live in Essex, England!

Crankshaft assembly

The crankshaft webs were roughed and semi-finished by a friend on a CNC machining centre and the 0.75 inch diameter holes reamed as a pair with the two webs clamped together. I reamed one pair of holes then used a piece of 0.75 inch diameter silver steel though the reamed holes to maintain the alignment while reaming the second pair of holes.

Assembling the crankshaft (figs 22 and 23) is a critical

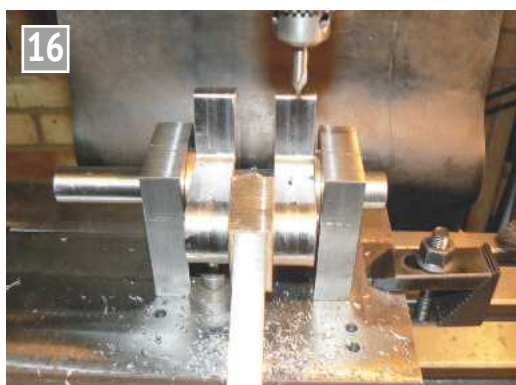
operation and my method of ensuring that all the alignments are correct was as follows:-

- One big end pin is Loctited into place in one of the crankshaft webs and allowed to cure.
- The second big end pin is Loctited into position in the crankshaft web with a 0.75 inch diameter silver steel rod put through the main bearing pin holes to ensure alignment.

- The con-rod assembly is also in place as is the crankshaft, ensuring there is not excessive lateral clearance.
- When the big end pin Loctite has cured, the holes for the 4mm locking pins are drilled and reamed on the mill (photos 15 and 16). The dowel pins were also retained with Loctite.
- When the Loctite on the dowel pins has cured then the main bearing pins can be Loctited in place.
- When the crankshaft curing is complete the main bearing dowel pin holes can be drilled and reamed and the dowel pins Loctited in place.
- The crankshaft should rotate freely in the pillow blocks.
- I used Loctite 638 permanent adhesive for this assembly.



Drilling and reaming the dowel holes.

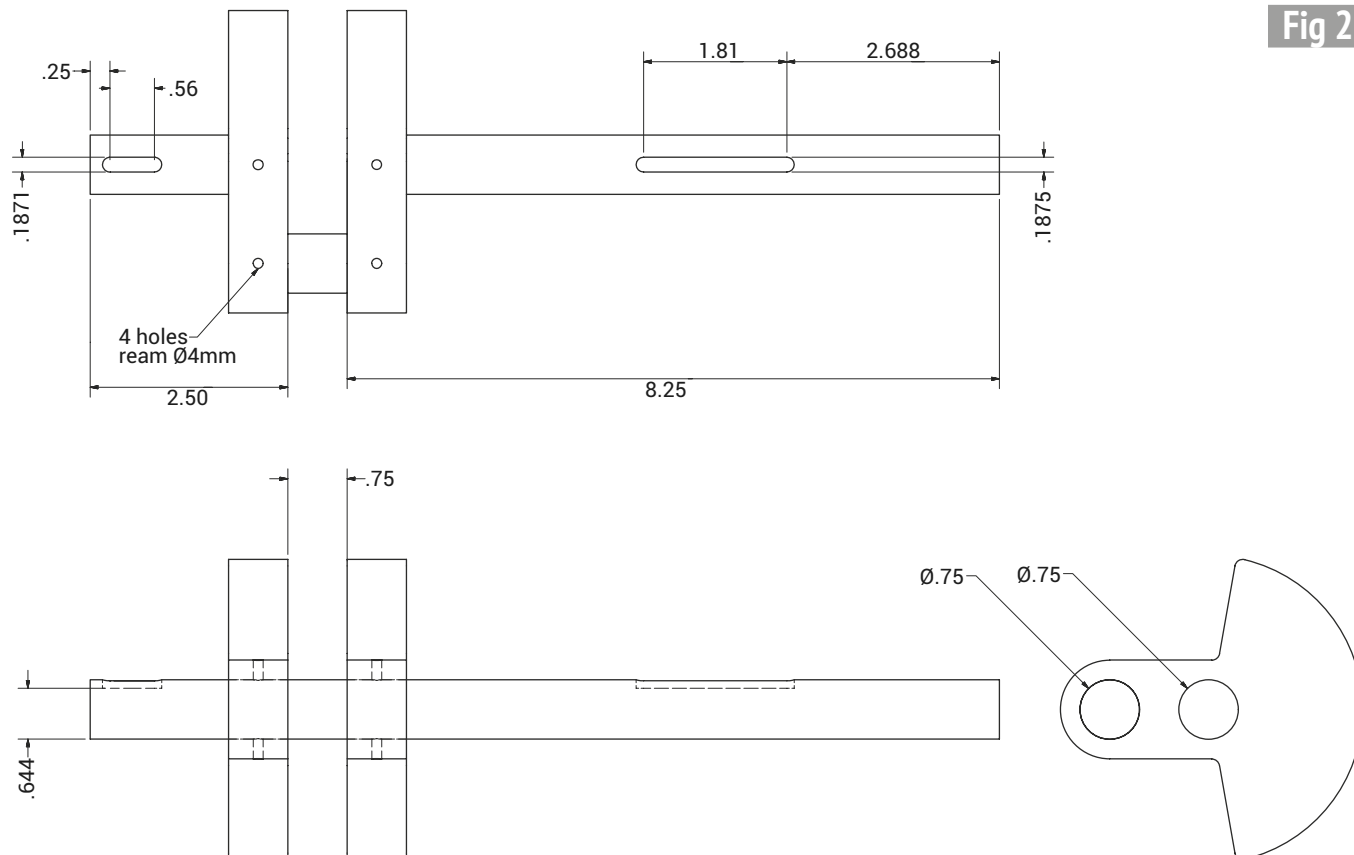


Another view of the dowel holes.

Eccentrics 1 and 2

Machining the eccentric (fig 24) was a little tricky and I was concerned that it would be difficult to get the accuracy required for the slot. Using a

Fig 22



Crankshaft Assembly

Bearing surfaces $\varnothing 0.75$ " silver steel

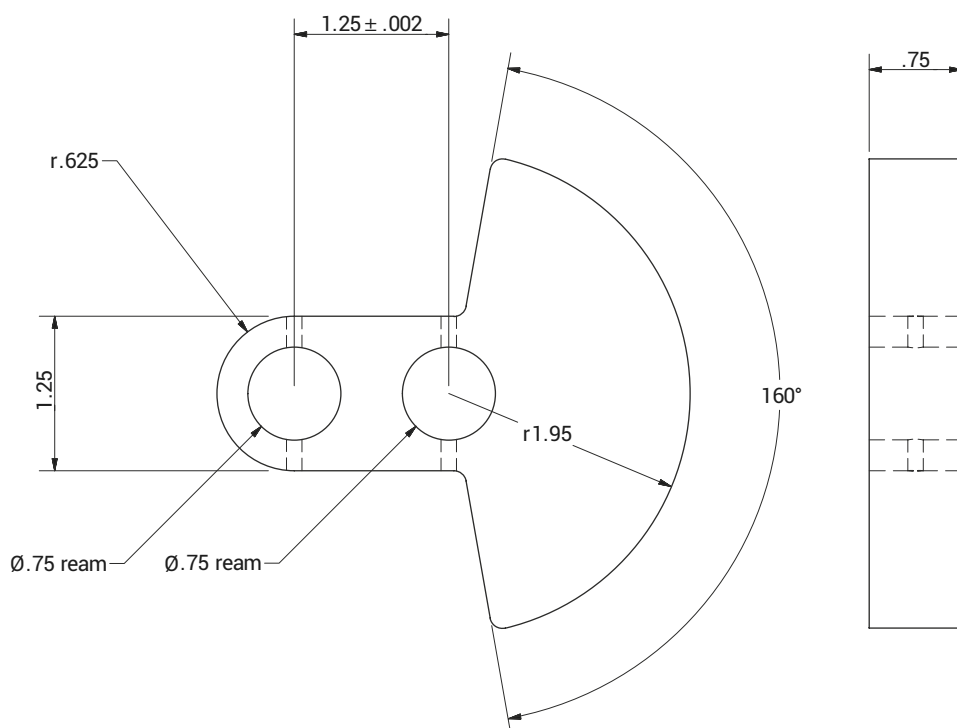
Assemble with Loctite 638 & pin with $\varnothing 4$ mm silver steel & Loctite 638

See crankshaft web drawing for further details

carbide parting-off tool at the appropriate speed, however, was not a problem. I machined the 2 inch diameter and the slot then using the four jaw chuck, off-set the 2 inch diameter by 0.375 inch total indicator reading (TIR) then bored the 1.0625 hole, then parted off. You should also mark with a centre punch, the highest point on the eccentric to aid setting the timing on final assembly. I have put tolerances on the drawings, however, the most important thing is that the parts fit together and run freely and I mate lapped these parts to achieve a good fit.

Machining of the second eccentric was much the same process.

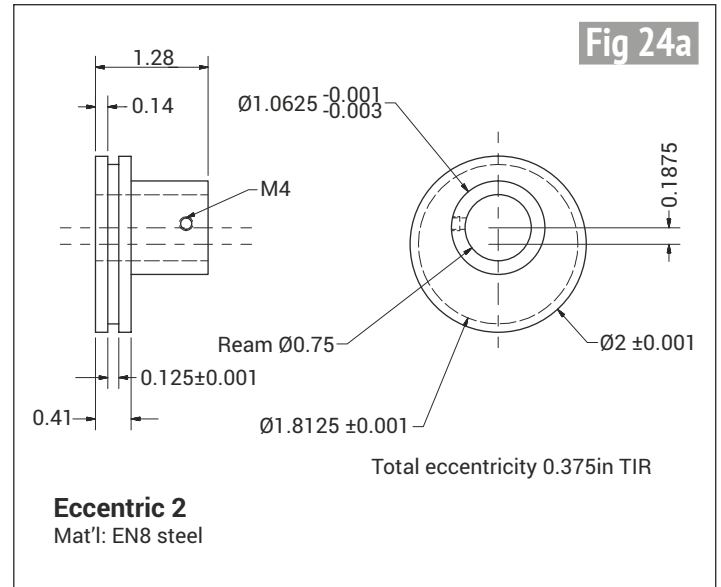
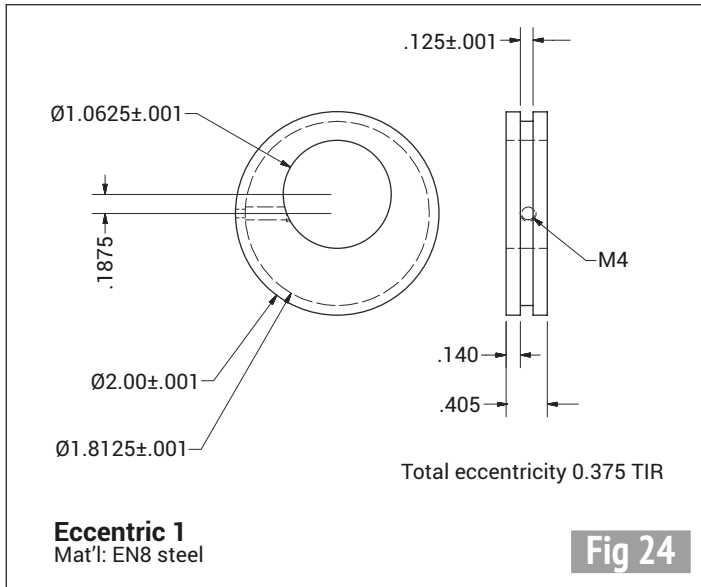
Figure 25 shows an alternative eccentric that will allow the forward and reverse to be set without the need to remove one of the straps. Two identical eccentrics are



Crankshaft Web

Mat'l: Mild steel

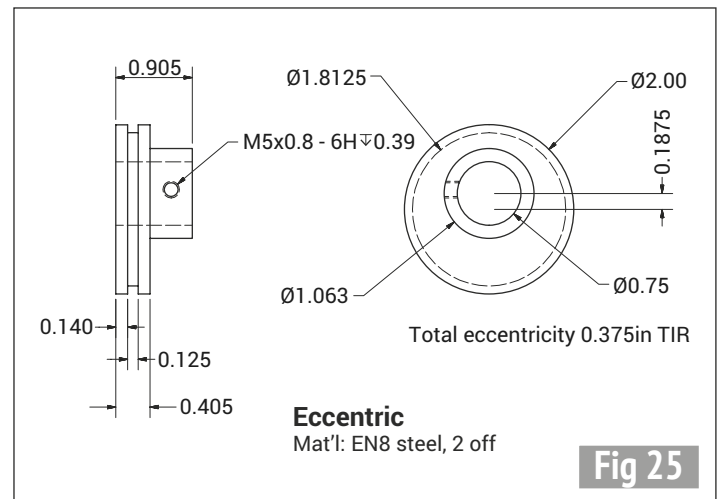
Fig 23



The most important features of the guide are the two guide bush holes and the $\frac{3}{8}$ inch BSW clearance hole. The position is critical for the free running of the engine and the size of the 1.125 diameter holes is to ensure a good interference fit to retain the bushes.

required with the alternative design but the manufacture is the same as the eccentric in fig 24.

ensure a good interference fit to retain the bushes. I roughed out the shape and drilled these three critical holes and then, not having a micrometer

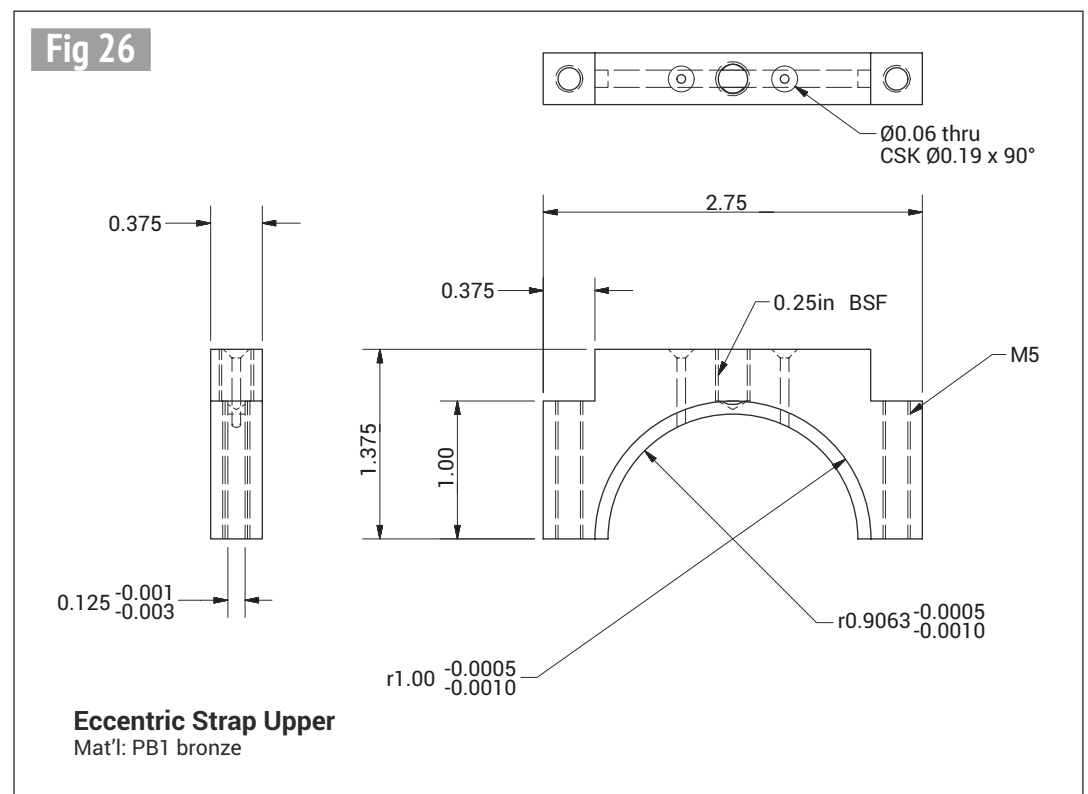


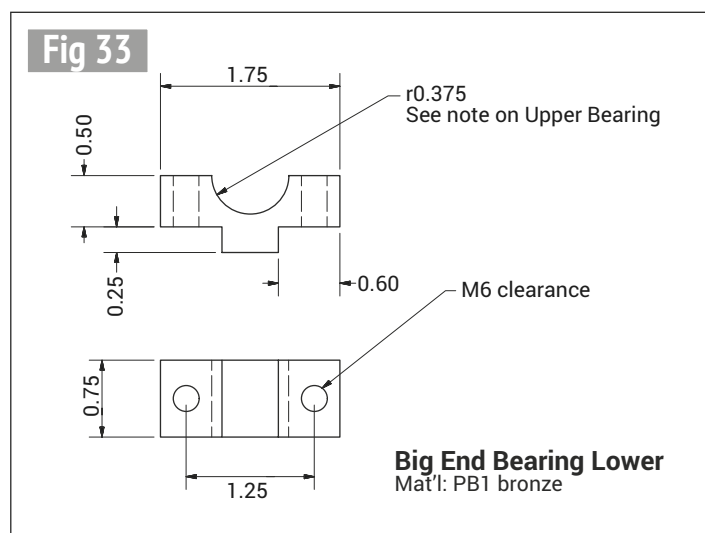
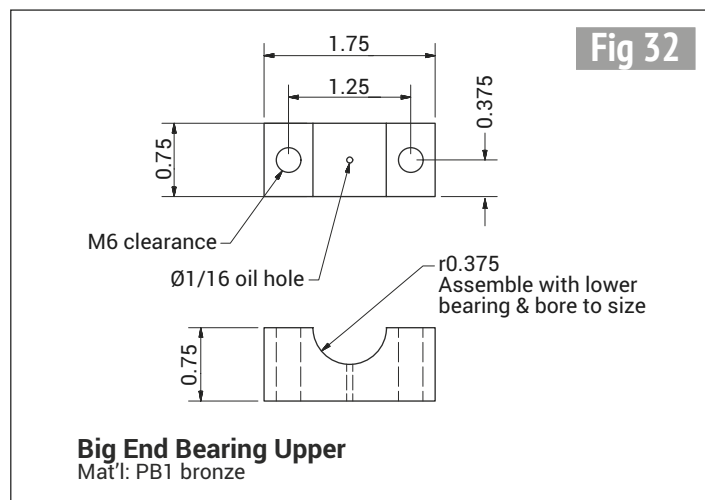
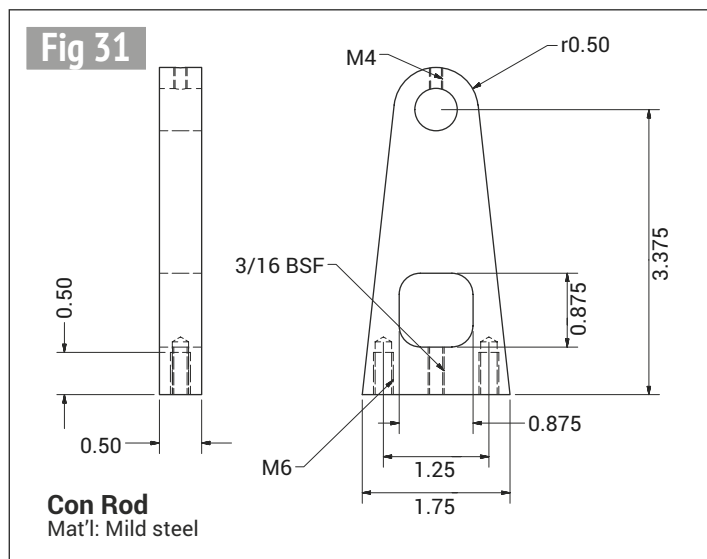
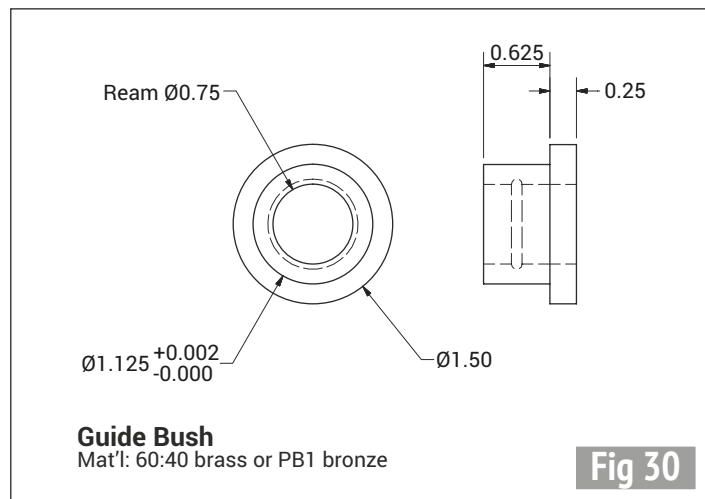
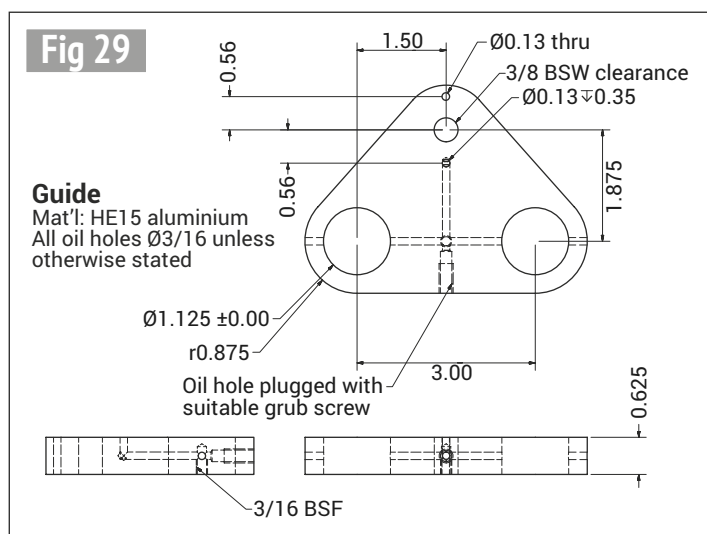
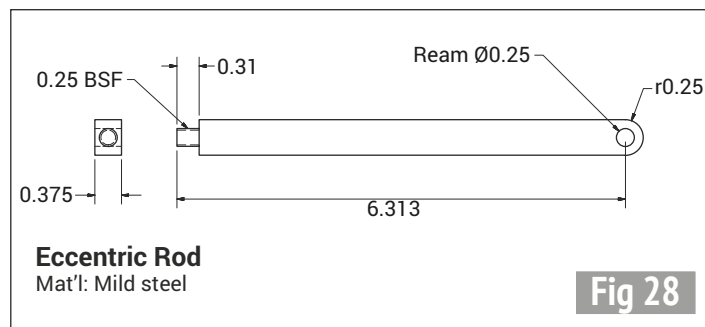
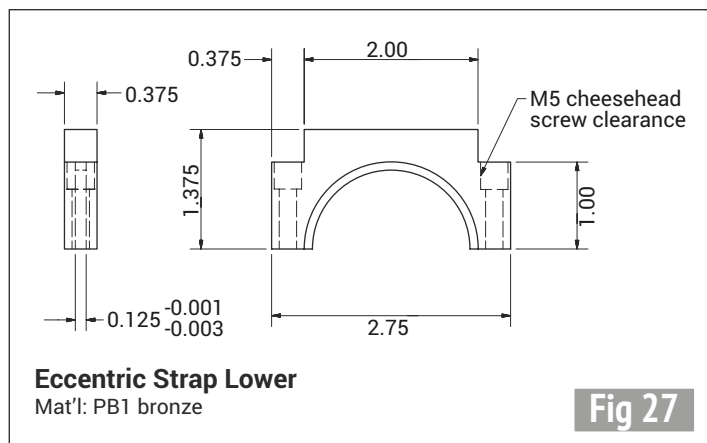
Eccentric strap (figs 26, 27 and 28)

I milled the profile and drilled and tapped the holes to make an assembly. I then skimmed the faces to thickness and noted the exact dimension for reference when machining the location step; rough bored the eccentric on the mill and, in a four jaw chuck, finished on the lathe to 1.812 inch diameter; then machined the step on one side. Reverse in the chuck and ensure that it is running true before finishing the step on second size. Mate lap onto the eccentric and keep as a set.

Guide bush

The most important features of the guide (figs 29 and 30) are the two guide bush holes and the $\frac{3}{8}$ inch BSW clearance hole. The position is critical for the free running of the engine and the size of the 1.125 diameter holes is to





adjustable boring bar for the mill, I bored out 1.125 diameter holes on the lathe using the four jaw chuck. The remaining 1/8 inch diameter holes are to feed oil to the guide bushes and the M6 thread used to plug the drilling. The bushes need the oil holes drilled on assembly using the holes in the guide to give the location.

Connecting rod and big end bearings

Manufacture of the big end bearings (figs 31, 32 and 33) was similar to the eccentric straps. This is finished on the mill and then bolted together and the 0.75 inch diameter finished on the lathe in the four jaw chuck.

●To be continued.

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Champion 20VS Mill

from Chester Machine Tools

PART 2

John Smith compares the requirements of the model engineer with the offerings of this milling machine.



Continued from p.719
M.E. 4560, 12 May 2017

In this article, the author proposes some mandatory and desirable requirements for a vertical mill for the model engineer. He then assesses the Champion 20VS mill against these evaluation criteria, showing how to measure the accuracy of the basic geometry of any vertical milling machine. The objective: to help you choose a mill that will enable you to do good work. Finally, he puts the mill to work to assess its flexibility, usability and performance.



Initial observations

‘Walking’ the mill down a pair of planks into the workshop from its shipping crate was not too hard, but it is a heavy machine. I was able to pick the mill up and lower it gently onto its stand using an engine hoist, as I didn’t have access to a pair of prop forwards. First observation: The stand provided has a very small footprint (340mm wide x 420mm deep). I judge that mounting an 8 inch rotary table at one end of the table and winding the table right out (which I would do when milling an expansion link) could make the mill unstable. Also, when operating the handwheels, the mill moves about far too much for my liking. If I were buying this mill, I would ask Chester to supply a stand with a much larger footprint (say 600 x 600mm). Of course, other stand suppliers are available, e.g. Ceriani and Wabeco, or you could have a stand fabricated. Remember; when your mill is worn out, the stand will still be as good as new, so buy the best you can afford to firmly ‘plant’ the mill!

I’m of the generation which reads the manual before a piece of equipment is used. It was a little disheartening. For example, here are the gib adjustment instructions:

- Turn the adjusting screw of the respective taper gib in the clockwise direction.

The taper gib is continued to push in and reduced by it the gap in the guide way.

- Control your attitude. The respective guide way must be still easily mobile from the adjustment, result in however a stable guidance.

Hmm. As someone whose business is words, I know that if the manufacturer were to email the Word file to me, I could send the edited file back within 24 hours. It begs the question: Why hasn’t this been done? However, I was pleased to find in the manual a comprehensive set of test results covering the accuracy of the geometry.

I also noticed that there were a few substantial specification differences between the Chester website and the manual (the web-site does have a disclaimer). These are highlighted in **table 2**, below, which also includes my actual measured values. The X-axis travel is very impressive! (The web site errors have now been corrected.)

First impressions

First impressions were very favourable. The Champion 20VS is a workmanlike little mill which doesn’t require much workshop space. It comes in metric and Imperial variants; I was given an Imperial machine to review. It is very solidly made and it has a generously-sized table with three 12mm

Web-site	Operating Manual	Measured	Table 2
Max drilling capacity (steel)	20mm	16mm	No problem at 17mm D (my largest drill)
Quill travel	52mm	42mm	51.8mm
Vertical travel	290mm	380mm	362mm
X-axis travel	490mm	280mm	489.2mm

Tee-slots and a coolant drain. Adjustable stops are provided in the front of the table. It has a dovetail column, which is much better than a circular column with a spline. All slideways are fitted with tapered gibs - a sign of quality. The ability to rotate the head by 90 degrees left and right allows the spindle to be set exactly vertical to the table along the X-axis. It has a two-speed, geared head operated by a mechanical switch. This is coupled to a variable speed control unit which appears to be of German manufacture. The motor power is stated as 1 HP which, if true, indicates a very powerful motor for its size. A switch is provided to reverse the direction of the spindle and there is a digital readout of spindle rpm. A work light and an emergency stop button are provided. Quill up/down movement is controlled by a three-handled handwheel. A manual fine feed dial, calibrated in 0.002 inch divisions and operated by a clutch, is also provided. Quill movement is indicated on a digital readout. The X and Y leadscrews are conventionally threaded (10 turns per inch) but the scales are a little unconventional. The X and Y dials are of very small diameter which only permits 0.002 inch divisions. Backlash was only 0.004 inch on the X-axis and 0.003 inch on the Y-axis and the table moved sweetly along both X and Y axes, giving confidence that the mill can be used for jig boring to the nearest 0.001 inch. The Z-axis leadscrew is threaded 8 tpi and the dial has 0.0025 inch divisions. As one feeds the tool down to the workpiece, the larger graduations (0, 0.075, 0.050, 0.025, 0) decrease as the head is lowered which I found *really* confusing when I put the mill to work. A 10 tpi leadscrew would give finer control and enable 0.002 inch divisions – much easier to work with. The captive nature of the drawbar ($\frac{3}{8}$ inch BSW on the Imperial machine and M10 on the metric machine) does mean that MT2 tooling with a mix of $\frac{3}{8}$ inch BSW and M10 threads cannot be used, neither can



Setting the head using an EDGE Technology Pro Tram.



My advisable tramping set-up.

large drills and reamers with MT2 shanks. A flat is provided at the top of the spindle – essential for tightening and loosening collet chucks and keyless drill chucks. The X-axis clamping levers are a little long and can catch on the base casting when moving the table in along the Y-axis. You will need the following additional accessories before you are ready to rumble (Chester offers a comprehensive range of accessories):

- A good quality machine vice,
- A set of thin engineer's parallels for use in the vice (SPI make nice ones),
- A copper-faced hammer (for releasing the drawbar and for persuading workpieces to sit down in the vice),
- A centre-finder (I use a Starrett one),
- An accurate square,
- A Clarkson type milling chuck with Imperial and metric collets,
- A few 2MT collets for the occasion when max headroom is an issue, and to hold plain shank end mills,
- A clamping kit,
- An accurately ground angle plate with tapped holes (SPI again),
- A DTI gauge and magnetic stand,
- A good selection of screw shank end mills and slot drills.

Review against mandatory requirements

1. Accuracy of the basic geometry

To undertake these measurements on your own mill or a prospective purchase, you need a dial test indicator

(DTI) with magnetic stand, a pair of parallels around 8 - 12 inches long and an accurate square. A good set of British-made parallels can often be found on eBay. If they retain their mirror finish, you know that they have been used for inspection only, rather than for production. A BS939/Grade B 150mm square can be bought for around £40. (Remember if the square is not engraved BS939 then you have no guarantee of accuracy.) However, for this exercise I bought a Kinex DIN875/0 150mm square from Workshop Heaven Limited. This was £35 delivered and is twice as accurate as BS939 Grade B. The accuracy is 0.000051 inch/inch, which is perfect for our purposes. The blade is also 3.8mm thick which is sufficient to run a DTI along. Note that I removed the swarf guards for these measurements.

a. Spindle verticality to table

I started by setting the head as accurately as I could using an EDGE Technology Pro Tram (photo 2). A screw and lock-nut end stop is provided on the mill, which makes tramping very easy but I took care to put some packing under the speed control housing in case the head fell to the left. Use the set-up shown in photo 3. Set the DTI so that the plunger is exactly 2½ inches from the spindle axis and to the left. Bring the quill down until the pointer moves a few revolutions and clamp the quill. Rotate the scale on the DTI to read zero. Lifting the plunger with your fingers, rotate the spindle by 180 degrees and read the clock. Divide the

reading by 5 inches and you have the verticality error per inch. Repeat the measurement along the Y-axis, remembering to zero the clock gauge again. Spindle verticality errors for the Champion 20VS were 0.0001 inch/inch in the X-axis (tramping is never perfect!) and 0.00026 inch/inch in the Y-axis. Very good indeed.

b. X-axis and Y-axis at right angles

Clamp a square on a parallel along the front edge of the table so that the blade of the square is precisely parallel to the X-axis slideways (using basically the same set-up shown in photo 6, later, but with the DTI plunger on the blade of the square rather than the front of the table). Then use the set-up shown in photo 4. Zero the gauge at the far end of the stock of the square with the table in a forward position and the Y-axis dial set to zero. Then wind the Y-axis handwheel in exactly 3 inches and read the DTI. Divide the reading by 3 to obtain the orthogonality error. The Champion 20VS was 0.0000 inch/inch from being exactly 90 degrees – a stellar result.

●To be continued.



Checking the X and Y axes are square.

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Ian Couchman describes the metal and woodwork techniques used in producing a model threshing machine.



Continued from p.708
M.E. 4560, 12 May 2017



The Tale of a 3 inch Scale Threshing Drum PART 10

On completing my 4 inch scale Ruston Proctor SD traction engine, I decided it needed some work to do so, after first completing a scatter mill, I then chose to make a threshing drum. Here I describe the combination of traditional and modern techniques used in its manufacture.

Fittings

I will now just run through some of the more interesting fittings on the machine.

There are quite a number of hinges of various shapes and sizes on the machine, which were all made in a similar way. First, blanks were cut (I used galvanised steel as I had a good stock!). **Photograph 215** shows the first stage. After making a bend in the end, the

part which will take the hinge pin is formed in the vice. If you get the angle of impact right, the metal rolls nicely around the former. If you don't ...

The holes are drilled at this stage - as it's easier to hold pieces with parallel sides - then the ends are cut to size. I used the mill but it's easy enough to do with a hacksaw and file. The edges are then trimmed to the required angle and the small ends rounded with a file. Finally, a piece of galvanised wire is fitted through the pivot holes, cut to length and lightly peened at each end to keep the pin in place. **Photograph 216** shows these last stages and **photo 217** a nice little cluster of finished hinges.

Photograph 218 shows one of the front wheel clamps. As mentioned earlier, it's important that the frame of the machine sits level, otherwise the produce won't feed down



Hinge blanks, galvanised steel.



Hinges awaiting their pins.

the slopes properly. As also mentioned earlier, the front axle is free to rotate sideways. These clamps are used to hold the front axle at the correct angle for the front of the machine to sit level. The only noteworthy part of manufacture was the left hand thread (on the right of the picture) which forms part of the turnbuckle. The thread on the rod was cut on the lathe and a tap was produced in the same way from silver steel, which was then hardened and tempered. The steel parts, as with most small, steel parts, were blacked by heating to red heat and dropping in old engine oil.

In order for the operator to get the machine level, three spirit levels are fitted to the machine, one on each end and one on one of the bottom rails. The spirit vials were bought in. They had lines on them, which were polished off. These vials are mounted in castings with a cover over them. **Photograph 219** shows one of the new levels and one on a full size machine.

Chocks were placed under the appropriate wheel to level the machine. This involved jacking up the corner of the machine to get them in place. To make life easier for the crew, Ransomes offered lever chocks (**photo 220**). To use these, the chock is assembled around the wheel and, by operating the lever, the chocks are drawn together, forcing the wheel up. **Photograph 221** shows the chock in use.

Photograph 222 is the nameplate, fresh from the foundry. Ransomes' serial numbers are made up as follows: first the year - 1900 + 10, followed by three digits indicating the number of machines built that year. For instance, one of the machines I used as a reference had serial number 59874. Remove the last three digits, add 1900, subtract 10 and you have the year of manufacture: 1949. So this machine was the 874th machine made in 1949. So to the number I gave mine: 125001, the first machine made in 2015!



Some of the many completed hinges.



A front wheel clamp.



One of the three spirit levels.



A pair of wheel chocks.



Wheel chocks in use.



Ransomes' nameplate with serial number.

On either side of the machine are shutters, which, when folded out, extend the working area on the top of the machine. These are supported by a prop in the centre of each side (**photo 223**), locating in small castings top and bottom. Removable cross boards are fitted at the front and rear of the working area. These have strap bolts at each end which pass through the shutters and are fixed with hand nuts (**photo 224** and, in use, **photo 225**).

Photograph 226 shows a couple of information plates fitted to the machine. Actually,



Extension shutter support prop.

the revs are a bit of a fib as this machine has to be run faster (more on that later). There are also various instruction boards fitted around the machine; **photo 227** shows two of them. They were made by printing the graphics on self-adhesive vinyl sheet with a laser printer. These were then stuck to a thin sheet metal backing plate and a wooden surround stuck to this. The whole assembly was then fixed with double sided tape.

As mentioned earlier, the rotary screen can be adjusted to allow for different sizes of grain. **Photograph 228** shows the adjusting handle. You can also see the unusual bearing which allows for flexing of the frame. Also visible is one of the bearings for the brush.

Photograph 229 is a view from the rear of the machine. Here you can see the two covers for the chobber/awner with the domed plate to clear the widest part of the chobber, also the ring pulls for lifting out the covers. Further up is the feeder's box. This is where the man feeding the drum would stand. The lower level meant less bending, which I'm sure was appreciated! It was also a handy place to stash bits and pieces when the machine was on the road between jobs. Then, of course, the heart of the machine - the drum. Just visible at the top of the opening is a check plate. This is fitted as close as possible to the beaters and stops grain being carried around the drum and thrown back out. If you've ever heard a threshing machine running, you will



Cast hand nuts.



The hand nuts in use.



Two of the various information plates.



Two of the various instruction boards.



The rotary screen adjusting handle.



A view of the top of the machine.

know the whine it produces. I'd always thought that this came from the fans but in fact it's the beaters running by this check plate which causes it.

Photograph 230 was taken from the front of the machine, above the shakers, and shows more check plates (as well as some straw from the last thrashing session!). These check plates and another set nearer to the front, are raised and lowered to control the flow of straw along the shakers.

And finally...

And finally, the finished machine is seen in **photo 231**. Did it work? Surprisingly well! Very clean grain with no detectable grain going out with the straw. Some lessons were learned, however. Firstly, the machine will not work at 1000 rpm. Grain sits on

the shoe surfaces, rocking gently back and forwards, instead of working its way down the slopes of the shoes and riddles. A much greater velocity is needed. In theory, it should run at 4000 rpm to get the same velocity as full sized machines get. In practice, I find that 2000 rpm works pretty well. The disadvantage is that the engine is running rather fast. One lesson learnt was that the engine kicks out a lot of oil when it's running fast but lightly loaded.

The second lesson, learnt very shortly after lesson one, was always have the engine down wind. **Photograph 232** shows the results of ignoring



Check plates viewed from the front.



The completed machine.



Grime from the engine's exhaust - better avoided.

lessons one and two! This was taken after a day's thrashing at Bardwell Threshing Day in Suffolk, the first time I had a crop to work with (a good bit of scrounging from the guys running the full size machine!). To overcome the

speed problem I came up with the device shown in the photo that has been at the top of each instalment in this series: the A(ish)-frame pivots at the bottom so both belts are tensioned by moving the engine back, while the whole



Quarter scale wheat!

assembly is held in place by the front wheels sitting on the angle base. The speed is stepped up by about 2.25, giving me a much more comfortable engine speed of about 150 rpm. I still need to make sure I'm down wind of

the thresher! All I need now, is to find someone growing quarter scale wheat.

Happy thrashing (photo 233)!

ME

Making a Maudslay Style Table Engine

Peter Russell explains the more interesting aspects of Willy Schneeberger's design.



Whilst I am not a trained and experienced mechanical engineer myself, I have built several steam engines and this is the third made to the drawings and castings of Swiss designer, Willy Schneeberger. I have no pecuniary interest, I just like his engines.

I am, by training, an electronics engineer and IT man and my workshop skills have been picked up along the way. I have, however, built several steam engines from castings supplied by Willy (ref 1). I don't know where he gets them made but they certainly know how to make them! He always supplies first rate castings.

Willy calls this one *Maudslay 1807*, but having done some looking around on the Internet, I think it would be more accurate to call it a Table Engine roughly based on Maudslay.

I think he must have had some spare time because he's already done a lot of the work for me; centring up the flywheel, cleaning up the side frames and generally machining faces flat.

Photograph 1 shows what we hope to achieve and **photo 2** is our starting point - the lovely set of castings.

First of all, I back up all the drawings by scanning them into my laptop, just in case! I use an A4 file to hold all the drawings - all in plastic wallets - that way they are easy to find and easy to take into the workshop without getting dirty.

REFERENCE

1. You can contact Willy Schneeberger by email: willy.schneeberger@ggs.ch. Drawings and casting can be purchased from Atelier MB Castings. Go to: www.ateliermb.ch/shops/gussteile/eu/contents/en-uk/d49_Maudslay.html



The completed engine.

I like to take some time to study the drawings so I know where I'm going and how I'm going to get there. I always think it's a bit like an exam – read the question at least twice before you attempt to answer it!

Throughout this description I have concentrated on the 'interesting bits', leaving out many of the simpler

operations. I hate hack-sawing and filing and I like writing about it even less!

Machining the base

The edges of the base casting are filleted but, as you might expect, they're a bit rough so the first job is to run around the edges with a ball nose end mill. Having measured the fillet it seems we need a

15mm tool and again as you might expect I haven't got one. Luckily my friend Noel had a $\frac{5}{8}$ inch one (15.9mm), well within tolerance! (Well it's not critical – it just has to look right.)

Photograph 3 shows the base edges being milled.

Next we need to drill and tap the six M3 mounting holes (**photo 4**).

This is a simple job so long as you take care to get the holes in the right places. The observant might notice that the casting is a bit shinier than in the previous photo; this is because I have already started polishing it. I'm a great believer in doing things a bit at a time: the more effort I put in now, the less I have to do when all the parts are complete and I'm dying to get the engine built up. The photo shows the base being tapped

The side frames

Do you ever get days that just don't go right? Well today was one of those. I started by joining the two side frames together by turning up a bit of mild steel rod so it was a tight fit in the circular hole in the castings, and squeezing them together in the vice. I had put a centre mark on the rod so I knew where the hole centre would be and I could use it as a reference for both the main shaft hole and the frame lengths. So far, so good. I then held the frames in the mill vice, the outer end supported by a piece of wood (**photo 5**). The intention was to find and drill the hole for the main shaft. It was an easy task to find the reference mark and move the table the appropriate amount for the hole to be drilled. As I came down with a (luckily small) centre drill, I saw it wander slightly and with a probably rude word, I pretty quickly raised the drill.

Why had it wandered? I soon realised that having removed the collet holder and replaced it with the Jacobs chuck, I had forgotten to lock the head of the machine. As it is a round column design it was free to move. This isn't the first time it's happened and it won't be



A very nicely produced set of castings.



Milling the edges of the base.



Tapping the mounting holes.



Holding the frames in the mill vice.



Milling the side frame feet.



Starting to polish the frames (note the damage!)

the last! I really should have known better!

After locking the head and finding the reference again, I successfully drilled the hole, deliberately a little under size as the next operation would be without the vice to hold the parts in registration and with a bit of scrap round bar jammed in the newly drilled hole.

The next operation would be milling the ends to length so the frames were clamped to the table on another piece of wood. **Photograph 6** shows the side frame feet being milled.

The milling operation went well, bringing first one end to size then turning the parts round and trimming the other. Then disaster struck again!

Changing over from the milling cutter to the drill chuck,

then finding the position of the first hole to be drilled, all seemed well with the world. Starting the drill - the chuck drops out onto the workpiece. I didn't know how fast to hit the stop button! A few more words that can't be printed, then the realisation that the clout I gave the chuck wasn't clout enough! Luckily the workpiece wasn't too badly damaged - but my pride was. Just a 'ding' on the top edge which, with any luck, I can hide on the inside of the job. I did manage to finish the drilling without any further problems so I suppose that was a positive. Some days are just bad days!

Photograph 7 shows the almost finished side frames. You can see the damage on the end of the left-hand frame.

Not quite finished and still needing a lot of polishing, but I had made a start.

The table top

The table top is a stepped rectangular casting with a hole cast through the middle. This hole has to be bored out to 28mm and its centre becomes the reference for all the other holes and the sides.

I had noticed that the cast hole was nearly perfectly circular so I thought I might try centring it using my rotating centre. As the hole becomes the reference and there is plenty of metal waiting to be removed from all sides, it doesn't have to be perfectly centred. With the rotating centre in the hole and just backed off from contact, it

was easy to see which jaw needed adjustment. Just a few minutes and it was centred.

Photograph 8 shows the table top mounted in the four jaw, ready for facing off and boring.

I started boring and the thought occurred to me that the hole was going to be a good bit bigger than the hole in my four jaw chuck! I needed space behind the workpiece so I reversed all the jaws and re-mounted and re-centred. This gave me a couple of millimeter clearance but I didn't think this was enough. **Photograph 9** shows the final set-up with a bit of wood behind the workpiece. I should have thought this one out earlier!

I completed the boring and faced off the workpiece. Then I changed to the three jaw and made a plug for the bored hole with a centre mark to use as a reference for drilling and sizing (**photo 10**).

There was still a lot of work to be done, milling the sides (**photo 11**) and the other face and then the steps had to be cleaned up and sized. Photo 11 shows the table top sides being milled.

All this took a lot longer than I had expected but, eventually I was ready to drill and tap the side frame fixing holes, the cylinder mounting holes and form a slot for the valve connecting rod. All in all, this piece has taken some nine hours to machine.

The cylinder

The first job is to find the centre so that the cylinder can be bored. Measuring the outer diameter I found that the casting was fairly regular, so I found the centre using dividers and pop marked it. I then mounted it in the four jaw and set about centring it in the lathe (**photo 12**). Then, starting with a small drill I drilled the bore progressively larger, until I could fit my boring tool into the hole. I used the boring tool to finish off the bore and I was very pleased to find that the bore was very smooth (**photo 13**).

I made a mandrel to fit the cylinder bore so that I had a



Ready to machine the table top.



Set-up to bore the table.



The table top with its plug, ready for milling and drilling.



The table sides being milled.



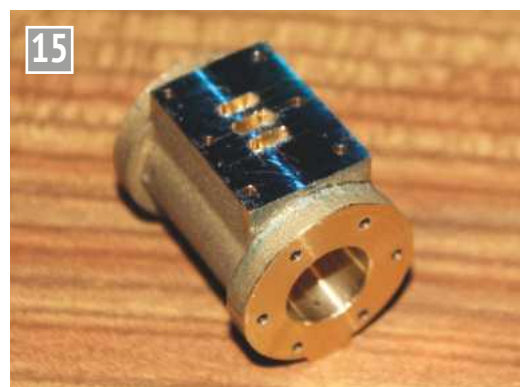
The cylinder being centred in the four jaw with the help of a home-made wiggler.



Boring the cylinder.



Milling the port face.



The port face marked out.

reference to set it up level in the machine vice. It might also come in handy later when it comes to drilling the flange holes. Milling the port face was pretty straightforward, just get it flat and take it down to the right level (**photo 14**).

It was at this time that disaster struck again! First of all my milling machine digital readout failed and then I had another run in with the milling machine not behaving itself (my fault really, but I just blame the tools!).

This resulted in work being held up until; a) I had bought a new digital readout and b) I had modified the mill/drill to stop the head rotating about the column.

After fitting the new DRO, as an exercise I drilled the flange

It was at this time that disaster struck again! First of all my milling machine digital readout failed and then I had another run in with the milling machine not behaving itself (my fault really, but I just blame the tools!).

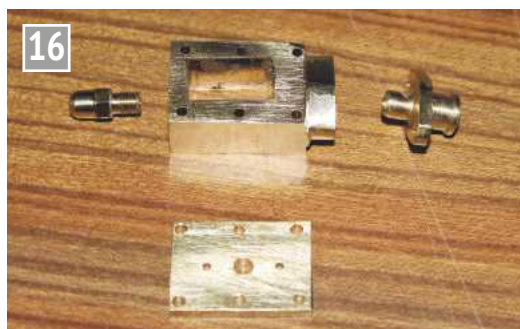
holes. I'm glad to say that the result was good.

Now, where was I? Ah yes, back to the cylinder.

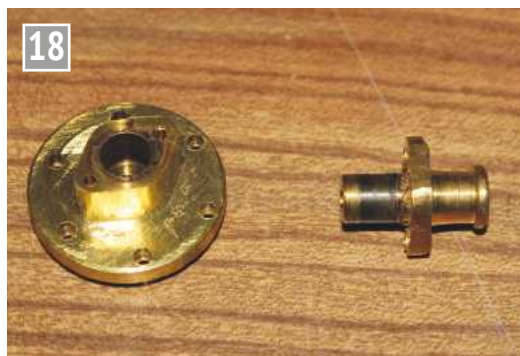
I blued the port face (**photo 15**) and marked it up on the surface plate. I do this more for reassurance so I know I'm in the right place when I use the DRO to direct the milling. The milling was fairly straightforward. I pre-drilled the ports to get rid of a lot of metal to make the milling easier. I just had to remember to go slowly as I was only using a 2mm cutter. A few passes and the job's a good 'un! While I was at it I swapped over from the collet holder to the jacob's chuck and drilled the holes for the steam chest bolts. It was great to be able to raise the head and still maintain registration. All that's needed now is to drill the exhaust port and the steam passages. Photograph 15 shows the cylinder almost finished.

The steam chest and its bits

As supplied, the steam chest casting incorporates a length of flange material so that the steam chest flange and the valve rod stuffing box flange can be made at the same time. This is a bit of a pain as the end of the flange material seems a long way out from the four jaw chuck. I started by drilling through the flange and into the steam chest to accommodate the valve rod. I then turned the valve rod flange and parted off. Next, I brought the steam



The steam chest component parts.



The cylinder cover and piston rod flange.

chest flange down to length and drilled it to take the valve rod flange. Now to the milling machine to bring the chest to size. No problems here, just a bit of end milling. I changed over to drill mode and drilled the holes for the mounting bolts and for the valve rod cap. I would have tapped the valve rod cap hole as well, but I didn't have the headroom to fit my tapping aid so I transferred to the bench drill press and tapped it there.

Now back to the lathe with a bit of 6.3mm hex brass to make the valve rod cap. Drill, turn, thread and part off. Now how to hold it while I turn a half round on the other end? I made up a holder from a bit of scrap steel round bar, tapped to take to the M5 thread of the cap and proceeded to turn the other end of the cap. Now a bit of hacksaw and file to make the steam chest cover. I spotted through the steam chest and drilled the cover. I also drilled for the steam inlet. **Photograph 16** shows the finished steam chest parts ready for a good polish.

The valve

The valve is of usual construction; a steam chamber on the bottom and



Machining the valve.



The bosses are turned in the four jaw.

a 'cross' on the top, the nut sitting in the cross. In all of Willy's engines the nut has two springs holding the valve in contact with the port face. **Photograph 17** shows the valve being machined.

The top cylinder cover

The top cylinder cover consists of a cylinder head incorporating a flange, mating with another flange to provide a stuffing box for the piston rod (**photo 18**). The casting again has an extended flange so that the parts can be machined on the same centre. So, with the round end mounted in the three jaw chuck, drill for the piston rod, turn the piston rod flange and part off. Bring the cover flange to length and drill for the piston rod flange then mount the flange end in the four jaw and turn the cover and boss to the right size.

Now to drill for the flange securing bolts. First of all, I glued the two parts together, ensuring that the flanges were correctly aligned. I then drilled (tapping size) through the top flange and into the cover flange. This way I know that they will mate up - not much room for error here, the bolts are M2! I also drilled for the

cylinder studs. When all was done, I applied a bit of heat and pulled the parts apart. The discolouration visible in the photo is due to heating and can be easily removed.

The bottom cylinder cover

The bottom cylinder cover consists of a block with a boss on the top and bottom, the top one fitting the cylinder and the bottom fitting the table top. It is drilled to take the cylinder studs and also for the four bolts holding it to the table top. The casting as supplied is just a rectangular block of bronze, so the first operation is to give it squared up flat sides - a quick job in the milling machine.

Now for the proper work. Using the surface plate, I marked a centre on both sides of the casting and then gave them both a light centre pop. Next, the block is mounted in the four jaw and centred using a wiggler. The first boss (doesn't matter which) is then turned to the right diameter and depth. The block is then checked for thickness and turned over in the four jaw and the centring re-checked. The block can now be brought to correct thickness and the other boss turned (**photo 19**).

●To be continued.

Track Construction at Newton Abbot

An elevated track with a novel design; **David Ashwell** describes it.



First sight of the new land. May 2004.



December 2005 after much clearance.

Now in their tenth year running, the club completed the basic build of a new, triple-gauge elevated track on a new site, using what they believe is a quite novel construction. It offers a very easy way to build a track; the actual assembly of the trackbed was completed in less than two years, mainly by two people working a three day week, with occasional assistance, and probably at a much lower cost than other methods. It has also proved to be much easier to maintain.

Background

For a number of years, the club operated a dual gauge, elevated track, approximately 200m long in a local park. The trackbed was constructed using straight concrete beams (railway sleepers) on brick/block pillars and the track itself was ½ inch square steel bar with welded joints, welded to steel strip 'stretchers', which were in turn screwed to wooden sleeper strips fixed to the concrete beams.

The site was far from ideal with limited parking, no power or water and no clubhouse; just a small, dark, damp concrete 'bunker' for storage. Additionally, in recent years we had several episodes of vandalism resulting in severe track damage. When making repairs it became apparent that our track construction, in particular the welded rails, was almost impossible to repair to satisfactory standards. No matter how careful we were when welding in replacement sections, a few weeks' thermal cycling always seemed to cause kinks to develop. We also had problems with the 'thrupenny bit' effect of the straight concrete beams round curves causing interference with driving and passenger trolleys (especially after thermal expansion of the track on hot days).

The final straw was when our treasurer's Polly locomotive was derailed, fortunately with only minor damage, by a coin placed on the rails by one of the local 'children'. After this no one wanted to run on the track and in 2004 it was decided to step up our search for a new site. A tenacious committee member took on

the task. Several possibilities were investigated and rejected until, in early May, the district council, in an attempt to keep him quiet, told him of a field they had just acquired to use as a flood barrier.

This didn't at first sound very attractive and our first impressions on a site visit were no better. It was a narrow valley with steep banks on three sides and no road access; we had to climb over fences and down a virtual precipice. The valley bottom rose by around three metres over its length of about 150m, a gradient of 1 in 50. There is a ditch running down one side of the valley (can't really call it a stream as there is only water in it when it rains, although it can be very impressive after a storm!). The ditch was only really evident at the top end of the site; 30m down it disappeared into a marshy area. The site was covered with thick brambles and scrubby bushes, with lots of mounds and depressions (photos 1 and 2).

The council, however, already had plans to put in an access road so that they could build a dam and sluice gate for flood management. Our quick measurements

suggested that there was room for a reasonable track with much better security than we were used to, so we decided to go ahead.

Site preparation

Our next visit to the site was in December 2005, when council contractors were putting in the access road. The council engineer was present and agreed that the contractors 'could do a little work' for us. We immediately jumped at this offer, did a rapid assessment of the lower part of the site and concluded that the largest curve we could fit here would have a 15m radius, but a steep bank was in the way. The digger driver (he later became a club member for a while) put in a fairly large cutting into this bank in a very short time (**photo 3**). These contractors have since done a lot of good work for us and we couldn't have done it without them. We have called them in at various times, whenever we had the funds: to dig a large platform out of a bank for our clubhouse, to add a loop road to the lower end of the council-built access road and to lay the concrete foundations for the clubhouse. After a number of club volunteers had spent several weeks clearing the undergrowth our contractors also did a marvellous job landscaping the site, smoothing out the surface and digging out the ditch all the way down to the culvert under the main road at the bottom of the site, with a bank on the side nearest the track to reduce overspill. This has been very effective and the marshy area has now gone.

We bought a prefabricated concrete building (8 x 5m) for the clubhouse, erected on site by a team from the suppliers. The building was essential for storage of large quantities of materials while the track was being constructed and as a workshop and refuge from the weather! For security, one of our members reinforced the steel door, which was then fitted with two padlocks and he fitted the windows with metal shutters, removable

only from the inside. A super job. Unfortunately, he later resigned from the club which was a great pity as he had been a major worker during the site clearance.

One of our members donated a 150 gallon stainless steel milk bowser on a small trailer. We put this behind the building and connected it up to collect rain water from the roof. An old 7.5KVA trailer-mounted twin-cylinder diesel generator was purchased; a noisy beast - but at least we had power. Our club treasurer took it home and re-painted it. We wired up the clubhouse with an RCB protected ring main and fluorescent lights, with a No-Volt-Release contactor operated by Start/ Stop push buttons next to the door and a time switch so that power can only be on between 7am and 12pm. A high-tech (i.e. expensive) composting toilet was bought and installed in a shed next to the clubhouse (**photo 4**).

Route planning

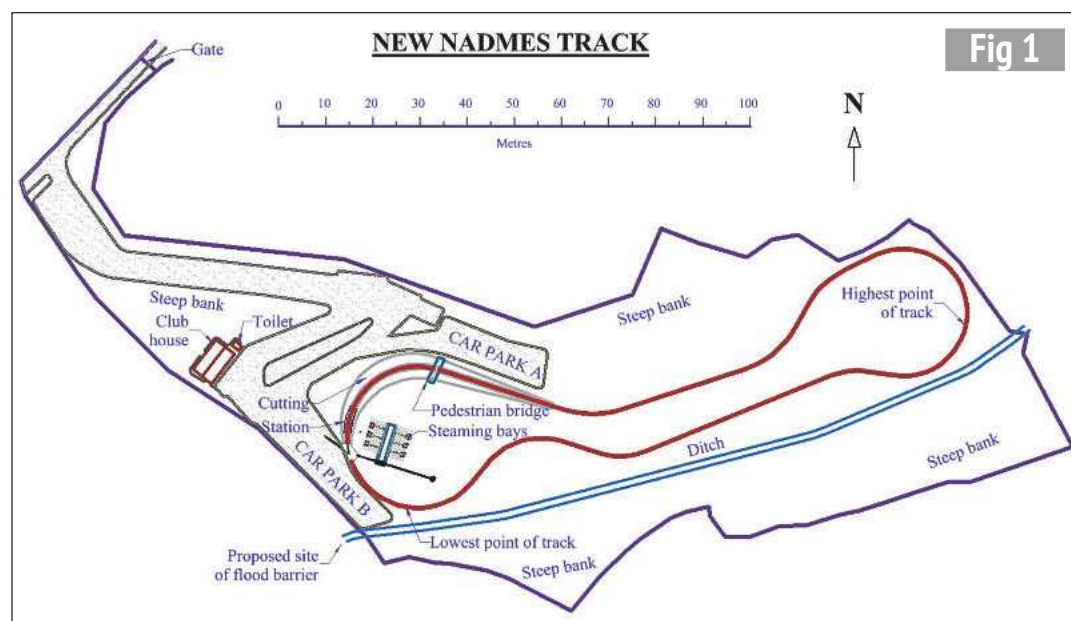
I got a 'dumpy' level, taught myself what I loosely call surveying and, with volunteer assistance, put in reference pegs along the centreline of the valley and at its corners. I then drew out a site plan which I imported to my TurboCAD package as a background layer. This allowed evaluation of many track route variants in order to optimise gradients. I had thought that the track would have to go over the ditch, requiring two bridges to be built, in order to get a reasonable track radius at the top end of the site, but there were a few practical problems:

- 1) Bridges would add cost and time; they would be around 4m long, so would be heavy.
- 2) Bridges might be damaged or swept away by the force of water in the ditch during storm conditions, so they would have to be removed after each day's steaming - at least a two-man job.

- 3) The ground rises steeply on the far side of the ditch, so a 3 or 4m deep cutting would be needed in this area. A cut and cover tunnel would be a great feature, but it would be expensive and delay construction due to safety considerations.

- 4) Checking with the council engineer confirmed my suspicion that there is rock close to the surface on the far side of the ditch and blasting would not be allowed due to the adjacent A380.

Fortunately, careful measurements showed that with a second, shallower cutting at the top end of the site we could just fit in a 13.5m radius curve without crossing the ditch. This was thought to be acceptable and after much iteration, the final layout evolved (**fig 1**); note that this is an accurately surveyed plan. It required the rails to be elevated to 1m above ground

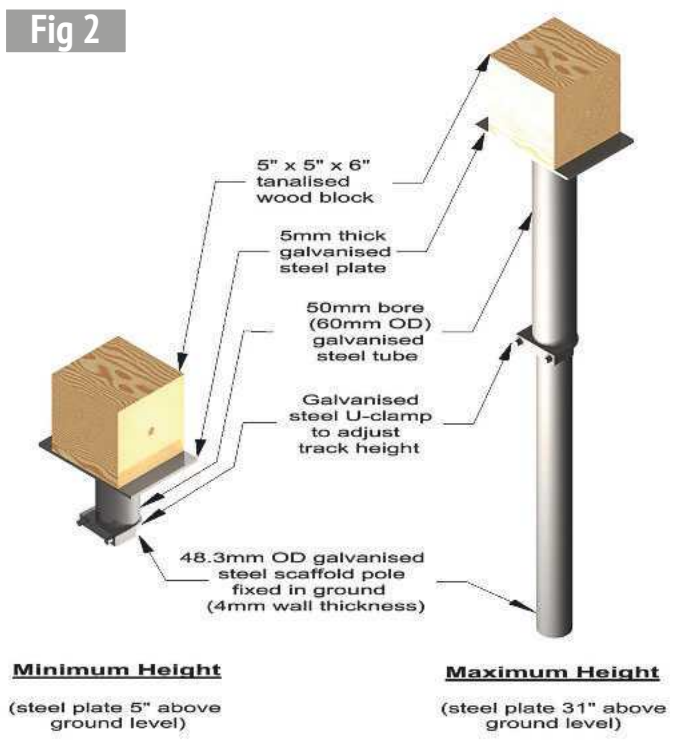


Early access road and the big cutting, December 2005.



The basic amenities.

Fig 2



at the bottom of the site (a convenient height for the steaming bays which were to be in this area); rail heights were reduced to about 120mm above ground at the top of the site to improve gradients, by use of the shallow top cutting. With 'normal' clockwise running, the steepest up-gradient is 1 in 61 and the steepest down-gradient is 1 in 57, both on straights. Gradients on curves are less

steep than 1 in 100. Sharpest curve is 13.5m radius. The total length of the track is just over 320m, more than 50% longer than our old track. There are straight sections between reverse curves and transition curves are implemented between straights and curves. A degree of super-elevation (camber) is used on curves, though we have found, in practice, we don't need much with our radii.

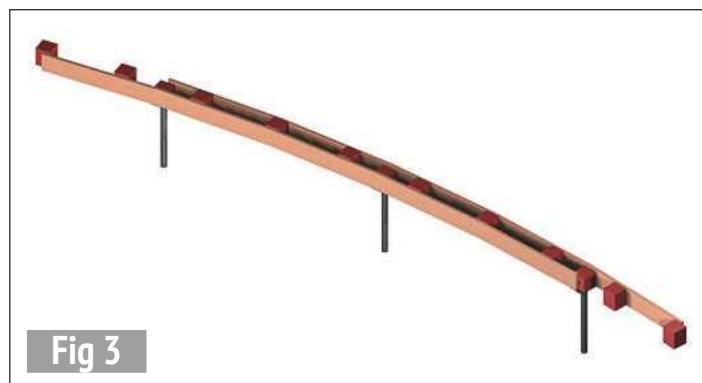


Fig 3

Note that I tend to be a bit ambidextrous with units; my CAD system doesn't mind which I use. In the workshop when working on my 3½ inch Britannia I prefer imperial measurements as that was how the prototype was built but in the field I tend to go with whichever rule or tape measure is to hand (quite annoying for my co-workers).

One of our aims was to provide a way to transfer locomotives between cars, steaming bays and the track with minimal delays to running traffic. With existing site restrictions, we were forced to put the steaming bays inside the track and, of course, the access road loop is outside. We decided to build a turntable which can quickly be changed between a) the running position, b) routing locomotives between a 'loading spur' on the

outside of the track and a 'test spur' on the inside of the track or c) between the test spur and the running track. A traverser (originally with a plain, flat steel top plate) is used to move locomotives between the test spur and the steaming bays.

Track design

In parallel with this work, the design of a new elevated track was investigated; it was obvious that none of the old rail was any use, though we did recover some of the old concrete beams for use as road edging. The Track Committee spent lot of time researching track construction methods at other clubs; I've never believed in trying to re-invent the wheel. In view of our club's limited resources, both financial and in available workforce, we concentrated on simplicity, low cost, fast construction and ease of maintenance. As previously noted, we wanted to avoid the 'thrupenny bit' effect round curves and a visit to the Taunton Club's Vivary Park track provided a major part of the solution. They use parallel pairs of 6 x 1 inch wooden planks to support the track sleepers, with the planks spaced by wooden blocks and with staggered joints. We were told that the Taunton track had survived for more than 25 years without major repair work.

Most clubs seem to use cast, reinforced concrete pillars for trackbed supports, usually in an 'A' section. The problems with this method are; 1) cost and 2) manufacturing time. We thought we could probably make, at best, maybe half a dozen a week so it could take a couple of years just to

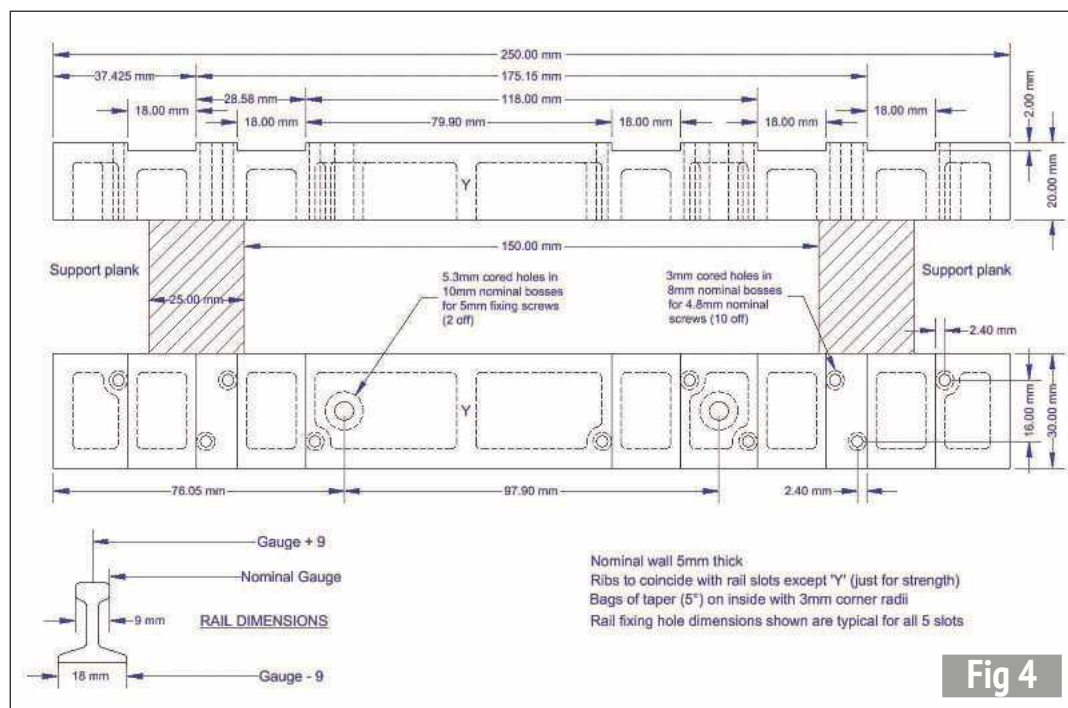


Fig 4

make the pillars. Also, because of the gradients on our site we would have to make many different heights of pillar. A few clubs use tubular steel for support pillars and this was the solution chosen.

We selected standard 48mm galvanised scaffold poles for the track supports, clearly plenty strong enough, spaced at a nominal 2m. At first we thought we would have to embed them in concrete (lots of work and expense) but our contractors reckoned they could drive the poles straight into the ground with a mechanical digger. One of the Track Committee members went round the site with a soil testing kit and established that ph levels were pretty well neutral so we concluded that the poles should last for at least 20 years without any extra protection.

Another Track Committee member then came up with the brilliant idea to use 'top hats' sitting on U-bolts clamped to the scaffold poles to support the planks and provide a way to adjust height after installation (**figs 2 and 3**). This is really a key feature of the design and the 'top hats' automatically pivot to the correct angle when the planks are bent around curves.

Our old track was dual gauge, 3½ and 5 inch. Since one or two members had 7¼ inch models, it was decided to provide for this as well, plus it offered another advantage in that the club trolleys could be re-gauged to 7¼ inch for extra stability (when we have time). The sleepers were therefore designed to take five rails, in the normal three rail configuration for 3½ and 5 inch plus an outer pair of rails for 7¼ inch, symmetrically placed for even drawbar pull if a 7¼ inch driving trolley should be used with a 5 inch locomotive (**fig 4**). Note that the rails fit in slots in the sleepers so gauges are set automatically.

Gauge widening on curves was discussed at length and a preliminary sleeper design made to cater for this, but after reading the excellent

series of articles in *Model Engineer* in 1988 - *Making Tracks* by Derek Monk, it was decided that our relatively large radii did not need it. Our club chairman owns a plastics moulding factory and was able to produce the 3000 or so sleepers needed. He first tried polypropylene but wasn't happy with the result so changed to polycarbonate; a much more expensive material but it produced a very superior sleeper complete with a realistic 'wood grain' effect moulded in (**photo 5**).

He also obtained scale section steel rail (2lbs/ yard) in 'run of the bundle' condition (nominally 3m) and their ends were milled square, then jig-drilled for fishplate bolts by volunteer working parties over a couple of weekends.

Trackbed construction

My CAD plan called for 161 track support poles, at spacings of close to, but not exceeding, 2m. These positions were pegged out on the ground using the reference pegs placed previously; a rather complicated and lengthy operation. After the pegging

operation I discovered we had 162 pegs. I calculated that this showed a measurement error of 1 in 161, or 0.6% and decided this wasn't bad considering my rudimentary level of surveying!

Our contractors were called in again in April 2007 and did a bit more landscaping, then drove in most of the scaffold poles at the marker pegs; this only took a couple of hours! We found that with a couple of helpers to direct the digger driver the poles could be kept reasonably vertical (**photos 6 and 7**). With hindsight it would have paid us to have taken a little more care in the positioning and alignment of poles – a few turned out to be slightly misaligned or out of position (or both); these required an inordinate amount of time and effort when we came to fit the planks, getting straights straight and curves smooth.

One of the track committee members had obtained more than 200 galvanised scaffold poles in lengths of 3m, 4m and 5m. We found that some locations would only take one or two metres of the shortest

poles before they bottomed on what was clearly bedrock; sloping shale beds had been found when the access road was put in and also when the foundations for our clubhouse were carved out. Other areas, predictably at the lower end of the site where sediments had been washed down, took up to 4m of the longer poles. We did not attempt to drive them in to measured depths, just left them long. We could not say for certain that all poles were bottomed on rock, but all took at least 4 tons of force from the digger so we are confident they won't move in service!

I generated a spreadsheet from my elevation survey measurements and the peg location data from the CAD plan. This established the required height of each pole above previously surveyed reference levels in order to achieve our gradient specs. It was then simple to go round the site with the 'dumpy' level and an angle grinder and cut the poles to their required heights – about 20mm less than the calculated heights to allow for final vertical adjustment.



Plastic sleepers with poziflange screws.



A little sunshine on the secured poles.



Planting the poles. April 2007.

In March 2007 I got fifty-three 5 x 6 inch Douglas Fir beams, 2m long from a local timber yard. These were cut into 650 blocks by a couple of weekend working parties; most were 5 inches long for the 'top hats' and plank spacers, others were cut about 12 inches long to be used to join the planks. The cut blocks were returned to the timber yard for high pressure tanalising in May, when the 172 4m long Douglas Fir 6 x 1 inch planks were also treated.

One of the track committee members had the 'top hats' made by a local firm – rectangular steel plates welded to short lengths of steel tube chosen to slide over the 48mm scaffold poles. Holes were tapped in the tubes just below the steel plates for stainless grub screws; these are primarily to prevent shake in service – the fit on the scaffold poles is necessarily a bit sloppy – but are also useful for preliminary height setting. The 'top hats' were coated with anti-rust paint by the fabricator and the treated 5 x 5 x 6 inch wood blocks, arranged so as to space the planks by 6 inches, bolted to their tops with stainless coach bolts by another weekend working party.

Galvanised U-bolts were slipped onto the scaffold poles and the pre-assembled 'top hats' dropped on (**photo 8**). We then went around the route with the 'dumpy' level again, carefully adjusting the level of each U-bolt until the steel plates of the 'top hats' were all at their calculated heights, though final small adjustments were made later when fitting the rails.

Planking started in autumn 2007. Planks were initially fixed using long stainless coach bolts to clamp the planks to the 'top hat' wood blocks. We started at the poles either side of the turntable and went in both directions making sure that the plank joints (made with the 12 inch long 'joining blocks' and stainless coach bolts) were staggered, ending near the middle of the circuit at the top of the



A pole with its 'top hat'.

track. Intermediate 5 inch long spacing blocks were added for extra rigidity, fixed in this case with stainless decking screws. Because the planks were 4m long and the poles nominally 2m apart, we were able to maintain the staggered joints around the route without having to shorten more than 2 or 3 of the planks.

As we had been told by our helpful contacts at the Taunton club, bending the planks round curves was quite easy. We found that 4 or 5 large woodworking cramps were essential to hold the planks together in place while setting the curve before drilling through for the coach bolts (**photo 9**). Note that we used coach bolts with large stainless washers and drilled generous clearance holes. It was quite difficult finding a suitable drill bit; we found an auger type bit with spiral flutes longer than the total thickness of the timber (8 inch) was required; a rare beast indeed! The bit had a tendency to jam in the damp timber and it was often necessary to reverse the drill to get it out – not possible if the bit has short flutes. We both had battery drill drivers with spare batteries and borrowed a third drill, but still had to get extra spare batteries to keep going throughout the day.

Fixing the planks was a relatively quick job, maybe three or four weeks (**photo 10**). Then we spent rather longer going round it several times, checking and smoothing gradients, straights and curves

and making sure transition curves looked good. Changes in 'super-elevation' (camber) on transition curves were very difficult to achieve, especially where there was also a change in gradient, partly due to the staggered plank joints. In one or two places we had to resort to the use of a woodworker's plane. My fellow conspirator, Ron, made a sort of calibrated plumb-line on a wooden stand, about 2 feet high, which proved ideal for measuring and setting camber.

Finally, we added stainless decking screws at every 'top hat' and joining block and stainless coach bolts at every spacing block to make it less likely that anything would move due to moisture and temperature changes in the timber. We found the trackbed became remarkably rigid once the spacer blocks were fixed in

place, particularly round curves, due to the staggered joints.

Note that the timber blocks are 5 inches high, while the planks are 6 inches high. The 'top hat' block top surfaces therefore end up 1 inch below the top of the planks (so that the coachbolts holding the blocks onto the 'top hats' are well clear of the sleepers above) but the spacers and joining blocks were very carefully fitted so that their top faces were flush with the tops of the planks, ready for fixing sleepers to. Note also that although the planks appear to be supported by the 'top hat' plates, and this was useful during construction, the plates are relatively thin and the real strength of the assembly is provided by the coachbolts and decking screws.

●To be continued.



Fitting planks.



The trackbed planked all round; July 2007.



Bolton Corporation No. 46 PART 2

Ashley Best's illustrated description of an award winning, scratch built model in 1:16 scale.



When Number 46 was withdrawn for scrapping in 1937, it was just another typical British four wheel, double deck balcony tram. There was nothing to indicate that it was, in fact, a significant tramcar. This article explains the significance and describes the making of the model.

Development summary

No. 46 was built as an open top car in 1900. It was given a short upper saloon in 1903 which was later extended

to a full balcony ended top cover with six drop windows each side and curved balcony seats. Then reversed stairs were replaced with direct 180 degree stairs, the trucks were given replacement axle boxes and track brakes and the standard Bolton destination boxes with large route letters were fitted. The tramway was more or less at its peak in 1930 and the fleet of large eight wheelers and the smaller four wheel cars had a standardised style. The livery was an attractive maroon and cream with deep yellow lining on the maroon and maroon lining on the cream parts.

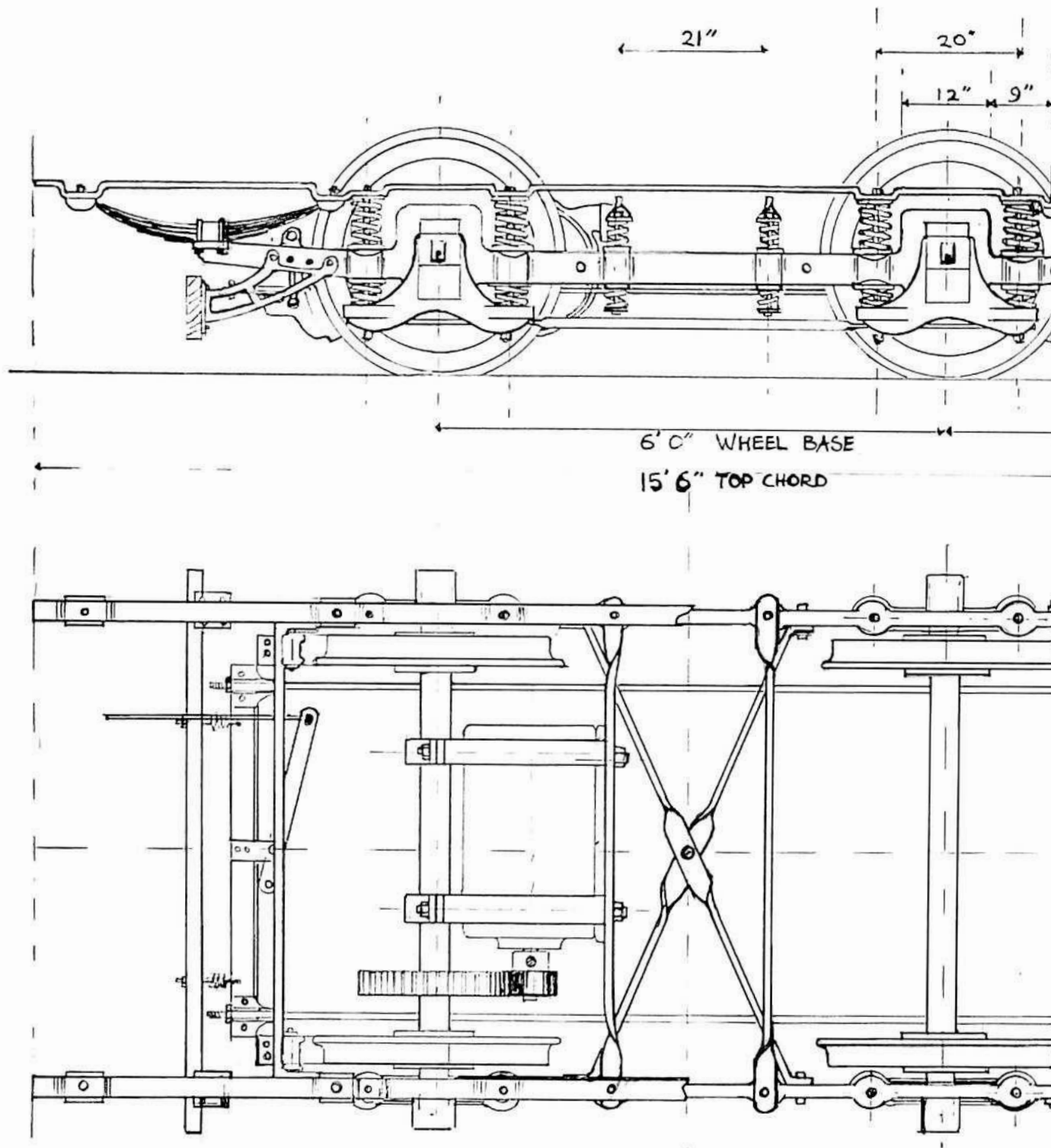
Destination boxes

The standard Bolton-designed top decks with their full height drop windows were a distinctive feature, as was the employment of route letters rather than numbers for destination indicators. Where possible, letters often had an association with the destination at the end of the line or the route to be taken. Examples of this are; H for Halliwell; D for Dunscair; F for Farnworth; N for Chorley NEW Road; O for Chorley OLD Road, but this application was not perfect and some letters had no logical association. The use of letters rather than

Continued from p.716
M.E. 4560, 12 May 2017

Fig 2

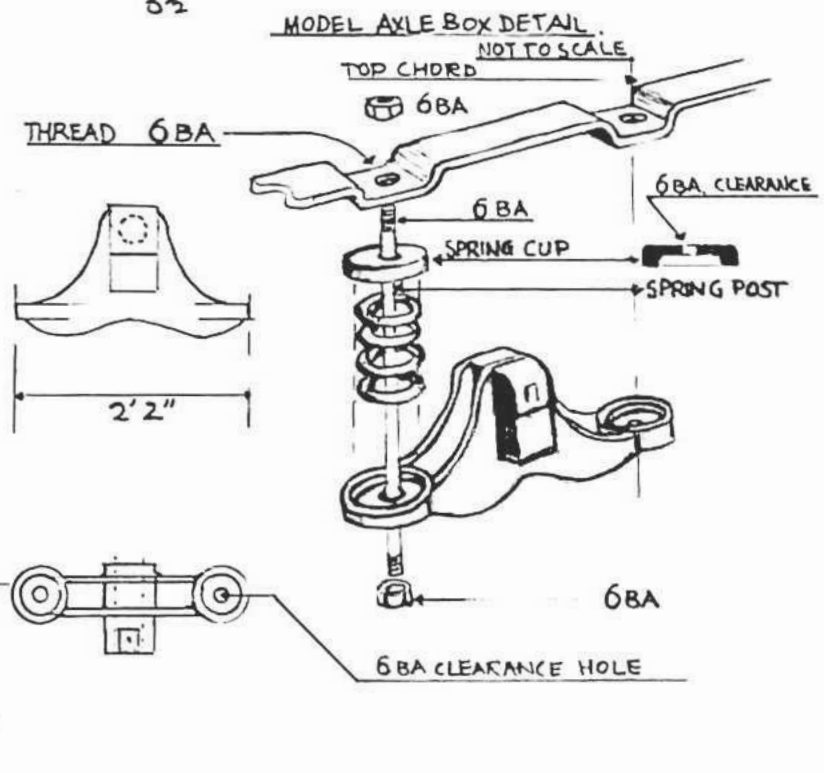
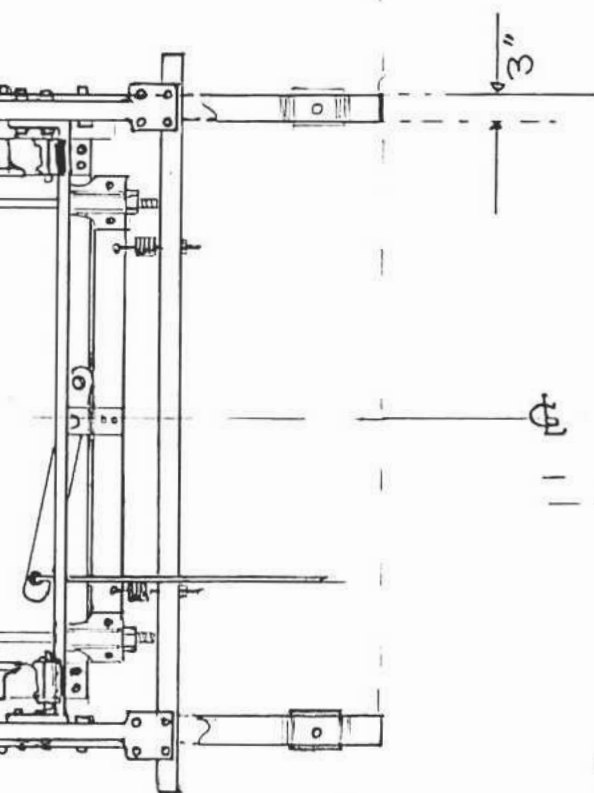
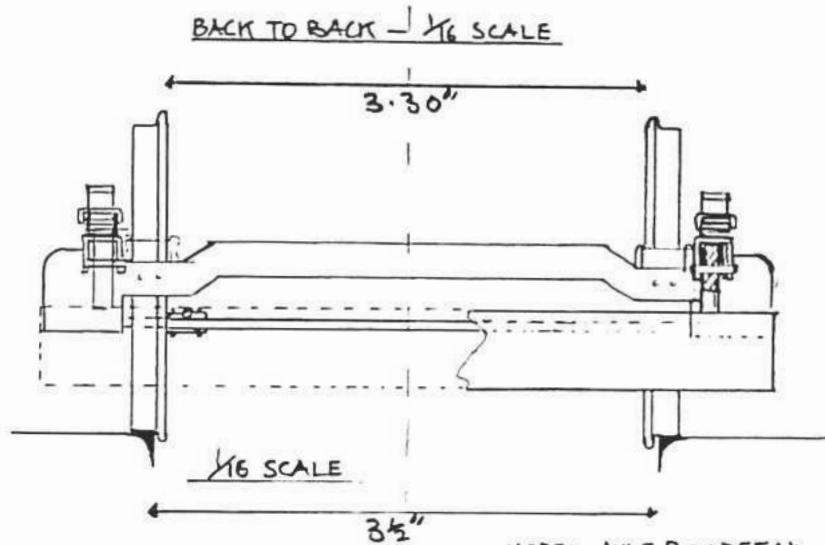
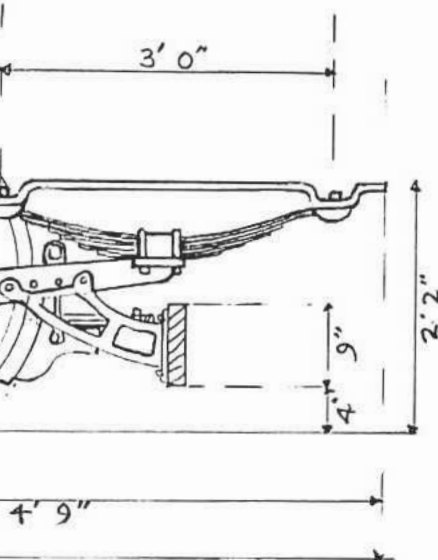
BRILL "WIDE WING" 21 E 6' 0" WHEEL BASE TRUCK



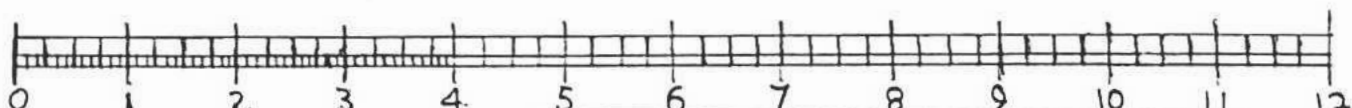
DRAWN BY ASHLEY BEST 2016

SCALE FEET/INCHES

CK. SCALE 1:16



SOME MODEL DIMENSIONS:- WHEEL DIAMETER SCALE 30"-33". TRACK GAUGE 3 1/2". WHEEL BACK TO BACK 3' 30". AXLES 1/4" DIAMETER. GEARS 7:1 RATIO. MOTORS-AXLE HUNG 12 OR 24 VOLTS TO REQUIREMENTS.



numbers was unusual but not unique to Bolton. Hull and Nottingham also used letters, but Bolton was the last to do so (**photo 12**).

An interruption

In spite of these individual characteristics, the Bolton system was in many ways an absolutely typical British tramway – standard gauge, overhead electricity supply with swivel head trolley current collectors. Together with almost all its neighbouring tramways in the mid thirties, it was scheduled for a rapid decline and would have been replaced by buses by about 1941. The war put a stop to this policy and the trams continued until the end of March 1947. In these latter days, neglect was all too obvious and the cars became dreadfully scruffy. I remember them as they were at the very end and even then in their run down state they ignited in me a spark of enthusiasm for tramways that continues to this day (**photo 13**).

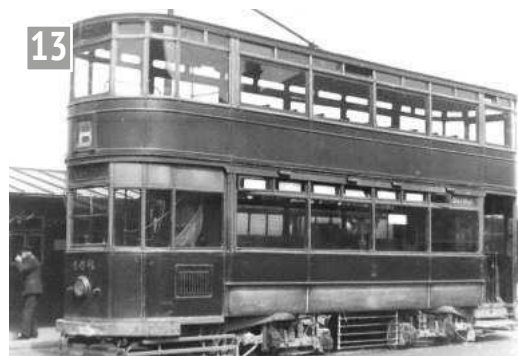
The model

Photographic evidence shows the pre-war tramways as smart, clean and well-maintained. I decided back in 1973 when I embarked upon my first 1:16 scale



Destination screens.

tram to make a Bolton car and produced a model of No. 68, an eight wheel car in 1938 condition (**photo 14**). Building that model was a learning process but, as my first venture into the world of model engineering, mistakes were made and although the resulting model looked reasonable and worked well enough, correcting its niggling faults would be impossible



Unkempt at the end.



No. 68 – my first model.

without virtually destroying it. Once my Manchester Project was completed, I felt that I could, with the benefit of more careful research, build a more accurate model of a Bolton tram. This time the choice fell upon No. 46 for reasons already outlined. Fortunately, I had access to a number of photographs of No. 46 as well as others in its class. I decided on the car in its final condition as an archetypal Bolton tram at the peak of tramway operation (**photo 15**).

Building the model

Before describing the making of the model, a few words are required about dimensions. The prototype tram was built to imperial measurement and working to 1:16 scale translates conveniently to a direct transfer of an actual one inch to $\frac{1}{16}$ inch which is represented on most imperial measurement devices. In the following article, therefore, all references to the original vehicle will be in imperial measurement. Most of the model's measurements also do likewise. Where a metric equivalent has to be employed, I have done so. I see no problem in using both

systems together and puzzle over the reaction of those who wish to abandon the imperial system altogether. It would present great difficulties for those of us working to replicate historical artefacts in model form.

The first part of making a model involves research leading to production of a drawing plus notes. In this I was given a great deal of help by the Manchester Transport Museum Society at Heaton Park, Manchester and in particular by Derek Shepherd who probably knows more than anyone about Bolton trams. For all my models I like to produce a full size 1:16 scale general arrangement drawing and this was achieved with reference to the standard 'Preston' design for the lower saloon to which I added the top saloon after I worked out the details (**fig 1**, M.E. 4560 p.714).

The trucks

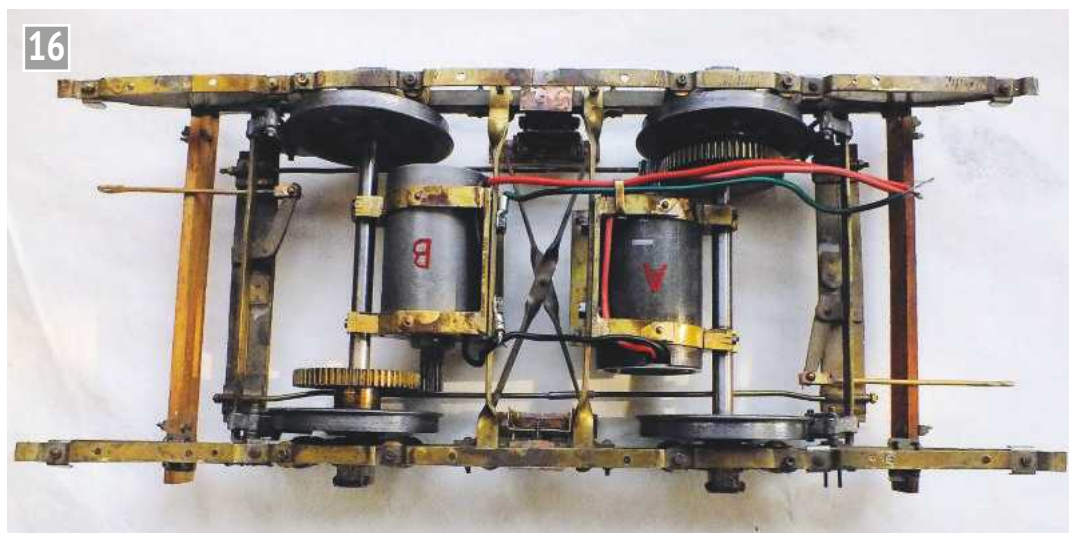
I always start with the truck as it forms the basis of the model and allows the body to be fitted to it rather than the alternative of having to make the truck fit a previously constructed body. The truck is the engineered part of the



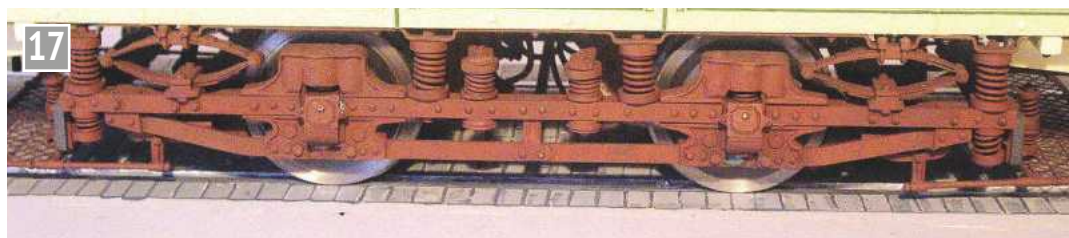
No. 46 on display at MEX, Brooklands Museum, 2016.

tram and everything else depends on it. **Photograph 16** is a top view of the truck for No. 46 and **fig 2** is the working drawing.

The four wheel truck in various configurations was the most widely used by the early British tramways. At first almost all such trucks were of American design with two major companies competing for the market, The Peckham Truck and Wheel Company of New York and the J. G. Brill Company of Philadelphia. There were others, mostly American, but these two were probably dominant. Their competing products were very different. Peckham trucks were constructed from a number of parts that could be assembled into a variety of wheelbases. The construction was riveted together incorporating standard axle box pedestals. They were marketed as Peckham Girder Cantilever trucks (**photo 17**). The Brill design was simpler and ultimately more successful. Brill trucks were used by the majority of British tramways. The four wheel version was designated 21E (**photo 18**). This was a really good design having the virtues of being simple, robust and reliable. It was so successful that a large number of almost - or,



Model 21E truck.



Peckham girder truck.



The Brill design.

indeed, identical - copies were made over the years by various manufacturers. Brill must have been a bit

careless over patent rights. In Britain, for example, Brush built trucks of the basic Brill design or with insignificant

detail differences. All the early British users of this truck imported them from America.

●To be continued.

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT IS
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- **ENV Aero Engine**
Part 2 by Stephen Wessel
- **Rosebud Grates**
- **Halstead**
- **The Doncaster Exhibition**
- **Micro-Lights**



Content may be subject to change.

ON SALE 23 JUNE 2017

Garrett 4CD Tractor PART 34

in 6 inch scale

Chris Gunn
completes
construction
of the belly
tank.



Continued from p.729
M.E. 4560, 12 May 2017

This article has been written to guide the builder through the construction of the 6 inch scale Garrett 4CD tractor designed by Chris d'Alquen. The writer has previously built a 4 inch scale Garrett and a 6 inch scale Foden wagon so has the benefit of considerable experience in larger scale modelling. Most machining can be done in the average home workshop but the supplier from whom the castings and drawings are currently available is able to provide a machining service for the largest items if required.

I worked my way around one side of the plate until I reached the end, leaving the last couple of holes undrilled until the side plates were fitted. Once one side had been completed, the other side was dealt with in the same way (**photo 299**). Anyone who has a set of bending rolls will be able to roll the plate to match the radius in the tank top before drilling the holes but thereafter the drilling should be carried out working from the centre outwards. It was a pity that

my set of rolls was not wide enough to accommodate the wrapper width but the method described worked well enough and was quicker than trying to locate a set of rolls to borrow.

The tank was flipped over and the bottom section was marked up and drilled, starting from the centre to the outside, and temporary $\frac{3}{16}$ inch Whitworth bolts were used to secure the bottom plate. It should be noted that the plate finishes well before the corner so that the joint between the base plate

and the sides would be hidden when the tank is installed.

Photograph 300 shows work in progress on the base plate.

I did not bother with a drill jig as I had done with the tender as there were so many curves in the belly tank, I drilled them freehand and they finished up looking straight and equally spaced, as indeed they are. **Photograph 301** shows the belly tank partly finished, with the curved section in place and the bottom plate partly secured.

I started on the ends next and decided to secure the vertical section of the wrapper first, leaving enough at each end to wrap around the top and bottom corners (**photo 302**). The photo shows one end fitted, with the top partially bent.

The plate was clamped to a piece of ply to stop it crinkling as the plate was wrapped around the corner. The stay tubes helped greatly to keep the plate in order (**photo 303**).

Once the first section of the bend was made, I then bought a couple of big carver clamps and used these to bring the wrapper round flat. I drilled more holes and pulled the wrapper around. Once the horizontal section was secured with screws, I had to remove the curved section to enable the last bend to be made. That was done but no more holes were drilled at this stage. **Photographs 304 and 305** show the last but one bend and the final stage.



Working around the curved plate.



Work in progress on the base plate.



Partly completed belly tanks.



One end piece was fitted next.

The second side was then dealt with in the same way and then the ends of the two sides were trimmed to a convenient length to leave a hole close to the end of the wrapper. However, I did not fit any screws in the last two holes to allow the curved section to be replaced and once in place, the ends of the curved section could be trimmed to match the sides. I made a strip 1.5 inch wide to span the joints and wide enough for a row of screws each side of the joint. Holes were drilled through and the joint secured with screws.

Once that was dealt with, the tank was turned bottom up and the two bends around the bottom corners were made. I used ratchet straps to pull the metal round the stay and the holes were drilled in the ends (**photo 306**).

Once the bend was made, I was able to trim the ends again and once again I made a joint strip to span the joint and drilled the holes. The holes were countersunk and I intended to use M5 countersunk Allen screws to hold the joints together. On final assembly, the hexagon key holes would be filled with body filler and sanded down so the joint could not be seen. In order to fit the strips, I had to remove the curved section to give access. **Photograph 307** shows the completed base.

That completed the manufacture of the sections of wrapper but there was still a lot more work to do before the belly tank was finished. I did decide to leave the stay tubes in position for the moment, as I would need to remove sections of the wrapper and I wanted the assembly to remain the same shape while this work was carried out.

The next thing I tackled was the front belly tank supports, which consist of an angle with the holes in it to connect to the support on the boiler at the front and a pair of double angle brackets which bolt to angle supports fitted to the hornplates. The angles were made to the drawing and all were bolted through the



Wrapping the end piece around the stay tube.

platework of the belly tank, into a retaining plates or stiffeners on the inside of the tank.

It was at this point I realised I had nothing to bolt this to on the boiler itself and perhaps, had I built an engine with a belly tank before, I would have realised this a lot sooner. In order to mount the tank I needed a saddle welding on to the underside of the boiler, as well as a bracket welded to each side of the hornplate. I was not confident I could make a good job of the upside down welding but it had to be done. I was aware that some full size engines support the belly tank with a strap that goes right over the top of the boiler and down the sides but I ruled this out in this case as the cylinder block was over the top of the belly tank and would interfere with such a strap. At some stage I needed to deal with this but, for the moment, I decided to carry on with the fitting out of the belly tank.

The next job I tackled was the angled stiffeners in the base of the tank to support the steering brackets. I decided to fit one for each bracket, an extra one in the centre for stiffness and an extra one alongside the tunnel that would be fitted for the steering wheel shaft to pass through the corner of the belly tank. These were cut from 30 x 30 x 5mm angle and are long enough to fit between the front and back plates. The inner corners were radiused to match the inside of the tank and ends of the bottom end faces of the angles milled so the bottom face of the angles were flush with the base plate. These were clamped in place until the



The end/top piece clamped.



The end/top wrapped and fastened.

steering brackets were made. The next item to be made was the tunnel for the steering shaft and I decided to make that from a piece of the 48mm tube, which I cut in half lengthwise and angled the ends to match the tank bottom and end. I welded triangular sections of plate to make the sides of the tunnel. This was tack welded in place between the two angles, before I cut the plate work, as I wanted to make sure everything was correct before this major step.

I made the two cover plates from 3mm plate for the mud holes next, as well as matching backing plates from some

6mm plate. I drilled the backing plate first, with an M6 tapping drill and spotted those holes through into the cover plate. The backing plate was tapped and the cover plate holes opened out to M6 clearance. Then I spotted the cover plate holes through the sides of the tank but once again, I did not cut the mud holes at this stage.

●To be continued.

In the next instalment I will leave the sheet metal for a while and attend to the machining of parts that are fitted to the belly tanks.



The completed belly tank base.



Ratchet straps used again as 'pullers'.

Ferrabee Pillar Engine, 1862 PART 3

Anthony Mount continues his new construction series; an unusual stationary steam engine.



Continued from p.693
M.E. 4560, 12 May 2017

I was looking through some old technical books and came across an engine exhibited at the International Exhibition of 1862 (not to be confused with the Great Exhibition of 1851); I rather liked the look of it, thinking it would make an attractive model.

Guide frames

Two guide frames (part 02a, fig 8a) are required and are supplied as laser cut parts but they still require some machining. At 8mm thick they are profiled but need reducing in thickness for much of their area. They are tapered but, by putting the tapered edges together, parallel outer edges are formed and they can be held in the machine vice.

Machine one at a time; do not forget they are handed. Reduce in thickness to 3mm and a close fit in the slots in the column. The next operation is to clamp them in the machine vice by the faces and machine in the rebate at the front edge.

Use the slide bar as a template to drill and tap the fixing holes in the front edge and on one frame drill the two holes in the lower area for the valve guide bracket.

I fixed the guide frames to the column using Araldite, slow setting variety.

Slide bars

The slide bar (part 02b, fig 8b) is supplied as a one-piece laser cut unit; it just needs cleaning up all over and the holes drilled for the studs.

Cylinder

Our cylinder (part 03, fig 9) is fabricated rather than a casting as it is a complicated shape and has a part annular groove around the middle. Ideally - especially if you want to steam the engine - use gunmetal or phosphor bronze, then there is no danger of rusting. Cast iron could be used but there would exist a problem of rusting if run only occasionally. Also, cast iron is not that easy to silver solder. I used mild steel with a cast iron piston as I only use compressed air to run my engines.

As you can see from the drawings, the cylinder is primarily made up from four sections. Cut off two 45mm diameter pieces and face off each end leaving them 0.5mm over length. Bore out to 25mm diameter to fit a previously made 25mm expanding arbor.

Mount the top section on the arbor and turn down the

body leaving a flange at the chuck end.

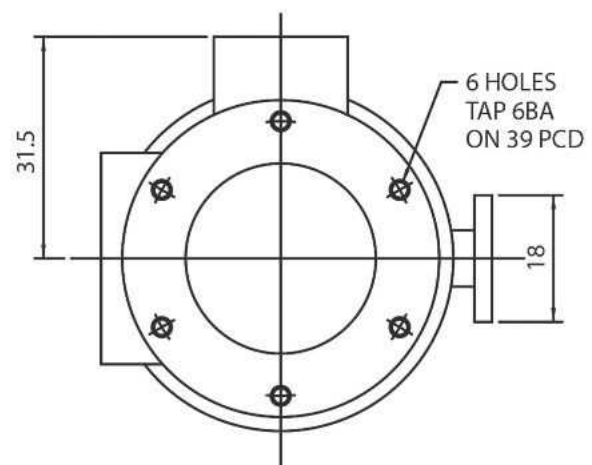
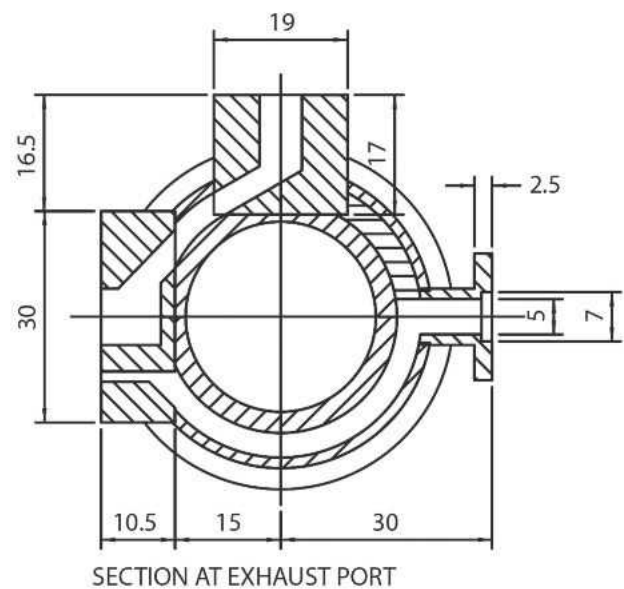
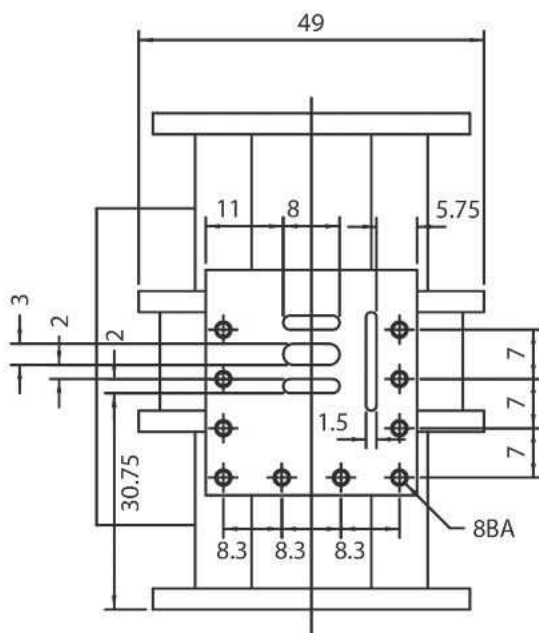
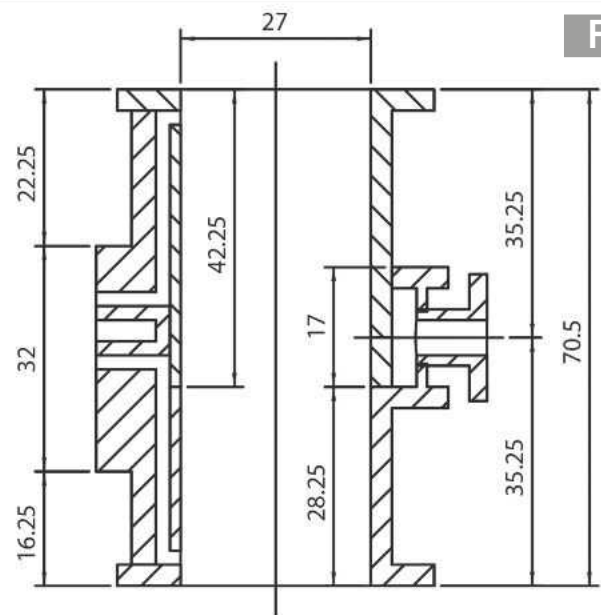
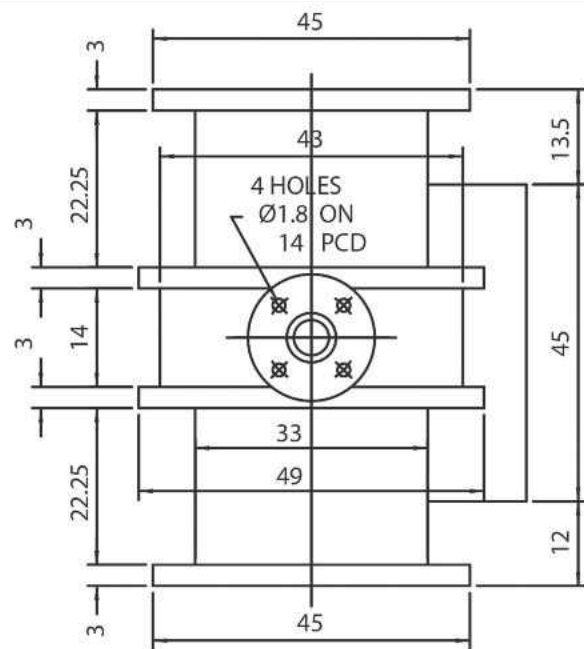
The lower section can be held by the arbor which is gripped in the lathe chuck, and the bore opened out for part of its depth to receive the turned down section of the upper cylinder.

You now need a special boring tool to form the annular groove. I have a 12mm boring bar grooved on the end for a 5mm square tool bit; it is slit for part of its length, which is then clamped together with an Allan screw, trapping the bit. With this you can get right up to an internal shoulder, which we have in this case. It's then just a matter of feeding in the tool until the shoulder is just touched. Turn the chuck around by hand to check all is clear, then feed into depth - 3mm in this case - and then repeat until the full width of the groove is completed. This operation is depicted in **photo 15**.



My home-made boring tool.

Fig 9



CYLINDER
1 OFF BRONZE FABRICATION
PART No. 03
(SEE ALSO DRAWINGS 09a AND 09b)

FERRABEE'S COLUMN ENGINE 1862	 FIRST ANGLE PROJECTION		Historic Engines South West
CYLINDER	DRG NO 09	REV'	
	SCALE 1:1	DATE 22-06-13	
Reproduction for any purpose whatsoever without written permission is strictly prohibited.	COPYRIGHT A. MOUNT 2013		

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A method using tailstock support.

Mount the blank on the expanding arbor and turn down the outside to the required profile. Instead of the arbor, the blank could be held in bored out soft jaws for the larger diameter flange and the other end given tailstock support by using a stepped plug in the end of the bore, as indicated in **photo 16**.

At this stage two holes can be drilled through the face of the annular ring at 90 degrees to each other, one where the steam inlet flange comes and the other where the block for fixing to the column comes. These holes are either side of a portion of the annular groove that is filled in and are useful for positioning the plug.

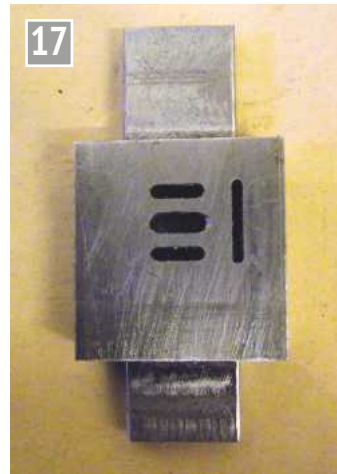
The plug is made up as a ring the size of the groove and then a piece is cut out of the ring long enough to go between the two drilled holes.

The three parts can then be silver soldered together; flux all three parts and then make up a ring, with a gap to clear the plug, of 1.6mm diameter

silver solder and put it in the bottom of the annular groove. Place the three parts together, ensuring the spigot of the top part seats on the bottom of the annular groove and that the ring of solder is around the spigot and not trapped under it. Then, another ring of solder can go around the top joint. Some short pieces of solder can also be pushed in through the holes in the annular ring to seal the ends of the plug.

Set up on the brazing hearth and apply the torch to the bottom section - it will take a lot of heat so a biggish burner will be required. Heat up and the heat will, of course, rise up around the joint and eventually the top ring will melt and form a fillet around the cylinder. If this ring of solder has melted, then as the inside ring of solder is below this and the burner is below the top joint, then it must have melted as well.

Once cold, lightly clean up all round - a wire brushing should be enough, if necessary the cylinder can be mounted again



The completed valve face.

on the arbor to clean up the soldered joint.

Valve face block

Put the cylinder body to one side for the moment and start to work on the valve face block. Start by machining a mild steel or gunmetal block to the overall dimensions, then set up in the machine vice and machine in the steam and exhaust ports. For this I used a three flute throw-away cutter which has one cutting edge coming to the centre so it can be used to plunge straight into the face without needing a predrilled hole.

Another narrower slot is required which connects with the slot in the steam chest flange which takes the incoming steam into the steam chest. The completed valve face is seen in **photo 17**.

Turn the block over and machine in the slot for the exhaust, which lines up with the annular ring, and drill the hole at an angle to go from the exhaust port to the recently



Showing the various slots and steam passages.

machined slot. Take care starting the hole which is at an angle; I had a centre drill the width of the exhaust port and used this to start the hole, the block being held at an angle in the machine vice. Also, put in the similar slot for the incoming steam.

With the block held flat in the machine vice the two slots for the steam passages which go lengthwise can be machined in. All these slots can be seen in **photo 18**. The block can be turned back again and the rebates each end machined in, after which it can be put on edge to reduce the width of the block either side of the steam passages.

The stud holes can also be drilled and tapped before silver soldering.

Another block is needed that connects the cylinder to the column base; this can be machined up from 19mm square material, requiring three holes in one face - two for fixing screws, the centre one conveying the exhaust to the condenser.

The centre hole connects with an angled hole, which can be seen in **photo 19** held in a machine vice for machining the angled hole with an end mill.

Valve seats

We can now return to the cylinder body and the seatings for the two blocks can be milled in. For stability, clamp the cylinder between two angle plates, as seen in **photo 20**, with a stud passing right



Machining the angled hole with an end mill.



Set-up for machining the valve seat.

through the cylinder and plates furnished with a large washer and nut each end.

The two angle plates are bolted down to the milling machine table with Tee nuts and studs, setting them square, of course. Also the cylinder needs to be orientated correctly; a thin parallel under the tapped hole for the stop valve inlet should help to set it square. Set the table stops so that you finish slightly short of the flanges each end. Find the centre of the cylinder and set the stops the other way so that the valve block is centrally trapped between the edges of the recess cut-out.

Machine first the area between the annular ring down to the level of the body, then zero the down feed dial for machining down to the correct depth. Follow this by carefully finishing off the junction with the flanges each end and with the width of the gap in the annular ring to receive the block.

While the cylinder is set up in this position, the slots each end adjacent the flanges can be machined in to take the steam from the passages into the cylinder.

Follow on in a similar manner for the seating for the other block but this time there is not as much to machine away (**photo 21**). Turn up the circular flange and stem for the steam inlet and we are ready for silver soldering.

Having cut through the annular passage it can now be inspected and you should see the yellow colour of the silver solder having amalgamated with the parent metal forming a nice joint. Push a piece of soft wire around the passage to check it is clear.

Make sure all the areas that will be soldered are completely clean with no dirt, grease or oxidation on them. Use a stud passing through the cylinder with washers and nuts each end to make sure the cylinder stays together in case the previous silver soldering of the cylinder melts. Flux the joints and assemble the parts wiring them on with soft iron

wire, so they do not move as the cylinder is moved about.

Set up on the brazing hearth on its side with a length of solder along one junction of the valve block and cylinder and proceed to heat up the cylinder with a gas torch until the solder melts into the joint. A big gas torch will be needed as it is quite a lump of metal to be heated up! Use tongs to turn the cylinder over and do the other side, then around the junctions with the flanges.

Turn over again to solder the fixing block and do not forget a touch of solder around the inlet flange stem. Allow the assembly to cool down then leave overnight in a bath of citric acid.

Wipe dry and check all over for any areas that might not have been soldered properly; all being well, give the whole cylinder a good clean up. Again, the wire brush comes in handy for removing stray flux and oxidation. If you have access to one a bead or sand blast could be used to clean up the painted areas of the cylinder.



Machining the second seat.

I used a syringe to squirt water through the ports and passages to make sure all were clear.

From now on the assembly can be treated as if it were a casting. Set it up in the four jaw independent chuck to bore out the cylinder to finished size. It will need packing pieces under the jaws to provide a secure hold of the cylinder, clearing the flanges.

The cylinder at this stage can also be faced off each end bringing it to finished length.

The cylinder covers, once made, can be used as drilling jigs to spot through for the studs each end. Two views of the completed cylinder are shown in **photos 22 and 23**.

● To be continued.



The completed cylinder...



...bored and faced to length.

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Spalding's Fourth Year

D.A.G Brown visits this East of England model engineering show.



Top Left: The outdoor steamers had plenty of space. Above: Richard Cannel with 4 inch Burrell, Bill.

It takes a brave person to promote a new model engineering exhibition; it relies on finding the right venue at the right time and cajoling clubs and traders to support the venture. Such has been the story of the Webster family who, three years ago, took the plunge with a modest offering in 2014, since when the event has expanded and blossomed into the experience which, this year, certainly drew the crowds on both days and made for a rewarding show for those who exhibited and those who visited.

Spalding is a unique country town in the middle of the fens; the centre of government for the Holland Riding of Lincolnshire, it is in the middle of a dead flat part of the county which grows most of the country's

vegetables in rich, grade one land and sprouts wind turbines at all points of the compass. Seasonal work pushes English into the second language of the town, which still remembers its heritage of the annual tulip festival for which thousands of visitors used to come and go by train from its railway station which, in the past, was able to boast three through lines from far afield, of which only the one - from Peterborough to Lincoln - remains in service.

Spawned from an horticultural business which branched out into a massive shopping mall, the Springfields Event Centre housed the exhibition, providing free parking safely segregated from pedestrians, areas for traders' vehicles and caravans and two good sized halls

for the show. It drew many clubs from almost 100 miles radius, many useful model engineering traders and a significant number of display models, which were certainly not there during the first year of inception. Happily the wretched candyfloss, bubble gum and junk traders never found their way in to divert the attention from the models.

Starting in the yard, the general picture is set by a group of engines simmering alongside the caravans. The smoky atmosphere is just right as the owners consider their next moves. In the foreground is a 4 inch scale Foster by Pat Franks, followed by another Foster of Ian Padgett, while three pensive gentlemen are waiting for the kettle to boil on Doug Crampton's (yes you guessed it) Foster: he is the

one on the left with the hat to keep the smuts off his head (**photo 1**).

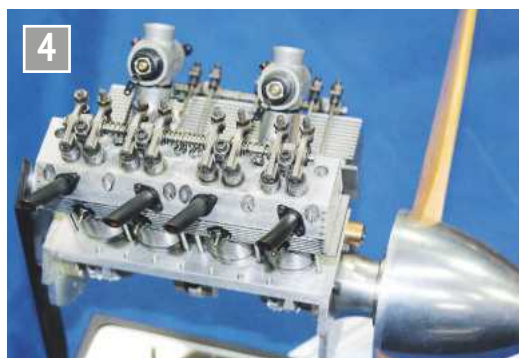
In full flight in **photo 2**, with his Burrell agricultural engine, is Richard Cannel, chairman of Peterborough Society. Bringing up the rear is a Ruston Proctor tractor being driven by Ross Gibbons. The running surface was a blend of tarmac, concrete and well-tended gravel, which made for interesting variation. The weather throughout was fair with quite a lot of sun. There was no sign of any waterproof gear.

Inside the halls my only criticism was a lack of natural light, but the lighting level was adequate and of reasonable tone. The centre of the main hall was dominated by the Gauge 1 Society track, which arrived as a flat pack with a swarm of ants to assemble it while we were not looking! Almost entirely steam powered, trains traversed the rails all day long, a mixture of home built examples and ready built far eastern models. The really skilled operators could pick up water at speed and even re-fuel on the run. Also running was a nice ex-GCR 4-6-0 at the head of a rake of teak coaches.

Among the club stands Lincoln had a comprehensive display and in the front a rebuilt Merchant Navy at the head of a Pullman rake of coaches was exhibited by C. Parker (**photo 3**). It should be remembered that Lincolnshire has a great engineering heritage; besides Robey of Lincoln, Aveling-Barford of Grantham and Blackstones



Rebuilt Merchant Navy by C. Parker on the Lincoln club's stand.



Paul Thompson's miniature V8 Cirrus aero engine from Saracen's Head Junction Group.



George Thomas bending rolls by Howard Lewis of Peterborough.

of Stamford there were many firms rooted in agricultural engineering all over the county, as well as BRM Cars.

A smaller society based near Boston is the Saracen's Head Junction Group; while mainly involved in steam locomotives, Paul Thompson's miniature V8 Cirrus aero engine was a lovely example of the diverse range of skills practiced (**photo 4**). It was exhibited with the sump removed so as to display the intricate interior of the crankcase through a mirror.

The Peterborough Society

had an extremely diverse display, including all sorts of engines and a lot of workshop equipment; Howard Lewis's example of George Thomas' bending rolls (**photo 5**) includes some subtle modifications for safety and free-standing operation.

It was good to see the exhibits from many other societies, especially from the world of model boats and aeroplanes. Boston Model Boat Club (**photo 6**) reminds us that that town is still an inland port, able to handle

consignments of timber and other commodities on the tide. Boston, of course, is also famous for its 'Stump' parish church with its enormously high tower and for its five-sailed Maud Foster windmill, still in working order.

A tramway layout from the Grimsby & Cleethorpes Society prominently illustrated the work of one man, Greg Marsden (**photo 7**). His scratch built trams provided interest on their 3½ inch gauge track, following each other and passing without fuss.



Boston Model Boat Club's display.



Grimsby & Cleethorpes Society's Greg Marsden brought along his 3½ inch gauge trams. ➤

Besides the club stands, there were a significant number of display models, not in competition with one another, but illustrating the diverse nature of the hobby.

Among the stationary engines on show, Raymond Greenwell's horizontal I/C engine (photo 8) was a good example, one of two models which he had on display being original designs published in *Model Engineer*. As a further diversion, making its way around the pond outside was a nicely turned out model boat under radio control (photo 9).

Linking the display stands with the trade, a halfway house was the cooperation between SMEE and CNC4U (photo 10).

A modular design for a CNC machine in the home workshop was provided on a commercial basis and the SMEE support from their digital group was in the software to link a 3D modelling programme into the operation of the machine.

For the hobby to survive and prosper into the future it is essential to connect with young people. Ingeniously the organisers promoted a schools' competition with the following remit: 'Given the free provision of a bogie and a rigid wheelset, to build a velocipede which, under pupil power, would traverse a 50m length of 7¼ inch gauge level



Raymond Greenwell's horizontal I/C 'Economy' engine.



Radio controlled boats were in action.

track in both directions without derailling'. Time constraints within the curriculum brought two entries, both from boys' grammar schools, with quite different approaches to D&T work and facilities available. In both cases the masters inspired the boys into working with the facilities that they had available.

Boston Grammar School is heavily into the display side of design and as a consequence they are orientated into working with wood and plastics (photo 11) with little ability in metal. On the other hand, Spalding Grammar School has some reasonable metalworking facilities and a master who is a serious cyclist and able to supply bike components from reclaim sources (photo 12). The two entries were therefore very different in their materials and approach to the project. Both schools learned the hard way



The SMEE collaborated with this trader to offer demonstrations.

about the strength of materials and construction and started to appreciate the significance of the design process.

In the event, both teams succeeded in completing the course and the verdict was that both were deserving of a prize, so both received a free magazine subscription. I had been pressganged into being

the competition judge so I was able to interview both teams with their schoolmasters and found them rewardingly articulate and forthright about the project which they had both carried out in out-of-school hours.

The overall verdict has to be: this was a good show; we look forward to next year. ME



Boston Grammar School's entry into the competition.



Spalding Grammar School's slightly more 'engineered' solution.

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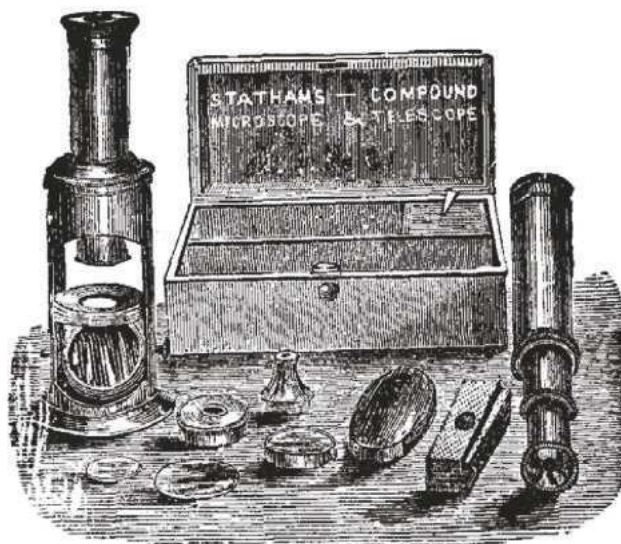
Magazines, Books and Plans

■ Full set of Model Engineers' Workshop, 19 volumes in blue binders, £150.

T. 01493 668358. Great Yarmouth.

Wanted

■ Wanted – more time at my easel and less at this blooming computer – **The Editor.**



Talistock Die Holder: A Great Timesaver

Brian Baker writes for the novice model engineer.



This is an ideal project for a beginner; it gives good practice in turning, boring and facing but best of all the result is a valuable tool that will save time in the workshop and last a lifetime.

If you have read any of my other offerings in *M.E.* you will be aware that my main interest is in making miniature locomotives, more recently in 7¼ inch gauge. In total the score is fourteen and a half, including modifying three kit



This is my original system that I made in the late 1970s, still in regular use.

locomotives (see *A Silk Purse*, in *M.E.* issues 4556 and 4559).

The tools that I make are mostly made to speed up locomotive production and one of the most useful that I have built is the device that is the subject of this article - one that I made many years ago and it must have saved me hours of time building my fleet.

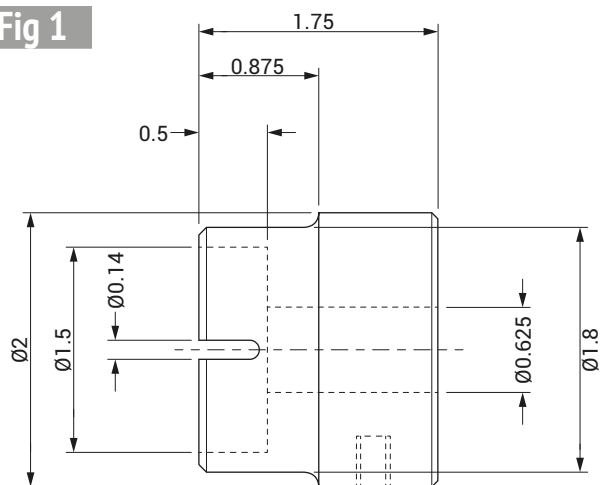
It is based on a design, published in *M.E.*, by the late and sadly missed George Thomas, whose work is, in my opinion the best ever described for model engineers. I adapted the design to suit my requirements and I offer it now as a system that will save a lot of time and, at the same time, produce reliable threads. **Photograph 1** shows the system with one die-holder in place.

In general, if a thread is to be used in a significant part of the model, say in a screw type regulator, I much prefer to screw cut the majority of the thread, say 80% and use the die to impart the final shape to

it. Smaller threads, particularly BA sizes, are more usually cut with a die only. Now, the conventional split dies need to be adjusted before use since they can cut under or over size, so three small adjusting screws are provided in the traditional type die holder and then they need to be tried out on scrap material before using them, then adjusted to cut the correct size of thread. With a job in the lathe and no scrap the correct size, testing the die setting is not so easy. That's where this tooling system is so useful; each die is carried in its own holder, which it never leaves, so once adjusted, it is set and only needs a minor 'tweaking' from time to time.

It is very straightforward to make and rapidly repays the time spent making it. The only extra advice I can give is to make sure that you make plenty of die holders, since you will never have enough. I have over thirty in use with a few spares to cover all the thread ranges that we use,

Fig 1



Main Holder



Main Holder Handle

including some metric ones. The system can be used to cut threads up to about $\frac{3}{8}$ inch diameter and, with limitations on length of thread, up to about $\frac{5}{8}$ inch diameter.

I have forgone my preference for the metric system with this tool, partly because it was originally drawn in imperial sizes and also because the new parts that I am making need to fit to the old. It is made from mild steel and if you can obtain the free cutting, 'lead' variety, so much the better. It is simple to make and I have made my instructions, I hope, with beginners in mind.

Making the tool

The first part to produce is the main holder body, which is made from a piece of mild steel about 4 inches long. As you can see, my piece was considerably oversized, rusty and came from a pile of oddments obtained at some long forgotten Club auction and then confined to the 'come in handy if you never use it' box. I am also turning, from the same piece, enough material for the holder drilling jig. Use the cutting oil of your preference liberally for all these operations. I prefer neat oil, rather than those diluted with water; I think it keeps the machine and the job rust free and is well worth the extra cost (fig 1).

Gripped in a three jaw chuck, or four jaw if you prefer, the outside diameter is first reduced to 2 inches and, if made from material of 2 inch size, the design will stand a 'skim' to remove any small imperfections (photos 2, 3 and 4). Check the diameter as you remove material; the finished outside diameter is not critical. Having faced the end clean and square, use a centre drill to start the internal hole, which needs to be accurately finished (photo 5). Keep opening out the hole, with larger and larger drills, increasing their size slowly, until you have opened it out as large as you can with your drills but take care not to open it out beyond $1\frac{1}{32}$ inch. This will allow a small amount



This rusty lump provided material for the main 'master' die holder, as well as for the drilling jig.



It turned up nicely....



... and was soon close to the finished diameter.



A centre drill gave me a good start ...



... followed up by successive larger drills ...



... until the hole is opened out just below finished size, which will be obtained by boring.



First, start to bore down to match the die holder thickness, towards the finished depth ...



... opening the hole up to final size after reaching finished depth.

of metal to be removed in the boring stage, which comes after making the bore for the die holder. If you have a $\frac{5}{8}$ inch reamer, then this would be fine to finish the hole but since this is not a size that is

easily available, I have finished the central hole with a suitable boring tool at a later stage (photos 6 and 7).

Before we complete the bore, we need to open out the recess in which the actual

die-holder will fit and this is done with a boring bar, firstly opening the central hole out to its full depth of $\frac{1}{2}$ inch, but leaving the recess diameter to be completed last; photos 8 and 9 show this process.

It is very straightforward to make and rapidly repays the time spent making it. The only extra advice I can give is to make sure that you make plenty of die holders, since you will never have enough.

Once the depth is correct, the bore can be opened out until it is 1.5 inches diameter and care should be taken to make this bore a snug fit for the die holder, which should fit in easily but with no slop (**photo 10**).

Now we can clean up the bore of the main holder body with a $\frac{1}{8}$ reamer if you have one, or with a suitable sturdy boring bar (**photo 11**). **Photograph 12** shows the overhang of the tool, which should be kept to the minimum needed to complete the bore to the correct depth. The completed hole should be a tight sliding fit on the central shaft (**photo 13**).

The bore diameter can be measured after each pass of the boring tool with telescopic bore gauges, a most useful device for locomotive builders. The appropriate gauge is inserted into the bore and, being held at an angle to the bore, the gauge gently tightened - but not too tightly - and the gauge is pulled across the centre of the bore and finally tightened. Thus the gauge is closed up as it moves across the diameter of the bore, which can then be measured with a micrometer.

Photographs 14, 15 and 16 show this process. Don't be afraid to make several passes back and forth at the same tool setting, since this process improves finish and makes the



The bore should fit the die holder blank easily, but without slop.



Now, with a change of boring tool, the central hole is bored to size.



This tool is sturdy and the overhang is kept as short as possible.



A test piece, in my case the taper slider from the original set, was used to check the finished bore size.



I used these telescopic gauges, loosely tighten the knurled lock, just enough to grip the arms, then the gauge is ...



... pulled across the bore ...



... and a micrometer is used to finally check the bore size.



Now, I have taken a cut across the outside to reduce the length of the grip that I produce with the next operation.

bore the same diameter right through. Make the finished size as close as you can and to avoid cutting the bore over size, only advance the tool by small amounts.

Photograph 17 shows work starting on the outside of the holder, after which we have to decide how our hand is to hold the device in use. It would be possible to knurl the

outside of the holder and that is how Mr. Thomas finished his holder. As luck would have it, my big knurling tool was on loan at the time but I decided to finish the outside grip with

a series of smooth grooves cut in the outside, using a conventional round nose lathe tool, mounted sideways in the lathe tool holder and using the lathe as a shaping machine. My dividing facility was on the Myford so I had to move the job into the four jaw chuck in that lathe but, before I did, I started the parting off process on the bigger lathe, reducing the work for the smaller machine (**photo 18**).

In order for the job to look neat, we need the grooves to be evenly spaced and I have used this simple device shown in **photos 19** and **20**, which I remember sneaking out to make in the workshop on a Christmas Day long ago, having found it described in an old volume of *M.E.* that I had as a present. It only works on Myford Super Sevens, which have a sixty tooth bull wheel, which will have to be cleaned up and suitably marked. Otherwise you could arrange to have your chuck backplate indexed by a friend with a dividing head.

The tool is advanced about 2 thou per pass using the top slide and is moved along the job by using the lathe saddle traverse hand wheel. I found that plenty of cutting oil and a total depth of 15 thou gave a satisfactory result.

Having made the first groove, I moved the headstock round three teeth and repeated the process, until all the grooves were cut (**photos 21** and **22**). Although the whole process took about half an hour, I was interrupted, so I wrote myself a note to remind me of what I was doing, in order to avoid slip-ups when I returned (**photo 23**).

I was then able to remove a little more of the outside to make it comfortable to hold and remove any burrs made during the 'shaping' process and I then parted off the holder using the partly completed groove, reversed the holder in the chuck and faced off the back of it, finishing off with a small chamfer (**photos 24** and **25**).

●To be continued.



The work is transferred to the smaller lathe which has dividing facilities; here it is being centred in the four jaw chuck, which I chose to use to better hold the long overhangs.



This simple device, with the painted 60 tooth Bull Wheel, allows simple dividing, in this case 20 positions per revolution.



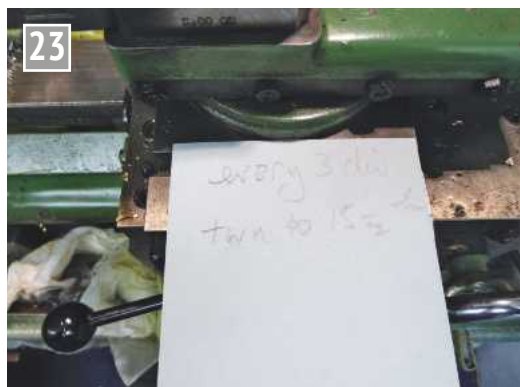
It is cut from 1/8 inch BMS plate and the part that enters the bull wheel, is shaped to fit the wheel's tooth.



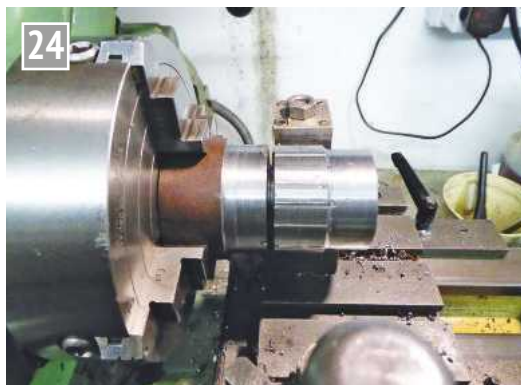
With a round nosed tool set at centre height, on its side and advanced about 2 thousands of an inch per cut, a groove is produced as a grip.



By keeping indexing round, an easy to hold grip is produced.



Bitter experience tells me that I will forget where I am on a task if I am called away, so, I write myself a note.



After a gentle skim to remove any burrs, I parted off the main holder, using the rear tool post and deepening the cut I made in the larger lathe.



With the job reversed in the three jaw chuck, the parted off face was cleaned up.

Ernie, the Apprentice Master!

Gordon Gurney recalls the man who taught him to pursue perfection.

In September 1960, at the age of 17, I embarked on a Mechanical Engineering apprenticeship with the War Office. This was at the Fighting Vehicles Research and Development Establishment (FVRDE) on Chobham Common near Chertsey. As my home was in Exeter, I was provided with accommodation at the YMCA apprentice hostel, attached to the Royal Aircraft Establishment, Farnborough. There were 250 apprentices in the hostel, which was basic to say the least. The worst aspect was the food and, in protest, some of the lads got hold of the cook's Lambretta scooter

Ernie commanded the respect of his young charges and in return he taught us the pursuit of perfection, in everything we attempted, and the patience needed to achieve it.

and somehow spirited it onto the flat roof some three stories up. It was reluctantly returned to mother earth, some days later, following dire threats from the Warden.

The hostel was about 20 miles from the FVRDE so each morning I waited outside, in the freezing cold, for an Army bus. This was an old Bedford with no heating, which crawled around the camps picking up Army blokes who also worked at the same place. This took the best part of an hour and, on arrival, it was a race through the factory to clock on by 8 o'clock – or else! From memory there were in the order of 1000



people who worked at the establishment, about half of which were civilians. We were issued with passes and were subject to the Official Secrets Act. All very exciting for a 17 year old who had never been away from home.

In common with many mechanical apprenticeships, the first six months were spent in the apprentice workshop. During this time, we were on probation to assess if we were suitable 'material'. Ernie Jordan was our Apprentice Master, all 6 foot 6 inches of him and an ex- REME Sergeant Major. On day one Ernie ('Sir' to us lesser mortals) handed each of the twelve 'recruits' a large lump of

mild steel and told us file it to a rectangular shape, a quarter of an inch thick, absolutely flat, square edged and to fixed dimensions. Having achieved this to Ernie's satisfaction, we then drilled five equally spaced holes along the centre line. These holes were then filed square to accept a half inch square plug which was also filed square and absolutely parallel along its length. The idea was that the plug should fit each hole precisely and should be a snug, sliding fit. Some latitude was made for the first couple of attempts but if, by hole five, this was not satisfactory - goodbye apprenticeship!

This was a demanding challenge for a young lad whose only previous workshop experience was in school metalwork lessons. My first attempt was decidedly slack and Ernie announced, in a loud voice, "Gurney has produced a S - - T fit; go and try harder lad", and I did. I didn't suffer nearly as much as one of our number, however, who had *almost* got the plug to fit in the first hole and, looking for a quick fix, banged it sharply on the bench to make it go in. This was not a good idea as it stuck firmly and resisted all attempts to free it. Ernie spotted these antics and removing the test piece from the said apprentice, ceremonially opened the window and chucked it out. Weeks of work gone West and a lot of time to catch up. These were hard lessons but they served to concentrate the mind no end.

There were lighter times in the 'Stalag'. For example, each day, two of us would be detailed to clean and polish the toilets and Ernie knew that one pair would take the opportunity to have a crafty fag. One day, when it was their turn, he produced a packet of cigarettes from his pocket and told them not to smoke in future but to show no hard feelings he would give them one last go. We were all quite staggered by Ernie's act of generosity, which was quite out of character. What they, and we, didn't know, was that Ernie had got hold of some display cigarettes, which were made entirely of filter tip material. The two 'victims', in their enthusiasm, failed to notice this and there followed loud coughings and splutterings from the toilets. Ernie was left in no doubt that his parentage was of an extremely doubtful nature!

I am sure that Ernie had played that trick many times before. During one of Ernie's frequent 'tool box talks' he told us that when he used to carry out depot inspections, during his service career, he always made an excuse to use the workshop toilet first.

Their state of cleanliness and maintenance would give him a good indication of what awaited him elsewhere. Applied psychology in action!

Ernie was a creature of habit, or so we thought, and every Thursday afternoon he would leave us for half an hour to take his Pools coupon to his mate on the other side of the site. He always went and returned by the same route so one week we decided to take a break in his absence. We used to get very weary standing at a bench for eight hours a day with only two short breaks and the half an hour for lunch – or, as we called it, dinner – in the canteen. Even a brief lean on the vice would incur Ernie's wrath. So we posted a lookout and relaxed, only to be caught red handed by Ernie, who had crept back by another route. He proceeded to point out the error of our ways, at

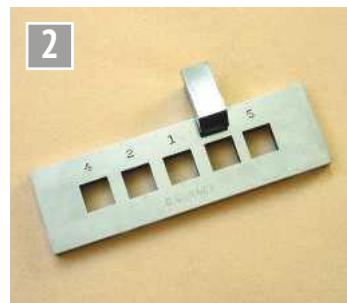
He said that I would draw on the experience, and the lessons learnt, and they would stand me in good stead in the future. I thought at the time it was a bit of old waffle, but how right he proved to be.

some considerable length and volume and we lost our breaks for a week. How he suspected what we were up to I shall never know but I suppose you didn't get to be an RSM without knowing what was going on behind your back!

I managed, together with the rest, to make a good enough job of the test piece and went on to make various tools, which would have culminated with the usual scribing block. I never got that far as, after five months, I had come to the conclusion that I may not achieve my ambition to become a design/draughtsman and there was a danger that I may end up stuck on the workshop floor. At six months I would have been required to sign up for the full five year term so I decided a change of direction was called for. I went for an interview

ADDENDUM

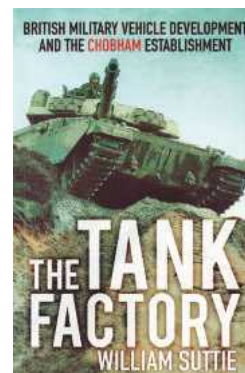
I recently came across a book called *The Tank Factory* (ref 1) by William Suttie. The book traces the history of the FVRDE and the development work carried out at Chobha, and I am sure that anyone with an interest in military vehicles would find it a fascinating read (usual disclaimer). On pages 95 to 97 is an account of the Apprentice Workshops, Ernie Jordan and a photograph of a test piece identical to mine. I was allowed to keep my test piece and I still have it in my possession 57 years on (photo 2), as a reminder of my time at Cobham!



with Devon County Council, with Ernie's knowledge and approval, and managed to get accepted as an Articled Pupil in the County Surveyor's Department. Unfortunately, the County Surveyor unexpectedly passed away on the very day I started; I hope my joining

I shall always be grateful for that experience of life and work at a young age and the important part that Ernie played. Ernie commanded the respect of his young charges and in return he taught us the pursuit of perfection, in everything we attempted, and the patience needed to achieve it. I have tried my best to apply this philosophy throughout my working life, with varying success, and to my life long interest in all things mechanical and in particular the production of several clocks (photo 1).

I have this recurring nightmare of arriving at the pearly gates (having passed the entry exam) and Ernie opening the door. He has a lump of mild steel in one hand and a file in the other. Oh no - here we go again ... I hope I am allowed the occasional lean on the vice this time! ME



REFERENCE

1. *The Tank Factory* by William Suttie. The History Press: ISBN 978 0 7509 6122 6

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



In April I had a night out with the IET in Barnsley. We visited the Astoria Centre, which is dedicated to cinema organs. They have a couple of Comptons, two Hammonds, valved and transistorised, and a Technics - very hi-tech but which many people thought sounded harsh. Too precise, technically wonderful but yet ... We had a tour of the Compton pipe chamber (photo 1) and a recital by Kevin Grunill, a renowned performer who has played for many years at Blackpool Tower ballroom, along with Phil Kelsall, the resident organist. Kevin finished with a medley of Blackpool Baroque. Well, 'Blackpool Art Deco' would be more appropriate but I know Art and he's not like that ... Anyway, moving swiftly on, I took along my digital voice recorder, an Olympus VN-7500; its sound quality isn't great - 200 to 8000 Hz overall - but I tried it out. Returning home, I plugged it into my Hi-fi amplifier (Earphone 'out' to Tape Deck 'in') and was rewarded with a passable recording. Not everyone likes these versatile instruments; one comment, not from those attending, was, 'dreadful cacophony'. However, as I have long harboured a liking for the King of Instruments, I found it fascinating, especially the playing technique known as 'waterfalling' and other ways of displaying the



Compton organ pipe chamber at the Astoria Centre.

abilities of the organ and its player. Compton organs are just like Wurlitzers but Mr. Wurlitzer got to the Patent Office first!

In this issue, several editors' pictures, the Ton, niggles, Azuma, an adolescent, the Coal Fairy, soft iron, maintaining dignity, a diorama?, Whitby Willie, a jig, dark skies and making a vice into a compound type.

Sheffield Society of Model & Experimental Engineers reminds us that their Open Weekend will be on 8/9th July; please advise Bob Potter or Pete Nash if you are bringing a locomotive. Saturday is for members and guests and Sunday is a free-for-all. W. www.sheffieldmodelengineers.com bobpotter53@hotmail.com or Pete Nash on 2300rocketman@gmail.com or 07855 502 513

The Link, April, from the **Model Engineers' Society (NI)** reports much Civil Engineering, pre-mixed concrete, 10 tonnes of stone, level crossing gates mounted, etc. Young Ryan drove the works train transporting tools and materials. Davy has built a diesel-outline shunter, wittily named *Maid of Scrap* (photo 2). Their completed level crossing gates look very fine (photo 3). W. www.mesni.co.uk

The Blower, March, from **Grimsby & Cleethorpes Model Engineering Society**, tells us that their only Life Member, Mr. Lingard, is approaching 'the Ton', as *Tornado* did on 12th April, sort of ... Several members visited the National Coal Mining Museum at Caphouse Colliery, Wakefield. I went some years ago and was impressed by the steam winding engine, which works in parallel with an electric one; a



Davy Edgar's *Maid of Scrap* at MESNI. (Photo courtesy of Editor, Terence Aston.)



Level Crossing gates by Derek Thompson at MESNI. (Photo courtesy of Editor, Terence Aston.)

good safety feature for visitors to contemplate. There is also a drift by which to walk out if required. Young Jacob Burton (son of Tom) has taken an interest in the club and attends frequently. He is keen to help and the members have been very good with him, if their patience has occasionally been tested! (Good wishes all round, here - Geoff.)

W. www.gcmes.org.uk

Derby Society of Model & Experimental Engineers announce a 'Niggles' rally. (Narrow Industrial Gauge Ground Level Engine Society) on 5/6th August. 1600 feet of 3½ and 5 inch gauge track. See the website for details; prior booking is essential.

W. www.derbysmee.co.uk

Stamford Model Engineering Society's March newsletter mentions the new Virgin 'Azuma', spotted on the ECML by Editor, Joe Dobson. Likewise, Great Northern trains are about to introduce ETCS, which will help to make trains completely automatic. They can run closer together, which increases capacity and speeds. A very different sort of model is by John and Mrs. John, who have produced an automaton doll, *Jane*, having nine independent movements and two dependent ones. Movement is by cams, levers and nylon strings (levers & strings, Yeah! - The Searchers, 1963). The eyes are tricky, as they must be independent of the head movements. *Jane* stands on a musical box operated by punched paper tape. Conceived about 12 years ago, she is a work in progress. (Just wait a few years, she will be completely independent, whether you like it or not! - Geoff.)

York City & District Model Engineers' second 'March' (April?) edition of *York Model Engineer* contains a useful summary of safe habits and practices in the workshop, by Tony Simons. Much is laid at the door of H&S, often without justification, but safe activity with things that can kill - flying chuck keys, for instance - is never wasted. Richard Gibbon



Ian Marsh's launch The Duke at Otago. (Photo courtesy of Editor, Lachlan Clark.)

wishes to relinquish the post of 'Coal Fairy' (akin to the Tooth Fairy, Sock Fairy, etc., who ensure our lives run smoothly by arranging for coal, coins exchanged for milk teeth, socks etc. to be magically available when required). The vagaries of coal merchants are often at odds with those of credit card companies, leading to him waiting at the club track for a delivery, whilst a tonne of 'best nuts' was innocently left on his house driveway... Beautifully stacked, it must be said! A Family Fun Day on Easter Sunday contains some good ideas; Rocket Launching, drive a train, a shunting competition, Lego construction and 'Build a Truck'. If your built truck will run on the Garden Railway, okay, you can keep it!

W. www.yorksme.org.uk

Model & Experimental Engineers Auckland, March newsletter has an interesting device made for a croquet club by Rodger Lane, in order to paint white lines on the grass. The trolley is guided by the beam of a small laser diode set up at the destination, the light from which impinges on a translucent sheet of Corflute (corrugated polypropylene sheet) marked with guidelines so the operator can keep the machine on track. Much better than following a string line! Murray Lane is building a Eureka electric clock. For

this he needed some soft iron. Now, at one time, this material was commonly available and cheap (the Eiffel Tower but NOT the Forth Bridge - which was the first to be built in steel). Nowadays it is neither common nor cheap, costing £8 per inch for ½ x ¼ inch bar (a tenth of this price in the UK). A magazine article proposed dismantling old Post Office relays but this has other problems. Just don't go taking your tinsnips to your local bridge!

Otago Model Engineering Society's *Conrod* for March bears on the cover a good photo of a high speed launch, *The Duke*, complete with two crew, both in lifejackets. Were it not for the small wake, I would have taken it for real (photo 4). Built by Ian Marsh, it is a 1200mm, quarter-scale model of his family waterjet boat, powered by a 30cc water-cooled two-stroke engine. Marlborough Society have extended their track and it is now the longest in NZ (by about 500mm). Tether cars were raced in Festival Week, which resulted in Murray Wright beating 'The Ton', with 162.7 K/h but Stu Holdaway created a new club record with 178.82 K/h. A Health & Safety report shows a ladder being supported on a staircase by a length of wood held on with mole grip welding clamps. (Cringe!)

W. www.omes.org.nz

Offcuts, March, from **Bromsgrove Society of Model Engineers** features a history of the Garden Railway, written by Keith Bucklitch, to celebrate its 25th Birthday. Dave Fort has solved 'Un petit problème' by not using sleepered track where his garden railway crosses some decking. Whilst the sight of his glamorous assistant going 'base over apex' may be initially mirth-inducing, the inevitable retribution would be most painful. He has used aluminium strip, 12 x 3mm, screwed down flat to the wood, causing little distress to pedestrians yet permitting the passage of trains. A seasonal addition to the newsletter masthead reminds me of Lonnie Donegan's famous ballad, *Seven Daffodils*.

W. www.bromsgrovesme.co.uk

Portarlinton Bayside Miniature Railway were having a AU\$2 Easter! Everything - train rides, food, ice creams, tea, coffee - \$2, said a Press Release.

W. www.miniaturerailway.com.au

Bradford Model Engineering Society's *Monthly Bulletin* for April, contains a report from David and Mary Jackson about the Manchester MEX (in Oldham) which he was somewhat apprehensive about attending due to the unpredictability of traffic on the M62. As it happened, this was not the problem but as

the report was being prepared, local radio was reporting a Blackpool tram on a low-loader approaching Skipton on the A59 which may have been! Also, the Northern Mill Engine Society's Bolton Steam Museum is having an Open Weekend on 30 April and a few members are planning to go together. Planning for Doncaster Model Engineering Exhibition is well under way and Graham Astbury's first attempt at 'editing' has been successfully accomplished. Well done!

W. www.bradfordmes.co.uk

Ryedale Society of Model Engineers' Monthly Newsheet, March, reports an excellent Open Day with glorious sunshine and a Night Run, which was most enjoyable, especially when the stars came out. North Yorkshire has some VERY dark skies! Nick Harrison, Nottingham SMEE Chairman, said to Ryedale's Editor, Bill Putman, as they waited on their locomotives for the 'right away', "If there was a definition of a perfect day, this is it"

W. www.rsme.org.uk

PEEMS Newsletter, from **Pickering Experimental Engineering and Model Society** had a 'Bring & Brag' evening in which Peter Bramley brought a precision pillar drill, modified from a fruit squasher, with parts 'found underfoot' at Grosmont railway station. Ted Fletcher made a disc type angle plate adaptor for his angle vice (I've got one of those vices) enabling the

cutting of compound angles. (Hmmm ... thinks, must investigate). Mel Doran made a Stirling Engine from a beer can and bits. The only cost was £2 for the lager!

W. www.nrmodeltruck.co.uk/peems.html

Steam Chest, April, from the **National 2 1/2 inch gauge Association** starts with a picture of *Little Toot* at the Whangaparaoa Railway in NZ. My first reaction was 'What a well-made diorama' as it looks much bigger. However, it is all a blind, since it is much bigger, being 15 inch gauge and fitting the driver in the cab (**photo 5**). Dave Batty's son has acquired an 'LBSC', 'Austere Ada' from a neighbour. Built in 1952 she still runs, after receiving a new connecting rod and a few extras such as cowcatcher and headlamp will complete her. She is in the livery of the Hong Kong and Kowloon Railway, British Section. Terry Neale has made a 'Whitby Willie', which used to run around guess where? NER Class W, they became LNER A6. Dating from 1907, originally as 4-6-0T, they were converted to 4-6-2T to carry more coal. (No jokes about Bram Stoker, please!) Terry's model is quite freelance in that it uses Netta, Mary Ann, Ayesha and Dyak components. His own design of slip eccentric uses one crank web as an eccentric, saving space. Editor, Cedric Norman begins a series on starting a workshop and Steve Eaton tells the story of his 'Toby' design, whilst William



Little Toot at Wikikamucau, from Steam Chest. (Photo courtesy of Editor, Cedric Norman.)

Powell tries PEEK in place of graphite string packing on pistons. Inchanga discusses the differences between slot drills and end mills.

W. www.n25ga.org

Bristol Society of Model & Experimental Engineers' The Bristol Model Engineer, Spring, has Chairman, Norman Rogers noting that it is 50 years since LBSC - aka 'Curly' Lawrence - died. There can't be many in the fraternity who have not heard of this practical model engineer, who designed many locomotives and made us aware that we could build them 'at home'. Robert Postlethwaite has acquired some Coventry die heads, and, knowing nothing about them, tried them out on his lathe. He was quite pleased with the results and invites further information. Dave Hockin made a camera tripod many years ago, from scrap wood, which is still serviceable. He has more recently made a camera flash ring using LEDs from a torch. He began taking photographs with a 1/4 plate camera, when you had to think before pressing the shutter. Now, when they are essentially free, people take shots willy-nilly. (I recall that Bishop Eric Treacy favoured a plate camera for many years, using a wire frame viewfinder, which allowed you to see what was 'out of shot', as well as in the frame; an aid to composition, he said - Geoff.) Bruno Taylor uses a simple

locomotive rollover jig, not his idea but 'seen somewhere'. Two octagons of plywood which bolt to the ends of the model, allowing you to easily work on the underside without making a large steel cradle and they store away, flat, when not in use. They have coped with a 5 inch gauge Boxhill, a Princess Marina and a Maisie (**photo 6**). An electronics night explained microprocessors, logic systems in signalling, power FETs and printed circuit boards. (I was talking recently to a signalling engineer who told me that nowadays, new recruits to S&T have no concept of interlocking, so they are taken to a preserved signal box to inspect the mechanical system under the lever frame and they then go to a power box to see the electrical equivalent. Only afterwards do they get to grips with computerised systems - Geoff.)

W. www.bristolmodelengineers.co.uk

And finally, Father, to friend: 'I have four sons, A Mechanical Engineer, a Chemical Engineer, a Civil Engineer and a thief.'

'Why don't you throw the last out?'

'He's the only one bringing home any money!'



Bruno's Octagonal locomotive stand, Bristol. (Photo courtesy of Bruno Taylor.)

Contact:
geofftheasby@gmail.com

JUNE

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|---|--|--|---|
| <p>5 Lancaster & Morecambe MES. Informal meeting. (Public running every Sunday.) Contact Mike Glegg: 01995 606767.</p> <p>5 Peterborough SME. Bits & Pieces. Contact Terry Midgley: 01733 348385.</p> <p>6 South Cheshire MES. Nigel Breeze: An 8F Miscellany. Contact Stuart Daw: 01782 767587.</p> <p>7 Bristol SMEE. Colin Maggs: The Bristol to Frome Line. Contact Dave Gray: 01275 857746.</p> <p>7 Chesterfield & District MES. Club running day. Contact Ian Blackburn: 01909 562458.</p> <p>8 Sutton MEC. David Moore: Signalling on the London Underground. Contact Jo Milan: 01737 352686.</p> <p>10/11 Cardiff MES. Welsh Locomotive Rally. Contact Rob Matthews: 02920 255000.</p> <p>8 Worthing & District SME. Meeting - Bits & pieces. Contact Ian Aitken: 07500 611166.</p> <p>10 Nottingham SMEE. English Electrics Day. Contact Pete Towle: 0115 987 9865.</p> <p>11 Bedford MES. Public running. Contact 07498 869902.</p> <p>11 Grimsby & Cleethorpes MES. Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.</p> <p>11 Sutton MEC. Afternoon running from noon. Contact Jo Milan: 01737 352686.</p> | <p>11 Westland & Yeovil DMES. Track running day, 11am - 4.30pm. Contact Bob Perkins: 07984 931 993.</p> <p>11 Wolverhampton DMES. Public running at Baggeridge Min. Rly. 1 - 5pm. Contact Ian Priest: 01384 287571.</p> <p>11 Worthing & District SME. Public running, 2 - 5pm. Contact Ian Aitken: 07500 611166.</p> <p>12 Leeds SMEE. Public Running at Eggborough Track from 10am. Contact Geoff Shackleton: 01977 798138.</p> <p>14 St. Albans DMES. Club Auction (Peter Haycock). Contact Roy Verden: 01923 220590.</p> <p>15 Sutton MEC. New driver training from 18.30. Contact Jo Milan: 01737 352686.</p> <p>16 Rochdale SMEE. General Meeting Castleton Community Centre, Rochdale. 7pm. Contact Len Uff: 0161 928 5012.</p> <p>16 Stockport DSME. Track night. Contact Dave Waggett: 0161 430 8963.</p> <p>17/18 Saffron Walden DSME. Running for Father's Day weekend. Contact Jack Setterfield: 01843 852165.</p> <p>18 Chichester DSME. 'Steam on Sunday' at the Blackberry Lane track. 2pm - 5pm. Contact Ben Ernshaw-Mansell: 01243 773451.</p> <p>18 Grimsby & Cleethorpes MES. Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.</p> | <p>18 NW Leicestershire SME. Public running 12 noon to 4pm. Contact Den Swain: 01530 412048.</p> <p>18 Plymouth MSLS. Public running at Goodwin Park. Contact Malcolm Preen: 01752 778083.</p> <p>18 Rugby MES. Public running at Rainsbrook Valley Rly., 2pm - 5pm. Contact Ken Eyre: 01788 842709.</p> <p>18 Tiverton & District MES. Running Day at Rackenford track. Contact Bob Evenett: 01884 252691.</p> <p>18 Welling DMES. Public Running 2 - 5pm. (Behind Falconwood Elec Sub stn.) Contact Martin Thompson: 01689 851413.</p> <p>18 Wolverhampton DMES. Public running at Baggeridge Min. Rly. 1 - 5pm. Contact Ian Priest: 01384 287571.</p> <p>19 Peterborough SME. Peter Jackson: Visit to Fenland Light Railway. Contact Terry Midgley: 01733 348385.</p> <p>20 Chesterfield & District MES. Meeting: T.B.C. Contact Ian Blackburn: 01909 562458.</p> <p>20 Grimsby & Cleethorpes MES. General monthly meeting, 7.30pm. Contact Dave Smith: 01507 605901.</p> <p>20 Model Steam Road Vehicle Soc. Club meeting. Bob Smith: Cotton Motorcycles. Village Hall, Longford, Gloucester. Contact Richard England: 01452617057. www.msrvs.co.uk</p> | <p>20 Nottingham SMEE. Midsummer steam up from 6pm. Contact Pete Towle: 0115 987 9865.</p> <p>21 Bristol SMEE. Midsummer Mayhem from 2pm. Contact Dave Gray: 01275 857746.</p> <p>21 Leeds SMEE. Mid-summer Steam-up. 12.30 until late. Contact Geoff Shackleton: 01977 798138.</p> <p>21 Salisbury DMES. Clive Grisdale: Gunsmithing. Contact Jonathan Maxwell: 01722 320848.</p> <p>23 Worthing & District SME. Steam up and fish & chips evening. Contact Ian Aitken: 07500 611166.</p> <p>24 Chesterfield & District MES. Club running day. Contact Ian Blackburn: 01909 562458.</p> <p>24/25 Model Steam Road Vehicle Soc. MSRVs Club Rally, Tewkesbury. Contact Richard England: 01452617057. www.msrvs.co.uk</p> <p>25 Bedford MES. Public running. Contact 07498 869902.</p> <p>25 Cardiff MES. Public running at Heath Park. 1 - 5pm. Contact Rob Matthews: 02920 255000.</p> <p>25 Chesterfield & District MES. Public Running, 12 noon - 4pm. Contact Ian Blackburn: 01909 562458.</p> <p>25 Grimsby & Cleethorpes MES. Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.</p> |
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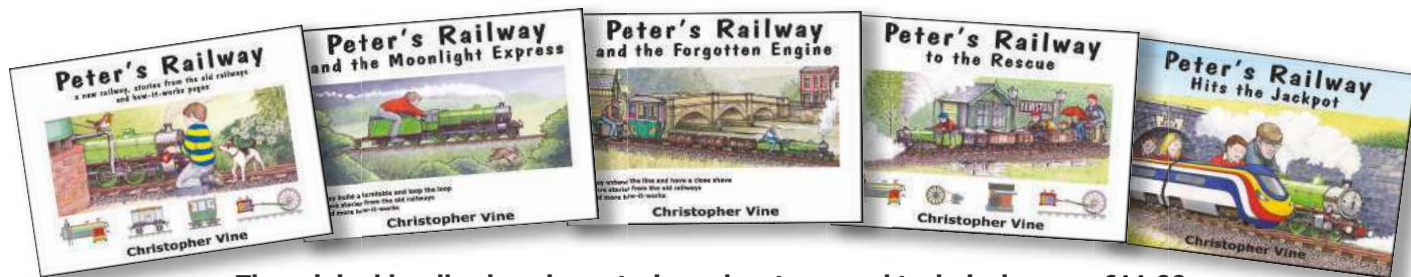
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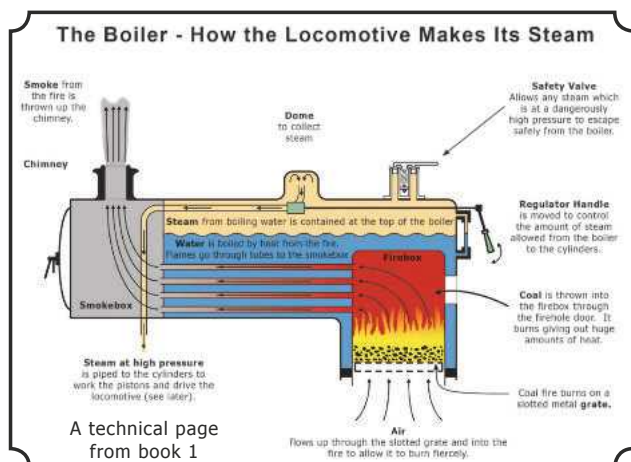
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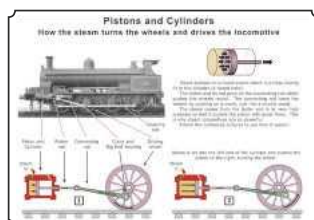
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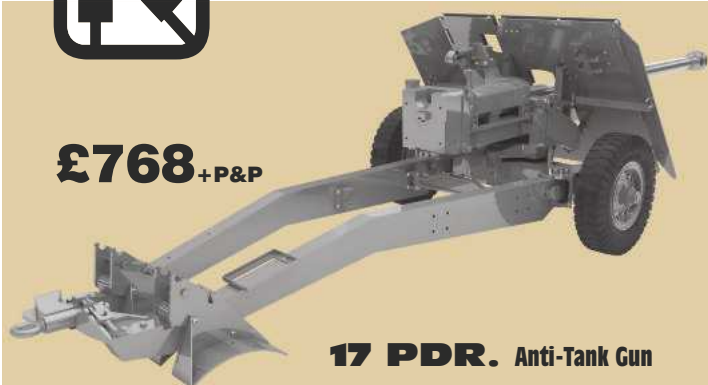
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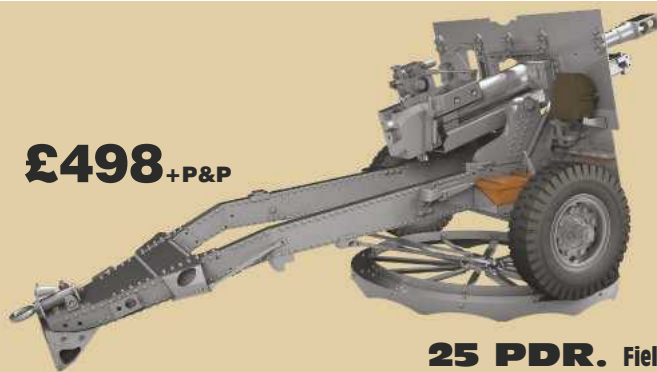
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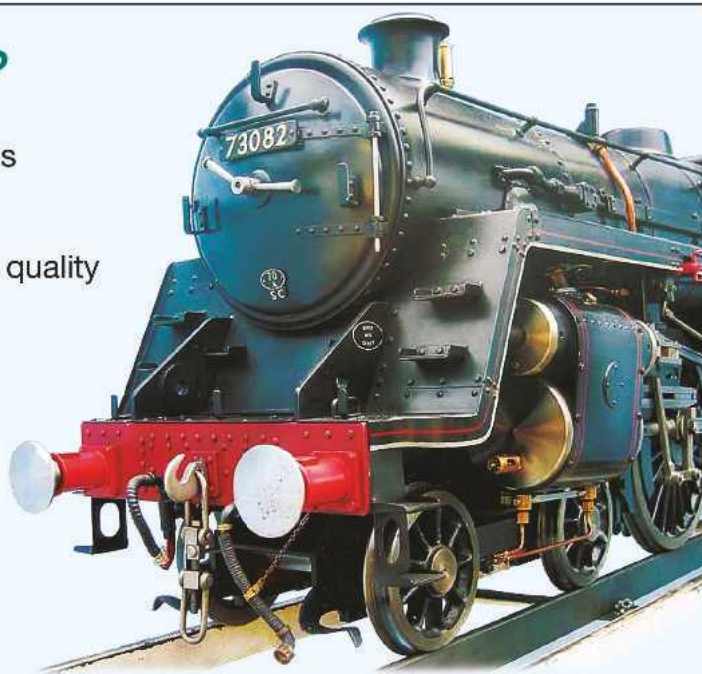
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