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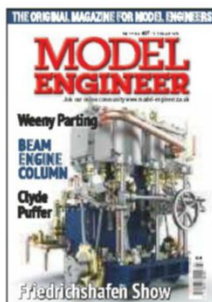
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A rendered image of David Milway's 3D model of a two cylinder compound condensing engine, published by Model Engineer in March 1923, generated by the Alibre 3D design package (photograph used by kind permission of Alibre).



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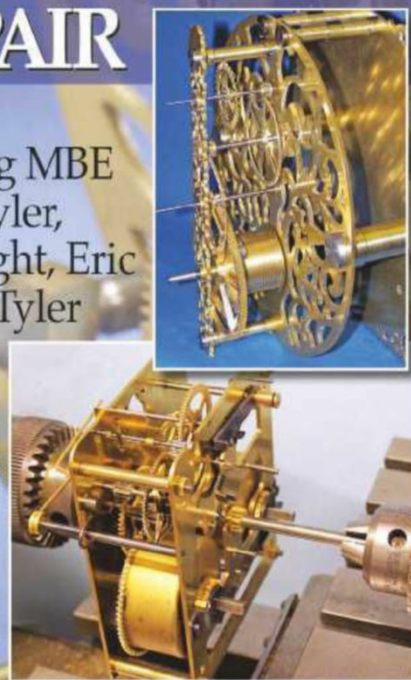
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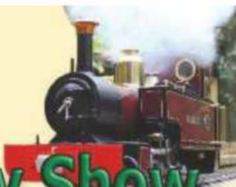
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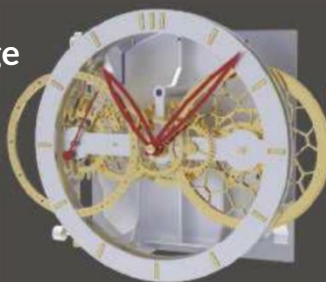
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YVETTE
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Designer

Model Engineer Competition

Most of you will be aware that there hasn't been a Model Engineer Exhibition since the show at Brooklands in 2016. I'm sorry to say that it's unlikely that we can run the exhibition in the immediate future. We do not wish though to deprive our readers of the Model Engineer Competition, which was a major feature of the exhibition, for longer than necessary.

I'm very pleased to say that the competition will now feature at the National Model Engineering Exhibition held at Doncaster. Mr Lou Rex, proprietor and organiser of the exhibition, has kindly agreed to host the competition and the Society of Model and Experimental Engineers (SMEE) has nobly taken on the task of organising it. Just as in previous competitions, Gold, Silver or Bronze medals will be awarded or certificates for Very Highly Commended, Highly Commended or Commended. The usual trophies may also be awarded and these are listed in the table.

The re-establishment of the competition is good news for *Model Engineer*, for the hobby and for the Doncaster show, which takes place at the Doncaster racecourse from the 10th to the 12th of May.

Now is the time to consider entering for the competition, as the deadline for entries is the 10th of April. An entry form and a copy of the rules are provided on the next two pages. There must be plenty of models out there that deserve a medal or a certificate, or a chance to win one of these iconic trophies, so let's get the reintroduction of the Model Engineer Competition off to a good start!

Martin Evans can be contacted on the mobile number or email below and would be delighted to receive your contributions, in the form of items of correspondence, comment or articles.

07710-192953

mrevans@cantab.net

Duke of Edinburgh Challenge Trophy	Entries for this Championship Award are eligible only after having gained a Gold or Silver Medal in a previous Model Engineer Competition
Bradbury-Winter Memorial Challenge Cup	Awarded for the most outstanding example of amateur mechanical craftsmanship
Barry Jordan Trophy (Doncaster Award)	Awarded for the Best in Show other than the winner of the Duke of Edinburgh Challenge Trophy
Junior Trophy	Awarded for the best work from a model engineer under the age of 18 years at the time of entry
Precision Paints Trophy (Doncaster Award)	Awarded for the model with the best finish
Bill Hughes Cup	Awarded for the best steam powered model
Aveling-Barford Trophy	Awarded for the best working model traction engine, road roller or steam wagon
Bowyer-Lowe Challenge Cup	Awarded for the best example of amateur craftsmanship and design of tool or workshop appliance
Claude B. Reeve Memorial Trophy	Awarded for the best horological entry
Crebbin Memorial Cup	Awarded for the best locomotive, example of general engineering or mechanically propelled road vehicle
Earl Mountbatten of Burma Trophy	Awarded for the best Naval entry
Edgar Westbury Memorial Trophy	Awarded for originality and soundness of design of any type of prime mover, working marine plant or fidelity to prototype of a working model I.C. engine
H.V. Evans Trophy	Awarded for research and/or presentation of a model ship
J.N. Maskelyne Memorial Trophy	Awarded for the model locomotive in any scale which does most to promote fidelity of design
John Thompson Trophy	Awarded for the best model horse drawn vehicle, wagon, cart, farm implement or caravan
Maritime Trust Award	Awarded for the best model of any full size extant restored or museum ship or boat, e.g. <i>Cutty Sark</i> , <i>Warrior</i> , <i>Belfast</i> , <i>Constitution</i> , etc.
Model Boat Kit Class Trophy	Awarded for the best entry in the class
New Zealand Cup	Awarded for the best locomotive based on a design by LBSC
R.N.L.I. Model Lifeboat Trophy	Awarded for the best model of any prototype whose main function is the saving of life
Tom Nevins Memorial Trophy	Awarded for the best model reciprocating stationary or marine steam engine
Club Trophy (Doncaster Award)	Awarded for the best model engineering society stand
Ship Model Society Trophy	Awarded for the best model marine society stand
Polly Model Engineering Ltd. Award	Awarded for the best example of a kit built model steam locomotive
Raymond McMahon Trophy (Doncaster Award)	Awarded for the best road vehicle in steam


10-12 May 2019
**Doncaster Model
Engineer Exhibition**

OFFICE USE ONLY

Please return completed form by Wednesday 10th April 2019 to:

Mr Mike Law, 12 Maple Drive, Elkesley, Retford, Notts DN22 8AX

Email: post@michaellaw.co.uk

Entries may be returned by either post or email but in order to reduce costs, the organisers would prefer to correspond by email.

CLASS	ENTRY NO.

ENTRY FORM COMPETITION & LOAN MODELS
PERSONAL DETAILS (Please print)

Surname _____ Forename(s) _____ Age _____

Address _____

_____ Post Code _____ Email _____

Home Tel No _____ Daytime Tel No _____

Model Club or Association _____

How many years have you been a modeller? _____

MODEL DETAILS – PLEASE TICK BOX IF MODEL IS FOR LOAN ☐

Entry Class (see overleaf for competition rules and categories) _____

Model Title (to be used for catalogue and display card) _____

Model Description (to be used for catalogue and display card) _____

Model Scale _____ Length _____ Width _____ Height _____ Weight _____

Type of construction _____

Parts not made by you and commercial items _____

Please supply a photograph of the finished model for insurance purposes. (Please note: It may not be possible to provide insurance for models entered later than 10th April 2019.)

 Are you supplying Judges Notes? Yes ☐ No ☐

Value of Model (the organisers will not insure the model unless a realistic value is entered) £ _____

I have read the rules and conditions of entry and confirm the information is correct to my knowledge and I accept the conditions of entry.

Signature _____

 Information about entries included on or with this form may appear in MyTimeMedia publications and on the exhibition organiser's websites.
Other than entrant's name, no personal information will be published.

**PHOTOCOPIES OF THIS
FORM ARE ACCEPTABLE**

To help you get the best from The Model Engineer Competition

These notes are written purely for guidance. Full information is contained in the Competitors' Information booklet which is sent to every entrant as part of the information package. If you have an item and are unsure as to the Class into which it should be entered, leave that section blank and we will take care of it. The Judges have the right to move any competition exhibit into another class if they feel that by doing so its chances of gaining higher marks or a more appropriate award are improved.

If the item is offered as a Loan exhibit please indicate this by writing Loan on the form in the box identifying the Class. Loan models are not judged but carry all other privileges associated with competition entries.

Part built models are particularly welcome in the Loan Section: visitors like to see work in progress, and entry does not preclude the item being entered in competition when completed.

The classes listed below are those associated with mainstream model engineering.

Engineering Section

- A1 Hot air engines.
- A2 General engineering models (including stationary and marine engines),
- A3 Internal combustion engines.
- A4 Mechanical propelled road vehicles (including tractors).
- A5 Tools and workshop appliances.
- A6 Horological, scientific and optical apparatus.
- A7 General engineering exhibits - not covered by the above

Railway Section

- B1 Working steam locomotives 1in. scale and over.
- B2 Working steam locomotives under 1in. scale.
- B3 Locomotives of any scale, experimental, freelance or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
- B4 Scratch built model locomotives of any scale, not covered by classes B1, B2, B3, including working models of non-steam, electric or clockwork powered steam prototypes.
- B5 Scratch built model locomotives gauge 1 (10mm scale and under.
- B6 Kit built model locomotives gauge 1 (10mm scale) and under.
- B7 Scratch built rolling stock, gauge 1 (10mm scale) and under.
- B8 Kit built rolling stock, gauge 1 (10mm scale) and under.
- B9 Passenger or goods rolling stock, over 1in scale
- B10 Passenger or goods rolling stock, under 1in scale.
- B11 Railway buildings and lineside accessories to any recognised model railway scale.
- B12 Tramway vehicles.
- B-K1 Working steam locomotives built from a kit.
- BK2 Working locomotives other than steam powered. (Any model locomotive in class B-K1 and 2, built from a commercial kit, entered into these classes will not be judged in the medal classes but can receive commended certificates and an award from a trade supplier).

Marine Models

- C1 Working scale models of powered vessels (from any period). Scale 1:1 to 1:48
- C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384
- C3 Non-working scale models (from any period). Scale 1:1 to 1:48
- C4 Non-working scale models (from any period). Scale 1:49 to 1:384
- C5 Sailing ships and oared vessels of any period - working.
- C6 Sailing ships and oared vessels of any period - nonworking.

- C7 Non-scale powered functional models including hydroplanes.
- C8 Miniatures. Length of hull not to exceed 15in for 1:32 scale, 12in for 1:25 scale. 10in for 1:16 scale: 9in for 1:8 scale. No limit for smaller scales.
- C9 For any model boat built from a commercial kit. Before acceptance in this class the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.

Scale Aircraft Section

- D1 Scale radio control flying models
- D2 Scale flying control-line and free flight
- D3 Scale non-flying models. including kit and scratch-built
- D4 Scale flying radio controlled helicopters

Model Horse Drawn Vehicle Section

- G1 Carriages & other sprung vehicles. (Omnibuses, trade vans etc.) Wagons, carts and farm implements. Caravans.

Junior Section

- J1 For any type of model, mechanical or engineering work, by an under 14 year old.
- J2 For any type of model, mechanical or engineering work, by a 14-16 year old.
- J3 For any type of model, mechanical or engineering work. by a 16- 18 year old.

All entries will be judged for standard of craftsmanship, regardless of the modelling discipline. i.e. a boat will not be competing against a military figure. Providing a model attains sufficient marks it will be awarded a gold, silver or bronze medal.

Model Vehicle Section

- K1 Non-working cars, including small commercial vehicles (e.g. Ford Transit) all scales down to 1:42.
- K2 Non-working trucks, articulated tractor and trailer units, plus other large commercial vehicles based on truck-type chassis, all scales down to 1:42.
- K3 Non-working motor bikes, including push bikes, all scales down to 1:42.
- K4 Non-working emergency vehicles, fire, police and ambulance, all scales down to 1:42.
- K5 Non-working vehicles including small commercial vehicles (e.g. Ford Transit.) scale from 1:43 or smaller.
- K6 Any available body shells in any scale or material, to be judged on appearance only.
- K7 Functional model cars/vehicles which must be able to move under their own power of any type. Can be either free-running, tethered, radio controlled or slot car, but must represent a reasonable full size replica.

DUKE OF EDINBURGH CHALLENGE TROPHY Rules and Particulars

The Duke of Edinburgh Challenge Trophy is awarded to the winner of the Championship Award at the Model Engineer Competition.

The trophy remains at all times the property of MyTimeMedia Ltd.

Any piece of model engineering work will be eligible for this Championship Award after it has been awarded a Gold or Silver medal at The Model Engineer Competition.

A model may be entered more than once but if the model wins it will be permanently retired.

Competitors must state on the entry form:

- (a) That exhibits are their own bona-fide work.
- (b) Any parts or kits which were purchased or were not the outcome of their own work,
- (c) That the model has not been structurally altered since winning the qualifying award.

COMPETITION RULES

1. Each entry shall be made separately on the official form and every question must be answered.
2. Competition Application Forms must be received by the stated closing date. LATE ENTRIES WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE ORGANISERS.
3. Competitors must state on their form the following:
 - (a) Insured value of their model.
 - (b) The exhibit is their own work and property.
 - (c) Parts or kits purchased.
 - (d) Parts not the outcome of their own work.
 - (e) The origin of the design, in the case of a model that has been made by more than one person.

NOTE: Entry in the competition can only be made by one of the parties and only their work will be eligible for judging.

4. A junior shall mean a person under 18 years of age on December 31st in the year of entry.
5. Past Gold and Silver award winners at any previous Model Engineer competitions are eligible to re-enter their model for 'The Duke of Edinburgh Challenge Trophy'.
6. Past Winners of an award at any previous Model Engineering Competition will not be eligible for re-entry unless substantially altered.
7. Previous entrants in 'The Duke of Edinburgh Challenge Trophy' may re-enter as long as they have not been previously awarded the Trophy.
8. The Competition organisers reserve the right to: (a) Transfer an entry to a more appropriate class, (b) Describe and photograph any models entered for competition or display and to make use of any such photographs and descriptions in any way they may think fit (c) Refuse any entry or model on arrival at the exhibition and not furnish a reason for doing so
9. Entry into the competition sections is not permitted by:
 - (a) Professional model makers,
 - (b) Anyone who has a financial interest in the direct supply of materials and designs to the public.

NOTE: If unsure, please contact the Competition organisers prior to the show.

10. The Judges' decision is final. All awards are at the discretion of the judges and no correspondence regarding the awards will be entered into.
11. Exhibitors must present their model receipt for all models collected at the end of the exhibition and sign as retrieved.
12. The signed release for each model must be presented to security staff when leaving the exhibition complex with display model(s) after the close of the exhibition.

IMPORTANT NOTE: PLEASE MAKE COPIES, INCLUDING PHOTOGRAPHS, OF ALL INFORMATION RELATING TO YOUR MODEL, AS THE ORGANISERS WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE: 10 APRIL 2019

Faszination Modellbau Friedrichshafen 2018

PART 1

John Arrowsmith takes a trip to Friedrichshafen to take a look at a vast display of model engineering.



This large German Model Engineering and Modelling Exhibition was held over four days at the Messe Friedrichshafen from the 1st to the 4th November. Where is Friedrichshafen? - it is located in Southern Germany right on the border between Switzerland and Austria on Lake Constance.

When I say 'large' I mean large. For those of you who know Alexandra Palace imagine seven halls each of that size or larger and they are all full of the greatest variety of modelling you can imagine. Included in this vast space was an indoor flying arena which was about 50 metres square, a boating pool about 80 metres square and 1 metre deep, a model radio controlled road vehicle arena where over 90 tons of soil had been prepared, along with a complete indoor car racing circuit which took up one hall, and a drone racing hall of the same size. Outside, there was another model boating lake for the really high speed craft to show off their paces accompanied by the outdoor



One of the twin Vee double acting cylinders attached to the rear wheel on the right-hand side of the Class 19 locomotive.



The unique Henschel 2-8-2 Class 19 locomotive in 5 inch gauge.

flying area which was located next to the Zeppelin Museum. The 7¼ inch gauge railway was also located outside in another large space adjacent to the jalopy racing circuit.

The organisers told me that attendance over the four days was about 53,000 people, which was a record for them at this show and that takes some organisation, with all the parking, public transport, ticketing and the multitude of different food outlets arranged around all the halls.

So what was there, and was it interesting for UK visitors? To be honest I was a little disappointed with - as we would call it in the UK - the true model engineering aspect of the exhibition. Yes, there were lots of steam and mechanical models on show, but the large-scale steam locomotives and traction engines that used to be the norm at Sinsheim were not there in any great numbers. However, this did not detract too much from the overall exhibition presentation as there was so much else to see.

In the engineering hall there was a good selection of smaller steam models with some 5 inch

gauge locomotives making a useful addition to the whole presentation. The streamlined Deutsche Reichsbahn Railroad Henschel No. 19-10 2-8-2, (photos 1 and 2), the original of which was built in 1941, was a very interesting and unique model. It was so unlike any other steam locomotive of its type. A few technical details of the full-size engine; the front bogie and front wheel set formed a Krauss-Helmholtz steering rack which gave a side movement of 95mm. The remaining driving wheels were fixed as on a normal locomotive. The rear Bisselachse bogie has a 65mm side play. The driving axles are not coupled to each other because each pair of wheels had a steam engine arranged unilaterally outside the wheel plane with two double acting V - shaped cylinders in a 90 degree configuration. To distribute the weight evenly, these cylinders were mounted on wheels 1 and 3 on the left hand side and 2 and 4 on the right hand side. These cylinders were connected to the wheels via crossheads and Siemens Pawelka articulated couplings ➤



This little 0-6-0 Class 89 locomotive was built in 5 inch gauge by Magnus Altherr.



The 7 1/4 inch gauge passenger railway on the outside display area.

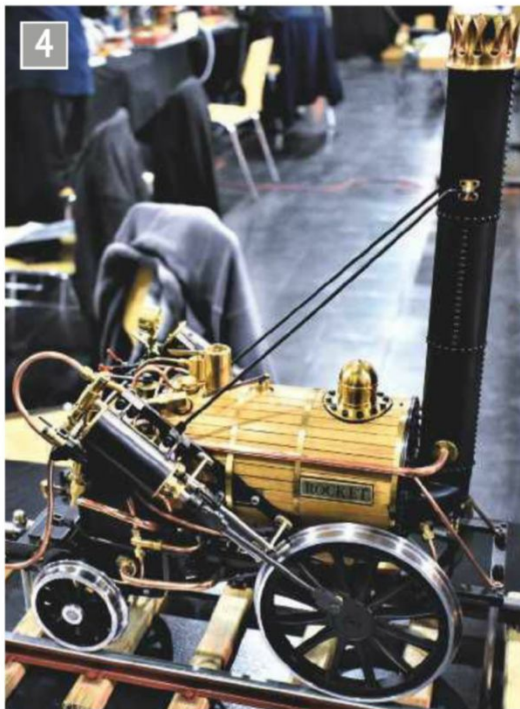


A well made Lantz Tractor in 1:4.5 scale.



A nice little rail mounted Lantz tractor and trailer.

This little potato masher was powered by a hot air engine.



This 5 inch gauge model of Stephenson's Rocket was nicely made and detailed.



This little track based Lantz tractor was well made and finished.



and a crankshaft mounted on the chassis. There were three types of lubrication on the engine: a gear pressure pump, a Bosch pump for the pistons and slide ways and spin lubrication for all other surfaces. As I said above, a unique locomotive.

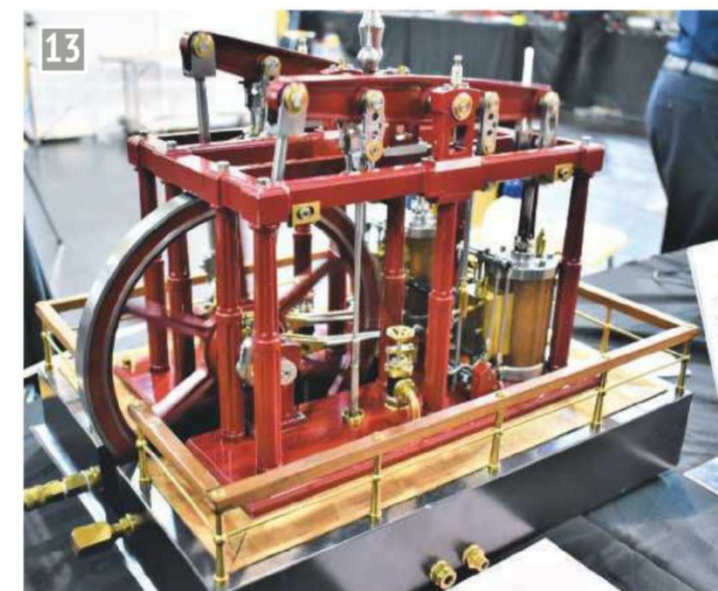
Another 5 inch gauge locomotive, the little Class 89 0-6-0 (**photo 3**) was built by Magnus Altherr in 1:11 scale and was an example of a typical German designed small tank locomotive. Well made, but it was a complete contrast to the massive Class 19. A 5 inch gauge model of Stephenson's Rocket was a smart looking model. I could not tell if it was scratch built or a kit but it looked the part with some good workmanship and detail (**photo 4**). Outside, the train service for visitors was handled by a 7 1/4 inch gauge 0-6-0 tank locomotive *Waldenburg* (**photo 5**). The original of this locomotive was built in 1912 at the Winterthur works and it was handling the very full passenger trains with ease. There were about thirty passengers on this train each time and I hope everyone takes note of the health and safety precautions necessary in Germany when carrying passengers in a busy show like this!

The model engineers here do like their Lantz tractors and there were many different prototypes on show, all superbly made. The little single cylinder two stroke Lantz HL12 in 1:4.5 scale was a case in point, full of excellent workmanship and detail (**photo 6**). A model of a Lantz Raup tractor with tracks instead of wheels was another fine model (**photo 7**). Another variation had a rail mounted tractor and trailer - again very well made (**photo 8**). They are also very keen on hot air engines and a novel *Kartoffelstampfer* (potato masher) was a very well made machine, which was quietly working away (**photo 9**). A very nice 2 inch scale Fowler traction engine, unpainted and showing some superb detail, was again quietly working away powering a small plank



A nice little Stuart Gas Engine.

Powered by a Fowler traction engine was this well-made planking machine.



An excellent example of the 'Dancers End' double beam engine.

The little steam Scotte Dampfbus circa 1885.

sawing machine (**photo 10**) built in 1:6 scale.

The popular Stuart Turner engines were also being shown in a variety of types and the little gas engine shown in my photograph was very well built and finished (**photo 11**). A steam powered Scotte *Dampfbus* circa 1885 in an attractive blue livery and built by Freidrich Prosegger was a well made model (**photo 12**). The double beam engine based on the James Kay 'Dancers End' engine circa 1867 (**photo 13**) at Kew Bridge Museum was an excellent presentation of this old engine. The original came from the Lord Rothchild

estate at Dancers End near Tring in Hertfordshire, hence the name.

I must mention the amazing collection of miniature oscillating engines on show.

They really were miniature and the smallest working one was smaller than a 1 cent coin. A display board showed the timeline of the process of getting smaller (**photo 14**). A

horizontal hot air engine was being used to operate a stern wheel paddle suitable for a boat installation - all extremely well finished, it was just purring around (**photo 15**).

14 MINI DAMPFMASCHINEN 2 Zylinder, oszillierend und doppelt wirkend				
2012	2012	2013	2014	2017
1,2 mm	1,2 mm	1,2 mm	1,1 mm	0,9 mm
2,0 mm	1,8 mm	1,6 mm	1,2 mm	1,0 mm
1,3 mm	0,3 mm	0,3 mm	0,3 mm	0,2 mm
35 mm	0,3 mm	0,3 mm	0,2 mm	0,17 mm
1,5 bar	0,5 bar	0,5 bar	0,5 bar	0,5 bar
2,7 g	1,7 g	0,9 g	0,55 g	0,45 g
1 mm	9,6 mm	9,3 mm	7,5 mm	6,9 mm
mm	9,2 mm	8,7 mm	7,2 mm	6,4 mm
mm	7,5 mm	6,5 mm	5,2 mm	5,1 mm

The fascinating selection of miniature engines displayed on the time line of their construction.



A Stirling engine-powered rear paddle system for a boat.

●To be continued.

ME Vertical Boiler - Fittings

PART 25

A project aimed at beginners wishing to develop their skills or those requiring a robust vertical boiler for the running or testing of small steam engines. **Martin Gearing** assembles his collection of boiler fitting parts and makes a start on their installation.



Continued from p.325
M.E. 4606, 15 February 2019

Assembly of boiler fittings

You should now have a collection of 30 parts, of which seven need silver soldering together before they may be assembled onto the boiler (photo 140).

Assemble the following parts together:

- One stop valve outlet stub (BF15) with stop valve body (BF9).
- Three mounting stubs (BF5), putting one with each of the following: clack valve body (BF8), gauge glass body top (BF10) and gauge glass body bottom (BF11).
- Three 70mm lengths of 4mm diameter (5/32 inch) x 22swg copper tube, putting one with each banjo (BF16) and one with the exhaust cap fitting (BF12).

Make up the following rings of 0.7mm silver solder (55%):

- Three rings to fit the 7mm diameter section on the mounting stubs (BF5).
- One ring to fit the 6mm diameter stop valve outlet stub (BF15).
- Three rings to fit the 5/32 inch copper pipe.

Silver soldering stubs to bodies

Take the stop valve outlet stub (BF15), stop valve body (BF9) and 6mm silver solder ring. Put the two parts in the pickle for 10-15 minutes, drain on removal and wash in clean water. Fit the silver solder ring over the 6mm plain section on the outlet stub. Apply flux to the recess on the stop valve body and locate the outlet stub into the recess. Push the ring close to the body and apply flux around the ring and stub.

Tolerances:

Non functional (i.e. parts not a fit or match) $\pm 0.1\text{mm}$

Functional (i.e. parts having to match) $\pm 0.02\text{mm}$



A selection of parts ready for assembly.

Lay the body on the square of fire resistant block you used when making the boiler, with the outlet stub facing upwards.

Using a small burner, direct the flame primarily at the body with an occasional pass over the stub but avoid directing it actually on the silver solder ring. After the water has boiled off the flux check to see that the ring is still in contact with the body, repositioning it with the scratch stick if it's moved. Continue heating until the flux goes transparent and shortly afterwards the solder will 'slump' and flow. Allow the flame to pass over the whole assembly whilst you check that a fillet has formed completely around the stub, rotating the square block if necessary. When an acceptable fillet has been confirmed, remove the flame and allow to cool. Put in the pickle for 5 – 10 minutes, drain and leave to soak in clean water for 20 – 30 minutes before removing any flux residue with a stiff brush.

The process is repeated for silver soldering both gauge glass bodies and clack valve body (BF 8, 10 & 11) to their mounting stubs (BF5 x 3) using the 7mm silver solder rings.

Silver soldering pipe to exhaust fitting

After pickling and rinsing the fitting and pipe, fit a ring of silver solder onto the end of the 50mm length of 4mm (5/32 inch) copper pipe. Flux the recess in the exhaust fitting and set it on the fire-resistant block before inserting the tube into the recess. Push the ring into contact with the fitting and apply flux over the ring around the tube. Arrange a support between the upper end of the tube and the side of the hearth so that the tube is held near to vertical. Direct the flame at the body with an occasional run up the lower end of the tube but avoid the silver solder ring. Everything else is as described for the stubs and bodies (photo 141).

On **no account** be tempted to put the completed assembly into the pickle **until it is cool**, and get into the habit of making sure when possible to always have open tube ends directed horizontally away from you when doing so. Pickle when cool, drain, soak and clean up as before.

Silver soldering pipes to banjos

Repeat the same process as carried out for the exhaust fitting for silver soldering the 70mm lengths of 4mm ($\frac{5}{32}$ inch) copper pipe to the two banjos (BF16). With a little care they can be done together. Set the second tube and banjo up 30 - 50mm away from the first and supported up in the same manner.

The same caution applies to allowing the pipe and banjo to cool, **before** putting in the pickle.

Installing gauge glass fittings

I found that washers made from offcuts of the tube plate material served well when installing the fittings. These were made by scribing ten (some for spares) 11mm diameter circles at 13mm centres on the copper, centre punching before drilling 6.4mm diameter holes, which were then deburred. The 11mm circles were then cut out roughly (using shears) clear of the scribed line and mounted on a 6.35mm diameter mandrel (quarter inch bolt!) and the outside diameter turned down to 10mm. After deburring, the washers were annealed before use.

The original design of the steam plant had no preference as to which pair of vertically adjacent bushes the gauge glass occupied - the idea being to make for easier installation of the gauge glass.

Rest the edge of a steel rule across the faces of each of the two pairs of vertically adjacent bushes installed in the boiler barrel. Select the pair that are the closest to having the two bush end faces level or no more than 0.25mm (maximum) out of alignment

with each other. Try each of the two pairs and choose the closest. If neither pair can satisfy this requirement you will have to choose the nearest and achieve the tolerance by means of adjusting the thickness of the washers installed between the upper and lower bushes and gauge glass bodies. The mounting stubs are of sufficient length to allow this. If the gauge glass bodies are any more out of line than this, there is a risk of the gauge glass cracking in use because of the stress imposed on it by the misalignment.

Having understood the tolerance required, we next have to select a copper packing washer of a thickness that will allow the body to become tight in the correct vertical position. Start with a copper washer thicker than required (about twice the thread pitch works well) and reduce its thickness until the desired position is achieved. The final location can be checked by means of two lengths of 5mm diameter metal rod, one cut 45mm and the second 65mm long, with the ends cleaned up.

- Fit the two gauge glass bodies with the gland nuts fitted finger tight, as this will have the effect of reducing the free movement of the rods. **Do not fully tighten** the gauge glass bodies into the boiler barrel bushes.
- Fit the 45mm length rod into the lower body recess. Tighten the lower gauge



Silver soldering pipe to exhaust cap fitting.

glass body until the end of the rod **just** lines up with the top gland nut bore.

- Tighten the top body until the 45mm rod can be **just** removed out through it.
- Slide the 65mm rod in through the top body and tighten the top body until the rod **just** lines up with the bore of the bottom body gland nut (**photo 142**).
- Repeat the checking process, until the 45mm and 65mm rods line up with the opposite gland nut bore – taking the mid-position of the free play of the rods in the body recess/gland nut to arrive at position with respect to the opposite gland nut bore each in turn **exactly**. Adjust the body positions as necessary to achieve this.

Please accept the apparent contradiction of the terms 'mid-position of the free play' and

(line up) 'exactly' – it will make sense when you actually carry out the task!

Fitting gauge glass blow down valve and discharge pipe

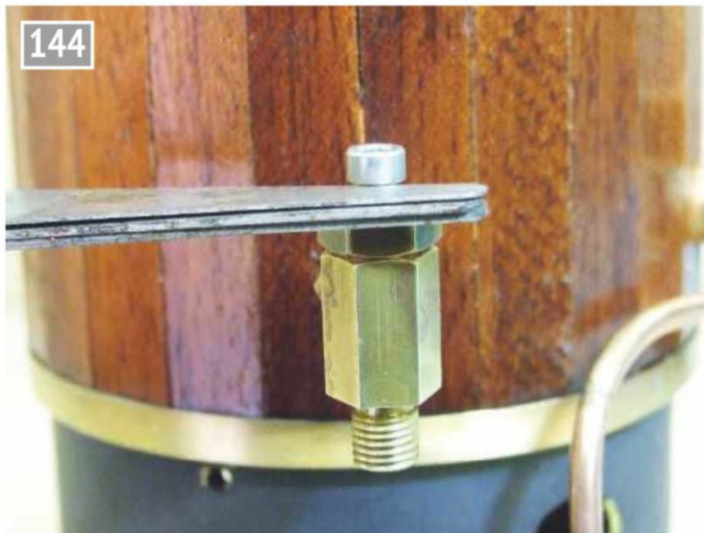
Take the blow down valve spindle (BF22) and screw it into the lower gauge glass body. Take one of the banjo/pipe assemblies and bend the pipe from the banjo so that any water is deflected down and away from the base of the boiler when the valve is opened whilst blowing down to clear the glass, avoiding the '13mm ignition hole' in the front of the base. Trim the pipe to length if required and file the open end at an angle for neatness. Secure the banjo to the body with a gland nut (BF6). No O-ring is fitted. The purpose of the nut is to secure the banjo and prevent the inadvertent removal of the spindle (**photo**



Lining up top fitting with bottom fitting.



Blow down valve assembled and pipe secured.



Measure amount to be removed from stop bolt.

143). Screw into the end of the spindle the operating lever (BF23).

Installing and adjusting clack valve

Screw on a gland nut to the $\frac{1}{4}$ inch x 32 ME thread of the clack valve (BF8) to provide protection to the cone. Drop in a $\frac{5}{32}$ inch stainless steel ball and rest the body on the gland nut on a solid smooth surface. Using a short length of $\frac{5}{32}$ inch copper tube give a **very light** tap with a small hammer, to seat the ball. Check that it has seated by sucking on the outlet with your thumb over the top. It should allow free passage of air but, if you blow, should shut instantly. Should it allow air to pass when blowing, check that the seat is clean and repeat the process for seating the ball. Avoid hitting too hard. *It is recommended that the ball used for seating is thrown away and a new unused one substituted but I have never found this necessary, if however you feel it necessary, remove the ball and discard, replacing with a new ball.*

Slip a copper washer over the clack valve plug (BF3) and tighten the plug in the body.

Slip a copper washer over the clack valve mounting stub and screw the valve into the remaining lower boiler bush. Adjust the washer thickness so that when tightened its centre line is vertical.

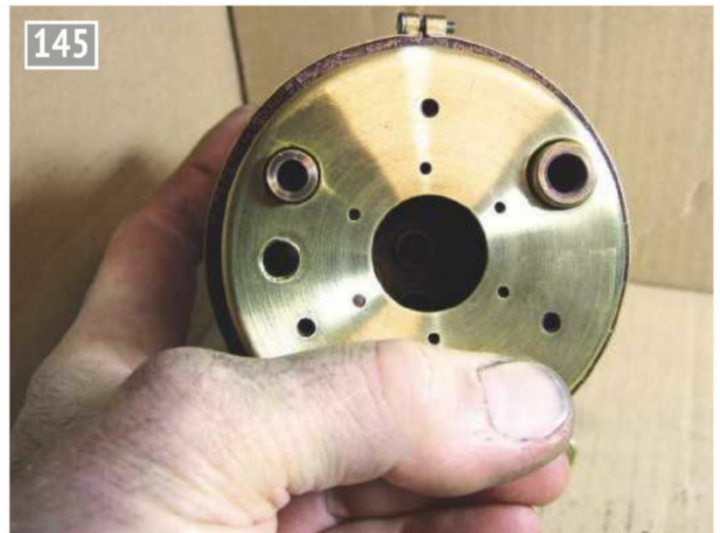
Screw a M3 set bolt into the plug GENTLY until it touches

the ball inside. Measure the distance between the underside of the bolt head and the top of the plug using feeler gauges or drill shanks (**photo 144**). Add to this measurement 0.65mm. This is the amount that needs to be removed from the end of the bolt to allow the ball the correct amount of lift for operation with a hand pump.

If you measure the overall length of the bolt and deduct the amount calculated the resulting dimension will be the new required length of the bolt. Run a couple of nuts onto the bolt and lock them by tightening, so you can grip the bolt in a vice to enable you to file the bolt to the new overall length calculated. Run some sealer under the bolt head and tighten the bolt into the plug.

Fitting tubeplate extensions and superheater

Fit copper washers over the $\frac{1}{4}$ inch x 32 ME threads of



Trial fitting of smokebox cap.

the filler (BF4) and safety valve (BF17) extensions and, with reference to fig 80 (the superheater header template, in the previous instalment), screw into their respective tubeplate bushes and tighten. Fit a copper washer to the superheater banjo bolt (BF18) before passing through the superheater header (BF24). Fit a second copper washer over the protruding $\frac{1}{4}$ inch x 32 ME banjo bolt thread before installing the assembly into the remaining tubeplate bush. Screw in hand tight.

Check the position of the header by trial fitting the smokebox cap, which should allow the three extensions to pass through the hole drilled for that purpose, as well as having the M3 tapped threads being visible through the three clearance holes drilled in the cap. A small amount of movement for adjustment (by way of turning the header around the banjo bolt) is

possible. When the header is positioned so the cap is able to be fitted, remove the cap and tighten the superheater header bolt. Double check the cap is still able to be fitted - in case the header moved whilst tightening. If the extensions are tight in the holes drilled in the smokebox cap they may be eased by careful use of a 'cone cut' or fine round file. Aim for the minimum of clearance that allows the cap to be fitted without undue force (**photo 145**).

● To be continued.

NEXT TIME

We shall continue to install the various boiler fittings that we have made.

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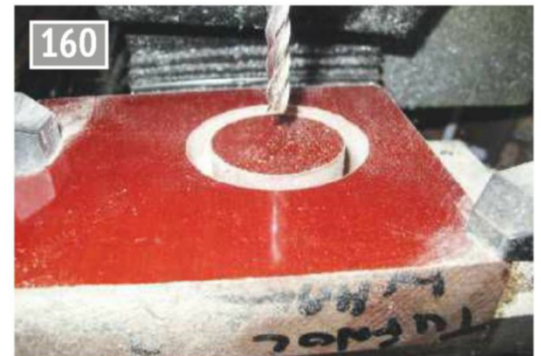
Mick Knights makes the slip ring for the ignition and then revisits the cylinder heads.



Continued from p.247
M.E. 4605, 1 February 2019



Tufnol billet set on the CNC mill.



Roughing the bore.

I mentioned in the introduction that the ignition, along with most of internal components, were made using the Ageless Engines plans. This means that there are several external components that do not follow the original Blackmore drawings and one of these is the Tufnol slip ring. I also mentioned at the start that sourcing a piece of Tufnol in the thickness required wasn't exactly easy, but I did and now it's time to machine it. Anyone who has ever machined Tufnol will know that it has a quite distinctive aroma; those who have not yet had the pleasure have an unforgettable experience awaiting.

The Tufnol slip ring

The function of the slip ring is to mount eighteen terminals

that make contact in pairs with carbon bushes that carry the HT current from the contact breakers – or, in the case of this engine, the CDI unit - where it is transferred to each of the twin spark plugs in an individual cylinder head. This will hopefully become a lot clearer when we reach the later stages of the build. The slip ring is a straightforward turning job but to cut down on expensive waste I roughed it out on the CNC (photo 159). The first operation was to rough out the bore. The back face will require facing to finish length so the wizard-generated 'cut circle' operation wasn't taken through to the back face as the central core could cause problems if it went walk-about as the cutter broke through the back face (photo 160).

Next, the outside diameter was generated while the rest of the material was removed in a couple of 'cut circle' cycles (photos 161 and 162). The final operation of turning the bore to a good sliding fit to the thrust box was carried out on the lathe; photo 163 also shows the centred positions for the terminals, which were pitched out on the CNC before the final 'cut circle' operation released the slip ring from the mother material.

There is a 112 tooth brass gear that meshes with another gear mounted on the thrust box locking ring. The purpose of this gear is to drive the contact breaker shaft but, again in this case, will drive a rotor with nine magnets mounted in it which will operate the 'Hall' sensor. This gear is available from HPC Gears but the price - over £70.00 exc. VAT and delivery - was all the incentive I needed to machine one in the workshop. I sourced a suitable blank online from the 'off-cuts' section on eBay; this particular piece of brass came from Germany and was exactly the right thickness and overall size to produce the gear blank, which was roughed out on the CNC mill. The semi-circular



Generating the outside diameter.



Removing the bulk of the material.

cut-out is to house a rise and fall cam, which will operate the mechanical oil pump (**photo 164**). With a raised central boss brazed in position the bore was reamed to 12mm and mounted on a piece of silver steel to have the outside diameter turned to finished size (**photo 165**). Once set in the dividing head the gear cutting can begin (**photo 166**). In order to cut this number of teeth an indexing plate needed to be produced with fourteen holes, as 112 teeth divided by the 40:1 dividing head ratio works out at five holes on a fourteen hole plate. It wasn't that long ago when working out the coordinates for accurately pitching out the hole centres would mean using the trig tables but these days, with number crunching DRO's, this is not the task it used to be. **Photograph 167** shows the indexing plate. As this plate will, I suspect, only be used on the very odd occasion, making it from a convenient piece of aluminium is perfectly acceptable. Using the Y axis DRO it's easy to rough and finish individual teeth at each indexed position. With no real way of mechanically checking the depth of each tooth I had to trust my setting and the readout. When a complete rotation of the gear was achieved and the blank indexed to the first cut tooth the cutter passed through the previously cut tooth form without removing any material. At this point there was an audible sigh of relief!

Another look at the cylinder heads

Time to pick up the cylinder heads again. As I mentioned in my introduction, I only decided to write up this build after I had completed all of the initial machining of the cylinder heads. Machining up to this point is covered in depth in both the Ageless Engines and the Blackmore guides. I would say that the method I elected to go with might be worth consideration.

First, the billets were faced to their finished thickness,



Turning the bore to achieve a close fit to the thrust box.



Roughing out the gear blank.



Finish turning the outside diameter.



Starting the gear cutting.



The special indexing plate.



Cylinder head located on the machining fixture.

after which the four bolt holes were accurately pitched out, then drilled and reamed at 6mm. These holes will act as a precise location for all subsequent milling and turning operations when mounted on a simple fixture. One of the last operations on the heads, once all machining requiring the use of the fixture is completed, will be to counterbore these holes to accept the body of the special cylinder head securing nuts.

The fixture itself has two of the holes drilled and reamed at 6mm while the other two holes are drilled and tapped at M6. **Photograph 168** shows a cylinder head located on the fixture, with two drill shanks providing the positive location. In order to allow machining

around the periphery of the head the two holes for the valve stems are accurately pitched out on all the billets and drilled and reamed at 5mm. Two corresponding holes are drilled and tapped at M5 in the fixture to secure

the head to the fixture after it has been located with the drill shanks, or dowel pins, which are of course removed prior to any machining (**photo 169**).

When the side cooling fins are being machined the fixture can again be used but in order



Secondary clamping through the valve stem holes.

to produce a radial groove around the side of the head it would need to be set on the rotary table and the slots generated by using a specially ground cutter. The Blackmore book goes into some detail about the types of hand ground cutters required.

When using a CNC mill the fixture can be set in the vertical plane mounted on the flat reference face and the slots cut using a standard 1.5mm diameter carbide end mill and a simple piece of G-code. I, of course, apologise to the majority of conventional machinists for this second diversion from the script and for reproducing a short piece of G-code as a demonstration.

Now, as the cutter path required for this operation needs to be an arching one

along the Y axis, we need to change the machining plane as the only two machine axes in motion will be the Y and Z. When the right angled Cartesian configuration is in operation then the X and Y axes are both active and the G-code for this is G17, which you probably haven't paid too much attention to it as it always appears as part of the machine parameters at the head of any program. One rule that must be observed is this: to change the live axis, the appropriate G-code must be changed within the cutting sub routine, while the G17 remains at the head of the program within the machining parameters.

If only the X and Z axis are required, then the G-code is G18 but in this case we only

require the Y and Z to be active and so the G-code for this operation is G19.

This is the subroutine required to cut the arching slot. The 'J' value is the arch centre from absolute zero on the Y axis, but instead of the usual circular interpolation 'I' value, this is substituted by 'K' which is the other centre position of the arch and is a Z value; in this case the arch is struck from a position 36.3mm below the work piece Z0. The start point for the arch is Y13.5 and the end point is Y-13.5. The initial and all subsequent depths of cut are of course increased incrementally in the drive program and the 'K' value is increased (with a 'Z' value) by the depth of cut applied.

This is the subroutine required to cut the arching slot:-

```
O1001
G92 X0 Y13.5
G00 X0 Y13.5
G19
G03 X0 Y-13.5 J-13.5 K-36.3
G00 Z1
X0 Y13.5
M99
%
```

Like most hand written G-codes the process is pretty much straightforward, all that's needed is the opportunity to use them and to be bold enough to try them out.

● To be continued.

NEXT TIME

We shall resume conventional machining and deal with the valves and valve seats.

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT IS
E NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE

● London Show

John Arrowsmith reports on the recent London Model Engineering exhibition at Alexandra Palace.

● GWR Pannier Tank

Doug Hewson describes the suspension on his pannier tank redesign.

● Turbines

Mike Tilby discusses fluid flow, Reynold's number and losses in model turbines.

● Lathes

Graham Sadler grinds his tool bits.

● Vertical Boiler

Martin Gearing completes the boiler by adding the last fittings, including the pressure gauge and safety valve.



Content may be subject to change.

ON SALE 15 MARCH 2019

Lathes and more

for Beginners

PART 34

Graham Sadler makes a holder and a set of reducers for easing the task of grinding toolbits.



Continued from p.314
M.E. 4606, 15 February 2019

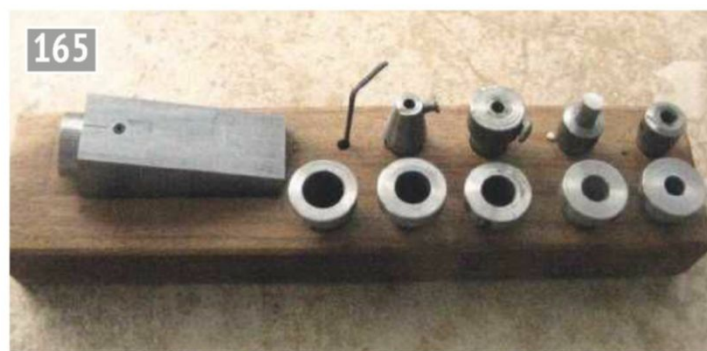
When attempting to grind small round tool bits for our boring bar system they can be a devil to hold. An attachment for the grinder will make this task a lot more straightforward. The holder consists of a block of steel, reamed a convenient size, and a set of carriers and reducers for the tool bits. These are free to rotate in the holder and are locked with a grub screw. **Photograph 165** shows my full kit (Imperial and metric, hence the number of holders). A close look will show damage on the flat ends of the reduced holders but not so on the tapered example.

Do make and varnish a decent rack!

Begin with 20mm square steel, about 60mm long. We need to drill and ream (or accurately bore) the hole in the centre. It would be nice to get this exactly in the centre, although it's not really necessary, but it is vital if you go for the follow-up of basic sharpening of slot drills to follow. This can be achieved in four ways: by accurate marking out, using the lathe itself, using engineer's buttons and by using a self-centring chuck.

1 - Marking out

File the end smoothish. Use marker then put the block on a flat plate. Engineers use a surface plate for this, which is useful but expensive. The old alternative was a piece of thick plate glass with the edges ground to remove the sharpness. I did mine with thick gloves, goggles and an oilstone. Glass could be obtained from glaziers but this



The complete round tool grinding aid set.

may now prove to be difficult. A modern alternative is to get a chunk of granite worktop, as an offcut from manufacturers or kitchen fitters. As a last resort, use the lathe bed (if yours is the flat type), the cross slide or even the table of your pillar drill.

A piece of 10mm flat steel can be used as a scribe guide for two cross lines. However, the edge will not be true as they are often slightly deformed so it's a good idea to face it flat. While you are at it do a whole range of thicknesses, stamp them and store for marking out (it's making sets like this which tends to slow things down when you start setting up a workshop - people with deep pockets could buy a set of parallels to do this job). Very lightly punch, inspect and move the punch position onto the exact intersection (**photo 166**). This shows four lines achieved by laying the scribe on the 10mm flat and using its diameter to give a line just over what is required making it very easy to get the punch mark central. Of course, a scribing or height gauge will achieve this with greater accuracy.

2 - Using the lathe with no marking out

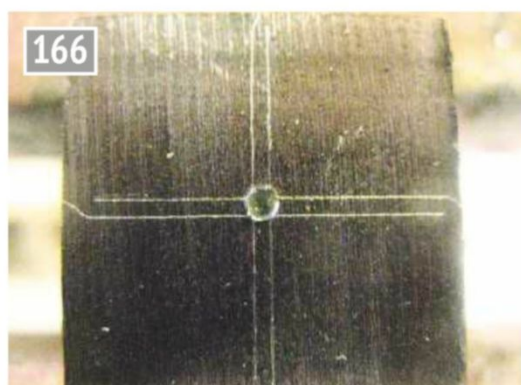
Hold in the four jaw chuck and use an engineer's square to set a face vertical, then do the same exercise we did when setting the sleeve eccentricity using the cross slide feed dial on front and back faces. Repeat for the other two faces, which will be easier after getting the first two correct as you now have a reading on the dial to work to. The worst way!

3 - Use of toolmaker's buttons

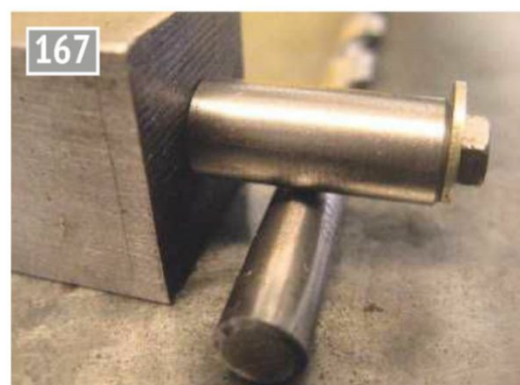
There is however a far more accurate and very useful way when two or more holes are needed at very exact spacing, e.g. when making a gear box and the mesh of the gears is critical, having to be at exactly the correct centres to avoid wear or an over tight fit. It is often used for faceplate work and centring in the four jaw chuck. For this job, using buttons is real overkill but it will serve as a useful exercise so you know what to do when the need arises.

The buttons are simple devices. Get three lengths of silver steel (they have accurate diameters) of 10mm diameter,

about 20mm long. Face and drill them 6.5mm for a good clearance on a 5mm bolt, face the outer end and clean the arris with a fine file. Now mark the approximate position of the hole; in this case simple diagonals will be good enough to get the position accurate to 0.5 - 1mm. Punch, drill and tap to M5. Assemble the button onto the work and loosely tighten the bolt. Now use a drill shank to get the button into the correct position (or digital callipers if using two or more buttons). Do this by pressing the work and button down onto the drill which is sitting on your flat surface. Rotate and repeat for the other edge. Tighten the bolt then recheck the position. The button is now centred exactly on the bar and far better than the marked punch position as indicated above. What size of drill? 20mm work, minus 10mm button = 10mm. Divide this by two to get a 5mm drill shank (which of course must be in a good condition). Now grip the block in the four jaw chuck and use



Centering with 4 crossed lines.



Setting a toolmaker's button to the centre of the holder.

the DTI on the button to centre the work as we have so often done (photo 167).

4 - Buy a self centring 125mm four jaw chuck

By far the easiest way! With this you just put it in the chuck as you would a piece of round stock in the three jaw chuck.

Methods 1 and 3 use the wobbler and the DTI to set true - I told you it would be used a lot! Face, drill and ream to 12mm then turn the boss to 18mm diameter. Set up the dividing gear to produce the same graduations as we did

for the boring tool holder body. On the top face, drill and tap for the grub screw, which when fitted must be just below the top face of the block. Produce the carriers from 18mm stock, 10, 8 and 6mm diameter (plus Imperial versions if needed) - these will hold commercial and shop made solid boring bars (fig 36).

The shallow groove is to stop any burr being raised by the grub screw on the carrier sleeve, making it difficult to assemble. Cut a single line on the flange with the graduation tool. Drill and tap for small

grub screws at about 30 degrees from the graduation line. Make the reducers from 12mm diameter bar and turn the shaft to 10mm to fit the carriers. They will also need a grub screw groove near the head - difficult to see in the drawing but it's there! Drill them to fit the tool-bits. It's not worth doing full diameter sleeves for the small bits as viewing the grinding process is not so easy so the extended length and smaller shoulder size makes this easier.

●To be continued.

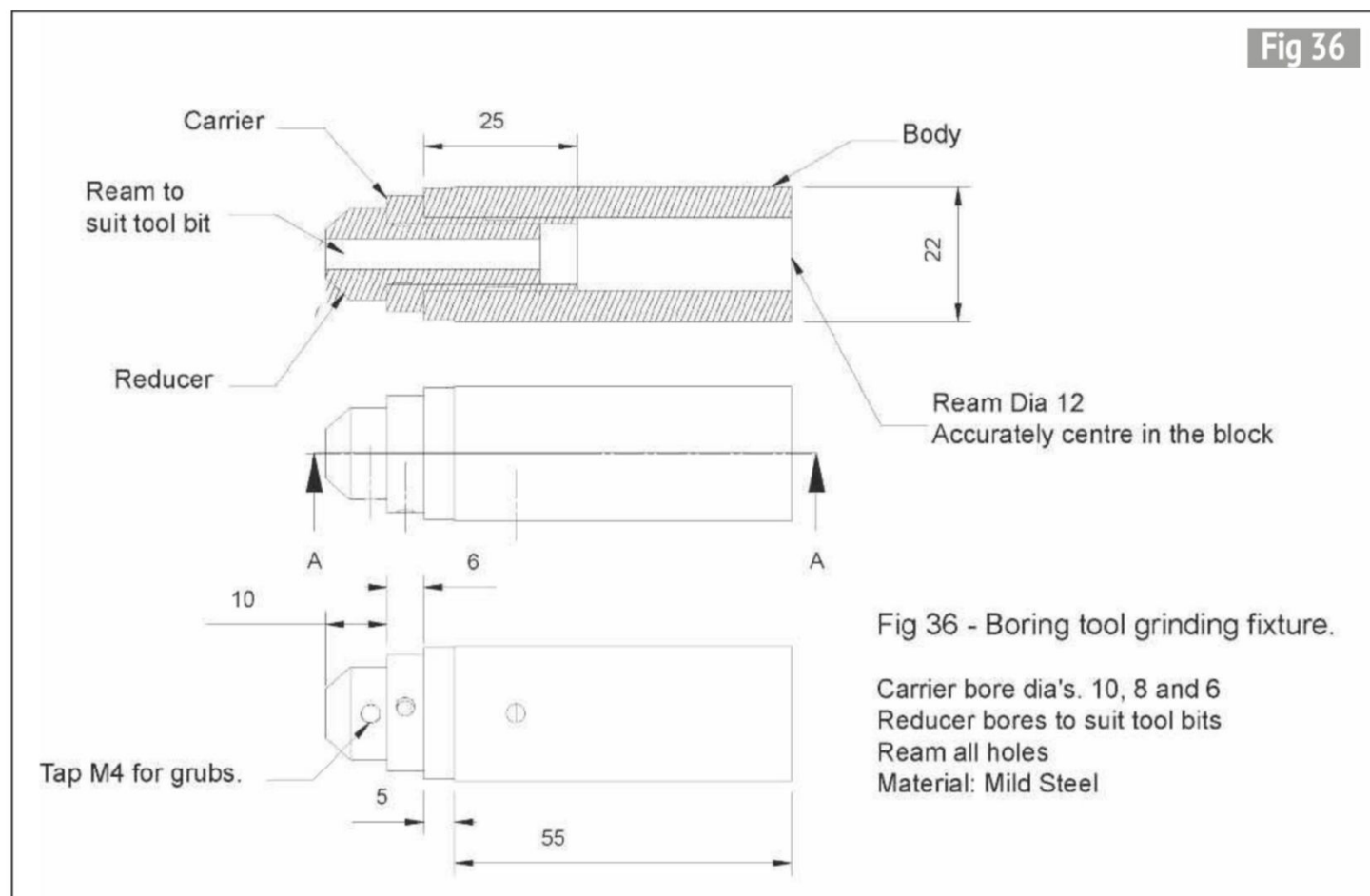


Fig 36 - Boring tool grinding fixture.

Carrier bore dia's. 10, 8 and 6
Reducer bores to suit tool bits
Ream all holes
Material: Mild Steel

Building the Model Engineer Beam Engine PART 3

David Haythornthwaite writes a series on how he built the *M.E. Beam Engine*. This is an old favourite and construction of this engine to 1½ inch scale was serialised in *Model Engineer* back in 1960. Times, methods and equipment have now moved on and the series describes how to build this magnificent engine in 1 inch scale from available castings.



Machining the main column

The main column is an iron casting of substantial proportions. It has a hollow core and the first temptation was to assume that this was concentric with the exterior surface of the casting. To check this, I chucked a piece of 1 inch mild steel in the three jaw chuck and turned a 2 degree taper on it until the tapered plug would enter the cored centre of the casting. Leaving this mandrel in the three jaw chuck and using a very large rotating centre in the tailstock, I pushed the casting tightly onto the tapered mandrel, using pressure from the tailstock. As the casting has large square corners on it, I carefully rotated the lathe by hand to ensure that the casting would rotate freely and then it was safe to spin the casting under power on a low speed. It was plain to see that the casting was not sufficiently concentric with the core to use this as my centre.

I marked the tapered mandrel ⅛ inch from where it entered the casting core,



Centring the column.

eased the casting off the mandrel and parted off the mandrel on the previously marked line. This gave me a centre plug which I hammered home into the end of the core of the casting using a soft hammer. I then made a second plug for the opposite end of the core and fitted it in similar vein. Now came the problem of creating centres about which to turn the casting. I had previously filed all flash from the casting and had removed a small lump on the column even. I mounted the column by its top end in the four jaw chuck and put mild pressure on the other end with a rotating pad in a rotating centre. Rotating the lathe by hand, I adjusted the four jaw to centre the casting at the top (chuck) end. The casting was too rough and non circular to use a verdict gauge on the outside surface so I reversed a lathe tool in the tool holder and rotated the casting slowly against the blunt end, noting the jaw number where the tool touched and making appropriate adjustments.

Once happy that I had the top end running fairly true, I ran under power at a low speed and could see that the bottom end of the column was running out of true. I carried out the same procedure with the lathe tool on the bottom end (tailstock end) of the casting and, with the jaws of the chuck slightly slack, tapped the casting straight with a soft hammer until it ran fairly true along its length. There is an element of compromise here as the column body and the rings round the body were not themselves quite concentric with each other. Once I was happy with the setting, I tightened the jaws of the chuck and centred the bottom end of the column as shown in **photo 15**. I then reversed the casting in the lathe and carried out the same procedure to centre the plug in the top end. You can see in photo 15 how little clearance there is on the cross-slide of the ML7, particularly with a rear toolpost fitted. I resolved to check and check again to ensure that I did not have a lathe/



Taper turning the column.

Continued from p.257
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casting collision once I started machining. It is particularly easy to make this mistake when turning tapers. Most of the turning was done with the rear toolpost removed.

George Gentry, who did the original drawings for this model, specified every conceivable dimension of this column and the drawing was quite daunting to me. Also, on measuring the casting, it was obvious that it was slightly small in diameter and I could not quite achieve the drawing sizes once it was machined, nor would I be able to achieve the exact drawing dimensions on the square base. I decided, however, that there were only a few critical points to note. The base and top should be square with each other and concentric with the pillar. The seatings for the beam bearings should be accurate but the rest of the pillar just needs to look right. Better engineers than I may disagree with this, but this casting is difficult enough to machine without ensuring that all the radii of the curves are accurate to those specified. I have rarely machined anything which required so many changes in tools and lathe set-ups in order to complete the item.

All the machining of the cylindrical part was done between centres and this meant that I could remove the casting for inspection and then easily replace it to the same setting. Also, I was able to reverse the casting end to end in the lathe in order to turn the various sections. The first machining operation was to face the underside of the casting to get my reference point. Using a carbide tipped tool, and taking a decent cut to get under the skin of the cast iron, I faced off the end, stopping just before the tool cut into the steel plug as this would possibly make the plug a sloppy fit. The hole could be de-burred once the plug was removed. I then faced the underside of the square top section in similar fashion and checked that the remaining thickness of the top section

was sufficient to arrive at the planned measurement. (It was ... only just.) The top side of the square base was then faced with a mixture of a carbide tipped tool and then a Q-Cut parting tool in the rear toolpost. The parting tool work was continued until the first parallel band was created above the square base plate. I turned the largest diameter that I could whilst achieving a continuous machined surface and this turned out to be less than the diameter shown on the plan. This was to be a recurring theme.

The bottom square base plate was much too thick at this stage and the question was how much to take off the underside and how much to take off the top side. By adding all the 8ths, 16ths and 32nds together on the plan I determined that the measurement from the underside of the top section to the top side of the bottom plate should be $5\frac{1}{16}$ inches or 5.1875 inches. My measurement was less than this so I faced the top of the bottom plate until this was achieved and then faced the bottom (outside) of the plate until the thickness was $1\frac{1}{32}$ inch or 0.4688 inch.

While I had the rear toolpost in position, I turned all the other small parallel shoulders using a blade type parting tool in the rear toolpost. This was done by eye as the 'lumps' on the casting were not in *exactly* the correct places and I turned each of them until the casting skin was turned away. This could be adjusted later. For all initial cuts I took a fairly substantial cut to get through the skin using a slow back gear speed of 39 rpm. In later cuts I took a little higher speed and on certain finishing cuts used the slowest direct drive at 210 rpm with a fine feed. At the first signs of chatter, slow the machine right down as chatter marks are difficult to eliminate. I was intending not to paint my column.

How you turn the taper on the column depends upon the equipment that you have on your lathe. The three methods

are : 1) by using an angled top slide; 2) by using a set over tailstock or 3) using a taper turning attachment. If you are thinking of using a top slide, you should be aware that the longest uninterrupted tapered section is 3.28 inches which is longer than the travel of many top slides and would involve resetting the tool half way along the cut. If you are using a set over tailstock and your centre plugs are fairly flush with the ends of the casting, then you need to set over the tailstock by 0.191 inch. I have a taper turning attachment on the lathe so I used this. I also have a DRO on the lathe so I used this to set the taper turning attachment. I ran the lathe on self act for a few revolutions and then zeroed the readings on the DRO. I then ran the lathe until the Y reading was 4.031 inches. Providing that the DRO is set to show 'Diameter', the X reading should show 0.25 inch if the angle is set correctly. Keep adjusting the angle until the readings are correct. Once I had the angle set, I checked that it matched the casting by doing a dummy run using a reversed tool (blunt end) which just missed touching the casting. If you do not have a DRO, this is how you need to adjust the taper setting.

Having carefully checked the set-up, I turned the tapered sections and the operation is shown in **photo 16**. I used a round nosed HS tool steel bit for this, using a left hand carbide insert knife tool to

finish against the shoulder on the right, and a carbide insert round profile tool to make the curved section to the shoulder on the left. As mentioned above, I felt as though I was forever changing tools and was glad of my Dixon Tool Post which eliminated setting up each time.

The next task is to turn the curved bands round the column and I intended to use an 'up and over' ball turning attachment for this task. However on the large, lower band, the close proximity to the square base made this method impractical so I reluctantly resorted to form tools. I say reluctantly as form tools are notorious for chattering (like many model engineers!!) but, in reality, this did not prove to be a problem. From a piece of $\frac{3}{8}$ inch square HSS I ground out a form tool, using a $\frac{3}{8}$ inch drill bit shank as a guide to get the shape correct. I gave the shape both top rake and side/ front rake and finally sharpened the item using a $\frac{3}{8}$ inch Dremel style grindstone running in my tool and cutter grinder. I made a LH form on one end and a RH form on the other end. **Photograph 17** shows the LH tool in action and I used the slowest possible speed in back gear (27 rpm). I was extremely pleased with the lack of chatter and the finish obtained, although the photo shows it after it had been finished quickly with emery paper (I'd done this before I remembered to take the photo).



Form tool.

For the smaller, top band I used my boring head (my wife thinks I have another one of those) as an 'up and over' ball turner as described in *MEW* Issue 133. **Photograph 18** shows this in action. The tool I am using is a home-made holder for an NJ17 insert from Greenwood tools. This works great when used in this way and I ran the lathe at 210 rpm once the skin had been removed. This enabled me to get a satisfactory finish as shown in the photo, which was taken from the back of the lathe.



Circular turning.

Finally, it remained to turn the two curved cornices under the top of the column and you can see from the photograph that these required quite a bit of metal removing in order to get a smooth surface. I did think about using the boring head again to create accurately shaped cornices, but after removing the outer skin by hand turning, I decided to continue shaping these by simple 'knob twiddling' which improves the left hand/ right hand coordination. I find that when trying to turn curves in this way, a slow speed helps as it gives you more time to think and react if the shape is going wrong.

The column base

At this stage the column looked as shown in **photo 19** and my thoughts turned to the problem of milling the base square and concentric with the round column and also how to line up the top section with

this. I decided to tackle the base first and I set the casting up in the lathe between centres, but at the same time gripping the top section in the four jaw chuck, with the lathe centre through the middle, so that I could transfer the chuck, complete with casting to a rotary table on the milling machine.

Before starting to machine the top and base squares, do check to see that the two square sections on the casting are in line with each other. Mine checked out okay. I set the rotary table on the milling machine with a tailstock in line with the axis of the machine as in **photo 20**. I rotated the casting to check which side of the square base was the lowest (smallest) and then machined this first. You can check with a square that the base is in the correct rotation and I packed up the

underside with parallels to give support whilst machining and also to ensure that the chuck would not unscrew during milling. I once bought an adjustable parallel at a car boot sale and this proved invaluable here as can be seen in photo 20. The first side was machined until the surface was machined all over.

Having chosen the lowest side as the first to machine, all that was now necessary was to note the Z (height) reading on the tool, turn the rotary table exactly 90 degrees and pack up again before milling the second side to the same Z reading. Repeating this on all four sides resulted in a perfectly square base which was exactly concentric with the column. Once the base was finished, I removed the chuck from the rotary table and fitted a centre so that the column could be flipped end to



The column so far.

end and the top square could be machined. Again, working with established centres makes life so much simpler.

In order to machine the top square I used the previously machined base square to index the casting. It was set up as in **photo 21** and the base square was packed up on parallels so that the top was sure to be in line with the base. As the rotation of the column was only prohibited by the parallels in this instance, it was imperative that nothing moved, hence the engineer's clamp to hold everything firmly in place. It is best to machine the two sides first. Machine them both at the same tool height until you have a fully machined surface. Then check the width of the finished top against the dimensions on the plan. Calculate the amount still to be removed and take half that amount off each side to



Column base.



Column top square.

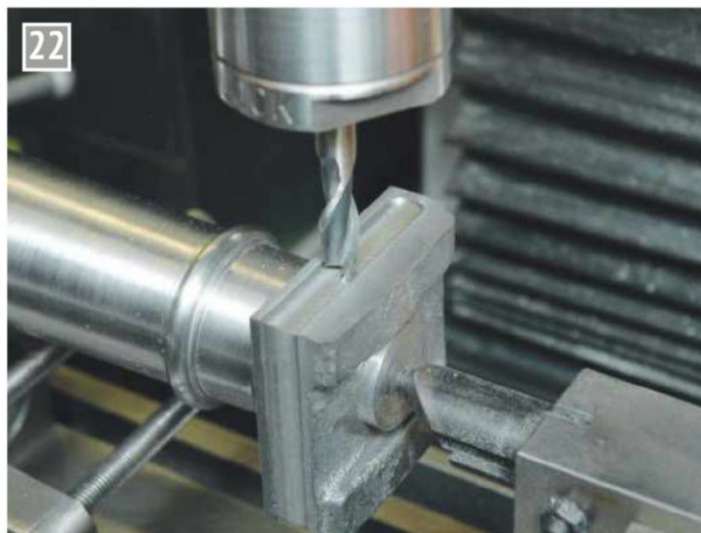
arrive at the desired width. If I did this again, I would ignore the dimension on the plan and would match the width to the width of the entablature which bolts on to the front of the column as this would have eliminated much work in resizing the entablature to match the top square. The other two faces on the cylinder and crankshaft sides were machined in similar fashion.

There is a frieze round three sides of the top (and part of the fourth side) and this consists of a groove $\frac{1}{32}$ inch wide and $\frac{1}{32}$ inch deep. I cut this using a $\frac{5}{16}$ inch slot drill and after checking the width of the groove, I widened it by 15 thou each side ensuring that the direction of travel did not create a 'climb milling' situation.

Photograph 22 shows this taking place. The blind ends of the grooves on the sides have square corners on the plan and I milled these almost square using a $\frac{1}{8}$ inch slot drill in the corners. The effect can be seen in **photo 23** and I found this to be acceptable.

The next task is to finish off the top and create the seating for the beam pivot bearings. In order to do this it is necessary to remove the centre plugs from the core so before doing this it is wise to think about whether any further rotating lathe work is needed, e.g. emery finishing on the column. Yes – I know that 'proper engineers' don't do that sort of thing, but I am afraid that I do and this is when I did it. Also, whilst the column was between centres on the milling machine table, I marked the centreline on the side of each bearing seating to later facilitate milling out the seating symmetrically about the column centreline.

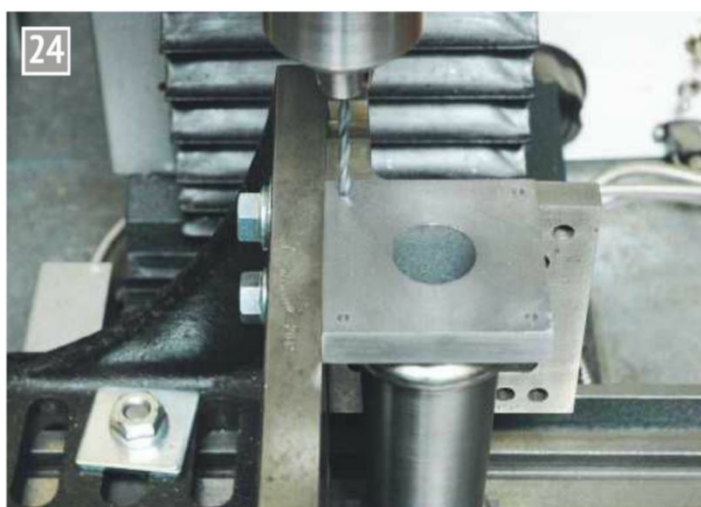
In order to machine the top faces, the column was set against a large angle plate set true to the Y direction of the miller. The base was clamped down, with the side tight against the angle plate and then shims were placed between the (smaller) top and the plate, before clamping the column to the plate. All



Column top groove.



Column bearing seats.



Drilling the bolt holes.



The finished column.

clamps were made using protection pads of MDF. First, the height of the seating was scribed using a height gauge and then a centre finder, fitted with a point, was used to align the mill and zero the DRO to the centreline of the seating from the previously marked (now vertical) centreline. The seating should be $\frac{54}{32}$ inch wide (1.6875 inch) so by subtracting the diameter of the cutter (0.375 inch) and dividing by two, I was able to set the DRO to -0.6562 and $+0.6562$ respectively to cut the ends of the seating. It is as well to cut slightly less, measure and then adjust accordingly, in case your tool is cutting slightly wider than the nominal size. Once the seats had been established it was only necessary to clean up the centre portion with a large end mill and to adjust the width

of each seat to the $\frac{13}{32}$ inch shown on the plan.

Finally, the column was inverted as shown in **photo 24** and the fixing holes were drilled with a No. 30 drill using two angle plates bolted together as a jig. As you will see, my large angle plate was only just large enough.

It now only remained to create a small silver steel punch, a sliding fit in a No. 30 hole to spot out the position for the tapped holes in the engine bed plate. In fixing the position of the tapped holes in the bed plate, it is necessary to carefully ensure that the bearing horns on the pillar are absolutely in line with the bed plate.

NB: there are two ambiguities in the drawings for the column. Firstly the height of the column to the central part between the bearing seats

is shown as $6\frac{5}{32}$ inches or $\frac{197}{32}$ inch, but when you add up all the individual measurements, they come to $\frac{198}{32}$ inch – so make your own choice there. Secondly, the fixing bolt holes are shown as a No. 30 drill - clearance for 5BA - and the bed plate is shown tapped 4BA. I fixed the column by tapping the bed plate 5BA and inserting 5BA setscrews fastened in from below.

The finished column is shown in **photo 25**. The column was an awkward little project which caused me quite a bit of thinking time but was very satisfying to make.

● To be continued.

NEXT TIME

We shall machine the crankshaft.

Sieg SX2 Plus Miller CNC Conversion

Graham Sadler explains how he converted his Sieg milling machine to CNC operation.



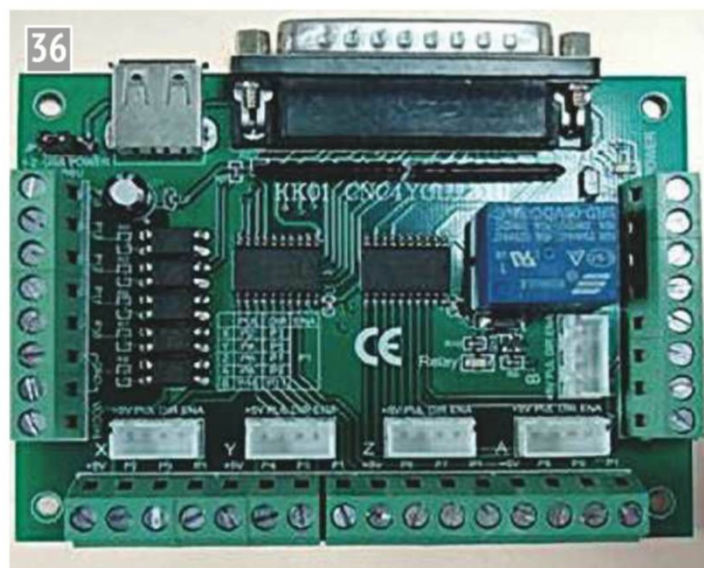
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Electronic system control box

I have not detailed any of the motor covers but I will post some photographs towards the end of the series. I found it much better if all guards were left off so that the slides could be moved by turning the pulleys by hand, which is an easier way of checking things. I have seen many conversions where feed handles are left on the machine. While this could be a good idea if this is your only machine and manual use will still be needed (it can take a lot of time to set up for simple milling operations), for me, having the Bridgeport, this is unnecessary. In any case, once again it makes the footprint of the machine bigger and there isn't enough room for them in my CNC setup. Now the machine is finished, we need an electrical box to control it. It consists of:

- A USB interface – UC100 motion controller.
- The Break Out Board ('BOB') which interfaces between the computer and the electronics box (photo 36).
- Stepper motor drivers - dedicated units which sort out all the pulses to the stepper motors and the direction.
- Power supplies - one powerful for the stepper motors, one 12V for internal use and auxiliary systems.
- Coolant pump control.
- User interface controls (switches and buttons etc).
- A strip-board relay system to control the auxiliaries.
- Emergency stop.
- Cooling fan.
- Sockets plugs and associated cabling for internal use and connection to the machine.

Mach 3 and BOBs normally use a parallel printer port (LPT) to communicate. This is a totally obsolete device on computers, USB being the way now. Yes, you can use an LPT



The CNC4YOU KK01 BOB (breakout board).

card in a PCI slot in the computer or even get an old computer with Win XP but eventually that computer will fail and with a newer one to replace it you're back in the same boat - no LPT. The trouble with using a card is that several will need to be tried before you get one to work (I know this for certain) and, even then, you're fitting an obsolete system. I spent

to be confused with cheaper USB to parallel converters. The UC100 is nothing more than a small plug, almost a dongle, and it's not much for your £100, but it works a treat, once you have upgraded to Windows 7. It won't work on the terrible Vista operating system in the workshop computer. Incidentally, the UC100 installation will install its

I decided to avoid the cheaper drive units from China or Germany. I purchased digital units from CNC4YOU - their service is excellent and advice was free and plentiful (from the guy who designed the units themselves).

an age trying all sorts of deep settings on the computer and my lad, who was in advanced computer system sales and problem solving, couldn't get either of my PCI cards to work. Judging by the CNC forums, this is a typical problem.

The simplest way to resolve these communication issues is to use a motion controller from CNC4YOU. This converts the USB signals into a virtual LPT and is designed to work with the programs. I used the UC100, which is not

own version of Mach 3 along with the required drivers. It is slightly different from the standard LPT type - you won't need any of the driver tests and you won't find the 'Pulsing Engine'. The Mach 3 installation manuals show these to be very important (LPT version) but neither are needed with the motion controller. I struggled with finding the lost elements until CNC4YOU put me right. (It would be difficult getting advice from China or Germany wouldn't it!)

I decided to avoid the cheaper drive units from China or Germany. I purchased digital units from CNC4YOU - their service is excellent and advice was free and plentiful (from the guy who designed the units themselves). This even included how to simply replace the MOSFETs if you blow them. By the way, the simplest way to blow them is to include fuses between the driver and motor. Don't do it! The digital units are quite clever and are programmed to adjust themselves to the exact characteristics of the motor connected to them. They don't cost much more.

For cables I used 4-core screened and you will need more than you think so be generous. I got 8 metres, which was not quite enough, even with the controller positioned directly under the miller, and had to be careful how it was cut - so get 10m. It's surprising how much spare is needed to pull the controller out for access to its back.

The electrical screening, it seems, is not really required for short runs in a domestic environment, but the screening does provide some measure of armour protection. The cores as supplied are the same colour, but are numbered.

A pile of heat shrink tube came from eBay, along with wire crimp terminals. For all the wires, prior to fitting into screwed mountings in the various units they should be sealed with solder to stop fraying. Don't solder onto the spade fittings of the switches, use proper crimped terminals. Use solder tags for the critical power connections and especially the mains earth, which should be at a single point. Do get yourself a decent crimping tool as you will use it a lot.

At this stage I am providing a complete shopping list for the converted machine (table 1). This includes the original machine itself and both the electrical and mechanical parts required. The total cost comes to about £2300.

Moore International		Table 1
Carry ball screws 14 x 4	600mm	
	560mm	
	470mm	
Nuts, 2 off screwed body X & Y axis	FGI (N)	
Nut, 1 off sealed, screwed body Z axis	FGR (S)	
CNC4YOU		
Breakout board	kk01	
Stepper motors: 1 off Z axis	2.2Nm holding torque	
Stepper motors: 2 off X and Y axis	1.5Nm holding torque	
PSU	400W 36V	
Drivers 3 off	Digital 50V 6.5A	
Timing Pulleys 10mm width 5mm pitch:		
3 off	15 teeth 6.35mm bore	
3 off	30 teeth 8.0mm bore	
Timing belts T5 ,10mm width:		
1 off each	300 x 60 teeth	
	275 x 55 teeth	
	375 x 75 teeth	
HTD belt 16mm wide 5mm pitch	330mm long	
4 pin chassis plugs and sockets	6 off	
Emergency stop switch	1 off	
Main power switch	1 off	
Terminal blocks	4 off	
4 core shielded cable	10 metres (minimum)	
Microswitches	4 off	
EMI chassis filter	1 off	
Mach 3 licence	1 off	
Motion controller	UC100	
Rapid Electronics, Farnell or similar		
2 pin chassis plugs and sockets	5 off	
Mains output chassis plug and socket	1 off	
Relays 12V coil DPDT 10 amp	2 off	
Switch, rocker type	2 off	
12V mini cooling fan	1 off	
Toggle switches 5A		
eBay		
5mm terminals		
Shrink wrap		
Wiring cable		
PSU 12V 8.5A	Check sizes - not many fit	
12V diaphragm pump	2.5L per min	
M6 button cap screws	10 off	
12V motor speed controller 5A min		
M5 and M6 cap screws	Lots!	
4mm air fittings for oil system	4mm nylon tube 2m	
Etc. etc.		
Software		
Mach 3 licence	CNC4YOU	
Mach 3 NFS wizard licence	New-fangled solutions	
Cut 2D	Verdict	
OR CamBam		
Machine Sieg SX2 Plus	Arc Eurotrade	

●To be continued.

Water Treatment for Miniature Steam Boilers PART 2

Bob Bramson examines the problem of corrosion within our boilers and looks at ways of dealing with it.



Continued from p.253
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Water treatment options

There are two basic methods for the treatment of feed waters used for steam boilers. The choice of a feed water treatment system depends upon the range of locomotive or traction engine operation during its lifetime, thus:

1. External feed water treatment

This is in the form of a fixed water treatment plant which provides contaminant free, chemically dosed water ready for use. This may be employed where it can be assured that the locomotive always takes its feed from the treated water. The boiler water is normally maintained between pH11 and 11.5. Modern systems work on the ion exchange or reverse osmosis principles which provide very pure water. Plant for these systems could be installed by clubs or societies, although the costs need to be fully investigated.

Note: At press, the author has no experience of the electrical induction method for treating water.

2. Internal water treatment medium alkalinity – based on treatment contained in BS 2486 (1997).

This is where the boiler water is normally maintained between pH 10.5 and pH 11.5. The basic chemicals added are sodium carbonate (soda ash) and tannin. Alkalies are known as bases and form H⁺ ions in aqueous conditions. This system is suitable for all boilers where the TDS can be maintained below 3,000 ppm. There is one drawback, however, whereby higher concentrations of TDS and sludge, which are consequent of the chemical additions,

tend to cause foaming at the water surface and a tendency for water carry-over. The TDS have therefore to be carefully controlled to ensure that high concentrations do not lead to heavy carry-over. This is generally achieved by blowing down regularly (in a safe and suitable place). Blowing down can be generally accomplished at the end of a run when the boiler is filled to the top nut and the blow down valve opened in a series of lengthy bursts to expel some of the sludge to about half a glass. The boiler is then filled to the top nut ready for the next run. If the TDS rise to levels causing carry-over, suitable antifoams can be employed (see 'Discussion'). Such treatment is safe to use in copper or steel boilers. The boiler conditions which should be maintained are:

Alkalinity (pH)
10.5 to 11.5
Tannin (ppm)
120 to 160
TDS (ppm)
3,000 max.

To maintain these levels, fairly frequent testing should be carried out. Dead easy if you've got the kit which could set you back several hundred pounds (the author purchased his cheap at a traction engine rally!). This is bread and butter stuff for professional Plant Engineers but is perhaps beyond the pocket and patience of the average model engineer. Again, this is where clubs and societies can provide facilities to the benefit of their members. Perhaps a good plan is for a club or society to appoint a member with the requisite knowledge as 'boiler

water analyst.' The Pressure Equipment Regulations go into detail about Bar Litre capacities and some big 7¼ inch gauge locomotives and large scale traction engines will possess a good deal of stored energy. A failed tube or seam could blow back and severely injure anyone nearby. A catastrophic explosion may kill bystanders so it is sensible to employ water treatment which will reduce these risks significantly.

There are, fortunately, several very user-friendly proprietary boiler treatment systems available, either in small quantities from model engineering suppliers or in larger volumes from the trade. In addition to the alkaline and tannin constituents, these systems sometimes contain some form of antifoam and corrosion inhibitors. They are safe and easy to use and can be supplied in liquid form. The running cost in comparison to having to re-tube or, worse still, renew a boiler is clearly minimal. The correct dosage is stated on the data sheets supplied with the kit. A rough judgement of the condition of the boiler water can be gained by observing the colour of the water in the gauge glass. After blowing down the drain cock on the gauge frame, let the water settle and it should be the colour of weak tea. Too light – add more. Too dark - blow down say quarter of a glass. Fortunately, with all silver soldered copper or all welded steel construction, when using these chemicals it is unlikely that overdosing would lead to any permanent harm.

At the end of a run, the boiler should be filled to the top nut, then blown down to half

a glass to reduce TDS and sludge concentration. After that it should be refilled at least to the top nut. It is not necessary or indeed desirable to blow down the entire contents unless the boiler is being laid up for several months. When the boiler has cooled down, a water sample should be taken and analysed, the results being logged to determine the trend in TDS and alkalinity levels and notes kept of any propensity to carry over. Also be aware that overdosing with boiler treatment may result in emissions of chemicals from fittings, in particular safety valves, which may cause nuisance to bystanders. Copper boilers should also be treated to minimise scale deposits, as scale formation can lead to overheating followed by consequent catastrophic failure. Although thankfully this is very rare, the addition of treatment should prevent this and prove beneficial to fittings with moving elements such as clack and blow down valves.

The consequences of water treatment

With the use of appropriate boiler feed treatment (photo 5), advantages can be expected due to the following:

- Minimal corrosion of all internal boiler and steam supply line surfaces
- Elimination of scale deposits and the risk of tube and plate failures
- Improved evaporation and reduction of fuel consumption

- Purer steam production with longer lasting superheater elements
- Less wear and tear on the wearing surfaces of cylinders, valves and pistons
- Longer periods between boiler wash outs, maintenance and tube renewals
- Virtual elimination of corrosion during periods of lay up

Additionally, in cases where water treatment is added directly to tenders or tanks:

- Performance of injectors maintained over longer periods (see below)
- Steel water tank and tender internal surfaces protected against corrosion

Depending on the level of alkalinity and the type of treatment used, there are effects on non ferrous materials, testing requirements, Health and Safety implications and environmental considerations which need to be considered.

- Lead is very slowly attacked by alkali in the boiler water and thus fusible plugs may require more frequent renewal or can be copper plated to resist corrosion.
- Gauge glass, if not of the appropriate grade, can be attacked by highly alkaline boiler water.
- A 'blow down' regime is necessary to reduce excessive TDS levels where antifoams are not used (miniature boilers should, in any case, be partially blown down after every run).

- Where adopted, wash out periods need to be optimised to remove sludge and old dislodged scale.
- Brass should never be used for boiler fittings. Alkaline water will attack brass and accelerate dezincification.
- After introducing boiler treatment on a used boiler, the old scale will start to dissolve and become dislodged. This needs to be emptied or washed out regularly over a period of time until the boiler settles down.
- Similarly, adding treatment to a tender or water tank will dissolve and dislodge old scale and deposits. Tanks need to be regularly purged, washed out and filters cleaned to stop the dislodged scale from blocking the injectors.
- With certain treatments, notably dissolved sodium carbonate and tannin, injector cones will suffer precipitation of chemical and be prone to failure by becoming clogged. In these cases, it is better to 'dose' the boiler using a suitable syringe and dissolved chemical prior to each steaming.
- With high concentrations of some treatments, it is possible that following lay-up periods, safety valves, water gauges and feed clacks may become clogged by deposits. Always check these critical items are free and properly functional before raising steam.
- Health and safety precautions need to be adhered to. These are printed on the data sheets that come with the treatment and are simple to perform.
- If there is any doubt about the concentration of alkaline in the boiler being too high (very unlikely, bath salts are about pH 11) the responsible water authority should be consulted before allowing used alkaline water to enter the mains drainage system.

steam generating surfaces are coated with boiler paint such as Apexior. This forms a very effective corrosion barrier but, in any case, it is recommended that new boilers receive water treatment with the very first fill prior to the hydraulic pressure test. This is to prevent rust and help start the formation of protective films within the boiler from the outset. Well constructed and managed boilers suitably treated may be expected to have long working lives. Provided fireside condensation and cinder cutting is minimised, all-welded steel boilers thus treated should result in significantly longer tube life, being limited more by erosion than by corrosion.

Maintenance

All full sized boilers are subject to the Pressure Systems Safety Regulations (PSSR). Our miniature boilers are subject to regular examinations and testing, the principles of which are predicated on the PSSR. Whilst complying with the regulations mitigates the key risks involved, it is desirable to carry out regular checking between statutory tests to ensure that the boiler is kept safe and in good condition. Miniature boilers are generally too small to provide for the facility of periodical washing out but the use of treatment should render this operation less essential. If provision for draining and examination is provided in the design of larger boilers, washing out should be adopted, based on the number of hours in steam, the periodicity being established by experience. The use of a TV probe is a valuable tool to examine the internals of a steel boiler, say on an annual basis or at least at testing time. All valves, gauges and fittings should be visually examined regularly and, in the case of steel boilers, the condition of the external surfaces should be investigated as if water and condensate can be seen permeating between the



Even darker brown is acceptable! This image of just-off-of-steam hot boiler water draining shows the sludge and colour associated with the treatment.

New boilers

When new boilers are procured, it is sensible to specify that the internal non-

lagging and the platenwork, this will cause corrosion from the outside.

Discussion

Water treatment for locomotives was pioneered in the USA and France. In France a highly disciplined approach was adopted employing frequent testing and control of treatment dosage. The reduction in boiler maintenance and increased availability for service was staggering with many boiler maintenance facilities being closed down in consequence (photo 6). On British Railways, experiments began in the 1930s. Initially, it would seem that the use of copper fireboxes and readily available labour gave rise to scepticism over the use of treatment and it is quite possible that management 'inertia' did not result in the highly disciplined approach that was adopted in France; results were far less satisfactory in consequence. In the 1940s economies in maintenance became paramount and a fresh approach to treatment had to be made. The use of treatment and conditioning plants stopped corrosion but the menace of scaling, although reduced, still presented problems. From 1952, British Railways introduced antifoam compounds in conjunction with sodium carbonate,

tannin and calgon (sodium phosphate) in lineside water supplies. It was found that very hard waters responded well to this treatment whilst those with medium and low hardness were generally scale forming rather than resulting in a mobile sludge, thus higher alkalinity levels were needed to deal with this problem.

Eventually the French Treatment Integral Armand (TIA) was adopted along with a similar treatment developed by ICI, the application of which was swapped from lineside to the boiler itself being used as the softening vessel. It was aimed at being simple to apply and the results eventually proved successful. The TDS levels were designed to be maintained at around 6,000 ppm which necessitated a small continuous blow down regime.

So much for the history lesson. The point is that as the alkalinity is pushed higher to combat the softer scaling waters, the resulting increased TDS levels causes foaming which is like a blanket of bubbles floating on the top of the water level. The foam raises the apparent water level and heavy steam demand gives rise to carry over i.e. water and salts being entrained in the steam. To suppress this, an antifoam chemical may be added. A powerful agent of this type is



A nearly unbelievable success: the TIA water treatment was employed by the SNCF at its Nice locomotive depot in connection with a fleet of North American-built 141R locomotives, such as the one shown above. The treatment was so successful in reducing boiler maintenance costs that three locomotives, numbers 1156, 1158 and 1159, were able to operate a cumulative 5,500,000 miles with fewer than 900 man hours of maintenance attributable to the boiler with washout intervals - twice that permitted in the U.S. The image above is of 141 R 568 built by the Baldwin Locomotive Works in 1946. Photograph by Dider Duforest on November 11, 1981 (Wikimedia commons).

polyamide.

In model and small boilers the problem of foaming has hitherto not been understood and consequently not investigated. The question is, does this phenomenon exist? Most likely, yes. And if so, how should it be combatted? The author hopes to learn more about this and a follow-up article is planned for the future.

Conclusion

Boiler water treatment has become firmly established for steam plant throughout the world. Miniature engines are getting larger and larger, as are the associated risks and potential for serious consequences. It is hoped that this article has helped to

provide understanding of the principles of water treatment systems and that universal adoption of treatment will become standard practice for all who operate steam models and miniature railways.

Acknowledgements

The author wishes to acknowledge the following: The Office for Road and Rail (nee HMRI) The Heritage Railway Association Mr. Shaun McMahon INTI Argentina British Railways Board – Paper; *Locomotive and Industrial Boilers in Argentina*. 19 November 1971; William Ridgeway Richardson.

ME

No.278

**DON'T MISS THE NEXT ISSUE, NUMBER 278,
OF MODEL ENGINEERS' WORKSHOP**

**MODEL ENGINEERS'
WORKSHOP**



Joseph Noci describes his journey to resurrect an Alba shaper and bring it under computer control.



Peter Shaw offers beginners advice on navigating your way through different types of lathe tooling.



Keith Johnson looks at using Cubic Boron Nitride (CBN) wheels for grinding.

Pick up your copy now!

A Trip on a Clyde Puffer PART 1

Roger Backhouse goes on an engineer's day out up the River Clyde.



Off to Crinan in Argyll for a delightful hour's sail on the last working Steam Puffer where VIC 32, owned by the Puffer Preservation Trust, offers working holidays in superb scenery (photo 1).

Puffers were some of the least glamorous vessels in British waters but, to this day, are regarded affectionately far beyond their Clyde and West of Scotland homes. Puffers were immortalised by stories of Para Handy and his *Vital Spark* written by the Inverary born journalist, Neil Munro (photo 2).

Puffers originated as canal boats and developed from unpowered scows on the Forth and Clyde Canal. William Symington first applied steam to a canal boat in 1803 with his stern wheeler, *Charlotte Dundas*.

The first 'true' puffer design emerged in 1857 when an iron hulled, screw propelled lighter launched on the canal. As freshwater boats they drew boiler water from the canal and did not need a condenser. They exhausted steam direct to atmosphere, hence the 'puffing'.

This was soon followed by larger vessels used for Clyde and West Coast voyages.



Puffers were immortalised by Neil Munro in his Para Handy stories.



VIC32 leaves Crinan Quay for a sail round the bay in July 2018.

These had condensers but the 'puffer' name stuck. From early days they were built with near flat bottoms and derricks. They could be beached to offload or take on cargoes, usually coal but also carrying building materials, timber, general goods and even whisky.

Wartime builds

During the Second World War the Admiralty used puffers to supply ships, particularly those in the Firth of Clyde. Convoys assembled at Tail of the Bank off Greenock.

This class of puffers had

the prefix SL VIC standing for 'steam lighter victualing inshore craft'. The Admiralty used a simple design enabling construction, away from the busy Clyde yards, by shipyards with differing skill levels and using riveted rather than welded hulls. The ships used coal fired steam boilers rather than diesel engines to avoid depending on imported oil. VIC 32 was built at Richard Dunstone's shipyard at Thorne near Doncaster. That yard had experience building canal boats and VIC32 went into service in 1943 (photo 3).



VIC32 is based at Crinan, seen one July evening among yachts in the canal basin.



Crabtree and Sons of Great Yarmouth built the compound engine in 1943.



Piston rod and valve gear.



Worthington Simpson boiler feed pump.



VIC32 burns Ayrshire coal, aiming to keep supplies as local as possible. Unfortunately it can be smoky. Welsh steam coal would burn too hot for the boiler.



A steam winch hauls up the anchor chain and operates the derrick.

VIC32 was used on various duties, based at Fort William, taking ammunition and supplies to the Atlantic fleet. Other voyages took her to Scapa Flow and even Devonport.

After the war many puffers were sold to Scottish owners who used them for coasting trades but by the 1970s improved road and ferry services largely killed their basic workload and all had gone from service by the 1990s.

In 1963 VIC32 was sold for breaking up. Luckily she

was purchased by Keith Schellenberg who had become Laird of Eigg. He probably planned to use VIC32 as an island supply vessel and steamed her to Whitby where he owned a shipyard.

She languished at Whitby until Rachel and Nick Walker saw her in 1975. A partner in a Thames boatyard, Nick was looking for his own vessel to restore. Rachel and Nick bought and restored VIC32, moving to Scotland and running cruising holidays until donating her to the Puffer Preservation Trust in 2002.

This gained Heritage Lottery Funding to replace her vertical boiler and carry out other repairs. Rachel and Nick are still involved in the running of holidays.

Engine room

First call for any engineer is the small engine room with the vertical boiler, replaced by R.K. Pridham Engineering of Buckfastleigh in 2006 when additional plating works were carried out. The two cylinder compound engine was built by Crabtree and Sons of Great Yarmouth (photos 4 and 5).

There is a condenser and a boiler feed pump by Worthington Simpson (photo 6) with an additional donkey pump used for pumping bilges, fresh water and water cooling the condenser.

Ed Turner, the engineer, stokes the boiler and does other jobs on board (photo 7). VIC32 uses Ayrshire coal, which is smoky. Welsh steam coal would be too hot for this boiler. In all things, Puffer Holidays aims to source supplies locally.

On deck there is a derrick and steam winch (photo 8).



Ship's wheel and compass binnacle. Navigation is now assisted by a marine GPS system.

The first 'true' puffer design emerged in 1857 when an iron hulled, screw propelled lighter launched on the canal. As freshwater boats they drew boiler water from the canal and did not need a condenser. They exhausted steam direct to atmosphere, hence the 'puffing'.

This was important as most places visited by puffers had no cranes. Puffers often beached and offloaded into carts brought out to the boat.

Wheelhouse

The wheelhouse is traditionally equipped with a wheel (photo 9), binnacle and chart table but navigation is aided by a GPS type navigation system. There's a speaking tube to communicate with the engine room. Running in cargo the bow would have been well down but as rebuilt for passengers it is much

lighter making steering more difficult when VIC32 catches the wind. Visibility is partly obstructed by the funnel with the all important steam whistle - ready to awaken reluctant risers - and the steam calliope (photo 10).

Accommodation

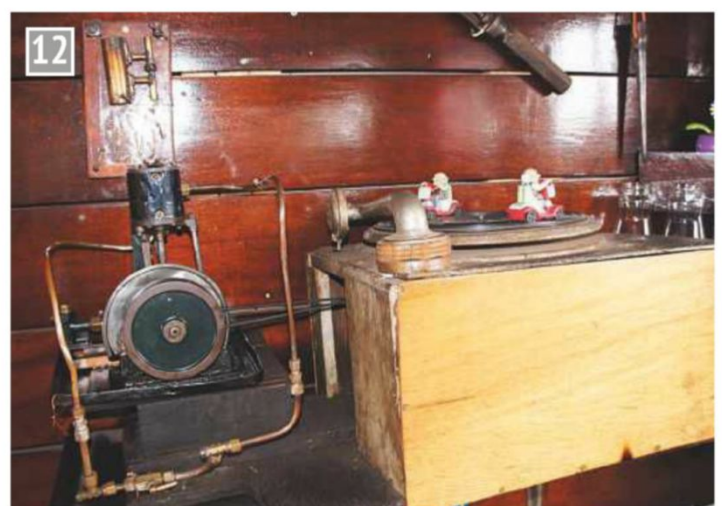
The former hold has been converted. A saloon and galley on the upper deck are heated by a wood-burning stove (photo 11). Small but comfortable cabins and washrooms are on the lower deck. Previous holiday makers



Steam calliope. VIC32 may be small but it can make plenty of noise although normal sailing is astonishingly quiet.



Saloon and wood burning stove.



This steam powered gramophone has a selection of 78 rpm records. Rocked in the cradle of the deep perhaps? Or even Rolling down to Rio?

are highly complimentary about their cruising experience. There's even a steam powered gramophone for 78rpm records (photo 12)!

●To be continued.

A Home Made Micro Parting Tool

Despite the plethora of tooling available these days to the model engineer, even those addicted to buying things of uncertain quality and provenance on the internet, sometimes there is nothing on the market that will do the job you require. **Mitch Barnes** has a go at sorting one particular problem out for himself...



The situation that brought this tool into the world was the need to make some teeny-weeny steel washers for the governor recently nearing completion for a Major beam engine, which I have been working on for some time. The washers I needed were 3.6 mm in diameter, with a 2mm central hole and just 0.6mm thick. Alongside using threaded nuts, governor pivots were frequently secured using split pins and washers – a carry-over from the millwrighting origins of the device – and I was determined to emulate this correctly.

In the early days of industrial steam, governors were likely as not made by blacksmiths – usually regarded in the public's eye as heavily built knuckle-draggers swinging hammers at red hot objects, but actually these chaps were and are often very skilled indeed. Take a look at this photograph of a governor on the Dancer's End engine by James Kay of Bury, built in 1867 and re-installed at Kew in 1977-8 (**photo 1**). It's not the actual governor I am modelling but it shows the standard of work commonly found on well-made engines of the Victorian period.

During the Industrial Revolution, the skill and knowledge inherited from previous generations of blacksmiths – who had created everything from barn door hinges and horseshoes to superb suits of armour and hand weapons – was visible in the valve gear, parallel motion and many other components for steam engines of various types. Blacksmithing techniques were helped along

with the appearance in the mid-19th century of new-fangled machines such as planers and precision lathes with compound cross slides. This enabled them more easily to produce parts where an element of precision was required in order for them to work properly.

There is a direct evolutionary line from their skills and hard work to the skilled machinists of today and it is my desire to honour that tradition of early craftsmanship by making this governor look well crafted. Whilst it is already a fine looking engine, there is room for improvement and personalisation on the Major beam engine. The particular example I was working on was intended to be brought to museum quality, which requires every component to be dead scale in appearance.

Back to the washers then. A search on the infonet and some protracted rootling through my own stock, accumulated over the last two decades, showed that nothing suitable was available. Purchased washers would be far too large in diameter for their hole size and anyway I didn't want anything stamped out, because it wouldn't be visually in keeping with the rest of the model, let alone full-size practice.

I would have to make my own then. Not too difficult: turn and drill out a bit of bright mild steel rod to appropriate dimensions to create a tube and then part slices off it. Simple!

Aha yes, but not quite so simple at this size because... the narrowest parting tool



Hardly the handiwork of chimps – yes folks, much of the work on this exquisite governor was created by blacksmiths. Note also the split pins and washers on the pivots...

I could find was 2mm wide, which is 3.3 times as thick as the parts coming off!

The problem with parting delicate or very thin lengths of tube is that when the blade starts breaking through, the stresses exerted by the blade on the remaining part of the circumference of the remaining web, between the part and the base material, can put unbearable force of the component being parted off, rendering its crumpled remains somewhat useless. This is more prevalent on very delicate parts.

Parting tools by their very nature exert a heavy side load on a piece of work and therefore the lathe itself, in order to do their job. This is especially so when using a

small lathe, in my case the Unimat 3 which, with the best will in the world, really isn't up to using a commercial parting tool for work like this, unless you have AGES to do the job or the material you are turning is Styrofoam (unlikely for a steam engine ...) or meringue (even less likely).

My solution was to make my own tool from a length of 6mm square BMS for the body, because this fits so nicely into the various tool holders available for the Unimat, but what material to use for a parting blade? Also, how would I hold the blade in place?

The nature of the task requires a narrow blade because this would exert a lower side load on the lathe. Of course, because I would be making my washers in bright mild steel, I needed something fairly hardy for the blade.

Every problem contains within itself the seeds of its own solution and the answer was sitting there in front of me on my workstation – I use Swann Morton scalpel blades, 10A mainly but not exclusively. Once they get blunt it's the sharps box for them, serving as their transit lounge to the great recycling furnace in the sky. Until now...

These blades are made of fine quality stainless steel – it's good enough for surgery after all and that's as good as it gets - along with tooling for the defence and aerospace industries. It takes only a couple of minutes on the offhand grinder to shape them to begin their new lives as parting tool blades. You can even grind them so they cut right or left hand to eliminate the chance of a burr to file off on such teeny bits as these. And grind angles on them to suit different metals of course.

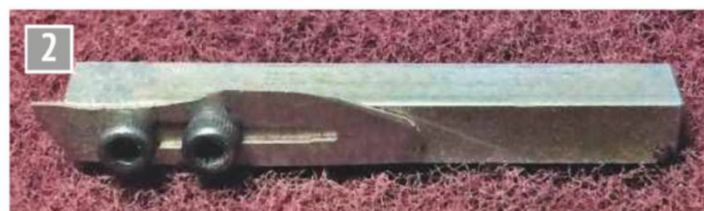
As for securing the blades in place, a pair of M2.5 screws holds them quite satisfactorily because those fixings fit exactly through the wider part of the blade slots. I used cap heads at first and took these photos with them in place but more satisfactory fixings would be button heads,

which have a flat underside to hold the blade more rigidly in place against the tool's body, reducing the chance of flexing during the parting process. Another advantage of button head screws is that, being lower profile, they allow a parting cut closer to the lathe chuck, or preferably collet holder. On tiny things I hate working with a chuck for fear of getting an impromptu knuckle shredding from those whirling chuck jaws. Far better to work close to a smooth surfaced collet holder instead.

While grinding a blade one day, one of my colleagues informed me that I was wasting my time because you can't cut brass with a scalpel blade. Well you can cut brass shim with one I thought, and we regularly cut K&S brass tube by rolling a scalpel blade over it - eventually the tube cuts through, although sometimes one imitates a cheap tube cutter and inadvertently cuts an unknown screw thread instead!

Anyway, my response was that it depends on the geometry of the blade. The stainless steel doesn't, as far as any of us know, have a consciousness and thus can't object to me trying it out or be annoyed with me that I have. I'm more interested in finding a way that something *can* be done rather than focusing on methods that don't or preconceptions that it *can't*.

Besides, this stainless blade was much harder than the brass, so it would be worth a try. Also, I had already made a couple of test washers by



So here it is - simplicity itself and economical to boot: the parting tool in the flesh.

then and I knew I could make it work. But thanks for the advice anyway. By this time, for me the last iota of doubt had saddled up and ridden out of town - perhaps it had ridden into his (photo 2).

Along with the advantage of costing virtually nothing because they are effectively already at the end of their working lives, these blades are available to me as an almost unending supply...

Being 6mm square the tool easily fits in a Myford toolholder too, despite those whirling jaws, and here it is in action, parting off a washer one lunchtime (photo 3).

You may be wondering why there's a wire poking up the centre hole of the tube that I'm parting the washers from. This is something I always try to do, to deprive the floor monster of his next meal. I accept that this is mean of me but any parted off component with a central hole just spins its way along the wire, which is held in the tailstock chuck. The parted off components can thus be easily retrieved, rather than the alternative of hunting for them through sharp swarf around the lathe, or worse, grovelling on the floor in vain hope and seemingly sharper swarf.

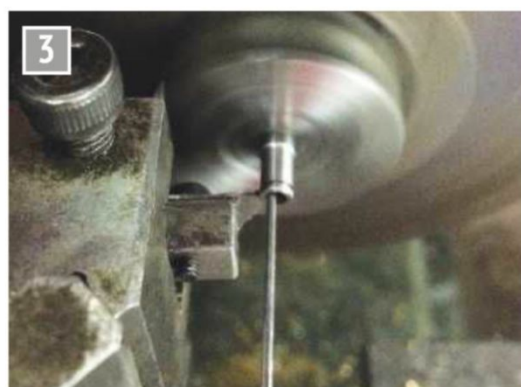
Often in life when you have a new tool you find

more opportunities to use it and such an opportunity to experience this one came up almost immediately after I'd made my washers.

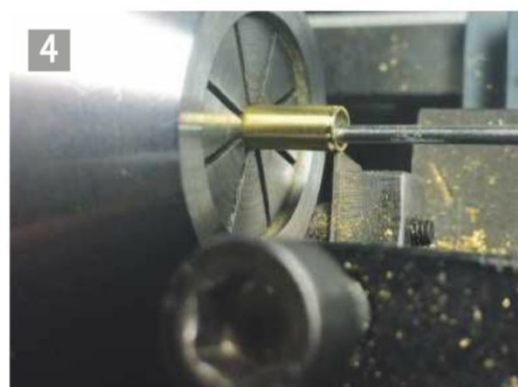
There was suddenly a requirement to cut slices of 0.4mm wall thickness hard brass tube for one of the commercial projects I was working on. Some of these slices were required to be just 0.5mm thick, which would be quite a challenge! Diameters required would be from $\frac{1}{8}$ inch (3.2mm) up to $\frac{1}{2}$ inch (12.7mm) - the larger they are, the more frail they become. I'm afraid that commercial confidence means that I can neither tell you what they were for, nor illustrate them, but for the sake of this yarn, I have reproduced some similar examples here.

It may be simple and easy to make, but this tool manages to cut some pretty thin bits, such as those shown in these photos (photos 4 to 9). To keep my client happy these are of different diameters and thicknesses than those I produced for the recent project. In fact, all of them are thinner.

When using the tool, you just have to go in carefully, exactly as you would when parting anything with a conventional tool. Note that not much cutting blade projects from



Although made for the Unimat, actually some of my washers were cut on a Myford 7.



Here goes on the fragile small diameter tubing, using a right-hand-ground scalpel blade, creating a V-shaped slot.

the shank of the tool: with all parting operations, rigidity is everything.

You will note that the tube is being held in an ER 25 collet holder, not just for safety, but for thin wall parts like this, a collet is a must because the point loads exerted by the jaws of a three or four jaw chuck distort the tube as pressure is applied, long before they can grip the tube enough to offer resistance to the cut about to be carried out. The collet jaws' contact area is far greater – almost the opposite amount of contact around the circumference of the material compared to a chuck's jaws – and spreads the load required to exert enough grip over most of the surface of the material. Consequently, a lower clamping pressure is also required, further lessening the chance of damaging the material. My ER25 collet holder with that nice smooth nose nut came from PRO Machine Tools and I wouldn't be without it.

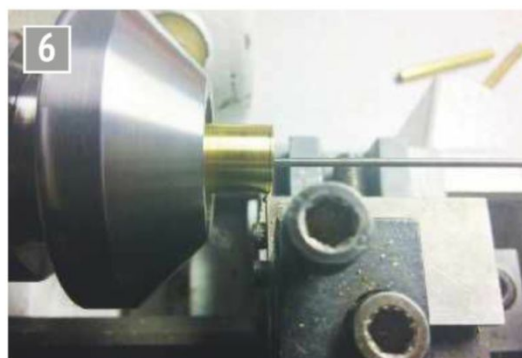
Soon after this, another opportunity to use the tool reared its head, for me this time, and also on the Major beam engine.

Most people miss these bits out, but the yoke that rides around the lower bracket of this particular variation of the Watt governor usually has either wheels or die blocks mounted on its yoke ends. This is to prevent the yoke from binding and to facilitate smooth running as the governor rotates. The requirement for a dead scale model meant that this governor was going to have them too. Remember that the Major beam is a $\frac{1}{8}$ scale model, and at that scale everything should be included if possible.

My shiny(ish) new parting tool enabled me to make those 1mm thick 3mm diameter wheels on the governor arm yoke (**photo 10**). Each one started life as a short length of $\frac{1}{8}$ inch diameter hard brass rod, which was turned down to size, drilled to clear 12BA screws, then counterbored for the screw heads. The final operation is seen in this shot of one being parted off. For



Yes, it's easy to cut such thin sections but smaller diameters are relatively stiff compared with larger ones.



The real proof of the pudding is on larger diameters so here we are parting off an 11.76mm diameter tube...



...and off it comes!



Success! Here I am measuring a second one just for the sake of making another.



Here's the proof that such thin parts can be parted off with the right tool.



The parting tool rides again - parting off a governor wheel.

no other reason than it was handier at the time, the wire here is replaced with a smaller size drill bit to keep it from the floor monster's hungry maw.

Assembling these components was for my ageing eyes more of a challenge than it would have been in my younger days but to my delight everything fitted. The attached photos show the assembled governor with those tiny washers and 3mm wheels in place (**photos 11 and 12**).

So there you have it - a bit of lateral thinking and a problem solved very simply – times three! I'm sure it'll come in handy many times in the future too.



ME The completed governor.



The proof of another pudding: the weeny wheels are juuust visible located in the governor lever's yoke, while the pivots carry the washers and pivots held by split pins.



Dear Martin,
I have followed the 'Thames Twilight' articles by James Wells with interest. However, may I be permitted to constructively add to the knowledge and in a minor way set the record a little straighter. James makes the statement that the Mulberry Harbour caissons and sections were only made in the London docks in ME issue 4604 (18th January).

That was most definitely not the case. The whole project was cloaked in complete secrecy. My knowledge in this small way was gained first hand from my own father. He was a Royal Navy engineering officer in World War II. He had been involved in more than one secret project, it transpires.

Like so many he refused to talk much about it all, in fact you could not ask, you had to just listen and put together tiny pieces as they came about. The only person he talked to much was a cousin (Dad's nephew) of mine of another generation who served most of his early life in the Royal Marines (25 years in total) including WWII. I just listened when I was allowed and that was not always.

However, back to the subject in hand. During the preparations for the invasion subsequently known as 'D-Day' my father was draughted to Sinah Warren Golf Club on Hayling Island in Hampshire. This had been commandeered by the Royal Navy to provide quarters for four naval officers, my father being one of them. Much to the chagrin of my mother five WRENS were also billeted there to look after them.

The secret project was the construction, using civilian Portsmouth Dockyard labour and naval labour, of sections of Mulberry Harbour on the western end of the golf course, the sections being slipped down rudimentary slipways constructed into what is known as 'The Run', the tidal entrance channel into Langstone Harbour. As late as 1999 to my certain knowledge

(I went and checked), evidence of these slipways and their accompanying winch/windlass equipment was still clearly evident on the ground. The hut at Hole 9 (I think) was the tea hut for the construction teams and remained (or its successors) even during my lifetime till that year. It was immediately adjacent to the lane running to what was the ferry pontoon from Portsmouth. It may still be there.

The caissons and sections were sunk to the harbour floor, away from prying Luftwaffe and others' eyes and special compressed air equipment had to be designed and constructed to break the mud seal and lift them when required. One section of harbour actually constructed by these teams fractured during one part of the process and as far as I am aware remains as testament partially submerged but visible at all states of the tide in Langstone Harbour just off the current harbourmaster's office.

I know the names of three of the officers but the fourth name has always evaded me. One was a Lieutenant Commander Odium, an already time served officer of Irish descent on pension who been recalled to active service for the hostilities. The other and I believe the Commanding Officer was a Lieutenant Commander Chappell, a career officer from a naval family and of course my own father Lieutenant Alfred Bayliss. Although I have no photographs of the work at all I have a few pictures of my father and his close comrades in their uniforms and in working dress at this time. Of interest to perhaps older persons like myself, these are small black and white pictures, taken with a small box camera obtained with coupons saved from 'Black Cat' cigarettes of the time.

If I may be permitted, my father maintained that two of the worst experiences of his naval career occurred during this period. The first that under the pressures of the war, the civilian workforce

(known locally as 'Dockyard Mateys') decided to go on strike. My father did not know quite how to handle this. However, the experience of Odium came through. He asked for my father's signal pad, wrote a signal and told my father to send it directly to the Admiralty. He received an almost immediate response with orders. The striking workers were gathered by armed Navy Regulators and my father had to read the message. Basically, the Riot Act. All workers were made subject to the Naval Discipline Act due to the emergency of WWII and if they continued to strike then it would be mutiny and every third man would be shot. They returned to work.

The other could be construed in hindsight as possibly amusing. On the eve of D-Day, the four officers with a bottle of rum played cards fully aware of what was going to happen the following day. It was make or break, we would win or we would lose the war. During one of those pregnant moments of silence and failed chatter in very tense moments, a funeral bell tolled relentlessly in the distance. My father admitted what remained of his hair bristled on the back of his neck in abject fear. Once the moment passed they realised it was the radio in the background and as far as I can make out the theme tune to a radio programme of the time was a funeral bell. I think the programme was called 'The Man in Black', a series of stories told by a broadcaster named Valentine Dyall.

I hope that this information helps to swell knowledge of the period. Sadly, some of this came from my brother now no longer with us as he spent time as a small boy of four years for one summer on a very restricted Hayling Island whilst our father served there. He actually saw with his own eyes some of this as he was considered too young. I am now the only one left as far as I know and I am post war.

Best Regards, Ian Bayliss

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TADPOLE

A Model Outboard Racer PART 2

Tony Bird constructs an outboard racer from a design first published in 1933.



Continued from p.244
M.E. 4605, 1 February 2019

At this point the hull was shown to a knowledgeable friend who said, "You are making a copy of a Boucher speed boat! Originals are very collectable and command a lot of money!". This was interesting as the original owner of the *Popular Mechanics* magazine published on the internet had written in the margin 'H.E. Boucher and Boucher Playthings'. Research was needed. The American friend who had sent the original *Live Steam* article was contacted. After a week or so he came back with: H.E. Boucher Inc. was a well-known model producer.

The boat model was supplied either as a kit of parts or ready to run. It was sold from 1930 up until the mid-1950's when the Boucher company ceased trading. **Photograph 14** shows the boat as supplied ready to run.

The Boucher made product appears exactly to be the same as the *Popular Mechanics* version except that the



A 1930 ready to run Boucher model boat.

cylinders, propeller and motor gear box are alloy castings and there is no centre frame in the hull, the hull sides being supplied already curved. The Boucher catalogue describes the model as: 'An exact copy of the most popular type of boat in the United States!'. Alas these boats have not been very well documented!

It must be assumed that someone copied the Boucher model and submitted an article to *Popular Mechanics*. Unfortunately the magazine does not credit any author; something that was common to many of its articles.

Rudder

Some thicker aluminium than used for the deck was found to make the rudder; first it was bent into a channel section (**photo 15**). A template was made to the dimensions in the text and the template used to make a sawing line on the channel, which was cut to shape with a piercing saw (**photo 16**). **Photograph 17** shows the rudder fitted to the boat. The *Popular Mechanics* text shows what is possibly a knob from the front of a radio being used to control the rudder. **Photograph 18** shows the rudder control shaft inside the hull.



Folding the rudder.

Engine

A start was made on the twin cylinder single acting oscillating engine. The engine drawings in *Popular Mechanics* consisted of a half inch squared grid on which the motor frame was drawn; the only dimensional information was the radius of the steam ports relative to the cylinder trunnion, which was $\frac{7}{16}$ inch.

The remaining components for the engine, its shaft and gear box, consisted of dimensioned isometric projections around an isometric GA drawing of the engine and a sectioned view of the boiler. Included with these

'Polly-Wog' - a Model Outboard Racer was the title of an article in the 1933 August edition of the American magazine *Popular Mechanics* which can be viewed online at:
books.google.co.uk/books?id=7OEDAAAAMBAJ&pg=PA287&focus=viewport#v=onepage&q&f=false

This article was also reprinted in the 1981 October edition of the American magazine *Live Steam*.

We at *Model Engineer* are of course aware that the name of the boat may cause offence to many modern ears, having been coined in a more – let's say – 'robust' age. Many words in the English language have multiple meanings or connotations, one of which may be offensive to a particular group of people. Consequently, the use of any of these words, even in a completely benign context, is met with extreme disapproval. 'Polly-Wog', sadly, falls into this category so I feel compelled to avoid its use, as far as possible. For the purposes of this article, then, the boat will be called *Tadpole*. The reason for this choice will be explained in a later part of the series.

Martin Evans - Editor



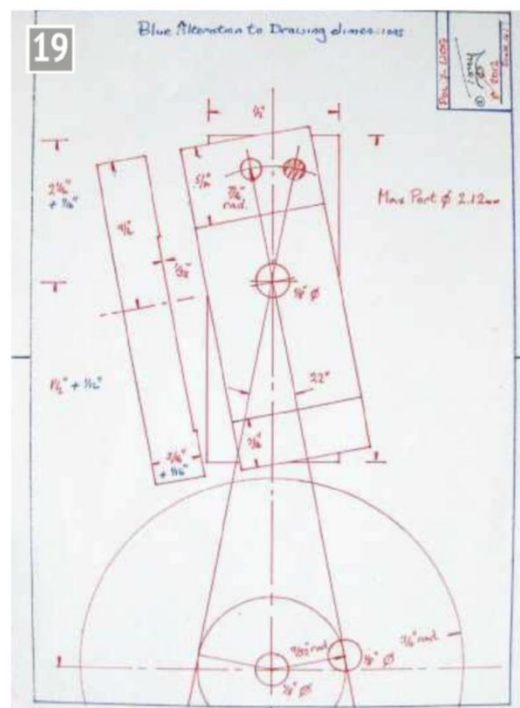
Cutting the rudder out.



Rudder fitted.



Rudder control shaft.



Cylinder drawing.

drawings were suggested ways of constructing the various engine components. Armed with this information it was decided to draw the positions of the cylinder pivot point and steam ports along with the axle and find whether they would work (**photo 19**). The drawing showed that to give adequate clearances the cylinder pivot point needed to be $\frac{1}{16}$ inch further away from the axle centre. In the text the steam ports were $\frac{3}{64}$ inch (1.19 mm) and the drawings showed they could safely be 2.10mm - interestingly the drawing shows a $\frac{3}{16}$ inch drill being used for this job; probably a mis-print of $\frac{3}{64}$ inch! It was decided to increase the cylinder port

block thickness by $\frac{1}{16}$ inch to give a larger big end/flywheel clearance.

On this basis, a start was made on the engine frame, which was done by making a steel former for it to be folded around. Alas, no photograph was taken of this being done.

The text called for the cylinder to be made from copper tubing of the size shown on the drawings which was $\frac{3}{8}$ inch outside diameter which apparently had an inside diameter of $\frac{1}{16}$ inch! As the piston was shown as $\frac{1}{16}$ inch it is likely that the copper tube should be $\frac{5}{8}$ inch outside diameter - another mis-print? The nearest copper tube available was 15mm which



Cylinder soldering finished.

was just about right, its inside diameter being 14mm. With the copper tube cut then turned to length it was soft soldered to a brass port block (**photo 20**).

●To be continued.

NEXT TIME

We make the flywheel and piston and move on to the gearbox.

A Large Capacity Coventry Diehead Attachment PART 3

David Earnshaw revisits his Coventry diehead attachment and reworks the design for a larger lathe.



Lever pin

The lever pin (fig 4) is very similar to the one for Mark 1 except that the $\frac{5}{16}$ inch diameter at the end is longer so that, when in place, it will protrude from the slot in the side of the body and will engage with the stop block, allowing the die head to be arrested and then trip. Also, the plain and threaded lengths

of the pin differ from the one in the Mark 1 unit. Again, the $\frac{3}{8}$ inch BSF section was screwcut to maintain complete concentricity when screwed into the sleeve.

not need to be screwcut. The $\frac{3}{8}$ inch long dimension allows for a $\frac{1}{16}$ inch flat washer to be included on each side of the lever.

Lever

The lever of the Mark 2 unit is bent to the shape as shown on the drawing (fig 6) as this was thought to be less clumsy than the one used in the Mark

Continued from p.241
M.E. 4605, 1 February 2019

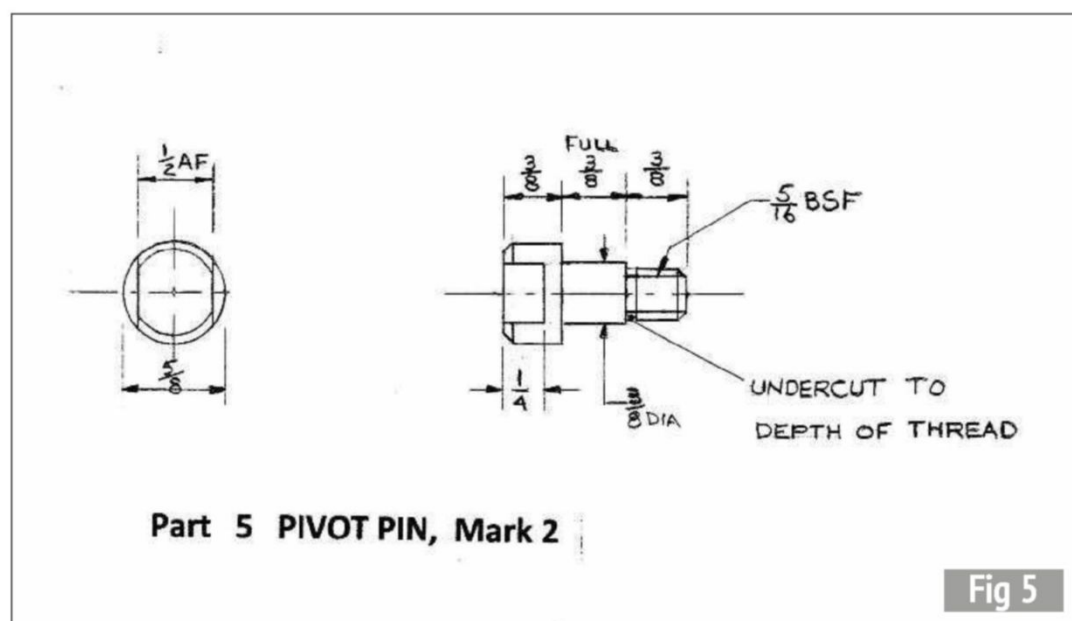
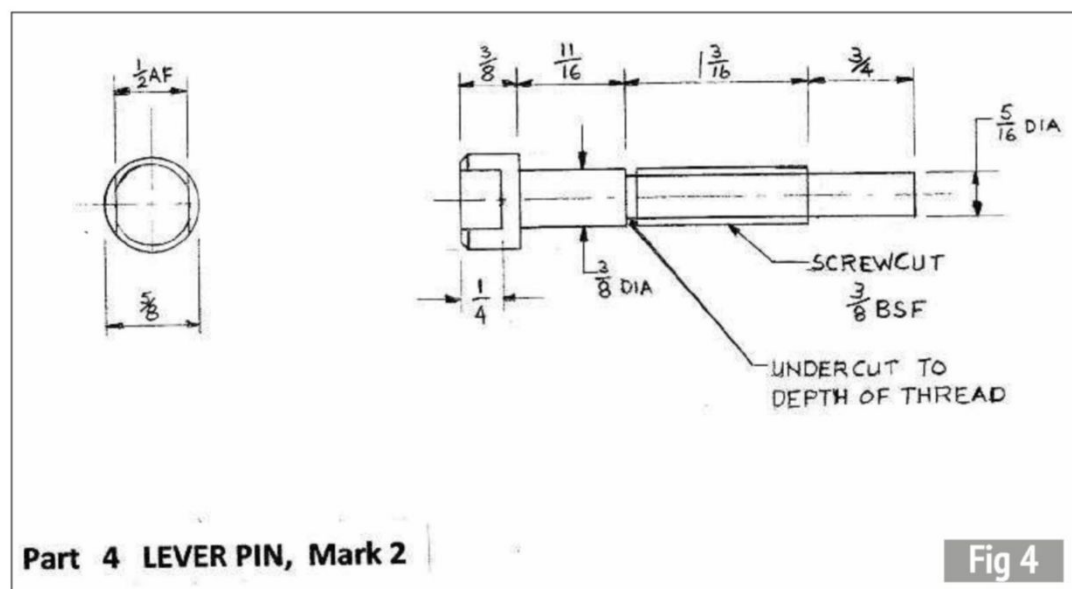
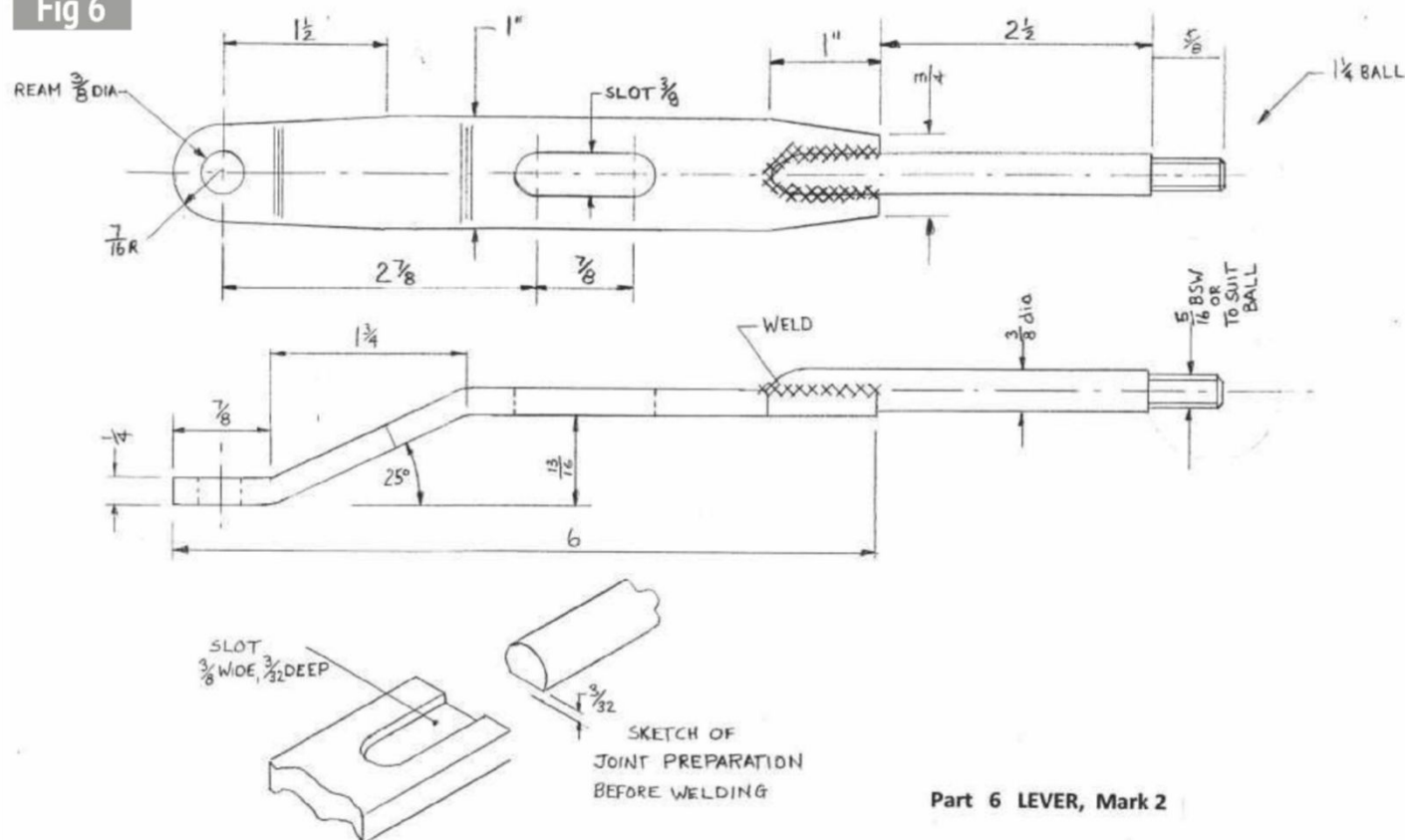


Fig 6



1 design. Bending metal is a relatively easy operation but bending it exactly where you want it to bend and to exactly the shape you want is quite another matter, unless you have a fly press of course! Bending metal of this section does require considerable effort and is best done hot or in the normalised state.

The first step in making the handle was to draw out an accurate pattern of the bends

on a piece of steel sheet in the workshop. The bending was done in the bench vice. A long time ago I had the vice jaw plates of my bench vice surface ground to remove the serrations which I find are unnecessary in our type of work. The smooth jaws give adequate grip without the need for serrations and the work gripped in the vice is not marked. There is also little need for 'faffing' about

with vice clamps to cover the serrations! I also 'softened' the right-hand vertical edge of the jaw plates, creating a slight radius with an angle grinder and finishing with an oil stone to give a small radius to the edge so that it doesn't dig into material being bent in the vice.

I find it best to do the bending before any marking out, cutting or drilling is attempted so, working on the end of a length of 1 inch x 1/4 inch bright mild steel flat, the position of the first bend was marked near the end of the bar. The area around this mark was then heated with a smallish propane torch to bring it to red heat but this was a slow process with the size of nozzle available and only a faint, dull red was achieved. Quickly placing this horizontally in the bench vice and tightening up, the metal was bent using a hammer and block of hardwood as a 'punch'. Using a piece of wood with the end grain against the metal to be bent avoids unsightly hammer marks on the metal.

After several checks and

adjustments to the bend the material was judged to confirm to the pattern marked out earlier on the sheet steel. The second bend was then produced in a similar manner, checking and adjusting until the two bends closely matched up with the pattern on the steel plate. Once satisfied with the result the metal was cooled and the correct length cut from the parent bar (**photo 7**).

The embryo lever was then marked out for the hole, the slot and the shaped ends. Drilling, reaming, slotting and filing to shape quickly produced the main shape of the handle. The circular part of the lever was prepared in the lathe before welding the two pieces together and final cleaning up.

● To be continued.



Material bent for lever handle.

NEXT TIME

We shall complete the diehead by making the stop block.

L&NWR 0-8-2T Heavy Shunting Tank Locomotive PART 6

Chris Rayward describes the construction of his 'D' tank locomotive.



Continued from p.225
M.E. 4605, 1 February 2019



Views of the front plate assembled with the tabs of the flanging strip chamfered and the slots given some clearance so they could be fitted through the curved openings prior to giving each of them a gentle tap with the heel of a hammer to secure them for silver soldering. Cleaning up was quickly done with the bulk of the joint tab area being removed from the outside with the coarse wheel of an off-hand grinder and then the two sections of the joint were filed flush.

Making the smokebox

Those of you who have seen the pictures of the locomotive chassis will realise that I still have to put the cover on the steam chest but I did not want to do this until I was ready for the air test to be carried out. However, as replacement gaskets are simple enough, I shall make the cover shortly but this does also require that I decide on the design of the smoke box or, more importantly, how this assembly is secured on the chassis, as the boiler will be very substantial. As the steam chest cover needs to fit inside the lower end of the smoke box this latter assembly will be made first.

Here, I asked Malcolm High if he could make me the front and back plates and add the slots for the two flanging

strips so the two plates would have a symmetrical and identical curvature and I could use rivets placed close to the corners. The rivets are so obvious on these locomotives that it is important they are positioned correctly. On the prototype, the smoke box wrapper extends down to cover the outside of the frame adjacent to the cylinder block each side but any small fastenings through this plate work were considered to be insufficient to hold the weight of the boiler.

The end plates and their flanges were made from 2mm steel and assembling them and silver soldering the joints was easy enough with the usual precaution of filing chamfers on the corners of the tabs and in the ends of the slots plus using the heel of a

small hammer to swage down the tongues. See **photos 34** and **35**.

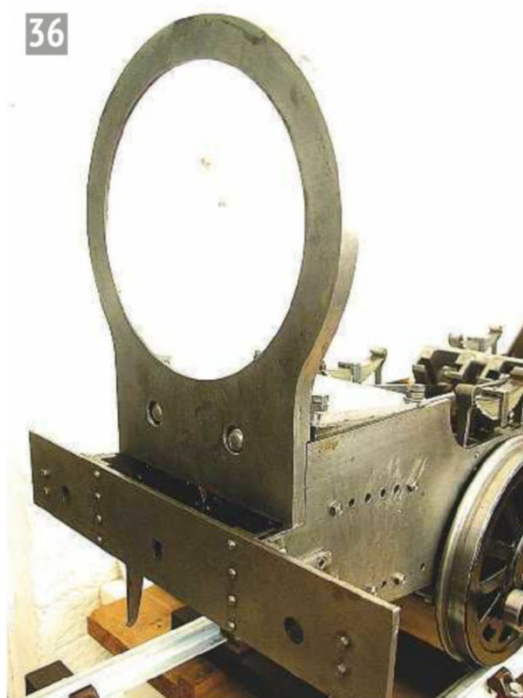
The front plate was completed by deciding how low it needed to be placed in the frame to match the required boiler centre line. Cylinder parts are often a bit out of scale and sometimes valve gear operation requires the boiler centre line to be raised up but I found I was able to place the front plate so the boiler centre line would be $8\frac{13}{16}$ inches above the rail head instead of a scale $8\frac{3}{4}$ inches. Without the weight of the boiler this is fine. My photograph (**photo 36**) shows the plate cut to size and fitted against the front of the chassis frame plates. Note how the flanged edge sits level with the outside of the frame as described above.

I have also added the two clearance holes for the front valve rod guide bosses as in full size. These have been slightly elongated since the picture was taken to allow easy fitting and they will be covered by a separate plate bolted into position after all the riveting has been done. I have chosen a specific prototype tank locomotive featured in Ted Talbot's book on the 0-8-0 family of engines as they are all similar, but not totally identical.

The rear plate was assembled in a similar way but before the cut outs were made for the steam chest bosses the means of securing the boiler barrel to it was decided. A standard boiler barrel will be used from nominally 5½ inch outside diameter by 10swg copper tubing and this has been obtained so a separate ring can be made to size and fitted to the smokebox rear plate.

The first thing I did was to check the diameter of the tube and, as it was not very round, I took an average of the outside diameters in at least six places to confirm it to be less than 5½ inches, at 5.475 inches. The ring was formed from ½ inch wide by ⅜ inch thick brass bar and I hot formed the ring in my vice. **Photograph 37** shows the first stage and it is actually surprisingly easy to hold the bar firmly at one end and heat the other end whilst using a pair of pliers (in a gloved hand) to ease the bar into a circle. It is not possible to do more than estimate the length of the strip required but eventually the material was shortened and, using the vice and a heavy hide mallet, a near circle was achieved so the join could be made with high temperature silver solder.

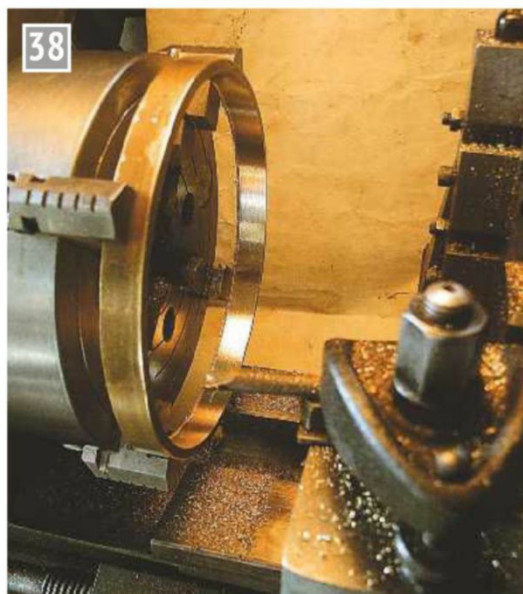
The ring must be just less than the final size as it will be bored to fit over the boiler barrel tube. For this, the ring was held quite gently in my four jaw chuck so as to exert the minimum of distortion and light cuts were taken to finish the bore and one edge (**photo 38**). The outside diameter



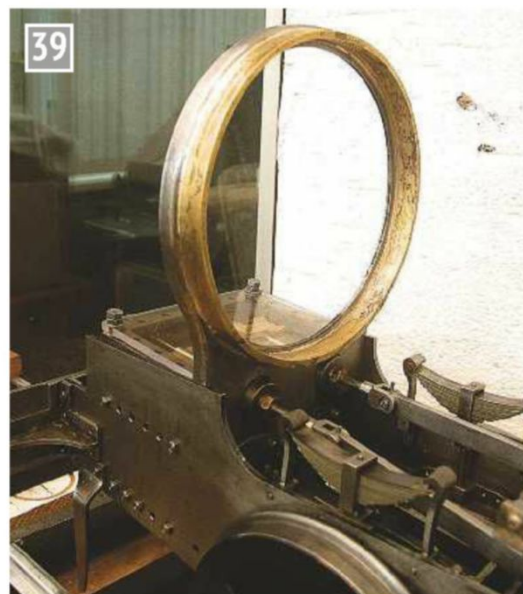
The smokebox front plate trimmed for height and cut away to fit against the front of the frame. The prototype has a separate lower plate to cover the slide valve boss clearance holes later.



The first stage of forming the brass bar into a circle. It will be found that this heating operation will leave the material slightly soft and able to be locally formed with a vice jaw or a mallet. Afterwards, a joint is made with high temperature silver solder and the ring finally trued to be as near round as possible.



The resulting ring should be just less than the boiler barrel diameter so it can be bored round and faced for soldering onto the rear smokebox plate.



The completed rear smoke box plate offered into position. It should just be possible to see the radius added to the rear corner as described in the text.

of the ring was also turned to provide as near an even thickness as possible for the ring of around ⅛ inch.

My full-sized drawing showed that the rear corner edge of the smokebox is actually a radius as the front ring of the barrel has a 'dog-leg' rolled into it. So, at this stage, the outside corner was filed to be about a 3/64 inch radius to

represent this appearance.

The next task was to silver solder the ring onto the back of the smoke box rear plate so it would be concentric with the opening for the flue gases. I did this in stages so as not to risk disturbing the flanged strip joint and my trusty old toolmaker's clamp did the job of holding the assembly at the hot zone. After cleaning up

I could match it to the front flanged plate and cut the flange to sit on the chassis frame behind the steam chest.

Then the two wide slots were cut after drilling ¾ inch diameter on the valve rod centre lines to clear the gland bosses on the steam chest. **Photograph 39** shows the rear smokebox flanged plate in place and later it will have a

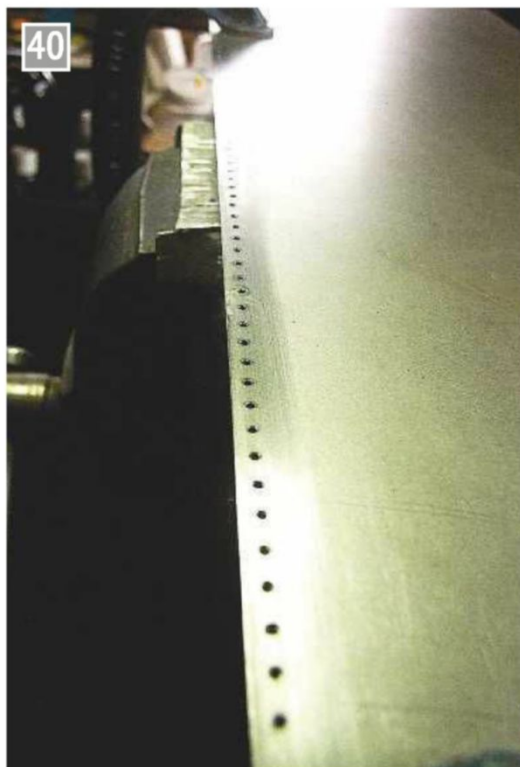
Fig 5



pair of special brackets each side to secure it to the chassis.

The final task this time is to make the smokebox outer wrapper and for this I had to scheme the rivet detail for both the wrapper itself and the front flanged plate. I have included my drawing (**Fig 5**) which gives all the details of the spacing holes and the extras such as the door hinge positions and the handrail knob centres. I am sure most potential builders will appreciate that setting out the pitches for rivet holes is much easier with metric sizes than relying on our imperial rules with $\frac{1}{64}$ ths! So, I asked one of my suppliers to pre-cut the wrapper plate for me from 18swg steel plate at $3\frac{1}{2}$ inches wide, as I do not have a guillotine. Then, working from the centre top position, I set out the wrapper rivet hole spacing on the edge of some sheet material of a similar thickness, so I could just cut a strip off about $\frac{3}{8}$ inch wide with a hacksaw and form it round the two flanged plates to check my rivet layout (**photos 40 and 41**). Holding it with small clamps meant I could mark off and trim each end of the strip to match the length of wrapper plate needed.

All seemed well, so the next task was to clamp the straightened strip to one



Marking out the rivet holes in a steel plate identical to the wrapper material, before cutting off a strip to check the hole spacing around the front flanged plate.



edge of the wrapper plate and, working from the centre, I drilled all the rivet holes. The rags on the back face were removed using a $\frac{1}{8}$ inch diameter drill with a hand brace to form a shallow countersink and the top outer edge of the hole was similarly de-burred.

Some may wonder why I have gone to such trouble.

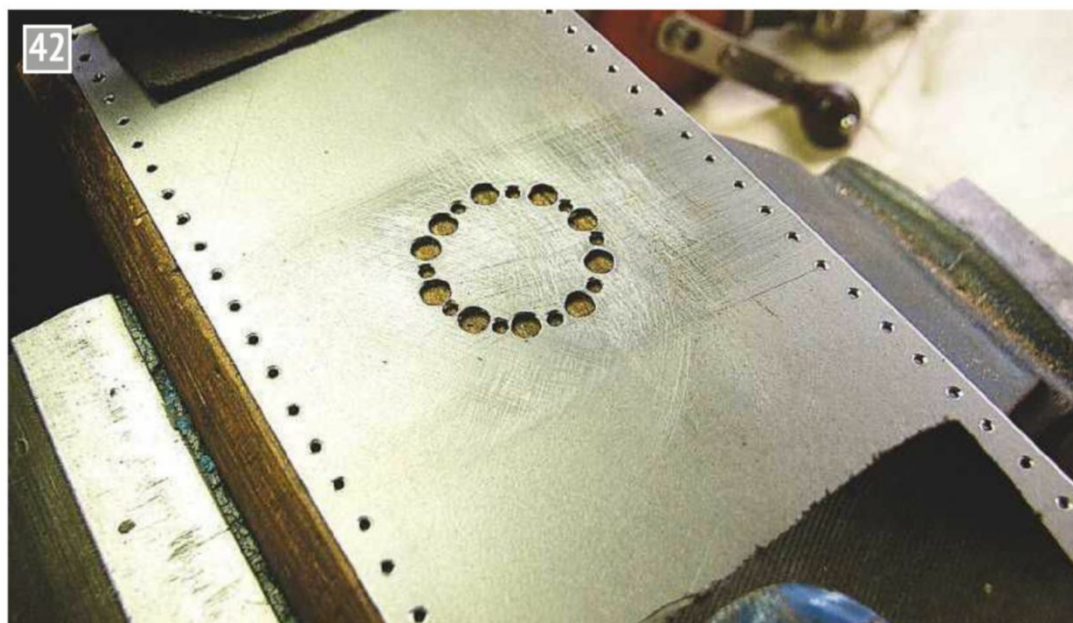
Well, the plate will be held as closely as possible to the smoke box flanges and any swarf which results when the rivet holes are drilled through will largely clear itself but the hole underneath will form a burr too. If the plate is to fit closely, then this burr needs somewhere to go and so the small countersink on the underside of the wrapper is

to allow for it. Equally, rivets have a small radius under their heads and the outside countersink is to allow them to seat fully down prior to closing the joint.

The last item to be added to the wrapper is the hole for the chimney opening and so a circle of small holes was drilled and de-burred while the plate was still flat. This is deliberately left in place as it helps to keep the plate rigid while it is being formed into circle (**photo 42**). Once the wrapper has been fitted to the flanged plates, the assembly can be held down on the lathe cross-slide with any suitable packing and the hole can be opened up and a precision boring tool used to achieve the final diameter.

All that remains now is to form and fit the smokebox wrapper to both smokebox plates and add all the rivet detail, which I shall describe next time.

● To be continued.



The wrapper plate with all the rivet holes drilled and trimmed to length. The hole for the chimney has also been marked out and the holes to release the centre piece have been made but this will not be completed until the wrapper has been attached to the smokebox flanged plates and it can then be bored for the required petticoat pipe diameter.

NEXT TIME

We shall make and fit the smokebox door.

Building Signals for 5 inch Gauge PART 7

Doug Hewson adds realistic detail to the running lines.



Continued from p.158
M.E. 4604, 18 January 2019

GNR lattice post signals

I thought that I had better start this instalment off with a bit of background, so this first photo shows the lever frame which I built for Belle Isle Signal Box. The name was chosen by me I am afraid to say as it was the Box at Kings Cross and Ferme Park Goods and the first one outside Kings Cross Station. I knew that when we laid the track there was going to be at least one scissors crossover there, so it seemed most appropriate. We haven't got Ferme Park Goods there but at least we have one end of Coton Hill Yard which includes several other items of railway interest, including a triangular Junction which surrounds the Box. There are also at least two other crossovers, including a couple of entrances into the yard, to add a bit of interest.

This meant some additional signalling and, in any event, I had pressed one of my own lever frames into service to go in the Box temporarily. This was only a 30 lever frame and,

with the additional levers for the yard entrance and the level crossing, we decided that we would need eighteen more levers in the frame. I set to over one Christmas to redesign the frame including all new interlocking and renumbering of the frame. I made the parts up as I had done before with eighteen new quadrant plates, eighteen new levers and the microswitches to suit. I had already accumulated the latches, latch guides, the catch handles and number plates ready for this event. All I had to do was make all the rest, like the catch handles.

Wiring it all together wasn't made any easier by the fact that everything was signalled bidirectionally as we have trains going two ways on our railway. I know that this is unheard of in some circles but do you know of any railway which only goes one way? No, neither do I. You would very soon end up with all the engines at one end!

Photograph 90 shows the lever frame installed with the block bells, telephone and the three instruments for point detection. The green lever at the far end of the frame is for the crossing gate gong and the brown one next to it is for the gate locks themselves. This lever needs to be pulled off when operating any of the signals which pass over the level crossing as otherwise they will not work.

For some time now, I have been wanting to build another lattice post signal. This one is to replace one of the old Ron Bray signals. It is at the exit from Coton Hill sidings just

before Belle Isle signal box in the down direction. It was also one of my very favourite signals at Barnetby Station and I used to love to see it bounce back to 'Danger' once the trains had passed by. It stood at the end of the footbridge at the entrance to the sidings until the Network Rail vandals destroyed it a couple of years ago in the name of resignalling.

Yes, I mean destroyed it as I thought that they would have offered it to some preservation society but, no, they just cut though the lattice work about a couple of feet up. The rest was also unceremoniously cut up and loaded on to the back of a lorry for scrap. It must have had a history as it was a real 'bitsa' with a GER bracket, two LMS finials and a GNR lattice post - wonderful stuff! **Photographs 91** and **92** show the signal still *in situ* at Barnetby Station.

Anyway, I started with the latticework and, having learnt from my last lattice effort, bought some $\frac{3}{16} \times \frac{1}{32}$ inch angle from Eileen's Emporium (I used to know Eileen and her husband Jim and used to call in fairly regularly for a cuppa when I worked in Leeds for a while). Fortunately they are still in existence (under new management) and you can get stuff almost by return of post from them. She had everything for the budding signal builder - anything down to 1mm angle!

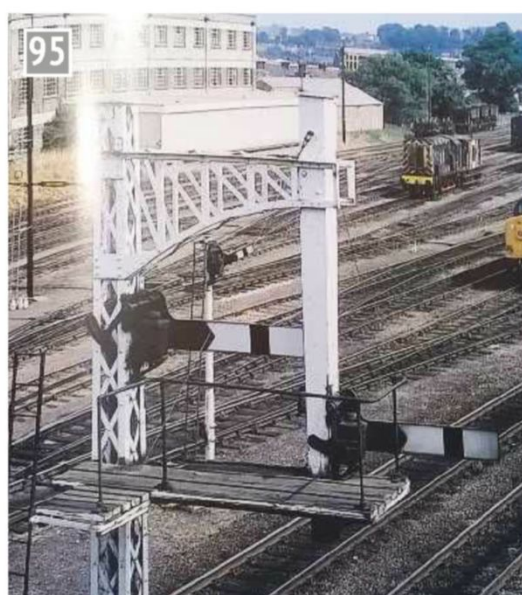
I started the signal by pinning two of the stringers to a board at the correct taper. I discovered from my previous effort with a lattice post that each level of bracing has to be made individually



so that the rivet holes line up properly. The ones in each side of the stringer were set out at a scale 18 inches apart and the stringers were then mounted on to a piece of 2 x 1 but I did increase it in width very slightly to give the whole thing a little more stability. The holes for the middle rivets are not in the middle and that was just one of the mistakes I made with the previous lattice post one I made (see **photo 93**). I hadn't realised my mistake until I had riveted all the diagonals together. Poo! The taper is only a quarter inch top to bottom so I just never imagined it would make all that difference. I can assure you though that the centre holes do not line up, so they were all drilled for the $\frac{1}{32}$ inch rivets separately.

The other mistake I made on this post was to use 20swg x 2.5mm strip for the diagonals and it was too thick. 22swg would have been much better. I therefore had to cut down the insides of the ends of the bracings with a small diamond disc to make room for the bracings which were to fit in the other two sides of the post. **Photograph 94** shows the lattice completed. Had I looked a bit more closely at other photographs I have of lattice post signals I might have also realised that some GN lattice posts also have two sides of diagonals at alternate spacings to the other two. **Photograph 95** shows a GN signal with this type of lattice. **Photograph 96** shows the base for my signal which is somewhat more substantial than the full size one as I couldn't put any guy wires up to my post like the full size one has!

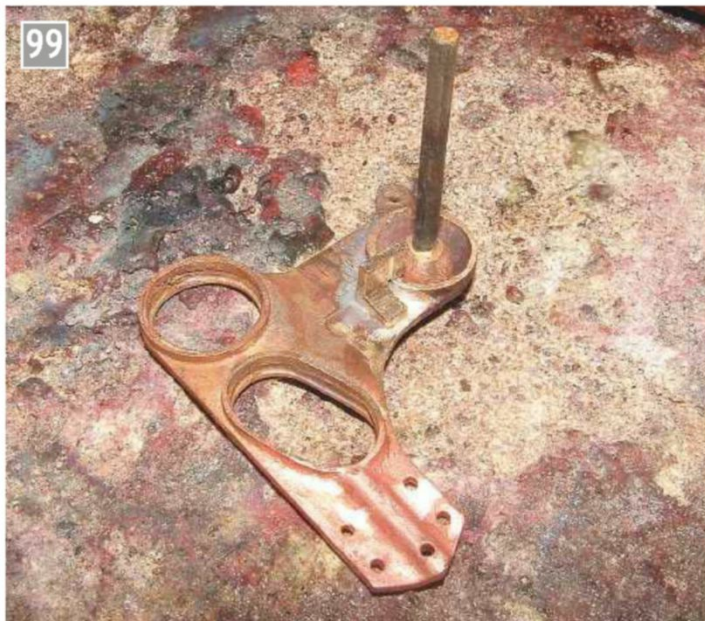
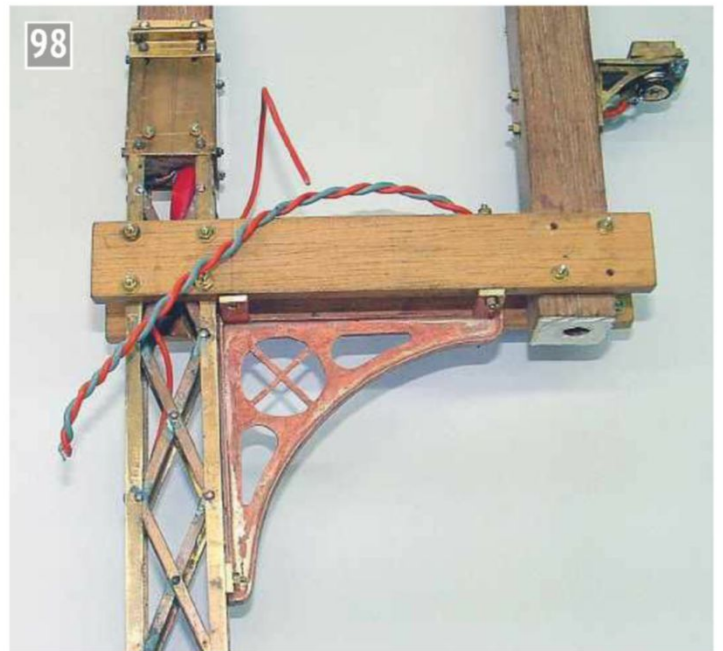
The next job was to make the GER bracket for the subsidiary arm. It consists of a 20swg brass centre piece edged with $\frac{3}{16}$ inch x 18swg brass strip. I had to file out the little circle with the four spokes in it first and they had to be typically at 45 degrees. The other thing is that the bracket is not a right angle due to the taper of the post. The sides



of the two tear-drop shaped cut-outs also had to be cut to align with the hole, which also had to be filed out, but it didn't take that long. **Photographs 97 and 98** show the making of the bracket and the completed job.

Steve cut me some timber to make the two dolls and they just fitted the outside of the lattice post perfectly so it was an easy matter for me to make the pair of timber cantilevers for the subsidiary

arm bracket. I also had the two finials in stock. I had to drill up the two dolls and then thread the wiring up to the lamps. I had to drill it at an angle both where the cables enter the post and where they emerge. I



also put a little timber plug in the bottom of the post to stop the creepy crawlies getting inside. The two dolls were also held together just behind the subsidiary arm by a pair of tie bars which were forged from $\frac{1}{16}$ inch welding rod. The ends were flattened for a couple of 10BA brass bolts.

Now, I have to say out of all the signals I have made I had never realised that upper quadrant semaphore signals have an inbuilt buffer stop

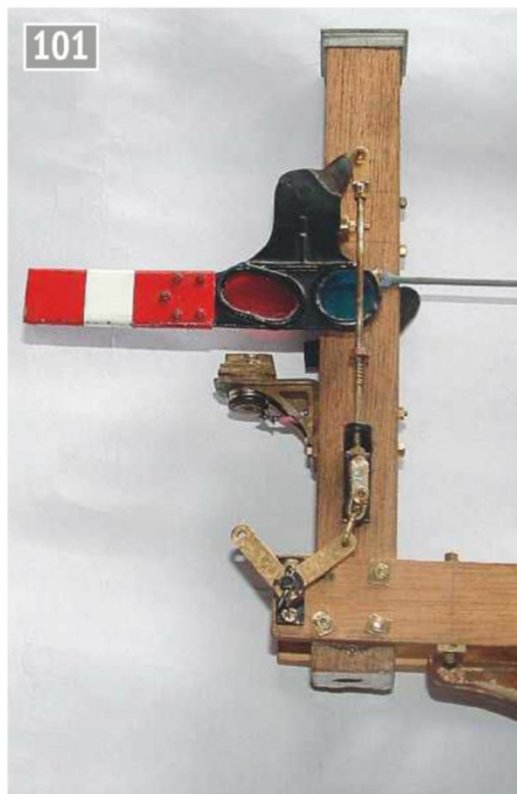
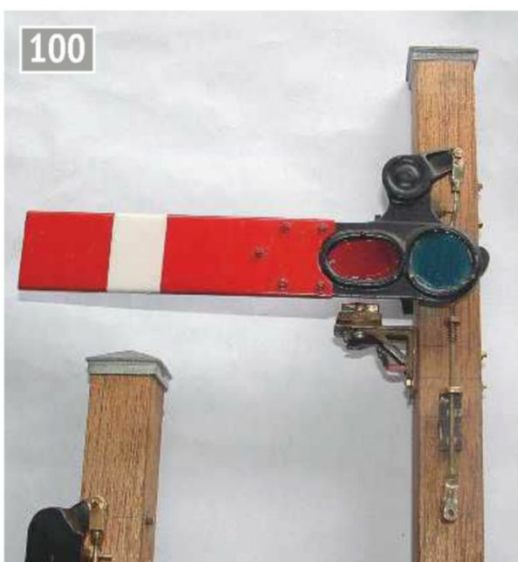
which makes them bounce so nicely. A main arm usually bounces about four times before coming to rest. This involves fixing a little piece of brass angle on the back of the spectacle plate to act as a buffer and a slight modification to the signal arm bracket to form the buffer housing. This latter consists of a piece of $\frac{3}{16}$ inch brass rod, a quarter inch long drilled with a $\frac{5}{32}$ inch drill to a depth of $\frac{7}{32}$ inch and the remainder drilled through with a No. 50 drill. It is silver soldered to the arm bracket in such a position as to ensure one aligned with the other.

I tried copying the linkage as best I could from the photographs of the full-size signal. This included making over shot springs in the system so that if the solenoid pulled the signal a bit vigorously it would not overshoot.

Photograph 99 shows the little buffer being silver soldered to the back of the arm. **Photograph 100** shows the main arm in place (I just couldn't wait to try it!) and the little buffer is just at the rear of the main arm. It bounces the obligatory four times just like the real signal! It was fitted with a car tyre valve spring.

Photograph 101 shows the subsidiary arm in place and you can also see the little sprung buffer a little more clearly on this photograph. The upper

I never heard of anyone falling off a signal in my life before and I have spent the best part of 50 years working amongst signals!



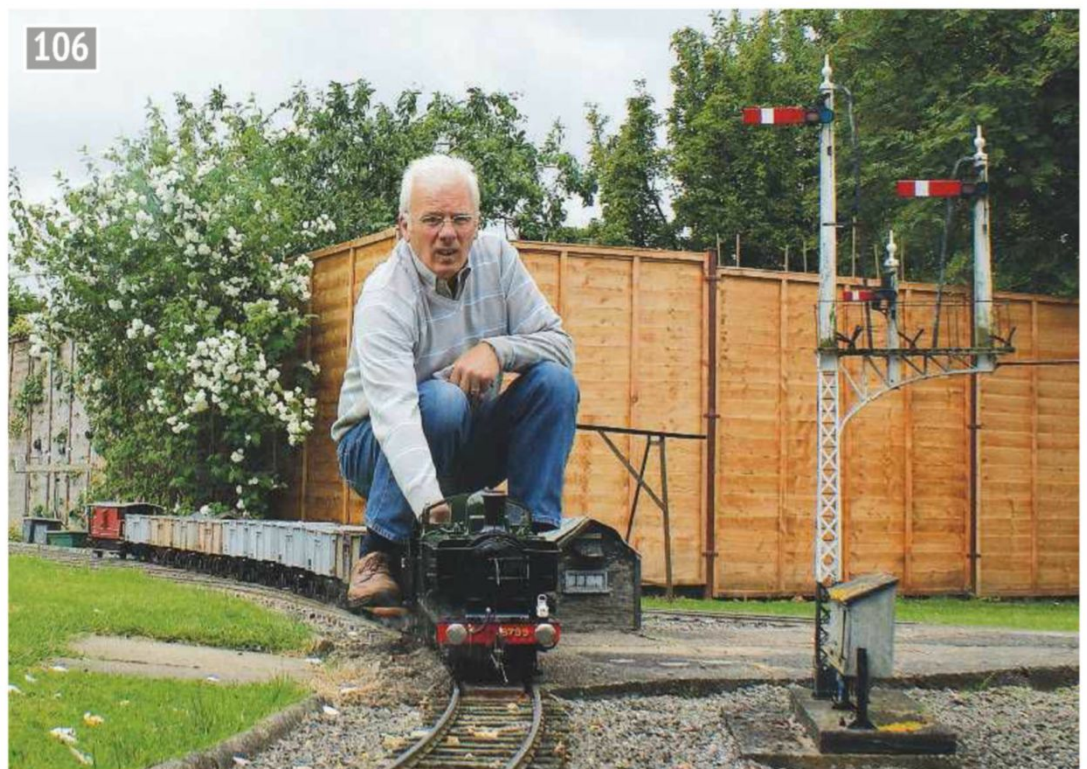
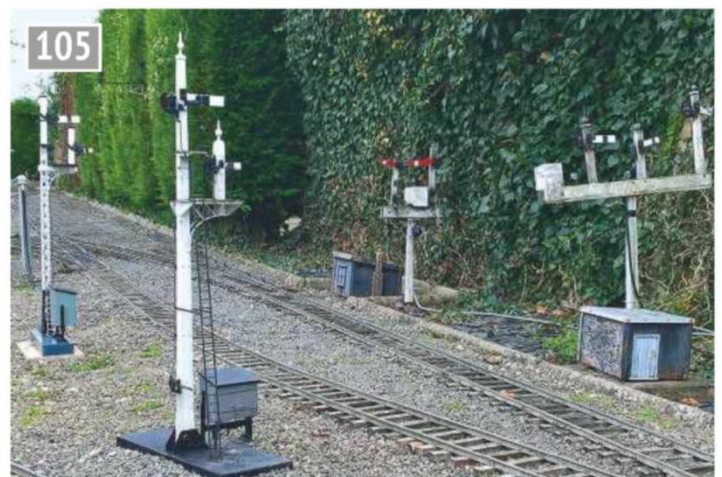
single man platform (**photo 102**) was made from a piece of $\frac{3}{16}$ inch x 18swg brass and the usual handrail from the obligatory $\frac{1}{16}$ inch welding rod. I didn't bother with the other stupid health and safety clutter which was added unnecessarily a few years ago. I never heard of anyone falling off a signal in my life before and I have spent the best part of 50 years working amongst signals!

In **photo 103** we see the solenoid box which was to my usual pattern, made from $\frac{3}{8}$ inch WBP marine plywood for the two solenoids. It is supported on a couple of columns made from $\frac{3}{8}$ x $\frac{1}{16}$ inch brass angle and has the usual cranks inside to finish the job off. I usually fit a separate terminal block inside the cabinet to attach the wires to. **Photograph 104** shows the signal siting which has the main arm for leaving the yard and the subsidiary arm for going across the points and down alongside the scissors crossover and off to the shed.

This leaves just two more to be built now for this section, both of which can clearly be seen to the right in **photo 105**. I tried standing one up straight for the photograph but it just fell over as the post was very rotten. The other one also has a splint up its middle to give it a bit of support and now this one also has something similar. The post has the consistency of Weetabix! At least now the signalman has full control of the yard and with the telephone in the carriage shed all working properly we can run the yard as it should be.

Photograph 106 is another lattice post signal which I built about 25 years ago and includes the Belle Isle up starting signals with the main arm to the right for the main line. The subsidiary signal in the middle gives access to Coton Hill Yard at the eastern end and the main signal on the right is for the goods avoiding Line which goes straight along to Coton Hill goods junction at the far end of the railway.

Frank is seen in photo 106 just passing over the junction



with his pannier tank and a nice little train of nine of our newish BR 16T mineral wagons

and an LMS brake van. We will come to the making of the GNR somersault signals in the next

article, one of which is shown in the immediate foreground.

●To be continued.

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



I have another fan! That's doubled my readership! He wrote and said he was in a dilemma; two magazines had arrived and he was torn between them. I told him I had a worse one as I got *MEW*, *Everyday Practical Electronics* and *The Engineer* that morning. He replied to the effect that "Three of a Kind Beats a Pair!"

In this issue, a cornucopia of construction, a coal mine, a steam motor bike, a Selsyn, a famous musical piece, Amy's Great-Grandmother, a Tamiya truck, a seasonal ghost story, Senior Olympics, sticky clacks, excavators, Lewis Carroll, and LOWMEX.

We are this time mostly taken up with photographs relating to the previous issue. From the **Gauge 1 Model Railway Association N&J** comes James Slater's Deltic (photo 1) and Bruce Fleet's train of Fisons tanker wagons



G1 Deltic 55019 (photo courtesy of James Slater).

(photo 2). LNER N2, 1744, from the hand of Andy Briggs (photo 3) is followed by pygmy painted people nicely nursing a 9F (photo 4). Moving up to 5 inch gauge, here is John Coleman's great 'Schools' at the Thornbury Exhibition (photo 5) and Davinder Matharu's CuP Alloys 'Best in Show' Fowler showman's

engine, complete with LED-illuminated canopy (photo 6). W. www.g1mra.com

PEEMS Newsletter, November, from Pickering Experimental Engineering & Model Society, has a comprehensive piece on speed trials at Elvington and Coniston Water, from Paul Windross. One entrant was riding a steam motorbike!



G1 Fisons tankers (photo courtesy of Bruce Fleet).



G1 N2 and dynamometer car (photo courtesy of Andy Briggs).



John Coleman's 5 inch gauge SR 901 Winchester at Thornbury (photo courtesy of Bernard North).

Pretty painted people (photo courtesy of Derek Pollard).



2 inch scale Fowler showman's engine by Davinder Matharu
(photo courtesy of Bernard North).

Meanwhile, the said bike and maker Graham Sykes will be presented in a talk in early February. Ted Fletcher spoke on the power factor of AC supplies. (Don't ask me to explain it - Geoff)

Model & Experimental Engineers, Auckland, *Newsletter* opens with a mention of the company Avspecs Ltd, which is building Mosquito aircraft, new. NZ lacks suitably qualified pilots, so a US flier will arrive to test fly it, their third. A fourth is to follow. Chris Ratcliffe showed a Desynn indicator. Also known as a 'Selsyn', it is a multiwire-connected, 50Hz AC-powered remote indicator of the direction or angle of a component, often used in submarines. (I used to have a set, of which the two end indicators were acquired years apart. Once I found out the proper connections and the correct power supply, they worked perfectly together.) Murray Lane has been restoring several old machines having broken castings etc. Repairing cast iron is complex and needed inspired thinking to sort out and make robust, lasting solutions.

Gauge 1 North, Yorkshire Group, has plans for improvements to the Ridings and Moordale layouts. The latter will be at Manchester in February and the former at Doncaster in May.

W. www.gauge1north.org.uk
Maidstone Model Engineering Society, winter

Newsletter, has a photograph of a large HGV on the front, wearing a Santa hat. Has he sacked all the reindeer? Ray Milliken, who has died, built a *Romulus* which appeared at a MEX, on the Southern Fed. stand, and was spotted and bought by David Rose, who wrote the 'Stripper' music. Ray was a prolific builder, making a traction engine, three steam lorries, a steam car, a Simplicity roller and a steam tricycle. Not confined to great metalwork, he built clocks, a writing bureau and an electric organ as well. He was going to build a hovercraft but was overtaken by events. Andrew Hulse writes at length on a 2-6-0, *Lorchwood*, a locomotive of many summers, which had seemingly incurable rattles and clanks. Passing through several owners, this 5 inch gauge version of LBSC's *Princess Marina* arrived at Andrew's door and, after many more clattery years, bits began to drop off and it was clear it needed major attention. Thanks to much assistance from Richard Linkins it now runs like a sewing machine and looks very smart. Amy Dixon bought a small traction engine, a Mamod, for a bargain price - £10! It is to be named *Jeanie*, after her Great Grandmother, who encouraged her. Many options presented themselves, like the colour - black & gold, or sparkly pink & purple? Settling on Ford Purple Velvet, Amy drilled out all the rivets and after painting

began reassembly, starting with the boiler gauge glass cover. Admiring her handiwork, her mentor suggested that the glass should have been inserted first. Send for the drill again - we've all done it! Thanks to Luke Bridges for instruction and oversight. The MENCAP run so entranced one youngster, says Rita Williams, that she insisted on staying on the train right up to the point where the engine went to the sheds! Simon Bridges builds a radio-controlled Volvo FH12 truck, from a Tamiya kit. (This was interesting, I didn't know what was involved in these vehicles - Geoff)

W. www.maidstonemes.co.uk

Coate Express, Xmas issue, from **North Wilts Model Engineering Society**, has a picture of an Advent calendar on the cover, bearing mugshots of the Great and the Good of the Society. Very original! John Spokes writes an excellent ghost story, 'A Christmas Journey', traditional at this time of year. A superbly funny proposal for a Senior Olympics bears frequent repetition. An extract - 'All competitors must be on drugs, preferably supplied by NHS.

Dumper Truck Timed Obstacle Race: Competitors will each use three trucks, points deducted for hitting trees and getting stuck. Every truck will have at least one fault and differing pedal arrangements.

Rowing: lacking the correct machinery, paint stirring will be substituted. Some stirrers have already emerged...! Reg Barratt made a $\frac{1}{12}$ scale *Flower* Class Corvette kit, named *HMS Begonia* (Google it), built in Beverley, Yorkshire. He also builds Whirligigs, wind-powered animated, simple automats. John Spokes also writes on the 'Not So Permanent' Way.

W. www.nwmes.info

Stamford Model Engineering Society informs us that Keith Hansell has made a $\frac{1}{12}$ scale, working fairground roundabout. The question, "Why do they all rotate clockwise?" is answered by "So that you can read the

name around the top edge as it is moving". John Hennessey showed some of his ever-growing collection of record players, wire recorders and radios. The *Wondergram* claims to be the world's smallest record player, yet is capable of playing both 7 inch and 12 inch records. (Apparently, no one seems to have thought about reading the details on the label as it plays, or maybe they did on cylinder machines - Geoff) Wire, steel band, and tape recorders were patented in principle by Valdemar Poulsen in about 1900. Reading the patent, it even covers computer discs and bank card magnetic strips.

The Link, January, from **Ottawa Valley Live Steamers and Model Engineers**, brings us up to date with Editor Graham Copley's 5 inch *Royal Scot*. Incorporating three cylinders, four eccentrics, three sets of valve gear, new, tight bearings and divided drive, there was no way it was going to run easily. Graham expected this, and was not disappointed. Well, he was, there is always hope! Anyway, our hero connected the cylinders to air at 100psi and gave them a blast. Surprised by this turn of events, the mechanism worked until the pressure dropped away. I think that's a result!

W. www.trainweb.org/ovlsme

Steam Chest, January, from the **National 2½ inch Gauge Association**, tells of Derek Round, who after running 16mm scale and 32mm gauge, acquired (as you do) a *Green Arrow*. After dealing with some problems, he attended a nearby 'Get-Together' and was hooked! At the York GTG, the weather forecast was dreadful, and only two N25GA members attended. Derek was unable to get *Green Arrow* to steam without using an electric blower. Once he removed the protective oily rag from the smokebox, matters improved immensely. A Gresley P1 retired hurt, blowing steam from the glands, with sticking clacks, and a B2 never made it beyond the 'naughty step', also with clack problems.

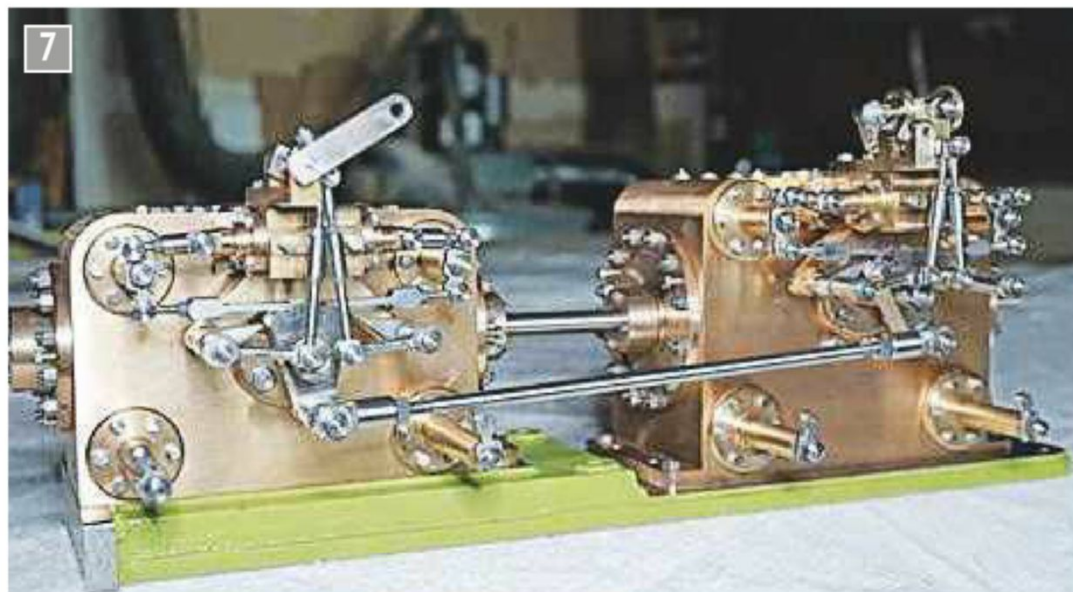
The weather forecast was obviously for somewhere else, as the day was lovely and sunny, and enjoyed by all! The final GTG was at Chesterfield and, unusually, one group began an earnest and knowledgeable session on driving trolleys. It's not always locomotives! Peter Haycock made two coupling hooks for *Ayesha*. Not liking commercial offerings, he made them from scratch, on the basis that, as they are quite prominent, they should look good. Derek Round also writes a Guide to Good Draughting, which designers should consult, and with which owners can compare their models. Peter Shaw writes on Threlkeld Quarry, near Keswick, which houses both the Vintage Excavator Trust and the Threlkeld Mining Museum. Their derelict narrow gauge railway has been revived, and takes passengers on a (realistic) jolting ride into the quarry, past a collection of ancient excavators. (That actually sounds quite interesting - Geoff)

W. www.n25ga.org

Port Bay Express, January, from **Portarlington Bayside Miniature Railway**, prints a possibly libellous, yet funny, piece by Douglas Adams (the very same!) about Australia and its people, who seem to have a thing about sticks. There may be something in it, as the sticks keep coming back. Australia also has animals, subdivided into Poisonous, Odd and Sheep. A long serving member of the railway has died - Marley, Dog of this Parish, and of John and Elizabeth Turner. When a fault in the track was discovered, Marley would stand guard until it was repaired. A gift suggestion featured lots of locomotives. I thought this was a little impractical, until I realised that it was a colouring book... Passenger numbers for December are up by 5%, and for the year, 16%.

W. www.miniaturerailway.com.au (You gotta go 'Ow' - Spike Milligan)

The Whistle, January, from **British Columbia Society of**



Corliss engine valve gear (photo courtesy of Dave Thorpe).

Model Engineers, also adopts an 'Advent Calendar' style for this issue, in this case, the Society's Award Winners. Also remembered as their Proudest Moment of 2018, their one millionth passenger, 18-month-old Ada Zhu.

W. www.bcsme.org

Bradford Model Engineering Society's Monthly Bulletin

includes John Shelton's (supervisor) account of the clubhouse reroofing, necessitated by loose and missing tiles, and rotting laths (sounds a bit 'Lewis Carroll', 'Twas brillig and the mossy tiles did slide and slither down the laths...). David and Mary Jackson visited Australia and, whilst Mary went to a quilt exhibition, he attended a car rally, including a display of English makes. This included a racing MG, bodywork made in Melbourne, trailed behind a Rover 110, whilst Ken Shipley took his Mk1 Ford Escort, trailed by his 420 Jaguar. A restored Vauxhall 30/98 of 1924 contrasted with a universally rusty, barn find of a 1953 Riley Pathfinder.

W. www.bradfordmes.co.uk

City of Oxford Society of Model Engineers' CoSME

Link, begins (after several reports and official stuff) with Steve Fraser's account of his railway interests entitled '32A to CoSME'. He's from near Norwich (32A), you see, culminating in the

purchase of a *Mountaineer* and finding out how to run it. John Winn writes up his visit to a steamboat rally in New Hampshire, USA. There he met Dave Thorpe, who is building a superb Corliss engine from Southworth castings (photo 7). Richard Brown describes the cast iron edifice in his garden, which originated (the edifice) in a boiler plant which was being demolished. David Price visited the National Coal Mining museum at Caphouse Colliery, Wakefield, and was most impressed. Don't go down if you are claustrophobic, he says. (I've been there, the steam winding engine is still used, but it has an electric winder too. If all else fails, visitors can walk out along a connecting drift - Geoff)

W. www.cosme.org.uk

Halesworth & District Model Engineering Society's

Winter Newsletter says that Horace Neath bought a box of 'stuff' at auction, for £100, and discovered that it contained most of the parts for a very rare Vulcan 2 inch scale traction engine. Very little is known of this long-gone company, situated in Beccles. (I like it already! - Geoff) The LOWMEX event went well, with some notably interesting models, including Adrian Cowlin's AEC *Matador* showman's gun tractor wagon created from a mobility scooter, Nick Gratton's 2 inch

Fowler showman's engine, and Bernie Towers's beautiful, part completed turret clock. All in, 43 members displayed their models - a great contribution! A pair of Daleks patrolled the school, somewhat bemused that their bid for world domination should begin in Lowestoft. A great number of other exhibits and stands were in evidence, including Brian Hammond's mediaeval castle, revealing fully detailed rooms within, after removing the roofs. I cannot do justice to this exhibition here but it is a 'definite must' to attend if you can. Finally, a cheque for £676 was handed to S.O.L.D. a new charity. (I couldn't access its website, my search engine claimed it was not correctly configured - Geoff) An interview with Martin Evans Mk2 (ME Editor) concludes the issue. Depending on the exact criteria, LOWMEX is a bigger show than the Midlands exhibition.

W. www.hdmes.co.uk

And finally: now that the two-day holiday is over, if you got one, we can say goodbye to all those 'Best of 2018' compilations, even of Eastenders... I really do not see the attraction of the "Diction of Dock Green".

Contact:
geofftheasby@gmail.com

FEBRUARY

- 26 Romney Marsh MES.**
Members' social afternoon, 2pm.
Contact Adrian Parker: 01303 894187.
- 26 Wigan DMES.**
Presentation by Mr J Schofield on 'The Isle of Man Transport System'.
Contact Brian Clark: brianclark2@sky.com.
- 28 Sutton MEC.** Cotton reel racing – make your own. Contact Paul Harding 0208 2544749.
- 28 Worthing & District SME.** AGM, 7.30pm.
Contact Geoff Bashall: 01903 722973.

MARCH

- 1 North London SME.**
Auction. Contact Ian Johnston: 0208 4490693.
- 1 Portsmouth MES.**
Club night – members railway heritage films, 7.30pm, Tesco Fratton Community Centre.
Contact Roger Doyle: doyle.roger@sky.com.
- 1 Rochdale SMEE.**
Members' projects and problems, at Castleton Community Centre, 7.30pm. Contact Rod Hartley 07801 705193.
- 2 Tiverton & District MES.** Running day at Rackenford track.
Contact Chris Catley: 01884 798370.
- 3 North Wiltshire MES.**
Public running, Coate Water Country Park, Swindon, 11am-5pm.
Contact Ken Parker: 07710 515507.
- 5 Romney Marsh MES.**
Products of the winter workshop, 7.30pm.
Contact Adrian Parker: 01303 894187.
- 6 Bradford MES.** AGM, 7.30pm, Saltaire Methodist Church.
Contact: Russ Coppin, 07815 048999.

- 6 Brandon DSME.**
Meeting at The Ram Hotel, Brandon, 7.45pm.
Contact: Mick Wickens, 01842 813707.
- 6 Bristol SMEE.** DRO/CNC evening. Contact Dave Gray: 01275 857746.
- 6 Leeds SMEE.**
Meeting night – jumble sale. Contact Geoff Shackleton: 01977 798138.
- 7 Sutton MEC.** Bits and Pieces. Contact Paul Harding 0208 2544749.
- 8 Tiverton & District MES.**
Club meeting at Old Heathcoat Community Centre, Tiverton, 7.30pm. Contact Chris Catley: 01884 798370.
- 10 North Wiltshire MES.**
Public running, Coate Water Country Park, Swindon, 11am-5pm.
Contact Ken Parker: 07710 515507.
- 10 Leeds SMEE.**
Public running at Eggborough track from 10am. Contact Geoff Shackleton: 01977 798138.
- 10 Sutton MEC.** Sunday track day from noon.
Contact Paul Harding 0208 2544749.
- 12 Romney Marsh MES.**
Members' social afternoon, 2pm.
Contact Adrian Parker: 01303 894187.
- 12 Southampton SME.**
AGM. Contact David Goyder: 02380 421201.
- 14 Worthing & District SME.** Club meeting, 7.30pm. Contact Geoff Bashall: 01903 722973.
- 17 Guildford MES.** Public Open Afternoon 2-5pm.
Contact Mike Sleigh: pr@gmes.org.uk
- 17 North Wiltshire MES.**
Public running, Coate Water Country Park, Swindon, 11am-5pm.
Contact Ken Parker: 07710 515507.

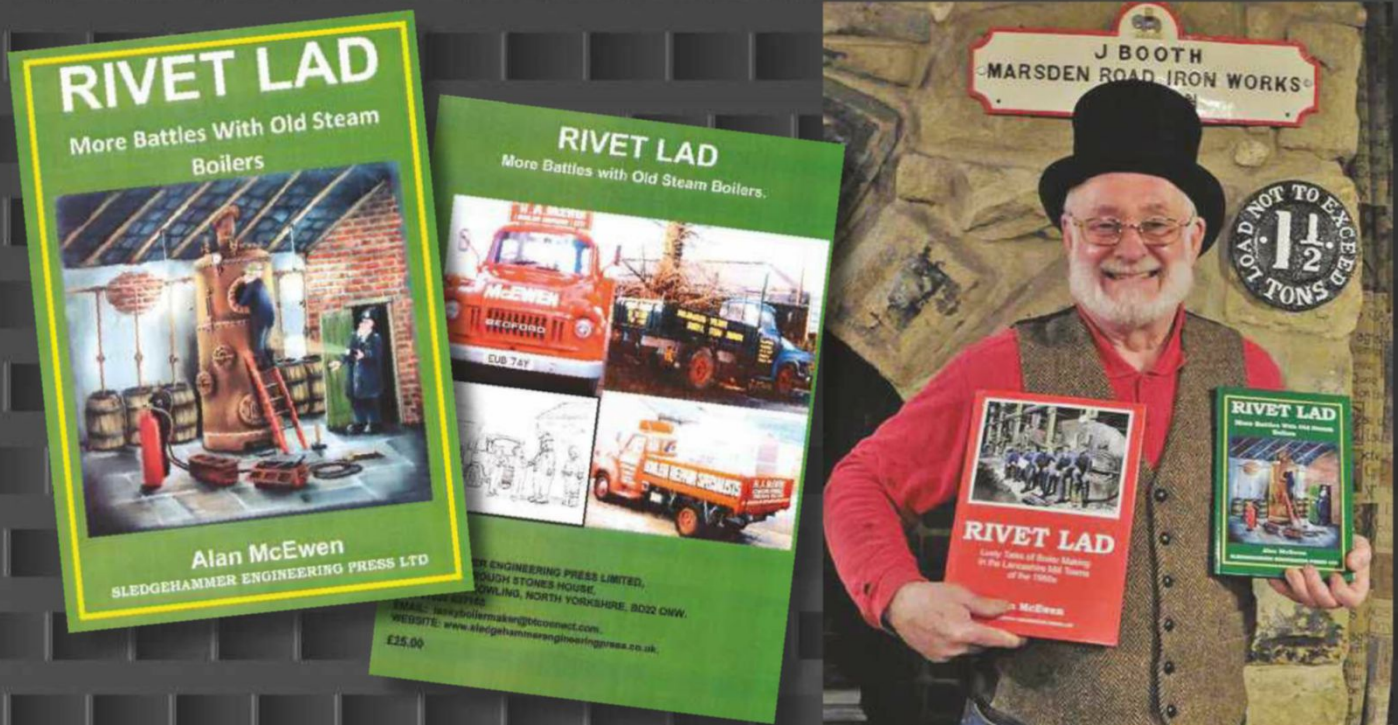
- 17 Tiverton & District MES.** Running day at Rackenford track.
Contact Chris Catley: 01884 798370.
- 19 Romney Marsh MES.**
Talk: 'RMMES – The Beginning' – John Wimble and Tony Crowhurst, 7.30pm.
Contact Adrian Parker: 01303 894187.
- 20 Bristol SMEE.** Spring auction. Contact Dave Gray: 01275 857746.
- 20 Leeds SMEE.**
Meeting night – 'Restoring a Full Sized Andrew Barclay Saddle Tank Locomotive' – John Dunn. Contact Geoff Shackleton: 01977 798138.
- 23 Worthing & District SME.** Cobweb run.
Contact Geoff Bashall: 01903 722973.
- 24 North Wiltshire MES.**
Public running, Coate Water Country Park, Swindon, 11am-5pm.
Contact Ken Parker: 07710 515507.
- 24 Portsmouth MES.**
Public running, 2-5pm, Bransbury Park.
Contact Roger Doyle: doyle.roger@sky.com.
- 26 Romney Marsh MES.**
Members' social afternoon, 2pm.
Contact Adrian Parker: 01303 894187.
- 26 Wigan DMES.**
Presentation by Mr T Heavyside on 'Lancashire Steam'.
Contact Brian Clark: brianclark2@sky.com.
- 28 Sutton MEC.** Bring and Show. Contact Paul Harding 0208 2544749.
- 28 Worthing & District SME.** Club meeting – 'Secrets of Cowfold Monastery', Keith West, 7.30pm. Contact Geoff Bashall: 01903 722973.
- 28-31 GL5MLA.** Shildon GL5 event. Contact Peter Layfield: 01406 365472.

- 30 Westland & Yeovil DMES.** Track running day 11am – 4.30pm.
Contact Bob Perkins: 07984 931993.
- 31 Bedford MES.** Public running, from 10.30am at Summerfields Miniature Railways.
Contact Brian Walton: 07498 869902.
- 31 Portsmouth MES.**
Public running, 2-5pm, Bransbury Park.
Contact Roger Doyle: doyle.roger@sky.com.

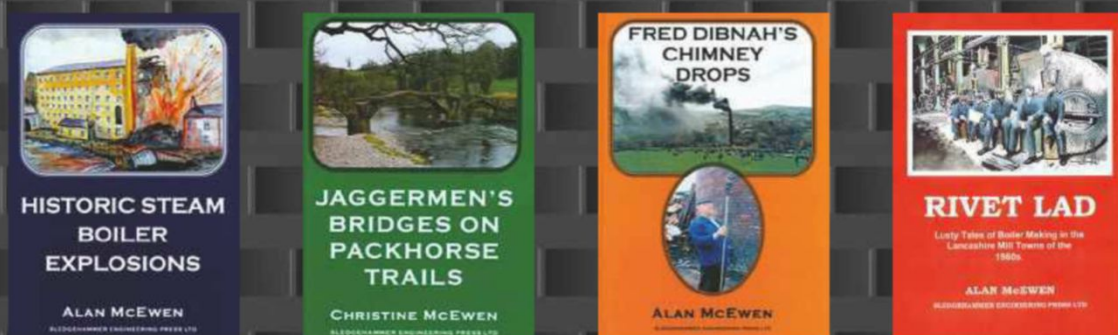
APRIL

- 2 Romney Marsh MES.**
Track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.
- 3 Bradford MES.** Spring auction, 7.30pm, Saltaire Methodist Church. Contact: Russ Coppin, 07815 048999.
- 3 Brandon DSME.**
Meeting at The Ram Hotel, Brandon, 7.45pm.
Contact: Mick Wickens, 01842 813707.
- 3 Bristol SMEE.**
Talk: 'Turbine Modelling' – John Beddis.
Contact Dave Gray: 01275 857746.
- 3 Leeds SMEE.**
Meeting night – Trophy night. Contact Geoff Shackleton: 01977 798138.
- 4 Sutton MEC.** Bits and Pieces. Contact Paul Harding 0208 2544749.
- 5 North London SME.**
Talk: 'Isambard Kingdom Brunel and the GWR' – Colin Gent.
Contact Ian Johnston: 0208 4490693.
- 5 Portsmouth MES.** Club night – 'A Piece of Time', 7.30pm, Tesco Fratton Community Centre. Contact Roger Doyle: doyle.roger@sky.com.

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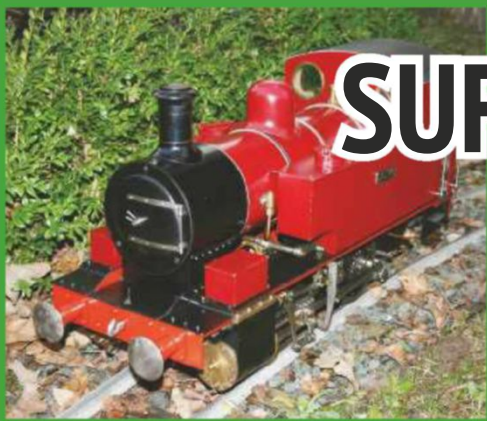
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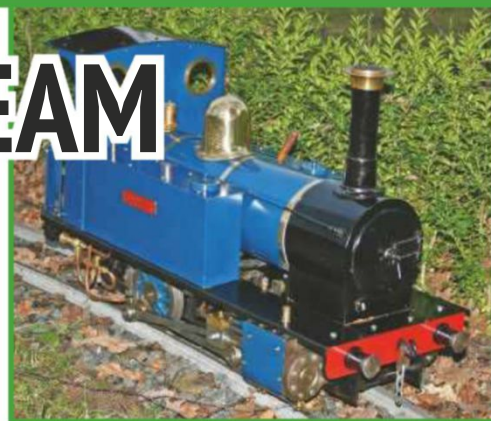
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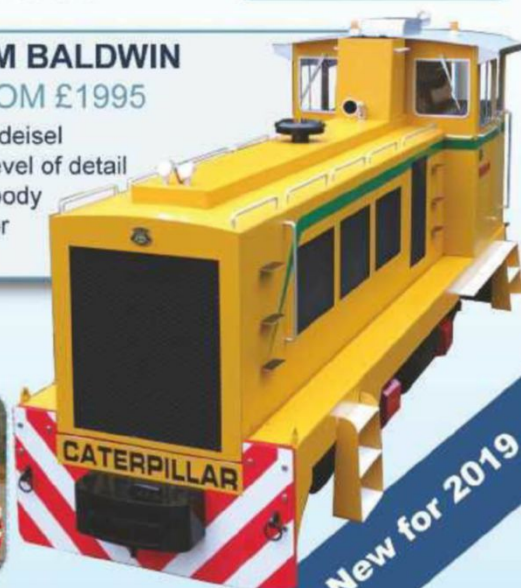
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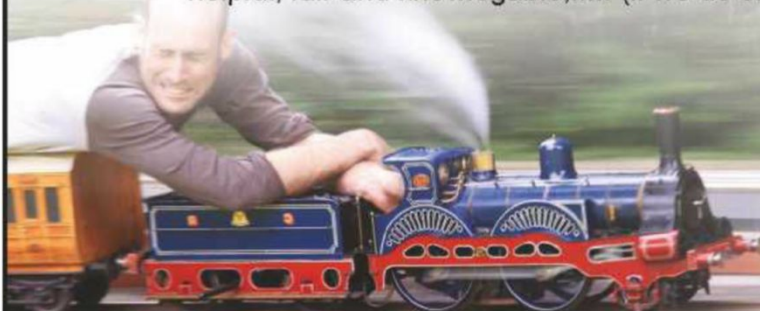
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- Painting and lining service
- Laser and water cutting
- Ce marked copper boilers
- Buy and sell live steam models

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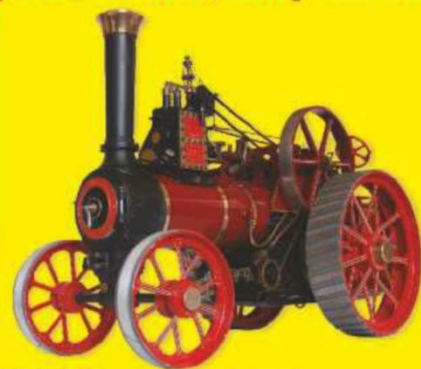
Hunselt, Simplex, Speedy,
BR Class 2, Horwich Crab,
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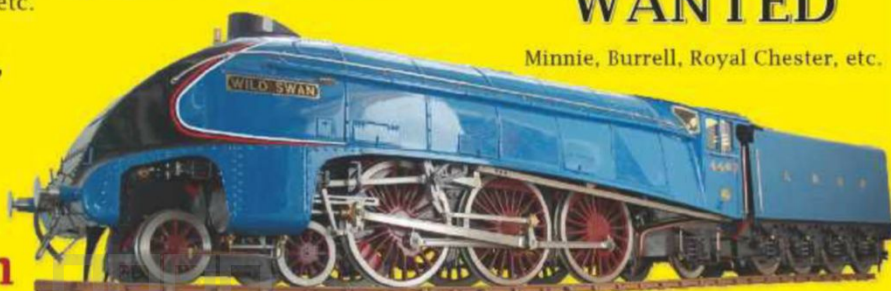
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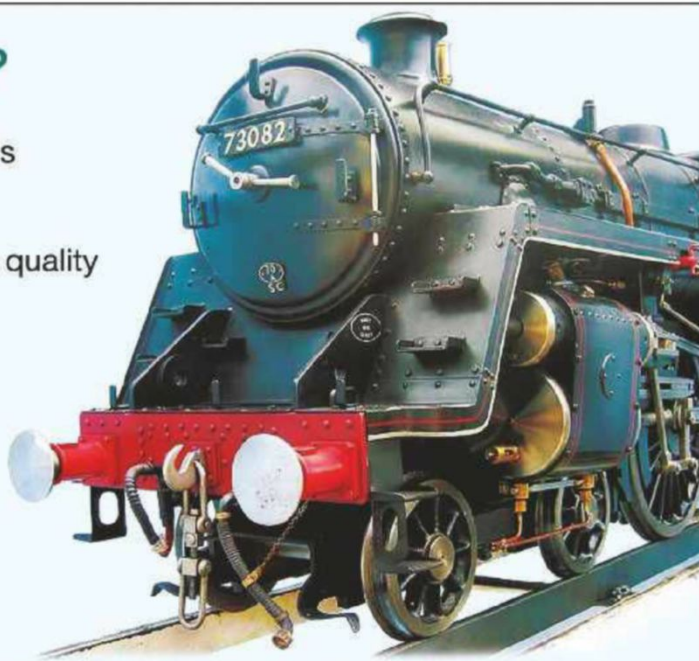
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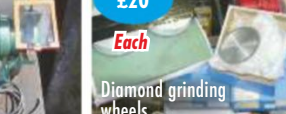
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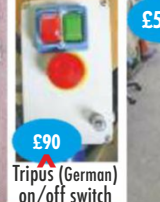
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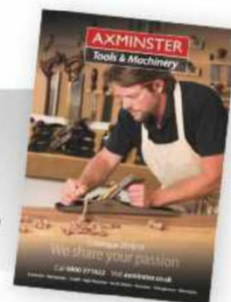
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