THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

Vol. 222 No. 4609 • 29 March - 11 April 2019

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- Forward/reverse lathe operation
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Clarke METAL LATHE

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- Electronic variable speed
- Gear change set
- Self centering 3 jaw chuck & guard
- Power feed

CL300M

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Clarke STATIC PHASE CONVERTERS

- Run big 3 phase woodworking machines from 1 phase supply
- Variable output power to match HP of motor to be run

FROM ONLY £229.00 EXC.VAT £274.80 INC.VAT

CONVERT 230V 1PH TO 400V 3PH

PC60

ROTARY PHASE CONVERTERS ALSO IN STOCK

MODEL	MAX. MOTOR HP	FUSE	EXC.VAT	INC.VAT
PC20	2HP	10Amps	£229.00	£274.80
PC40	3.5HP	20Amps	£269.00	£322.80
PC60	5.5HP	32Amps	£319.00	£382.80

Clarke ARC / TIG INVERTER WELDERS

- Efficient inverter technology
- Variable output current

FROM ONLY £129.98 EX.VAT £155.98 INC.VAT

MODEL	MIN/MAX OUTPUT CURRENT	ELECTRODE DIA. (MM)	EXC.VAT	INC.VAT
AT133	10A-130A	2.5/3.2	£129.98	£155.98
AT135	10A-130A	2.5/3.2	£169.98	£203.98
AT162	10A-160A	2.5/3.2/4.0	£149.98	£179.98
AT165	10A-160A	2.5/3.2/4.0	£199.98	£239.98

Clarke MIG WELDERS

Quality machines from Britain's leading supplier

See online for included accessories

135TE

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MODEL	MIN-MAX AMPS	EXC.VAT	INC.VAT
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- Protects to EN379
- Suitable for arc, MIG, TIG & gas welding

SEE FULL RANGE IN-STORE/ONLINE

Clarke ANGLE GRINDERS

INC. DISC & HANDLE

CAG800B

FROM ONLY £24.99 EX.VAT £29.99 INC.VAT

MODEL	DISC (MM)	MOTOR	EXC.VAT	INC.VAT
CAG800B	115	800W	£24.99	£29.99
CON1150	115	1150W	£27.99	£33.59
CAG2350C	230	2350W	£52.99	£63.59

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BEST SELLER

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MODEL	JAW WIDTH	BASE	EXC.VAT	INC.VAT
CV75B	75mm	Fixed	£19.98	£23.98
CV100B	100mm	Fixed	£20.99	£25.19
CVR100B	100mm	Swivel	£24.99	£29.99
CV125B	125mm	Fixed	£31.99	£38.39
CVR125B	125mm	Swivel	£36.99	£44.39
CV150B	150mm	Fixed	£49.98	£59.98
CVR150B	150mm	Swivel	£52.99	£63.59
CMV140	140mm	Swivel	£79.98	£95.98

Clarke DRILL PRESSES

- Range of precision bench & floor presses for enthusiast, engineering & industrial applications

B = Bench mounted
F = Floor standing

FROM ONLY £69.98 EX.VAT £83.98 INC.VAT

CDP152B

MODEL	MOTOR (W) SPEEDS	EXC. VAT	INC. VAT
CDP5EB	350 / 5	£69.98	£83.98
CDP102B	350 / 5	£79.98	£95.98
CDP152B	450 / 12	£149.98	£179.98
CDP202B	450 / 16	£189.00	£226.80
CDP10B	370 / 12	£199.98	£239.98
CDP352F	550 / 16	£229.00	£274.80
CDP452B	550 / 16	£239.00	£286.80
CDP502F	1100 / 12	£549.00	£658.80

Clarke TURBO AIR COMPRESSORS

8/250

FROM ONLY £89.98 EX.VAT £107.98 INC.VAT

- Superb range ideal for DIY, hobby & semi-professional use

* 'V' Twin Pump

MODEL	MOTOR	CFM	TANK	EXC.VAT	INC.VAT
8/250	2HP	7.5	24ltr	£89.98	£107.98
7/250	2 HP	7	24ltr	£94.99	£113.99
11/250	2.5HP	9.5	24ltr	£109.98	£131.98
8/510	2HP	7.5	50ltr	£119.98	£143.98
11/510	2.5HP	9.5	50ltr	£139.98	£167.98
16/510*	3 HP	14.5	50ltr	£209.00	£250.80
16/1010*	3 HP	14.5	100ltr	£259.98	£311.98

Clarke MILLING DRILLING MACHINE - CMD300

- Bench mountable, tilts 45° left & right from vertical
- Table travel 100x235mm
- Table Effective Size LxW: 92 x 400mm

CMD10

£599.00 EX.VAT £718.80 INC.VAT

£399.00 EX.VAT £478.80 INC.VAT

Clarke MICRO MILLING & DRILLING MACHINE

- Bench mountable
- MT2 Spindle Taper
- Face mill capacity 20mm, end mill 10mm
- Table cross travel 90mm, longitudinal travel 180mm

MODEL	MOTOR	SPINDLE SPEED	EXC.VAT	INC.VAT
CMD10	150W/230V	100-2000rpm	£399.00	£478.80
CMD300	470W/230V	0-2500rpm	£599.00	£718.80

Clarke 3-IN-1 SHEET METAL MACHINES

- Bend, Roll & Shear metal up to 1mm thick
- Min. Rolling Diameter 39mm
- Bending angle 0-90°

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SBR610

ROLLING

SHEARING

FOLDING

MODEL	BED WIDTH	EXC VAT	INC VAT
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SBR610	610mm (24")	£439.00	£526.80
SBR760	760mm (30")	£519.00	£622.80

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- All totally enclosed & fan ventilated for reliable long-term service

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3/4	4 pole	£79.98	£95.98
1	2 pole	£79.98	£95.98
2	2 pole	£94.99	£113.99
3	2 pole	£119.98	£143.98
4	2 pole	£139.98	£167.98

Clarke CONTRACTOR 18V BRUSHLESS COMBI DRILLS

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powered by Li-Ion

CON180LI

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MODEL	VOLTS	BATTS	EXC. VAT	INC. VAT
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CON18LI	18V	2x 4.0Ah Li-Ion	£159.98	£191.98

Clarke MEASURING EQUIPMENT

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MODEL	DESCRIPTION	EXC.VAT	INC.VAT
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CM180	0-25mm Micrometer	£10.99	£13.19
CM145	150mm/6" Digital Vernier	£17.99	£21.59
CM265	300mm/12" Digital Vernier	£34.99	£41.99

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EXTRA WIDE 56" CHESTS/CABINETS IN STOCK

MODEL	DESCRIPTION	EXC. VAT	INC. VAT
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CBB210B	10 Dr Chest	£139.98	£167.98
CBB203B	3 Dr step up	£72.99	£87.59
CBB215B	5 Dr Cabinet	£199.98	£239.98
②CBB217B	7 Dr Cabinet	£249.98	£299.98
CBB213B	3 Dr Cabinet	£199.98	£239.98

Clarke GRINDERS & STANDS

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STANDS FROM ONLY £47.98 INC.VAT

FROM ONLY £32.99 EX.VAT £39.59 INC.VAT

POLISHING KITS 4" TO 8" FROM ONLY £27.59 INC VAT

With sanding belt *8" whetstone & 6" drystone

MODEL	DUTY	WHEEL DIA.	EXC.VAT	INC.VAT
CBG6RP	DIY	150mm	£32.99	£39.59
CBG6RZ	PRO	150mm	£42.99	£51.59
CBG6RSC	HD	150mm	£54.99	£65.99
CBG6SB#	PRO	150mm	£56.99	£68.39
CBG6RWC	HD	150mm	£59.98	£71.98
CBG8W* (wet)	HD	150/200mm	£58.99	£70.79

Clarke ROTARY TOOL KIT

CRT40

£29.98 EX.VAT £35.96 INC.VAT

Kit includes: • Height adjustable stand with clamp • Rotary tool • 1m flexible drive • 40x accessories/consumables

Clarke BOLTLESS QUICK ASSEMBLY STEEL SHELVING

NEW RANGE

- Simple fast assembly in minutes using only a hammer

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Clarke CRANES

Fully tested to proof load

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MODEL	DESC.	EXC.VAT	INC.VAT
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CFC2000B	2 ton fold	£199.00	£238.80
CFC1000LR	1 ton long reach	£219.00	£262.80

BEST SELLER

CFC100

- Folding and fixed frames available
- Robust, rugged construction
- Overload safety valve

Clarke HYDRAULIC LIFTING TABLES

- Ideal for lifting & moving models
- Foot pedal operated

HTL500

FROM ONLY £299.00 EX.VAT £358.80 INC.VAT

MODEL	MAX. LOAD	TABLE HEIGHT MIN-MAX	EXC. VAT	INC. VAT
HTL300	300kg	340-900mm	£299.00	£358.80
HTL500	500kg	340-900mm	£319.00	£382.80

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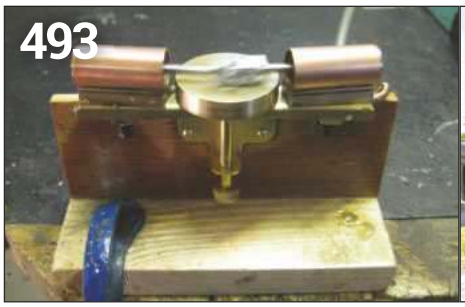

IN THIS ISSUE

Vol. 222 No. 4609 29 March - 11 April 2019

ON THE COVER...

Steve Russell, of the Leeds SMEE, fires up club secretary Geoff Shackleton's injector tester (photo courtesy of Nigel Bennett).

Small and mighty

Proxxon *FD 150/E Lathe & 6 Piece Cutting Tool Set Package Deal*

£529.96 *Inc.vat Code* **717495**

Proxxon Code **24150** (lathe only)

Watch video
proxxon.com

PROXXON MICROMOT System

Light, stable and precise turning.

This compact metalworking lathe is perfect for facing and longitudinal turning, boring, taper turning, parting and drilling.

- High maximum speed (5000 rpm) allows very small diameters to be machined
- Spindle made from die-cast aluminium
- Powerful, quiet-running DC motor with 2-stage belt drive and electronic speed control
- 3-jaw self-centring chuck supplied
- Distance between centres 150mm

The high quality cobalt HSS steel tool set consists of a boring, roughing out, parting, finishing, right and left cutters, contained in a handy wooden box. All cutters are 6 x 6 x 60mm.

BriMarc TOOLS & MACHINERY

For more information or to find a retailer go to ***brimarc.com/proxxon*** *or call* ***03332 406967***

Price may be subject to change without notice.

Wheels, buffers and detailing parts in 5" and 7 1/4" gauges

Contact 17D Miniatures:
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Email: sales@17d-miniatures.co.uk

7 1/4" Narrowgauge 6" Dia. £22.85 ea

7 1/4" g Fully Machined 8 Spoke Wheels - £29.90 ea

5" g. Plain Disc Wheels - £9.75 ea

7 1/4" g. Plain Disc Wheels £14.85 ea

....and probably the biggest range of buffers in the land! (this is just a selection!)

Silvertown Lubricators Kits
12 Feed: £92.00
8 Feed: £86.00

7 1/4" available - 5" coming soon

5" g. Timken Covers - just in!

7¼" g. 2 & 3 Feed Oil Boxes
2 Feed: £16.50 pair
3 Feed: £18.50 pair

Prices ex-works & excluding VAT

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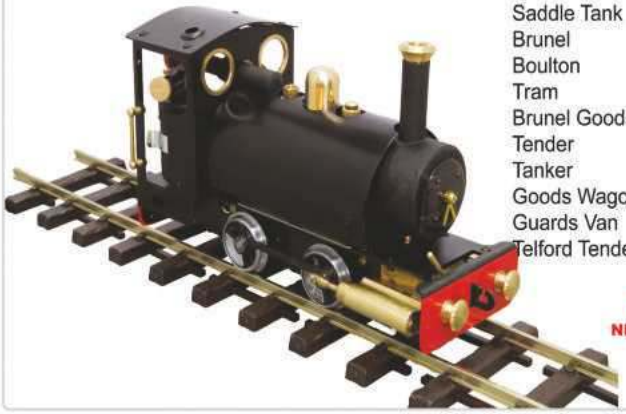

Telford	MTELG0	£452.00
MKIII	MK3 From	£336.00
Saddle Tank	MST From	£336.00
Brunel	MBrunelOG	£440.00
Boulton	1351BO	From £325
Tram	1351TR	£495.00
Brunel Goods Set	BGS-CC-N	£520.00
Tender	MTDR	£39.00
Tanker	MTNK	£39.00
Goods Wagon	MGWN	£44.00
Guards Van	MGVAN	£50.00
Telford Tender	MTDR-T	£45.00

A FULL RANGE OF THE NEW BATTERY RUN MAMOD LOCOS IN STOCK

DON'T FORGET! ELECTRIC LOCO CHARGER £35

*In stock as of 07/02/19, please note these loco's may no longer be available, check stocks online or call. Please note basic range takes 4 weeks from inital order and other locomotives are in batches. Batch dates will be in product description. Locomotives in stock will state instant dispatch available.

PECO

32mm (SM32) Track

Flexi Track - 12 Pack	SL600x12	£110.00
Flexi Track - 4 Pack	SL600x4	£38.00
Flexi Track - Single	SL600x1	£10.00
Setrack Curve - 6 Pack	ST605x6	£48.00
Setrack Curve - Single	ST605x1	£8.50
Setrack 38 Radius Curve - Single	ST607	£8.50
Setrack 38 Radius Curve - Six Pack	ST607x6	£48.00
Right Hand Point	SLE695	£45.00
Left Hand Point	SLE696	£45.00
Y Point	SLE697	£45.00
Small Radius Right Hand Turnout	SLE691	£45.00
Small Radius Left Hand Turnout	SLE692	£45.00
Wagon Turntable and Crossing	SL627	£20.00
Rail Joiners - 24 Pack	SL810	£3.50

45mm (G45) Track

Flexi Track - Six Pack	SL900x6	£79.00
Flexi Track - Single	SL900x1	£15.00
Setrack Curve - Six Pack	ST905x6	£45.00
Setrack Curve - Single	ST905x1	£8.50
Setrack Straight - Six Pack	ST902x6	£45.00
Setrack Straight - Single	ST902x1	£8.50
Right Hand Point	SL995	£60.00
Left Hand Point	SL996	£60.00
Point Motor Mounting Plate	PL8	£3.60
Metal Rail Joiners - 18 Pack	SL910	£6.00
Insulating Rail Joiners - 12 Pack	SL911	£3.10
Dual Rail Joiners - 6 Pack	SL912	£6.00

SUMMERLANDS CHUFFER

These highly developed and precision engineered chuff pipes that can bring the real sound of a working steam loco

A wide range always in stock!

Specials can be ordered on request

£29

inc. P&P

ROUNDHOUSE

In Stock Now*

Sammie	32mm & 45mm	£660
Bertie	Maroon,32mm	£660
Bertie	Blue, 32mm	£660
Bertie	Deep Brunswick Green ,32mm	£660
Bertie	Yellow ,32mm	£660
Little John, DHR Blue, Red Buffers		£602
Little John, Victorian Maroon, Chevron Buffers		£602
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IMLEC 2019

The International Model Locomotive Efficiency Competition this year will be hosted by the Leyland Society of Model Engineers. It will take place from Friday 12th July to Sunday 14th July at the club track in Worden Park. The competition is for 3½ and 5 inch gauge coal-fired locomotives. The closing date for entries is 31st May and application forms should be sent to secretary Alan Crossfield.

A copy of the rules and the application form may be downloaded from the society's website at www.leylandsme.wixsite.com. In addition, the website contains information about a local caravan park, and other accommodation options, as caravans or camping cannot be accommodated in Worden Park. The website also provides details of how to find the Leyland track.

Model Engineer Competition

Here is your last reminder to enter your model into the Model Engineer Competition, to be held as part of the 26th National Model Engineering Exhibition at Doncaster Racecourse from 10th to 12th May. The organisers hope to be absolutely inundated with entries to celebrate the re-establishment of the competition after an absence of a couple of years so don't be shy – enter our best model and try for one of the coveted prizes! To make life as simple as possible, a copy of the entry form and the rules are provided for you on pages 530 and 531.

The closing date is 10th April and this is, as they say, for the third (and last) time of asking.

Machine Mart

The new Machine Mart catalogue is packed full of all the tools and equipment you need whether you are a hobbyist, DIY enthusiast or professional. Featuring over 600 price cuts and new products, the 508 page spring/summer catalogue is a 'must have' for anyone seeking a huge choice of tools and equipment at unbeatable value.

With over 21,000 items of tools and machinery in stores across the country and online, you'll be sure to find the tools you need. To order your catalogue simply go online to www.machinemart.co.uk, visit your local store or call 0844 880 1265.

Proxxon Tube Belt Sander

I'm told the battery powered Proxxon RBS/A Tube Belt Sander is perfect for grinding, cleaning or putting a brushed finish on pipes or tubes. It is particularly effective in places difficult to reach using 'regular' power tools. The RBS/A greatly reduces time-consuming refinishing by hand in restricted areas. It is suitable for sanding, brushing and cleaning steel, non-ferrous metals and especially stainless steel.

It features continuously variable speed control (full-wave electronics) for constant speeds under load. Motor power is transferred to the planetary gearing, contained in robust die-cast aluminium housing. The head can be angled by up to 60° at the push of a button. There is a dust extraction outlet for connection to a vacuum cleaner for clean working. The main body of the machine is glass-fibre reinforced polyamide with a rubberised grip for comfort and greater control.

The sander is supplied with four abrasive belts (two of 80g, two of 180g) and two satin-finishing belts. The RBS/A includes Li/A (10.8V) battery and rapid battery charger in a virtually unbreakable polypropylene case with a handle and two snap closures.

It is currently available at £222.96 including VAT and further information may be found at www.brimarc.com.

RIP Brian Perkins

We regret to report that Brian Perkins, Duke of Edinburgh Trophy winner and frequent contributor to *Model Engineer*, died on 4th March aged 87. Brian's funeral will be held on 5th April at 11:15 at Canford Crematorium, Westbury-on-Trym BS9 3PQ and afterwards at Kingsweston House. An obituary for Brian will appear in the next issue of *Model Engineer*.

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

Building Signals for 5 inch Gauge PART 8

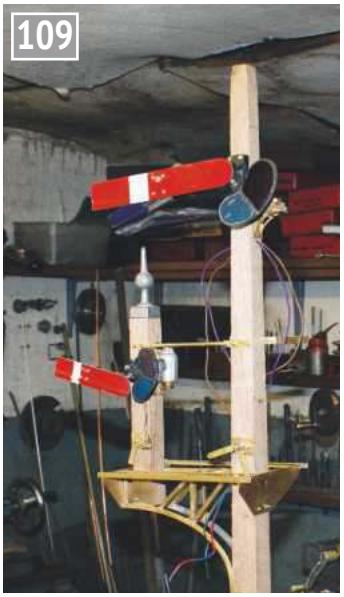
Doug Hewson adds realistic detail to the running lines.

Continued from p.393
M.E. 4607, 1 March 2019

Great Northern somersault signals

I will finish off by telling you a few things about our GNR somersault signals. These are ones which our relatively new member, Steve Clarke has built, which form the entrance/exit signals to and from the locomotive shed. They are situated around our Belle Isle signal box. There are two which are of a similar design and then another one which has the Stowmarket down distant beneath it. All these signals have tapered timber posts with the lamp wires either up a hole though the middle or hidden down one side and a groove filled with resin. **Photograph 107** shows all the parts which Steve made for the somersault signals x7! **Photograph 108** shows the arms painted and ready to mount on the signal.

Yes, he has built seven somersault signals altogether for our railway, which is no mean feat. He had to fabricate everything from scratch. Mind you, I had one left in my garden for six months or so, so I took advantage of that fact and produced a drawing of it, so at least he had something to work to, and it also helped that there were several somersault signal posts left on the Grimsby to Louth Railway which still had some fittings left on them.



During the same time he has also built three LNER grain vans, at least two LNER 12 ton vans, another four plank wagon, which he copied off one of the ones on the Grimsby to Louth Railway line, and installed all the signals which he and I built - oh yes, and he has done most of the wiring to connect them to the two signal boxes, so how's that for starters?! **Photograph 109** shows the first of Malc's and Steve's somersault signals in the workshop part built.

Photograph 110 shows the back of a very similar signal at Holt station on the North Norfolk Railway. I

≫

have shown the back of the signal to show all the detail. **Photograph 111** shows one of the 'Adlake' signal lamp brackets which I made for some of our older type signals. Take no notice of the pivot in the post as this was made for one of our Midland signals. **Photograph 112** shows the actual lamp pattern which I made for these signals, apart from the wire handle which has to be added later.

Photograph 113 is one of the old Ron Bray signals which sadly had to go as the post was very rotten at the bottom - and the fact that it was a GCR signal and not a GNR one. I must say, though, that it did last about 60 years. The signal which replaced it is shown in **photo 114**.

Some people have emailed me to ask what runs on our railway and what is the layout like so here is one of them. **Photograph 115** is Ballan Baker's lovely K1 standing at the next signal which Steve built. This is our Belle Isle No. 43 with the Stowmarket distant under it. It has seen a bit of service now, of course and if you think the distant arm is the wrong colour then Steve tells me that is it was correct for the time of building, not that we built it over 100 years ago! Steve also built the lovely little lineside hut to house the solenoids for the signal as well. There are three solenoids in there, one for that lovely little concrete post signal in the background but more of that later.

Photograph 116 shows the back of signal No. 43 and a much better photo of Belle Isle No. 4, which is the concrete post signal. Again, this is another magnificent piece of

work from Steve. He made a mould for this signal and then cast it in a resin-based cement. I think he coated the inside of the mould with a cement retardant to get the desired effect to show the sandy surface. It was built with a 3/32 inch diameter rod up each corner, bound in a little cage. We all thought the effect was brilliant. Mind you, he has not built another one! This signal acts as the shed release signal and acts when point No. 3 is pulled off. This is the road which comes round the back of the box in the triangle and also serves as a head shunt for the sidings which can be seen in the background.

Photograph 117 shows Peter Layfield enjoying a run on one of his NER 0-8-0s. This was obviously just after Peter's locomotive fell off the end of one of the raised steaming bays at another track. However, it had its fall broken by its tender, so he repaired that and then painted it black! This photo was taken a bit earlier before Steve had made his somersault signal to replace No. 43. The old No. 43 now stands as Chinley Junction No. 45 which you have seen before amongst the LMS signals I described in an earlier article.

We now come to where we had a disaster when the large poplar tree which fell across the line (beware large poplars, they are a real menace) and it destroyed one of our signals. **Photograph 118** shows the damage. Mind you, the signal was very rotten at the bottom, which we hadn't noticed so we would have had to do something about it anyway but perhaps not just yet! I put some splice plates around it, lengthened it slightly and then re-painted it. This was one of the very first signals I built for my own railway which was installed in 1984. **Photograph 119** shows Ballan Baker just passing the repaired signal with a lengthy goods train (must have got some steam on to pull that

115

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119

lot as he is just coming up to the steepest point on our line and on one of the sharpest curves to boot!). The stop signal on the left is the main line signal and the subsidiary arm on the right is the one for taking the shed road.

We now come to the southern shed exit signals Nos. 13, 16 and 17 where Frank's pannier tank is standing waiting for the signal. His engine was brand new at the time (**photo 120**). He is just waiting to go off to Coton Hill yard. I just thought you might like to see his locomotive! This is another signal which I built for the railway but then had to add another 6 inches as I didn't think it was anywhere near tall enough (the number of times I have had to do this! - you might have thought I would have realised by now).

120


121


122

123

No. 13 signal is the lower one and is the signal to go straight down the goods avoiding line, so no other signals should be pulled off for that, apart from No. 10 which is the gate lock. These types of signals go from left to right down the post. The next signal No. 16 is the one which Frank needs which in addition requires No. 14 pulling off, which is the points into the Yard. The upper signal on the post is No. 17 and also requires the addition of No. 9 which is the main scissors crossover and takes you out on to the main line. The routes are better shown in **photo 121** which shows the layout. I just put **photo 122** in there as it shows the signal off in much better detail.

Photographs 123 and **124** show the clock I bought for Belle Isle signal box (sorry, no photo of it in there, silly me). Photograph 123 shows the face as I bought, it and photo 124 shows the finished job, which I think looks much better. I drew out a new face on the CAD and then removed the hands and stuck it on and then just pushed the hands back on.

ME

124

TADPOLE
A Model Outboard Racer
PART 3

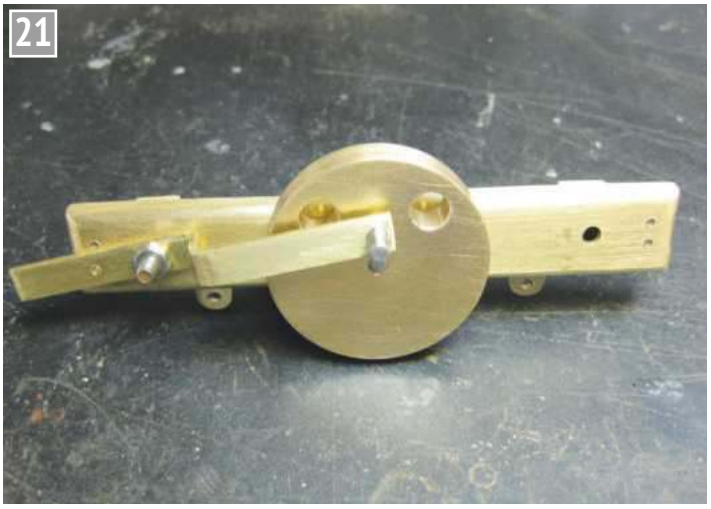
Tony Bird constructs an outboard racer from a design first published in 1933.

Continued from p.383
M.E. 4607, 1 March 2019

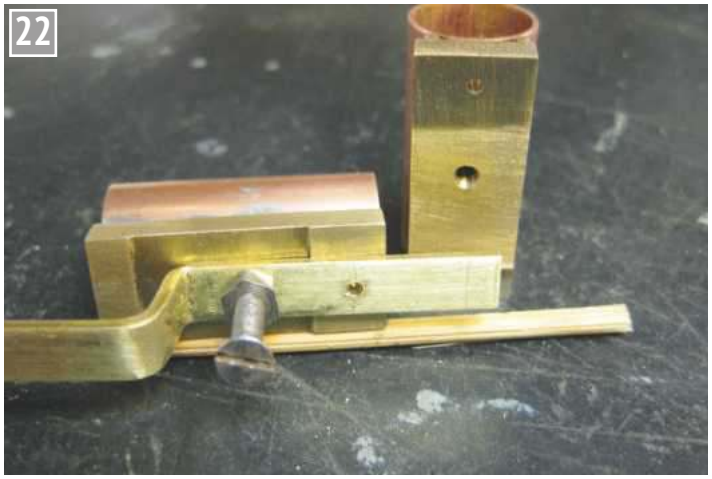
Flywheel

This was made to the drawing, giving the engine a 9/16 inch stroke. With the flywheel complete and with the aid of a jig the steam ports could be drilled in the engine frame (**photo 21**). The same jig was then used to drill the steam port in the cylinder (**photo 22**). With the steam ports drilled in the engine frame a ⅛ inch diameter copper pipe was hard soldered across the steam ports of each engine (**photo 23**). This done, holes were drilled into the pipe through the steam ports leaving the exhaust ports open to the atmosphere. **Photograph 24** shows a trial assembly of the engine parts made so far.

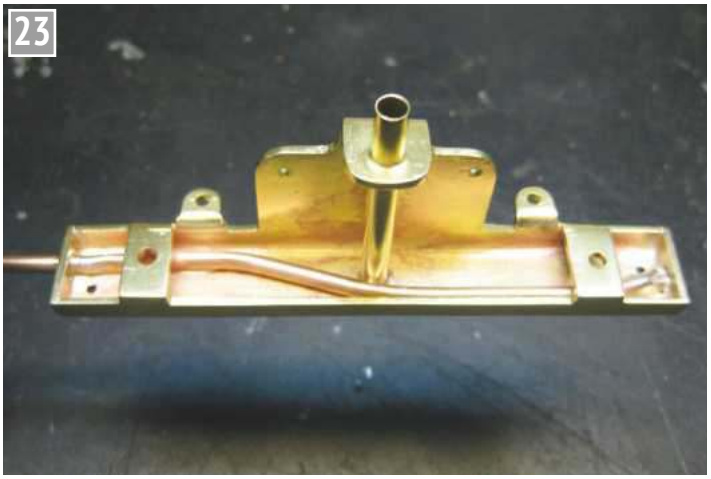
The piston assembly was made next, starting with the piston itself, which is made of brass and hollowed at the back to lighten it. The square aluminium for the big ends was machined to size on a shellac chuck and, after being drilled and tapped, it was milled to shape. With a length of ⅛ inch steel connecting



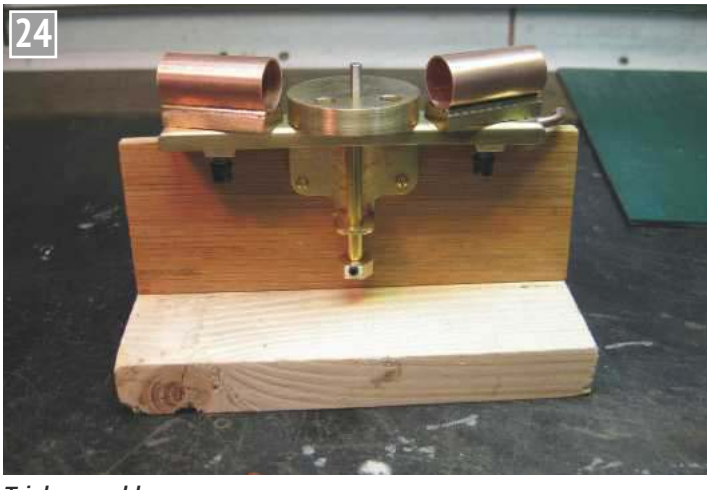
Jig used to drill steam ports in the frame.



Jig used to drill cylinder ports.



Frame finished.



Trial assembly.

the piston and big end the piston unit was complete (**photo 25**). The pistons were fitted to the cylinders, which were mounted on the engine frame (**photo 26**). The engine was then run on steam for the first time (**photo 27**).

Gearbox

In the original text the right-angle drive gear box for the propeller required a brass pipe 'T' piece and some bevelled gears of the type that were used to tune radio condensers. Neither of these were readily available today. The construction was also quite complex so a different approach was devised.

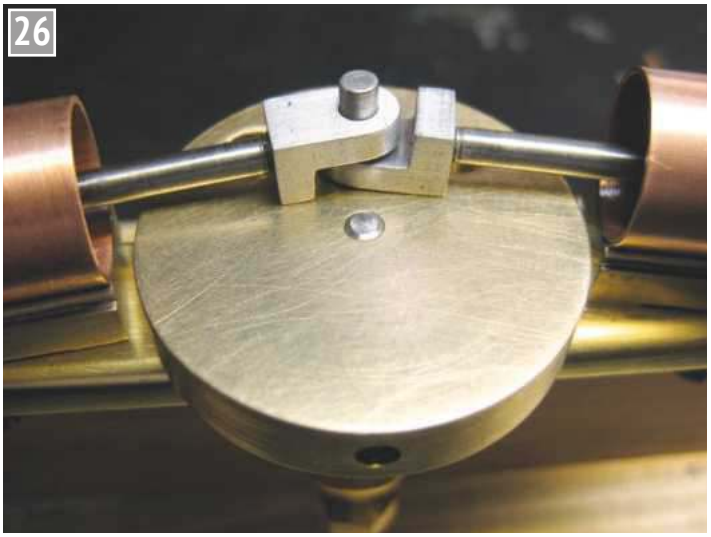
First, some small plastic bevelled gears were sourced from a model shop. Then a sketch was made of a gear housing. Some brass sheet was folded up into a channel section and this channel was drilled to accept the axles of the gears (**photo 28**). Sides were then soldered into the channel (**photo 29**) and another piece of brass was formed around a rod to make a cover for the gear box. This cover was folded and cut to fit the gear box, completing the gear casing (**photo 30**).

Bushes were turned for the gear box axles (**photo 31**). **Photograph 32** shows the gear box assembled without its cover and **photo 33** shows the engine as built so far fitted to the transom of Tadpole along with the gearbox.

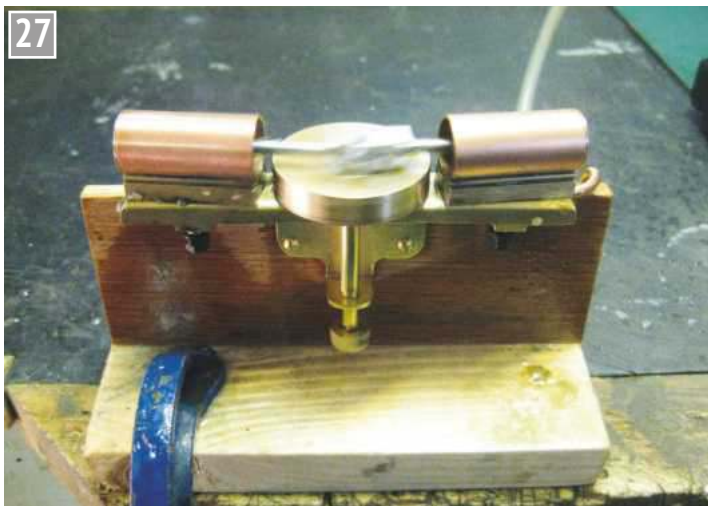
Propellor

Both Popular Mechanics and the Live Steam magazine suggested buying a 2 inch diameter propeller with a 3½ inch pitch but as there were drawings of how to make one it was decided to have a go at doing this. First, the propeller boss was turned and drilled from hexagonal brass stock. A mitre box was made and

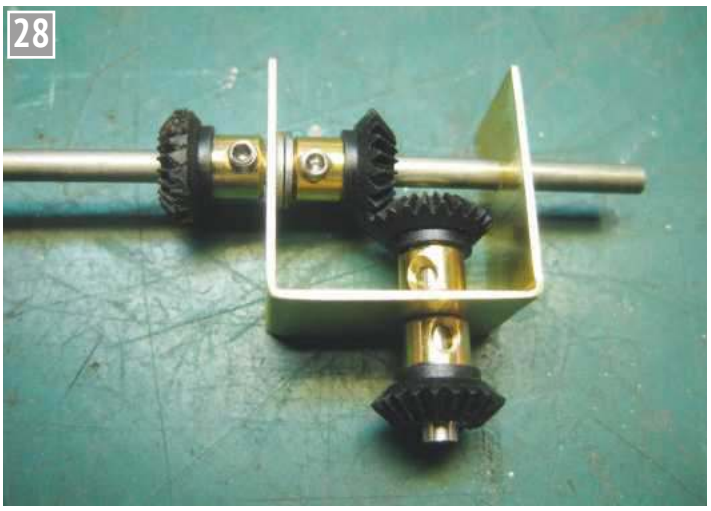
Piston finished.



Big ends.



Engine first steaming.

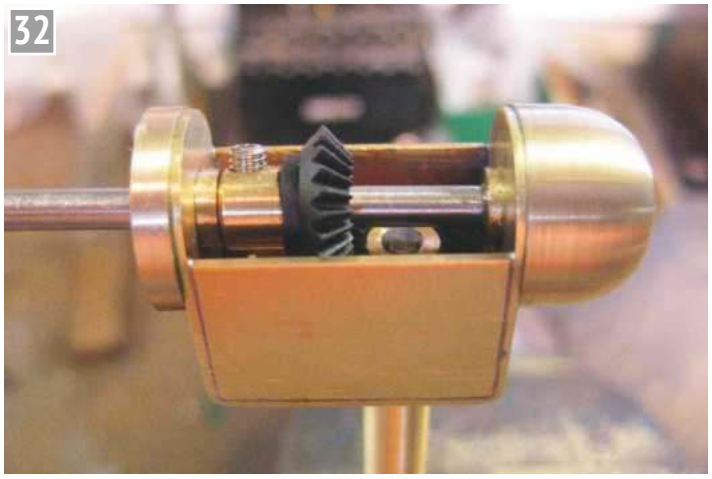


Gear box with gears.

Gear box soldered.

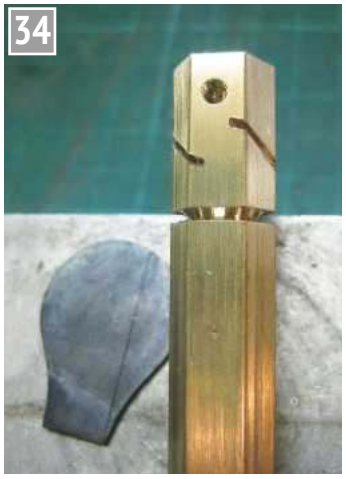
Gear box cover fitted.

Gear box hand turned bush.



Gear box gears fitted.

Gear box fitted to engine.



Propeller boss cut.

Propeller turning finished.

Propeller blades cut.

the flats of the hexagonal rod were used as an index for cutting the slots for the propeller blades (**photo 34**). The slotted rod was turned to a round section and one end streamlined (**photo 35**). Three pieces of brass sheet were then stuck together and sawn to make the propeller blade blanks (**photo 36**). Finally, the blades were filed to shape and soldered to the boss to produce the finished propeller (**photo 37**).

●To be continued.

NEXT TIME
We make the boiler.

Propeller fitted to gear box.

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

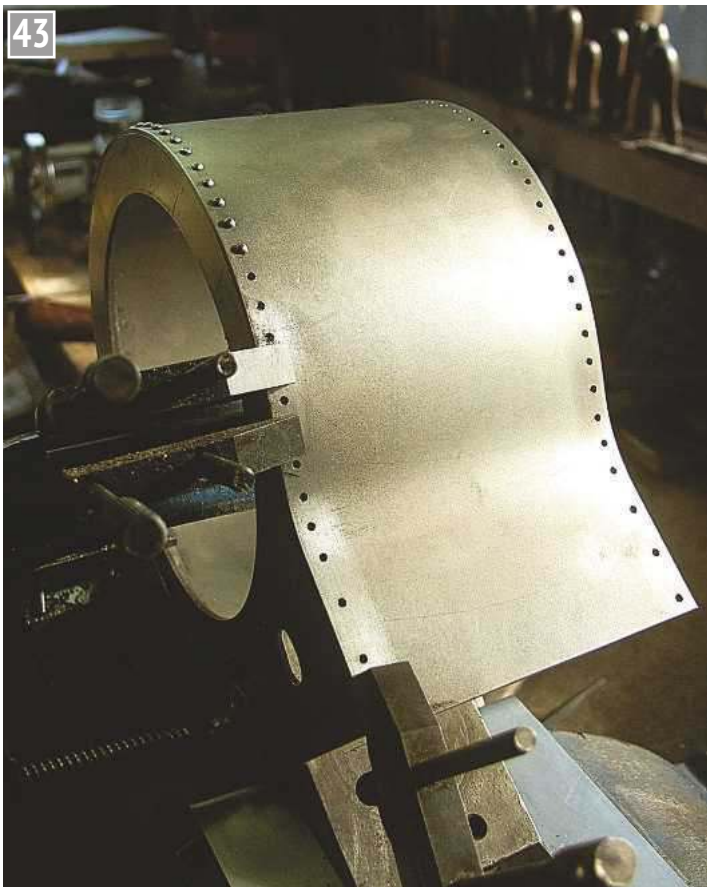
PART 7

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

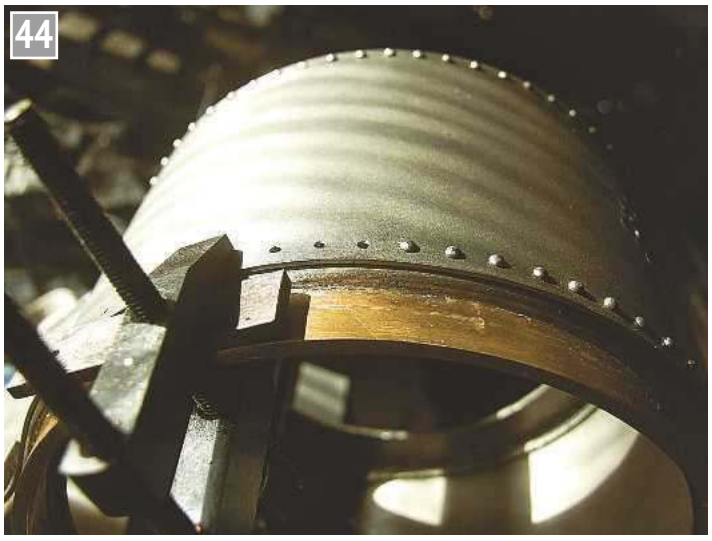
Continued from p.389
M.E. 4607, 1 March 2019

Completing the smokebox assembly

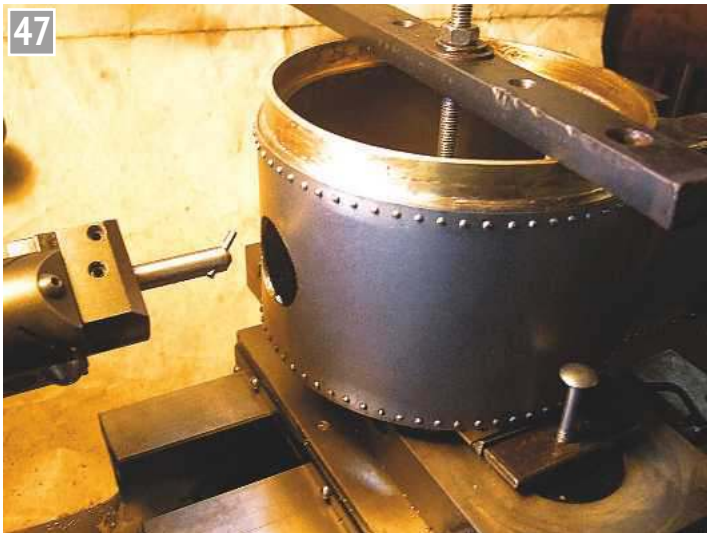
Now we have the wrapper, it requires the curvatures to fit snugly to the front smokebox flanged plate and the rivets added progressively from the top adjacent to the chimney opening. I formed my wrapper around a chuck body of 5 inches diameter as the spring in the sheet material meant the actual size was very close to 6 inches diameter. The reverse bends lower down were formed around a short length of 1½ inch diameter steel bar. The narrowness of the wrapper meant I could hold the lower edges with this bar positioned squarely in the vice using some loose jaws made from alloy angle to protect the steel surface. Fortunately, the steel was semi-hard and formed easily as well as being adjustable by hand for the final fit. Builders will realise that the final fit of the wrapper will be very close to the flange and so there may be some small adjustment to the overall length after the riveting has taken place.



The first row of rivets successfully fitted; it was found that the lower rivets on each side were very close to the end due to the closeness of the fit of the wrapper compared to the use of the original hole spacing strip.

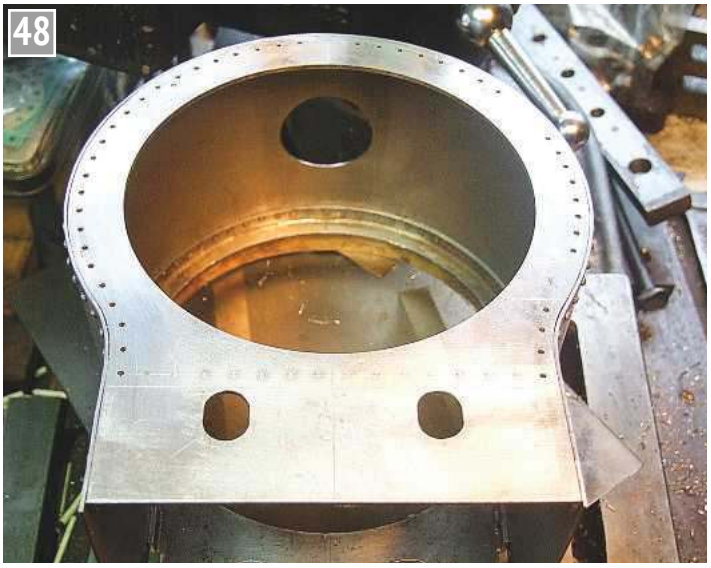


The second phase of the assembly was slightly more awkward as the positioning had to be done by measurement from the boiler barrel location ring and the clamping applied with a packing strip.



The smokebox assembly held on the lathe cross-slide and lined up with two centres. The remaining bridges from the drilled holes were cut away and an adjustable boring tool was used to bore the hole for the chimney petticoat pipe. This was done very carefully until a piece of round material of 1 3/8 inch diameter could be fitted as a gauge.

With the scribed centrelines of the wrapper and flanged plate aligned as accurately as possible, hold the wrapper in position with a collection of small toolmaker's clamps; you cannot have too many of these. I began by hand drilling the top three rivet holes and added these rivets first, making sure the wrapper was square to the front face of the flanged plate. I cleaned all the burrs off the holes inside and actually cleaned all the black finish off the rivet heads to start with as this meant I could check the head form. (Mass produced rivets sometimes have a distorted head where the material has come out of the mould punch to give an extra narrow ring or lip around the head. This should always be removed or the rivet discarded so as not to spoil the appearance.) The rivets also had to be shortened to 3/16 inch long and the burrs removed before inserting them and peening them over, inside initially, with a small punch. The clamps were then moved around so another pair of holes could be drilled on each side of the centre and the tasks repeated. If this sequence sounds laborious and time consuming, it certainly can be; but patience is needed to ensure that it is done carefully and the fit of the plate assured. Later on round the circumference, I was able to swage down the rivets by using the heel of the small four ounce hammer through the hole for the door. Note that the rivet spacing at the bottom of the wrapper on each side is greater than for the main structure and should match the layout of the bolts on the front plate (**photo 43**).



The rivet holes marked out and drilled through the front flanged plate - but the rivets will be left till later to ensure they are not accidentally damaged in the meantime.

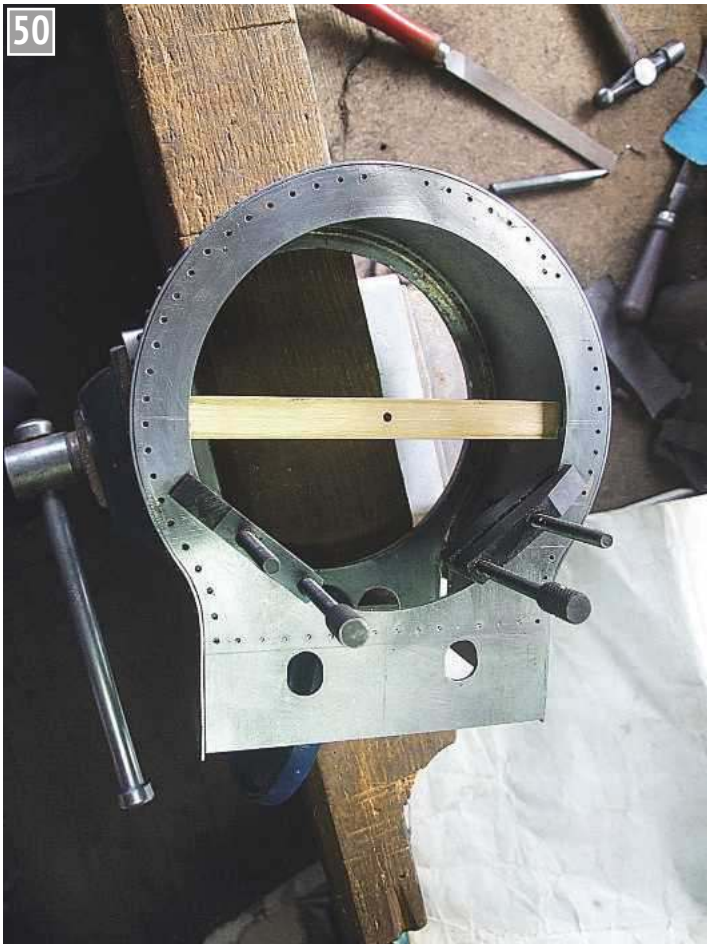
A close up view of one of the two door closing bar brackets before adding the rivets. As stated in the text, the centres for their fixing holes were arranged to avoid a clash with the external rivets.

The second phase of the assembly to fit and rivet the rear flanged plate is just more of the same and carried out in the same order from the top rivet position. The initial location of the wrapper is slightly more difficult as the rear edge of the flange now has a radius so measurement with a rule to the edge of the boiler ring is advisable to keep the structure square. It was also found that relative alignment between the inside circumference of the smokebox plate and the contact area on the wrapper made the clamps move so a small packing piece was used for stability (**photos 44** and **45**).

Having reached this stage, I cut away most of the material between the holes left around the opening for the chimney; it is easier to do this while the assembly is on the bench rather than when it is mounted on the lathe. Then, I set up the smokebox assembly on my

lathe cross-slide to centralise the hole for the chimney position. I did this using two lathe centres; one in the lathe tailstock to enable a simple measurement to be taken to ensure the assembly was in line with the lathe bed and the other to register against the centre mark in the removable disc of material in the wrapper. Note that at this stage, the front flanged plate has not had any holes drilled or rivets added so as to use the plain face for adding packing and clamping purposes. I then gently filed out the remaining hole edges to take out the centre and filed away some of the sharp points before boring the hole (**photos 46** and **47**). The boring operation had to be done very carefully and with small adjustments to the tool radius as traversing the assembly too quickly would risk snagging the tool and disturbing the setting.

The order of the tasks for the next stages is a matter of preference but the detail rivet plan for the front flanged plate can be marked out to the sketch included in Part 6. These rivets around the circumference are only decorative and the holes are actually spaced 3½mm in from the edge of the 'flange' (not the wrapper) to give room for closing them inside. Marking out was done firstly with a pencil and rule and then a scriber but finally checked with a pair of dividers. I started the holes with a centre punch and a small centre drill to ensure the position was correct and then drilled the holes and again de-burred both the inside and outside faces (**photo 48**). At this stage, I did not fit any rivets but of course this left the spaces needed for the two door hinge brackets. Readers may have noticed, however, that I have not shown the location for the two closing bar brackets for the door which are on the inside face of the front flange. This was an oversight on my part and these are needed next. They are double bent pieces of steel strip made from 1/4 inch wide material of 1/16 inch thickness which should be placed such that a closing bar is on the horizontal centreline of the door opening. I have allowed for the ends of the closing bar to be 3/8 inch deep by 3/16 inch thick. This section of bar will be wider in the centre, of course, with a slot for the closing 'dart' and will be plenty strong enough. The brackets are handed to have an off-set of about 10 degrees to follow the curvature of the door opening. As they will be placed close to the door aperture, the external rivets should not have to go through them meaning that closing the 1/16 inch rivets alongside them will be accessible inside. My closing bar was made from a piece of 5/8 x 3/16 inch brass bar with notches to locate it at each end and a 6BA clearance hole in the centre. I then positioned the two brackets with clamps to check the closing bar was central (**photo 49**). The clamps were kept in place to drill the two rivet holes for 5/64 inch iron rivets to hold each bracket to the inside of the front flange. The countersinks for the rivets were made no more than 1/8 inch diameter so the rivets could be swaged down



The closing bar lined up across the door opening to ensure the clamping hole location was central.

Two views showing the machining of the door casting using a 5 inch three jaw chuck.

carefully onto the front face before filing them flat (**photo 50**).

The next task was to find and machine a door casting. I located a smokebox door with the help of Phil Owen at Blackgates Engineering; the component for the 5 inch gauge LNER Class B1 was found to be very suitable, having an outside diameter of 5 1/16 inches, and it had quite a shallow 'doming' as required for my prototype. I used a bronze part but it could easily have been in cast iron. The casting was meaty enough to machine down to quite a small thickness by carefully centring the holding bosses, inside and out, and using the cross-slide and top-slide feed-screws to take off the excess material with a small, round nosed tool (**photos 51** and **52**).

The outside diameter was turned very carefully and the rear contact face cleaned up to be flat, but I did have to take some time to finish the front face by hand, with a file and emery tape, on the bench and it gave a very acceptable result. The final job was to drill a 6BA clearance hole through the centre to match the closing bar for the part to be held concentrically later (**photo 53**).

●To be continued.

NEXT TIME
Next time I will fit the door hardware and complete the external details.

The smokebox door clamped using a 6BA Allen screw ready to position the door hinge fittings.

A Trip on a Clyde Puffer

PART 2

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

Continued from p.377
M.E. 4607, 1 March 2019

Holidaymaker's experiences

Cruises include five day holidays for up to 12 passengers in Crinan's coastal waters and across to Jura. There are also trips through the Caledonian Canal plus early and late season cruises on the Clyde. One day group hires are possible from Glasgow and Inverness. In July there may be free one hour trips from Crinan. These are highly popular so book up well in advance. For the programme please see the website or write to the address below (**ref 1**).

A holiday starts with loading coal (**photo 13**). Nick says this brings everyone together, as these are mostly working holidays, though he points out if you want to sit and enjoy the scenery that's fine too. *VIC32* burns around 3.5 tons of coal in a week's trip, enough for around 80 nautical miles.

Elizabeth and Martin Cook of Sevenoaks enjoyed three holidays on the *VIC32* including one from Glasgow to Clyde ports, a trip to Jura and along the Caledonian Canal. Martin describes the experience as 'superb' adding "you can either do nothing or you can help run the boat". He's enjoyed steering under supervision and, as might be expected from a SMEE member, time in the engine room.

Elizabeth says she did 'anything but cooking' and both praised the food. A far cry from the diet of red herrings and tinned meat which upset the crew of the *Vital Spark* (see *The Sea Cook*)! At Jura passengers enjoyed fresh prawns Nick Walker had bought from a neighbouring fishing boat. Others have reported equally positive experiences and come back every year. Puffer holidays are already well booked up for 2019. There is no experience

Coal to be loaded on board. Loading coal is the first job of the holiday; Nick Walker says it brings everyone together. The Caribbean Princess *this isn't!*

The Vital Spark *of Glasgow is the former* VIC72*, converted to diesel power and moored at Inverary Quay. Note the wheel house is now before the funnel. Local scenery is superb.*

VIC27 Auld Reekie *undergoing repairs at Crinan boatyard.*

Yacht entering the basin at Ardrishaig from the Crinan Canal. Leisure traffic is now the main canal use saving a voyage of over 140 miles round the Mull of Kintyre.

Unusual Crinan Canal retractable bridge at Dunardry, currently out of use following vehicle damage.

like it and the scenery is superb.

Other surviving puffers

Many puffers were wrecked on Scottish coasts and others scrapped. Among several survivors are the *Spartan* (formerly *VIC18*) moored at the Scottish Maritime Museum at Irvine, one of several converted to diesel power. Those converted have the wheelhouse in front of the funnel rather than behind as in a traditional steam puffer. Another converted to diesel is the *VIC72*, now renamed the *Vital Spark* of Glasgow and moored at Inverary Quay (**photo 14**).

At the time of writing Crinan boatyard was repairing the *VIC27*, built in Cheshire (**photo 15**). Now renamed *Auld Reekie* it was used as a youth training ship.

VIC56 was built in Kent and is appropriately based at Chatham Dockyard where it is reportedly a working exhibit.

Crinan Canal

The Crinan Canal was built for smaller vessels to avoid the long and risky journey round the Mull of Kintyre. John Rennie was the engineer and work finished in 1801 but after several problems, including a reservoir failure, Thomas Telford was appointed by the Government to make improvements. It's rightly claimed to be 'the most beautiful short cut in Britain'.

VIC32 *alongside the tug* Duke of Normandy *at Crinan basin. The Duke was built in Germany in 1934 and worked in the Channel Islands. It was taken over by Allied forces post war. Originally steam it was converted to diesel. It has recently relocated to Cheshire.*

Lister stationary engine in the Crinan coffee shop.

Engineer Ed Turner ready to tie up at Crinan.

Nick Walker at the wheel. With his wife Rachel he was instrumental in saving VIC32.

Further reading and viewing

Among several books about puffers and the area:
Puffers by Guthrie Hutton. Stenlake Publishing. Reprinted 2013. £10.00 (pictorial history).

Last of the Puffermen by Keith McGinn. The real world of Para Handy. Neil Wilson Publishers. £9.99

Crinan Canal and puffers

The Crinan Canal by Marian Pallister. Birlinn. 2016 £9.99

Neil Munro's classic *Para Handy* stories are available from the Inverary Tourist Information office. Front Street, Inveraray, PA32 8UY. Tel. 01499 302063. His works are commemorated by the Neil Munro Society. www.neilmunro.co.uk Tel/Fax: 0141 339 5425 e-mail: mail@neilmunro.co.uk

Videos

The Maggie - 1953 Ealing Studios comedy about a puffer and her rascally crew.
Saving VIC32 - video about the rescue and restoration; available from 'Savethepuffer' (ref 1).
Clyde Puffer Memories (Scottish Maritime History Archive Series, vol 7) - archive film shows the unglamourous nature of puffer work.

Where to stay and eat

Crinan is an attractive place. The Crinan Hotel overlooks the bay and has a Michelin recommended restaurant, seafood bar and pub. The coffee shop by the canal basin has some farm stationary engines (**photo 19**)! Other places to stay and eat in Cairnbaan, Ardrishaig, Tayvallich and Lochgilphead.

Booking advised especially in Scottish school holidays and summer weekends for restaurants.

Contact details

To join or contribute to the Puffer Preservation Trust contact:
The Puffer Preservation Trust
The Change House
Crinan Ferry
Argyll PA31 8QH
Tel. 01546 830133 Email **savethepuffer@hotmail.co.uk**
Website **www.savethepuffer.co.uk**

UK taxpayers please use Gift Aid when making a donation - HMRC add 25% to the value of your donation at no cost to you. Preserving a puffer is an expensive business.

For holidays contact

Cathy MacLennan
SL 'VIC 32'
Crinan Boatyard
Crinan
Lochgilphead
Argyll PA31 8SW
01546 830133 or email **savethepuffer@hotmail.co.uk**

Thanks

Particular thanks to Ed Turner (**photo 20**), engineer, and to Rachel and Nick Walker (**photo 21**) with their team on the VIC32 (**photo 22**).

Thanks also to staff at Inverary Tourist Information Office for information about the Vital Spark of Glasgow and the Neil Munro monument.

The nine mile towpath is an easy walk or cycle ride. Engineering works include sea locks and basins at each end (**photo 16**) plus a flight of locks at Cairnbaan rising to a summit of 32 feet above sea level. It is fed by seven reservoirs and crossed by swing bridges with an unusual retractable bridge at Dunardry, currently out of use following an accident (**photo 17**).

Until recently, Nick Walker also owned the tug, *Duke of Normandy* moored in the Crinan Basin. This was built in Oldenburg, Germany in 1934 and was taken by British authorities from Jersey where it was captured (**photo 18**). Originally steam it was converted to diesel.

Reference

1. **http://savethepuffer.co.uk/holidays/**

VIC32 *prepares to berth at Crinan Quay.*

Building the *Model Engineer* Beam Engine

PART 4

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.

Continued from p.369
M.E. 4607, 1 March 2019

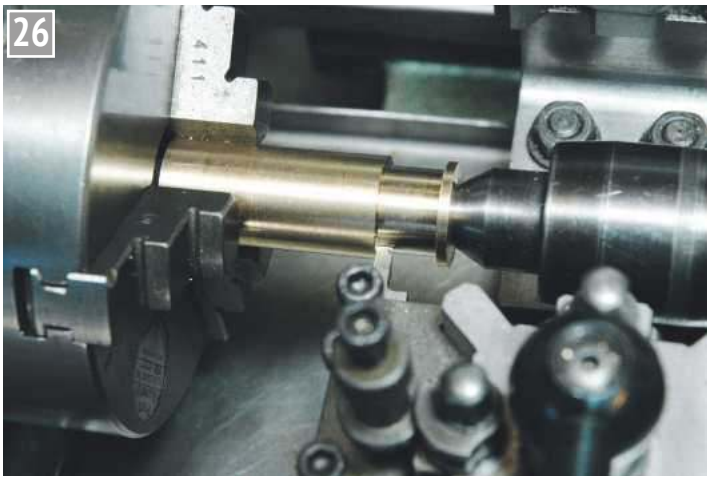
Crankshaft bearings

As I had finished the flywheel, I decided to construct the crankshaft and main bearings next. The bearings are Plummer block bearings with split bearing liners. I hadn't previously made this type of bearing, but an identical method of construction can be used for the main crankshaft bearings, the beam trunnion bearings and the valve shaft bearings.

I started by turning the bearing liners for both crankshaft bearings from one piece of ¾ inch diameter phosphor bronze bar, cutting sufficient for both bearings and a chucking piece. Both bearing shells were turned quite a bit oversize and **photo 26** shows the first one being grooved out using a finely honed parting tool. The second shell was similarly formed, leaving a parting off distance between the two shells. The reason for leaving the item oversize is that after turning, the item is to be slit into two, soldered together and then turned to the correct size.

Once both shells had been turned oversize, the tailstock support was withdrawn and the item was bored right through by first drilling with successively larger drills and then finally finishing off with a 12mm reamer, which is undersize for the finished required bore of ½ inch. This is quite a deep hole to drill and I eliminated any possibility of the drill jamming by taking (say) a ¼ inch drill half way through, widening most of that to ⅜ inch with a ⅜ inch drill to give clearance before taking the ¼ inch drill through the remaining half.

Purists would say that I should have had a special drill for the bronze with a more flat angle on the end to stop the drill from grabbing, but I found a normal workshop drill to be quite adequate. Finally I reamed 12mm (as I had the reamer) and the item looked as in **photo 27**, which also shows one of the Plummer block castings into which the shell is to be fitted. Before I removed the item from the lathe, I scribed a line across the end of the item, using a scribing block, in order to give me a line on which to split the item. As the item



Turning the crankshaft bearings.

Bearing before splitting.

Splitting the bearing.

»

Final boring of shells.

Bearing castings.

Slitting Plummer block.

was to be split one side at a time, this helped me to ensure that I made the two cuts diametrically opposite to one another.

The problem of holding the shells in order to slit them along the entire length was solved by supporting the shells on a ¼ inch silver steel bar that passed through the shells and rested on the top of the machine vice jaws. The vice jaws were then closed on the shells thus supporting the shells horizontally ready for slitting (**photo 28**). In order to ensure that this worked correctly, I first 'clocked' the top of the vice jaws with a verdict indicator to prove that both jaws were the same height and then did some complicated measuring/calculating to determine the height of the centreline of the shells. The accurate size of the supporting bar (¼ inch) and the known diameter of the central hole helped these calculations.

The slitting saw that I used was 0.5mm thick and I took successive cuts along the length of the item removing only 0.25mm at each pass in order not to distort this fragile slitting saw and thus cause the saw to cut off line. Obviously, a sharp saw and slow speeds of around 200 RPM were required.

Once the shells were split, I carefully degreased them and tinned the mating surfaces by applying flux, then heating and applying soft solder. The items were then carefully laid on a firebrick, assembled exactly in line, one on top of the other, and heated with a needle point flame until the two items visibly settled together as one piece. I applied light pressure to hold the two together whilst cooling and on cooling I was satisfied to see that I had the items exactly in line.

The shells were now returned to the lathe, using the tailstock centre to help with alignment and the outside surfaces were turned to the correct final dimensions. Finally, the bore was finished to ½ inch diameter using a small boring bar (**photo 29**), the bore being checked by careful measurement and using a piece of ½ inch silver steel as a go/no go check.

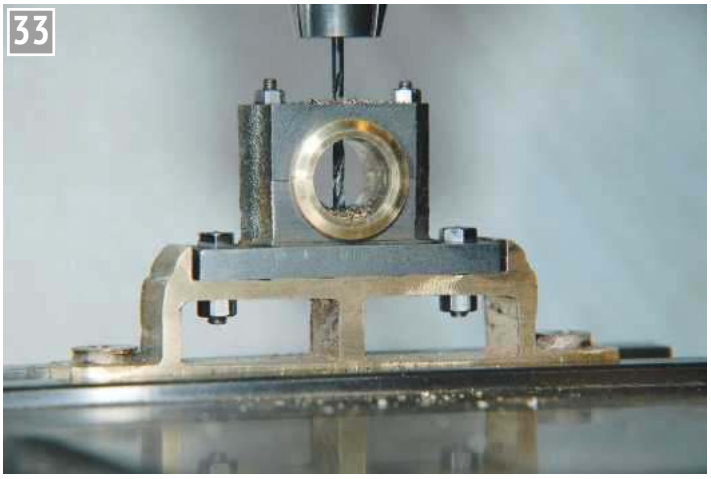
The shells were parted off using a rotating tailstock as support and were finally carefully faced off one at a time in the three jaw using a chuck backstop to assist the chuck in holding these items by the narrow outer flanges. Finally, the pairs were marked as pairs using a centre punch prior to separating by gently heating and then cleaning off excess solder from the joints using 'wet and dry' on a flat surface.

The castings for the Plummer block bearings caused me to think carefully and to check the drawings several times to see if I was reading them correctly. The bearing castings have an oval moulding cast into them, as shown in photo 27, and the drawings show that the width of the bearing at this point should be 15/32 inch (0.4688 inch). Reducing the width to these dimensions would completely remove this feature from the casting and I can only deduce that it is cast in so that if you wish to do away with the split bearing shells, and simply make a solid, cast iron bearing, then you may do so and the moulding would simulate a 'proper' shell bearing. This would make the job much simpler, although it would not represent full size practice. The moulding, being slightly oval, would become circular if the casting were split with a suitable thickness of slitting saw.

Even though I was making phosphor bronze shells for the bearings, the moulding on the casting did form a useful purpose, as the width of the casting was the same across the mouldings as it was across the base. This facilitated milling the casting as it could be laid on its side or gripped in a vice more easily.

Each reader will proceed with the milling in their own way but I started by milling the tops of the 'feet' to create a faced area for the holding down nuts. I then turned the casting upside down in the milling vice and reduced the thickness of the base to 3/16 inch (0.1875 inch) as shown on the plan. I milled the top parallel to the base so it could be easily held in the vice, then turned the casting on its side resting on parallels in the vice and reduced the width of the base to 5/8 inch (0.625 inch) ensuring that I took equal amounts off each side. In the same manner, I reduced the width of the main body to 15/32 inch (0.4688 inch) ensuring that it was central to the base. This removed all traces of the mouldings mentioned above. I then shortened the

Boring Plummer block.



Drilling shells.

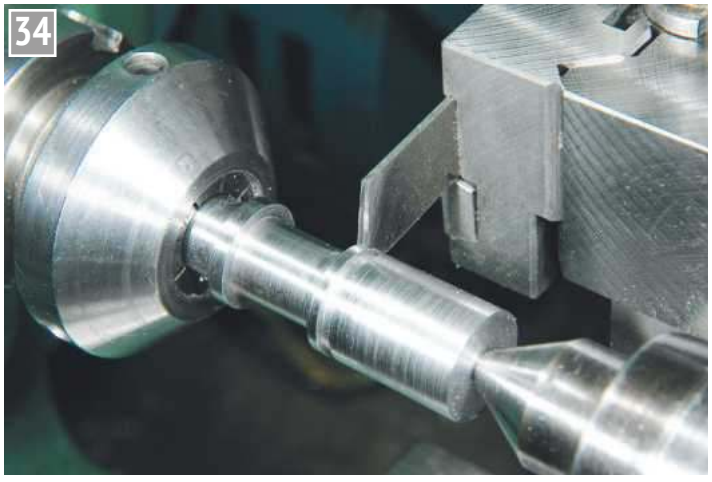
length of the base to make the main body central to the base and to finish 129/32 inch (1.9063 inch). The last milling operation was to reduce the height of the casting to 11/32 inch (1.0313 inch) PLUS the width of the slitting saw that I was about to use to split the casting (1/16 inch).

All the milling now finished, I marked out the centre height of the bearing at 19/32 inch (0.5938 inch) and also marked the vertical centre on both the sides and the top.

The next task is to drill the holes for the 5BA holding down bolts at clearance size (1/8 inch) and for the 8BA studs to clamp the shells in place. The holes for the 8BA studs should be drilled at tapping size (1.8mm) and should be drilled to a depth sufficient to reach the lower part of the block once it is split. This ensures that once the block is split, it will bolt together with both top and bottom halves in line.

Although the plan stipulates 8BA studs, I thought that 8BA was a little mean for a bearing of this size and so I actually used 7BA studs and nuts which I thought looked good – and I had the studs in my box of BA sizes which was a bonus. Therefore I drilled 2.0mm tapping size and 2.4mm clearance. The choice is up to you. At the same time, I drilled a pilot hole for the oil cup on the centreline, but did not drill sufficiently deep to break into the shell hole once it was bored. At this stage the bearings looked as shown in **photo 30** and you will see that the bearing shells had not been split at this stage, being mounted onto a piece of ½ inch silver steel.

In order to use a slitting saw in the milling machine to split the bearing castings, I had to bolt them to a metal plate with 5BA bolts and then mount them on parallels on the milling table. The reason for this arrangement is that the boss on the end of the slitting saw would have fouled a milling vice if I had used one. As it was, there was little room for manoeuvre and I had to cut from both sides to split the casting. The set-up that I used is shown in **photo 31** and I actually turned the casting horizontally through 180 degrees to cut the second side. I marked the top and bottom pairs with centre punch dots prior to splitting to ensure re-assembly in the same configuration.



Bearing groove.

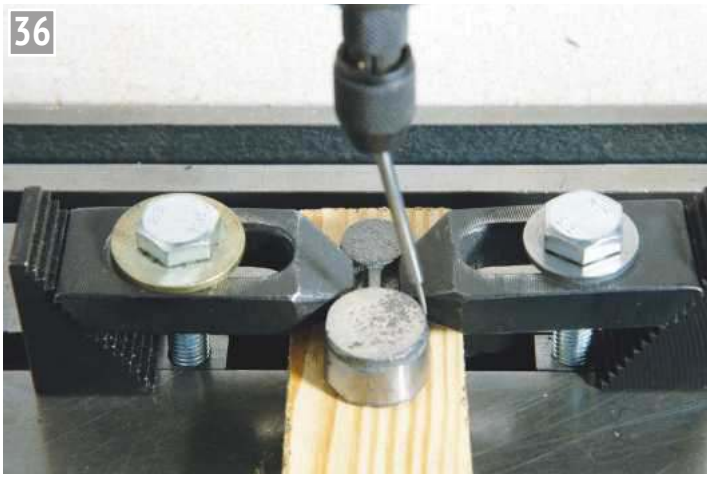
The bottom halves were now tapped and 7BA studs fitted, whilst the top halves had the stud holes drilled out to clearance size and the items were assembled.

If I had owned a 5/8 inch machine reamer I would probably have drilled the main hole, for the phosphor bronze bearing shells, undersize and then reamed to 5/8 inch to take the bearing shells. As it was, I had neither the reamer nor a suitable undersize drill available so I decided to do the job properly and bore the Plummer blocks out on the lathe, using the faceplate and a small angle plate. The advantage of doing it in this way is that you get the chance to try the shells for fit and if incorrect (too tight) then it is still possible to bolt the Plummer block together again whilst still on the faceplate and take another thou off.

Photogaph 32 shows the Plummer block set up on the lathe having taken great care to line up the centre position with a sharp centre placed in the tailstock. A very small centre drill was used carefully to prove that the item was centred correctly and then the hole was drilled to ½ inch diameter and bored to 5/8 inch diameter. The size of the hole was checked carefully as it approached the final size as under no circumstances should the shells be loose. You will see in photo 32 that I balanced the faceplate carefully with weights.

I wished to secure the bearing shells by pinning them into the Plummer blocks in order to stop any chance of them turning in the blocks. The top shell requires a hole in it to allow the oil to reach the bearing surface and this must obviously stay directly under the oil cup. The bottom shell requires a small pin to locate it into the Plummer block. I had some 5/64 inch silver steel in stock which works out at 1.98mm, so I selected a 1.9mm drill and drilled through the oil cup mounting hole, after first lining it up with a 2.7 mm drill in the predrilled tapping hole for the 5BA oil cup. The 1.9 mm drill was then used to drill straight through the top of the Plummer block, straight through the bearing shell and into the base of the block. **Photograph 33** shows this being carried out. The bearing shell was then removed and heated to separate the two parts. A small pin of 5/64 inch ≫

Keyway.



Locating the crank.

silver steel was then pressed into the hole in the Plummer block base such that it would locate in the shell but would not reach right through the shell casing and touch the shaft. It was necessary to open up the hole in the shell with a fine needle file.

Main bearing pedestal bracket

One of the main bearings - the one next to the crank, sits on to the engine bed plate in a cast-in shoe. The other main bearing adjacent to the flywheel, sits on a pedestal bracket, bolted direct to the baseboard, and this comes as a gunmetal casting

Shaping the pedestal is a straightforward milling and filing job.

The casting was obviously cast in a long length and then a length was sawn off for the individual casting supplied. The item should be 5/8 inch wide (0.125 inch) but had been cut rather too small for the casting to be cleaned up. It was therefore a compromise between leaving some sawn marks on the finished item and milling the item a few thou undersize. The casting was also too short to finish to the correct length of 3 19/32 inch (3.5938 inches) and the spacing of the holding down bolts at 3 inch centres did not tally with the centres of the cast-in pads. No dimension is given on the plan for the height of the bearing seating and this was determined by taking a line with a straight edge from the bearing seating on the bed plate in order to ensure that both bearings were in the same plane. Both bearing shoes are milled out to 2 inch wide which gives 3/32 inch adjustment space for the bearing positioning.

The holes for holding down the outer bearing onto the pedestal bracket are shown as oval to allow for adjustment. Unfortunately I found that it was impossible to make holding down bolts (5BA) that were long enough to bolt the bearing to the pedestal and were still short enough to be inserted from underneath. It was therefore necessary to bolt the bearing down to the pedestal with the nuts underneath, which makes for fiddly assembly as illustrated in **photo 33**.

Crankshaft and crank

The crankshaft is constructed from three separate pieces: the main shaft, the crank arm and the crank pin. The main shaft and the crank pin are straight turning jobs, apart from the keyways, from mild steel but the crank arm is an iron casting. I started by turning the main shaft from ¾ inch free cutting steel bar. The shaft is 5 inches long altogether and I cut off 5.75 inches so that I would have a chucking piece on the crank end, which I parted off later.

The plan shows the shaft to be ½ inch diameter with two locating collars of 9/16 inch (0.5625 inch) either side of the crank bearing, to stop end float. Inexplicably to my mind, the shaft size increases as it becomes the hub of the crank arm to 17/32 inch (0.5313 inch). I considered the extra 30 thou diameter would not be discernable to the naked eye and as I didn't have a reamer of this size, I decided to make the hub ½ inch diameter like the rest of the shaft. You may like to make the shaft with a chucking piece at each end to take the centres, during turning, and then part off later.

I made the mistake of putting a rather large centre in the outer end of the shaft, before I realised that this would be very clearly visible in the final model. It looks totally inappropriate in the finished model so if you do create a centre in the shaft itself, then make it a small and neat one. Turn the length of 3.75 inch at 0.5 inch diameter for the main part of the shaft. Then turn a further 13/16 inch (0.8125 inch) at 9/16 inch (0.5625 inch) diameter to form the location collars and the second bearing surface.

At this point I reversed the item and fitted it into a collet chuck, clocking the item to ensure that it was running true to within one thou. If you do not have an accurate collet set, I suggest that you either use a four jaw chuck or turn the whole thing between centres. Once I knew that it was running true, I put a centre into the other end and proceeded to turn the second bearing surface. As this bearing surface is between two flanges, you may do this with a left and right hand turning tool, but I hate trying to join up two cuts in opposite directions so I proceeded as follows. First, I put two grooves at either side of the bearing surface with the bottom of the grooves at 0.5010 inch diameter using a parting blade in the rear tool post. Then, with a sharp pointed tool I took the whole of the centre of the bearing surface down to 0.5010 inch. I measured the width of my bearing shells and made the bearing surface 1 thou wider than the shells. My shells had finished a few thou wider than the stated dimensions. Once I had the bearing surface at the correct width, and 10 thou over diameter, I carefully reduced the diameter to 0.5 inch exactly, using a parting blade in the rear tool post. I must stress that it is imperative that your parting blade is ground at exact right angles and is very sharp in order to be able to cut with a traversing cut, using very slow feed and a fine cut across the surface of the bearing. **Photograph 34** shows this procedure taking place.

In order to mill the keyway, I used a collet adapter attached to a rotary table and supported the tail end with a tailstock (**photo 35**) but most people would probably clamp the shaft onto V-blocks. Do ensure that it is lined up absolutely parallel to the table movement.

The crank arm is a casting and is a most difficult item to hold whilst machining. It is rounded at both ends and

Reaming the crank.

Facing the crank.

the sides are not parallel. One side of the casting is mostly flat but with a boss on it where the crank pin is fitted and the other side is of various levels and shapes, making holding the item quite a problem.
I started by clamping the casting to the milling table on top of a piece of wood (**photo 36**). The wood had a recess drilled under the crank pin boss to enable the casting to lie flat and I spent some time with a fine file cleaning up the rest of the underside to ensure a good seating.

Once this had been clamped in line with the Y axis of the table, I used my edge finder in the form of a 'sticky pin' to align the milling head with the centre of the large boss on the casting. If you don't have an edge finder, then a piece of dowel in the chuck, with a lump of blue tack and a dressmaker's pin will suffice. Point the pin at the circumference as shown in photo 36 and rotate the chuck by hand to see if the pin follows the circumference. Adjust the table position until you are satisfied that you have the centre and then zero the dials/ DRO. Move the table exactly 1.25 inch using the dials/ DRO and carry out the sticky pin operation on the smaller boss to ensure that you are happy with the alignment.

Having established the centres of both bosses 1.25 inch apart, I centre drilled then drilled and reamed holes for both the ½ inch crankshaft (in my case) and the ¼ inch crank pin as shown in **photo 37**. I then mounted the crank onto an expanding mandrel through the ½ inch hole and used this for facing the majority of one side (**photo 38**). In the photo the small boss is being faced with a boring tool. This mandrel was also used from the other side in order to bring the large boss to the correct thickness and diameter. A mandrel was made an interference fit into the ¼ inch hole at the other end and this was then used to turn the small bosses and to finish off the facing of the plain side.

Do the majority of the facing from the large hole as there is only limited grip for turning from an interference fit into a ¼ inch hole. If mounting the item in this way stretches the ¼ inch hole slightly it is of no consequence as the crank pin will be made to fit. Once I was happy with both sides, I mounted the crank onto the rotary table (**photo 39**) for each end and profile milled the two boss circumferences and the intermediate outline. This calls for lots of knob twiddling using three controls; rotation, X and Y movements. This needs careful thought and soothing music bearing in mind that the direction of travel needs to be chosen to ensure that you are not 'climb milling'. At this stage the crank looked as illustrated in photo 39 but the small boss outline has still to be finished.

Actually, I had to make the crank twice, and the following sorry story shows how we all make mistakes sometimes. The plan shows the crank to be fixed to the crankshaft with a keyway. I decided to make this an interference fit and dispense with the keyway. I made the end of the crankshaft 1.5 thou oversize and put the crankshaft into the freezer to shrink it. I then pressed the cold crankshaft into the ½ inch hole using the vice. It was VERY tight but having started I had to persevere. I continued winding the vice until there was a loud crack and the casting split. Words like 'bother, dash and blow!!' ensued and I rang Reeves who had a replacement casting in the post the same night. Having practised on the first one, it was amazing how quickly I made the replacement. Needless to say, the next one was sized to a nice gentle fit with the application of a little Loctite to secure it to the shaft. I later decided to fit a keyway which is much more secure and certainly prototypical!

Making the crank pin is a simple turning job only requiring care with the diameter and width. I left mine loose until the connecting rod was made in case it had to be altered, but you can always fit the con-rod to match the crank pin if things are not quite right.

●To be continued.

Profiling the crank.

NEXT TIME
We shall tackle the rest of the bearings.

PART 1

Renaissance for *Rainhill*

Norman Barber recalls his early years in model engineering.

I completed my latest locomotive, a 5 inch gauge LION based on the LBSC *Titfield Thunderbolt* design, in the spring of 2014. Looking around for the next project I decided that I had too many years on the clock to start another locomotive from scratch but I did have one which would benefit from a rebuild. This was the first locomotive I had ever built, now seventy years old.

The boiler of this model had suffered an 'incident' (more of this later) some years ago and I decided that it would be a good idea to replace this and put all of my models into a sound operational condition before shuffling off to the great workshop on the sky. This was to be a quick refurbish and re-boiler exercise, expected to take a few months at most. That was five years ago! Time scale expectations had not anticipated the serious health problems which developed soon after the start of the project but, thanks to the care and ministrations of the NHS, the objective has now been achieved.

A review of the original build, the facilities available at the time and the conditions under which it was carried out is probably more interesting than the actual rebuild and serves to illustrate some of the changes that have taken place in the facilities available to model engineers during the last sixty or seventy years.

Grandfather in his workshop.

My first workshop

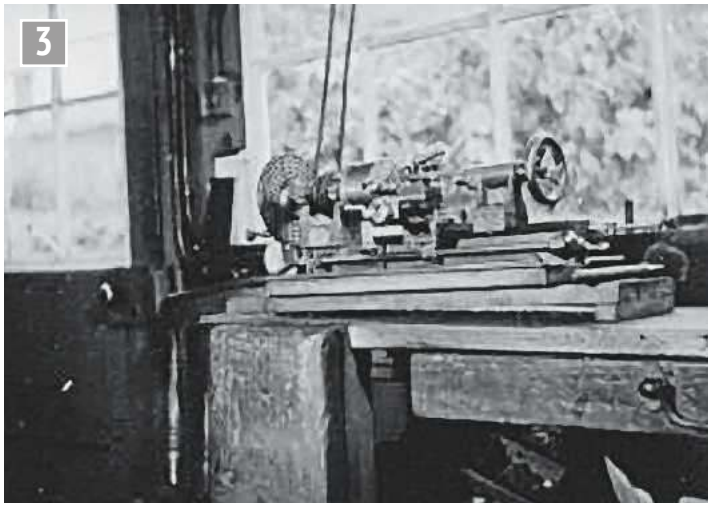
Following the death of my paternal grandparents in 1944 my parents purchased the family home from their estate. Readers may recall my description of these events in my article 'Reminiscences' (*M.E.* 4568, September 2017). My grandfather, who had been a self-employed locksmith, had established a workshop at the bottom of the small garden to service that business (**photo 1**). The workshop was, by any standards, a fairly primitive affair but in my twelve-year old eyes it was paradise and I moved into the workshop as my parents moved into the house!

By present standards the facilities available were basic in the extreme. The workshop was housed in a substantial wooden building at the bottom of the garden (**photo 2**). The interior of the building was dominated by a large coke fired forge with a chimney through the roof. A bench ran along one side and across one end of the building with a blacksmith's leg vice secured to the end bench. At the other end of the building was a crude treadle driven lathe. There was no means of lighting the building although windows were fitted along the whole of one side and in the wall behind the vice. There was no power since the house had not had an electricity supply before my parents purchased it.

Making a start

I began to teach myself to use the lathe, reading every book and piece of literature I could find on the subject in the local library. This learning process was frustrating because the limitations of the facilities I had soon became very obvious. Sharpening turning tools, for example, had to be carried out on a hand powered grinder. This device was clamped to the bench and driven by a handle turned with the right hand whilst the tool being sharpened was manipulated with the left hand. A very high ratio gear drive between the hand drive spindle and the grinding wheel spindle enabled a speed which was just about adequate to be achieved for the wheel. This process was not easy but lessons learned the hard way are well remembered and better facilities are better appreciated when they become available. The tools in question were of course, carbon steel – no high speed steel tools featured in the inherited selection.

The workshop at the bottom of the garden.



The new small lathe.

The lathe itself was crude in the extreme. The mandrel was solid with a plain nose and a pointed screw supporting the rear end (like a centre) and providing a thrust bearing. A very small lever scroll three jaw self-centring chuck was mounted on the mandrel nose and secured with a grub screw – not the most accurate or rigid set-up! There was no lead screw. A compound slide rest carrying a tool post could be clamped to the bed in the required operating position. This was obviously not part of the original machine and had been adapted from some other source. It was in fact better engineered and more substantial than the rest of the machine but the feed screws employed right hand threads, resulting in the requirements to turn the handles anticlockwise to feed the tool forward to make a cut – i.e. the opposite to the instinctive direction of rotation found on most machines.

The tailstock barrel had a plain hole, rather than a taper, into which tooling could be secured with a grub screw. The only problem was that there was no tooling! I was obliged to make any that I required to suit the application. The tailstock also employed a right-hand thread resulting in anticlockwise rotation of the handwheel for forward feed of the barrel.

Crude though all this sounds, I managed to learn the basics of turning using these facilities. I also learned to improvise when the facilities did not permit the usual techniques to be employed. For example, there was no tailstock chuck with which to hold a drill. This was overcome by using a stub fitted to the hole in the tailstock barrel and provided with a countersink into which the end of a drill could be located and supported, the drill being clamped in a carrier or tap wrench to provide the necessary torque resistance. A hole could not be started using a centre drill in the usual way and a depression had to be formed in the end of the work piece using a turning tool to provide the starting location. Whilst all of this activity was in progress one had to remember to keep treadling!

There was no measuring equipment in the workshop as inherited other than steel rules and 'stiff joint' callipers. The remainder of the tooling comprised basic files, screwdrivers, punches, etc. and a few drills. There was no screwing tackle.

Getting on

By the time I was fourteen years old I was attending the local technical school, started taking *Model Engineer* magazine on a regular basis and had begun to develop the facilities in the workshop. This was a slow process due to lack of funds. My parents were only able to provide limited pocket money, with occasional extra contributions when a particular

> I began to teach myself to use the lathe, reading every book and piece of literature I could find on the subject in the local library. This learning process was frustrating because the limitations of the facilities I had soon became very obvious.

and (for me) expensive item was required. They were always very supportive but my father was a commercial artist and knew nothing about engineering matters.

One of the first facilities to be installed was electric power and lighting. This was achieved by means of a cable buried inside a length of steel conduit alongside the garden path. I remember that the cable had to be purchased new but the conduit and all of the fittings and switch gear were obtained from a local junk yard at knock down prices. The supply end of the cable was plugged into a fifteen amp round pin socket in the house. This was before the days of standardisation on thirteen-amp sockets. Bearing in mind that I was only fourteen years old and had learned what I knew about electrical installation by reading books and magazines there is no doubt that the installation would not have met the approval of the authorities even in those days when regulations were less stringent than today. It all worked, however, and the heart does not grieve for what the eye does not see!

An early improvement was the purchase of a better lathe. This was a cheap and rather small affair – only 2½ inches centre height – with no back gear and no screw cutting facility (**photo 3**). It was more accurate than the old treadle driven machine for small work but it was still necessary to use the old machine for a job of any significant size. At the same time as the new lathe was obtained a small ¼ inch drilling machine was acquired (**photo 4**). Prior to this hole drilling was carried out using a hand drill or by mounting the drill in the chuck of the treadle lathe and drilling against a block of wood supported by the tailstock, which was used to feed the job onto the drill.

The new machines required power to drive them but I could not afford to purchase two electric motors. I did manage one however - a ⅓hp Brook machine. A visit to the junk yard plus some begging yielded the wherewithal to install a line shaft in the roof of the workshop with power take offs via countershafts with fast and loose pulleys for each of the machines. The only means of transport for these acquisitions was my bicycle (the family never owned a car) and I remember lashing things like lengths of shafting and pulley wheels to the bicycle for the four-mile ride (or walk, if the load was too large for safe riding) home from the junk yard.

This installation was extended in later years to drive another lathe, a 'Zyto' 3⅜ inch centre height machine, acquired from a friend for the princely sum of £5. This machine arrived on the scene too late though to contribute to the construction of *Rainhill*.

●To be continued.

A very young author with the drilling machine.

POSTBAG

'Uncle Jim' Crebbin

Dear Martin,

I am researching the life and locomotives of James C. Crebbin (often known as 'Uncle Jim'), a celebrated model engineer in the first half of the 20th century. He was noted for making several experimental locomotives, testing ideas on flash steam boilers, oil firing and compounding. Jim Crebbin was one of very few British model engineers to make compound locomotives which ran very successfully.

He knew leading railway engineers of the day including G. J. Churchward, W. A. Stanier and Edouard Sauvage, travelling extensively abroad and giving presentations about his findings at Swindon and to model engineering societies. This was remarkable as he worked full time as a clerk at the Bank of England and had no formal engineering training.

One of his engines, *Cosmo Bonsor*, will feature at an exhibition in the York Railway Museum later this year. The ownership of another, *Aldington* (later renamed *Conversion*) is also known but I am trying to find where others might be located.

The engines were built to 4½ inch gauge and so cannot be run on today's tracks. Though some were built for oil firing they are believed to be all coal fired now. Although Jim Crebbin tried compounding he later converted his engines to simple expansion.

The engines are: *Boorman* - a 4-2-2 in outline similar to a Dean single of the GWR, *Sir Felix Pole* - a 4-8-0, *James Milne* - a 4-6-2, and a Santa Fe articulated Mallet rebuilt by Jim Crebbin believed to have been named *Sir Charles Hambro*. (This was owned by SMEE but was damaged whilst on loan. SMEE then sold it.)

There are believed to be two further locomotives: *Ole Bill* - a 0-6-0 tender engine and *Old Bill* - Jim Crebbin's rebuild of an 0-6-0 tender engine as a two cylinder simple expansion engine.

He also built model boats and donated a trophy to the Model Power Boat Association as well as one still awarded in the Model Engineer Competition.

Even more remarkable are his other inventions. The Bank of England staff magazine, *The Old Lady*, mentions in March 1926 that 'It is not generally known that he is the inventor of a surgical instrument now in general use in many parts of the world'. This invention may have resulted from his earlier treatment for TB in the King Edward VII sanatorium at Midhurst but it could have had an entirely different origin.

Unfortunately, his retirement in 1935 was marred when he was hit by a motorcyclist and spent some time in Finchley Cottage Hospital. There was an interesting follow up when *Model Engineer* reported that 'Cheery Uncle Jim' had mentioned the surgical instrument improvements he'd devised after his recent illness. ('An accident to Uncle Jim', *Model Engineer*, 1936 Vol 74 issue 1818 page 242, and 'Cheery Uncle Jim', *Model Engineer*, 1937 Vol 76 issue 1861 page 2).

Any information will be welcome. Jim Crebbin was a versatile engineer with a remarkable range of interests. Just how remarkable is slowly coming to light.

If any reader has information about these locomotives, instruments or his boat models I'd be grateful if they could contact me either by email at arbe1950@googlemail.com or by phone on 01904 781832 (preferably before 8pm).

Location information will of course be kept confidential unless otherwise indicated.

Yours sincerely,
Roger Backhouse (York)

Gear Cutting

Dear Martin,

I am confused. That is a normal state of affairs but it has been aggravated by the conflicting information on gear cutting that abounds in print and on the Internet.

Following fitting an A-axis to my CNC milling machine I needed something to do to prove that my new purchase worked as desired, so I bought a few gear cutters and read books and Web articles. Everything was written in such a complex manner. I wasn't interested in epicranioid curves with added pudendum (ahem! – *Ed.*). I had a steel rod, found in the shed – probably left by the previous owner 32 years ago - encrusted with rust. I wanted simple information on what diameter I should clean it up to and what depth I should cut the teeth.

I may be retired, but my whole professional life in science has involved proper, easy-to-use metric units, not Units Victoriana which are spoken in fractions and measured in thou, so I had opted for gear cutters in modules. My Proxxon change-wheels had module 1 gears, so I searched for the information I required to make similar cogs.

The diameter and number of teeth were simple to find, but the depth to cut was not. *Machinery's Handbook* suggests that the whole depth should be 2.25 times the module. A Web site agrees with that figure, except for a module less than 1.25, when the factor should be 2.4. *Gears and Gear Cutting* (Ivan Law) suggests a factor of 2.157. I tested cuts at various depths from 2.1 to 2.4, and Law's figure seems to provide gears that have profiles closest to the Proxxon gears.

What is the correct figure for the whole depth and why do different sources provide different figures?

Tony Chabot (Birmingham)

Write to us

Views and opinions expressed in letters published in *Postbag* should not be assumed to be in accordance with those of the Editor, other contributors, or MyTimeMedia Ltd. Correspondence for *Postbag* should be sent to:

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Responses to published letters are forwarded as appropriate.

Young Engineers

Dear Martin,
Further to Patrick Hendra's letter I would like to add to the points he raised.

His first concern followed his visit to the Farnborough Engineering Show where he observed the attendees to be of an older and male based demographic while the industry is calling out for new blood. I am now retired from a lifetime career in engineering and when I started in the 1960s there seemed to be lots more openings for youngsters of all abilities. Unfortunately for the ladies at that time, education for the girls was aimed at making them homemakers rather than career people. A lot has changed since then fortunately. There appear to be two ways to become engineers today: either an apprenticeship or to go to university.

Although some large companies offer apprenticeships leading to professional qualifications, the word 'apprentice' is synonymous with subsidized employment for school leavers as hairdressers or care workers. Back in the 60's we had 'sandwich' courses, usually structured over four years, where a percentage of your time was spent on the job with the rest of the time spent at a technical college or polytechnic and of course we got paid for the privilege. I believe the industry should bring back this valuable concept with the schemes already offered by the likes of BAe Systems and Rolls Royce re-defining the concept of apprenticeship to make it more discerning.

At club level at Wimborne we have several younger members. I believe this is partly due to our large number of battery electric locos which are more affordable over steam engines which require a heavy investment in workshop facilities. Like the Eastleigh club, this can be a rarity these days when many of the traditional clubs consist of an aging group of retired tool makers.

Finally, how can model engineers help to encourage further interest in STEM subjects at school? Four of us are currently running an after-school engineering club at a local school. We began by rolling out Imagineering projects (https://imagineering.org.uk) which is an excellent way to get started. Having run our club for many years we have added projects of our own, even using BBC Microbit computers. Our club is the most popular after-school cub in the school with a waiting list at the start of each term and we are pleased to have roughly equal numbers of boys and girls.

Malcolm Batt (Wimborne District Society of Model Engineers)

Content of Model Engineer

Dear Martin,
I would like to thank Mr Jeremy Buck for his kind and encouraging comments regarding my work in a recent 'Postbag' (M.E. 4606). Of course, not everyone wants to build a Barclay well tank, but *Model Engineer* is arguably the most hoarded magazine ever, with many collections nationwide - so who knows how many Barclays will be built in years to come...

I am well aware that many subscribers just want a good read and I am of the opinion that well-placed humour and the occasional anecdote, along with the inevitable 'drill an x diameter hole and tap it y BA', makes for more interesting reading. I too have sat down in the workshop with a cup of tea and a supply of Golden Virginia and read the latest issue from cover to cover without touching the lathe!

I note that, within the current series, I have attempted to address various specialised but related tasks, such as dome raising, scraping of working surfaces, designs of steam fittings applicable to other work, etc. And yes, a lot of work does go into it, particularly the drawings so it's no surprise that the odd error creeps in.

Finally, I wholeheartedly agree with Jeremy that the current editors are doing an excellent job.

Regards,
Terry Holland (Malaga, Spain)

Dear Martin,
'Postbag' for the 26th of October last year contained a letter from Ken Bristow here in Aus' indicating he thought the content of *Model Engineer* was excellent. I wish to add my support to his statement for it is a great read at the moment. On top of that I would add that most are instructive, informative and just as importantly, entertaining!

He also mentions that all this happens only because of those who do contribute. As a contributor I know the amount of time that can be spent on these things so - more strength to all of your elbows - and I for one would like to express my sincere appreciation to you all. Whether an article is interesting to individual readers is a very personal thing but a wide range of topics has to be catered for but once again the Editor can only hope that a suitable range of articles will come in.

I would be remiss if I did not mention your own articles on something I always wanted to accomplish but never have or will, a garden railway. Fascinating reading.

Having said all that I just have to mention a few that stand out to me personally.

Firstly, I have to say I am simply astonished at what some people undertake and what I read and see in 'our mag'!

As stated, we all have our favourites but even so it is fascinating to read of other people's interests and how they went about bringing their models to fruition.

Doug Hewson stands out because of the standard he works to (and for which he is renowned). Both his signal articles and those on how to make the best of our photos are excellent and I for one will endeavour to 'try harder' in regard to the latter.

Ashley Best's article on his Bolton Corporation tramcar and workshop practices are instructive even to those of us who were trades people. Then there are Terence Holland's well tanks and Chris Gunn's 6 inch scale tractor, to mention just a few, but there are many more.

I must make mention of Mick Knight's astounding undertaking of a quarter scale Bentley BR2 rotary aero engine. Now, I have seen one or two rotary engines here in Australia but I really had not grasped the enormity of building one until reading Mick's article. And what an outstanding piece of work it is with the text and pictures showing clearly what was involved.

So, to ALL those who have, are and will contribute to *Model Engineer* to make it the great read it is today, our grateful thanks.

Les Phillips (Australia)

Gunge

Dear Martin,
Graham Astbury's advice on potential cleaning solvents brought to mind a personal experience of some years past.

I had been given a brand-new Merlin aero engine piston protectively coated with what had the appearance of very thick, mildly-tacky grease that proved to be resistant to a variety of solvents. From memory, they included petrol, Gunk, cellulose thinners, pre-paint body wipe, methylated and white spirit, etc. All proved to be ineffective, save for one (I've forgotten which) that simply converted the coating into really sticky and tenacious goo.

The piston long remained in its messy cocoon until, by chance, splashed with paraffin while I was brush-cleaning some small metal parts. Hey presto! After a few minutes in a bowl of paraffin and some light brushing the piston was a bright 'gem'.

Kind regards,
Bill Colson (Isfield, East Sussex)

Sieg SX2 Plus Miller CNC Conversion PART 9

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

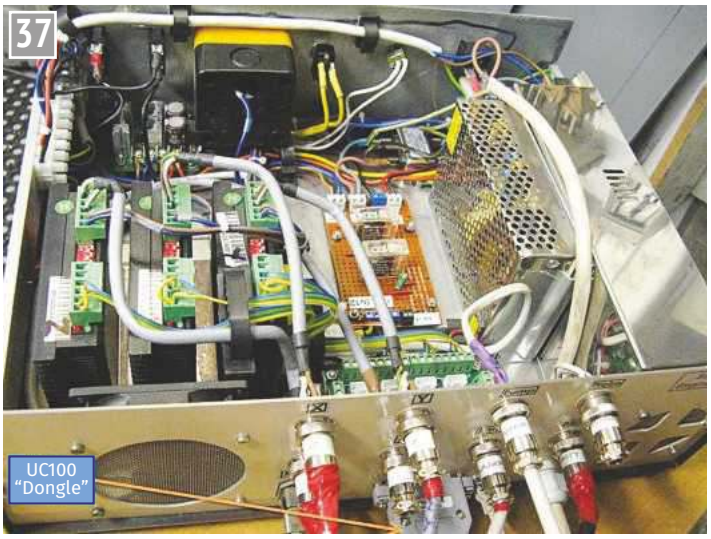
Continued from p.371
M.E. 4607, 1 March 2019

Making the box

I tried to find a suitable enclosure but they were all far too expensive or the wrong size. As the position for mine was tight in my small workshop, I decided to fabricate it.

Layout of the enclosure was mocked up inside a cardboard box to house the following: four drivers; a power supply unit (PSU) for the driver circuits at 36 volts and another power supply at 12 volts for the auxiliaries; BOB (breakout board - the interface between the computer and the drive systems); 5 volt power supply; fan, pump motor speed controller, mains filter unit (according to CNC4YOU the ones in the socket are poor performers) and finally various switches, and sockets.

Two pieces of 18 gauge steel 500mm by 320mm are used, bent at right angles 57mm from the short ends. If I were doing it again though, I would increase the size to 530mm x 350mm with the same bends and the drawings have been modified to these dimensions (**fig 21**). This would make it both wider and deeper (front to back) as things are a little tight inside (**photo 37**). The extra space gained at the front would allow easier connections of the congested area round the mains and the PSU terminals. It's quite surprising just how much space the tremendous number of wires take up. You will need a lot of different coloured wires. Mine came from a scrapped washing machine and the advantage was that many already had the spade fittings on one end. The disadvantage was that



Case back view.

the wires are really a bit too thick, making bending them to get a neat layout more difficult.

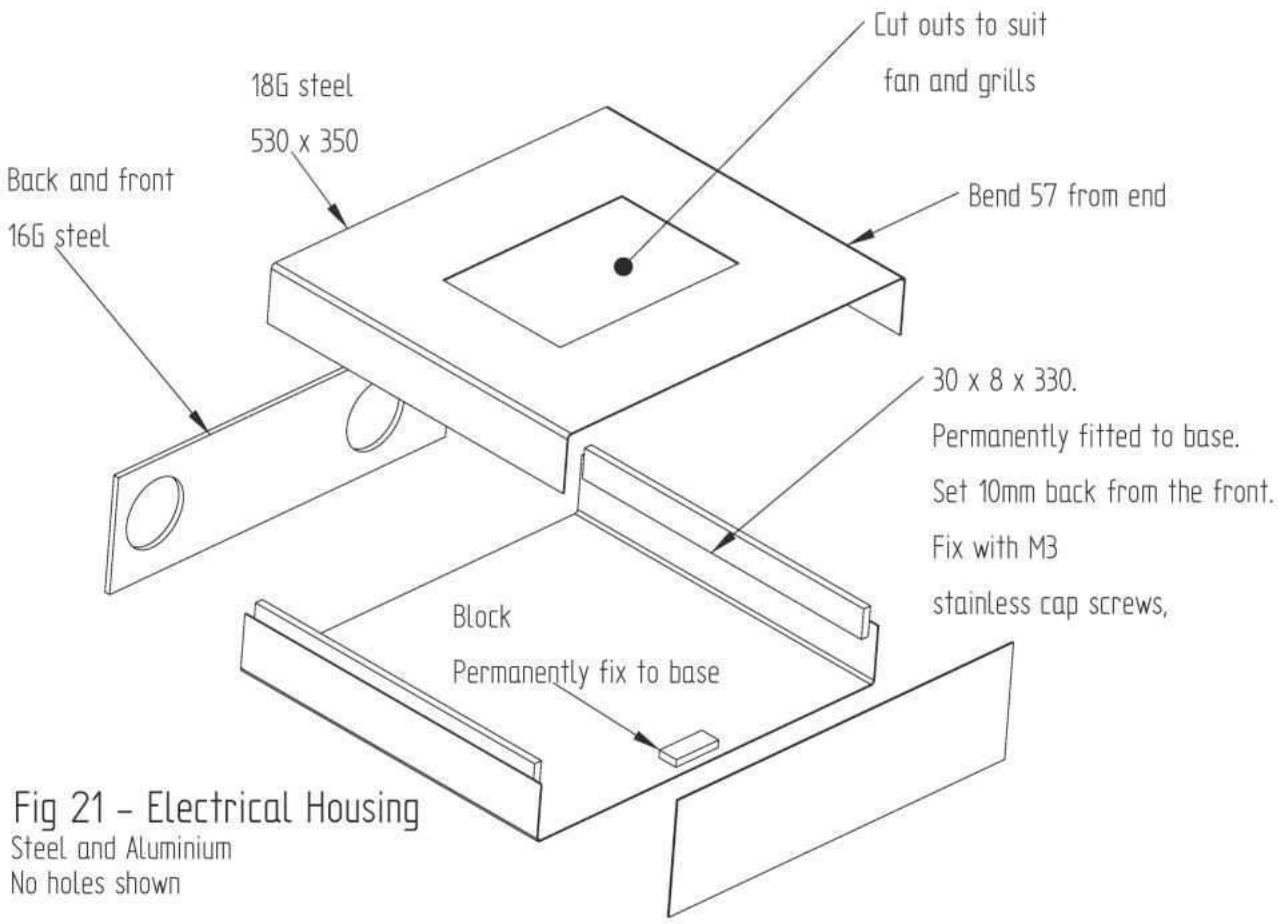
The top and bottom of the case are joined by a 30 x 8mm 330mm long strip of aluminium permanently fixed at half depth to the base piece and fixed to the top with four nice M3 stainless cap screws purchased for a song at the Fosse. The joining strip is cut 5mm shorter at each end to enable the front and back panel to be recessed inside. These are cut to a good fit after completing the outer shell. They are screwed into the joining strips which consequently need to have square ends and be the same length.

A small aluminium block is fitted permanently to the base centrally and the front screwed to this to provide resistance to a rapidly banged emergency stop button (believe me you will do this a lot at first!). The block was not deemed necessary at the back. The BOB is screwed to the case base frame and the back making a very solid unit. I modified the supplied E stop as it was of the lock off type, a feature not required in this set-up. I am thinking of adding another onto the head of the machine where it is more accessible.

The whole box is mounted via the spindle locknut to the case front and the back shell is screwed in place mainly to stop rotation. Note the bent stainless sheet shield round the spindle rocker switch to stop accidental switching in **photo 38**. Do not use a toggle switch here as it would be too easy to switch it by accident. When using edge finders or working with the MDI line in Mach3 it will save having to type a start/stop command in the MDI (Manual Data Input command line) and it makes things a lot easier.

Check the size of your BOB - all the other components are of a standard size. Space is left for another driver unit for a rotary axis if required. This fourth driver did however

Fig 21



have all the wiring and the output socket fitted, obvious in **photo 39**. It's not much additional work now but in future it will be so much easier. In use the drive units run cool and have large built in heat-sinks so they can be mounted close together. The driver PSU unit should be mounted close to the back of the box so its built in fan can draw air from the grill in the back plate.

I fitted an additional 12 volt PSU to provide power for the relays, pump and lamp; it also supplied a LM7805 5 volt 3 pin regulator to give power to the BOB which is mounted on the stripboard. Although the BOB can be powered from the USB in the computer, a separate power supply means one lead fewer (there's a lot of these) and is also the recommended method. A big advantage is that the power to the BOB is not there unless the control box itself is switched on. You will need to change the jumper on the BOB (located next to the USB socket) to set it to non-USB power.

Produce the holes in the back for the sockets, switches in the front and fan vents. Drilling any hole in sheet material is a difficult task with standard jobber drills, as one invariably gets a serious snatch or a triangular hole caused by the point breaking through before the drill is cutting to full diameter. The chisel end of the drill has nothing to guide it so the cutting lip digs in and the drill flexes by different amounts dependant on the width of the cutting lip to the drill flute. At the same time it bounces up and down - result, a 'triangular' hole. Instead, use a step drill which gives a very clean, round and accurately sized hole. I tend to use the metric set whenever possible so preserving the sharpness of the rare and more difficult to obtain (at the right price) Imperial type. The cross in the back for the 36V driver PSU vent was the first hole I cut and was overkill as a simple hole would have been okay.

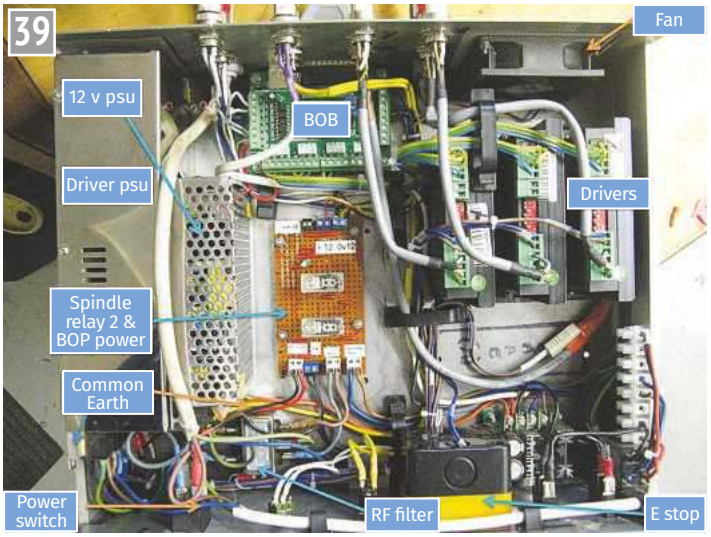
Case front view.

Spray paint the outside of the case. To clean up any work prior to painting, clean with solvent and then scour it with kitchen scouring powder. Using solvent on its own is useless. It will merely dissolve

any surface oil, spreading it around and leaving a molecular level film of hydrocarbons on the surface. It is this layer which inhibits a solid paint bond. To check if the surface is ready, look for the water you use to wash away the powder completely wetting the surface. If there is any beading and water droplets form, then do it again! Paint must be applied within an hour or new oxide films will form.

An alternative is to heat the component with a gentle flame to about 200°C which will burn off the hydrocarbons. A domestic oven in this case is too dirty and grease filled for this task (don't let her indoors hear me saying that) but be careful you don't have a yellow flame or locally overheat. While the paint is hardening obtain some waterslide decal transfer paper off the internet to produce some smart graphics and apply - easy to use and so, so much better than Dymo tape! Follow the instructions which come with it.

Instead of making louvres for ventilation in the top, I fitted an aluminium domestic ventilation plate (from a builders' merchant) angled towards the back into the top cover to let the hot air out and - yes - it does throw quite a surprising amount of heat out. Use gauze inside to keep the muck out of all three vent holes. Four rubber feet from the DIY store were fitted underneath, mainly to give the 4BA fixings a bit of space. The front and back panel layouts are shown in photos 37 and 38. I did make one mistake and this is the reason for widening the box (corrected in the text and drawing); the output socket to the spindle is at the bottom under the digital X and Z motor sockets. This is not a good position, so I moved it to the outside of the back cover beyond the fan where the UC100 'dongle' title box is in photo 37. A socket is far better than a simple cable clamp as it means you don't have trailing cables during handling.



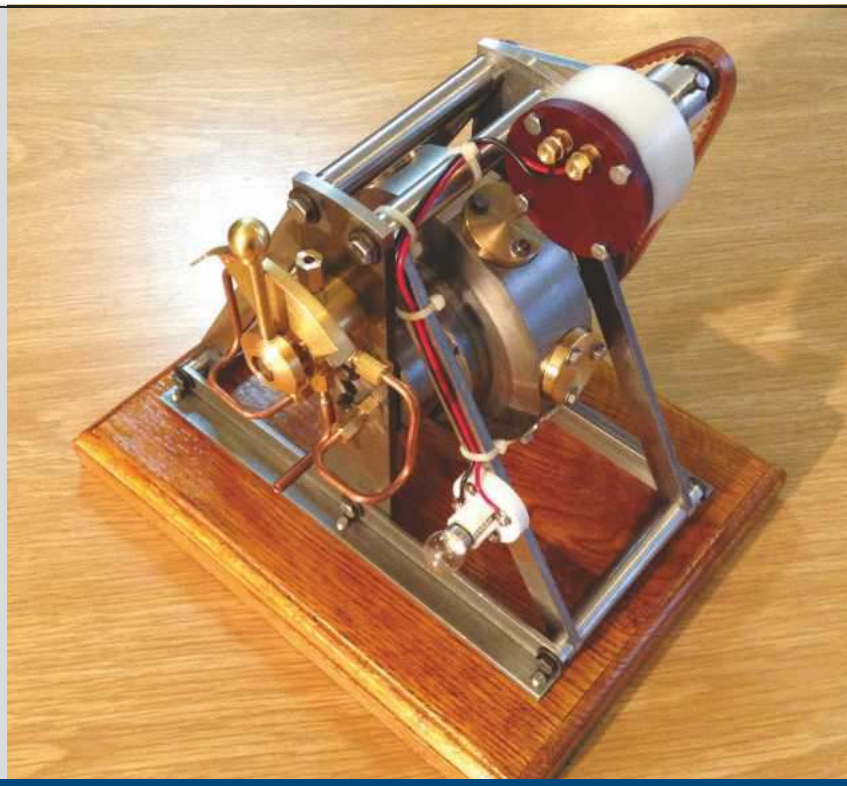
Internal arrangements.

●To be continued.

NEXT TIME
We add the auxiliary controls

- **West Somerset**
  Graham Gardner remembers his visit to the West Somerset Railway steam rally.
- **Cylinder Block**
  Hiroyuki Watanabe tackles the complexities of casting the cylinder block for a Japanese type C53 three cylinder locomotive.
- **Barclay Steam Test**
  Terence Holland carries out a steam test on his Barclay well tank.
- **Rob Roy Rally**
  Rex Hanman offers a retrospective of the 2018 Rob Roy Rally.
- **Rotary Engine**
  Kevin Barry presents a design for a comparatively simple stationary six cylinder rotary engine.

Content may be subject to change.



ON SALE 12 APRIL 2019

A Money Saver

Ted Jolliffe says "Spend a few minutes to knock up this little tool"

Most households use tubes of one sort or another, for such as toothpaste, ointments, medicines, creams, etc. I learnt of one well known brand of tomato puree so packaged.

One of the disadvantages is - how to get the most use from a tube? As they get towards the end of their life it becomes difficult to extract the contents so several days' worth can easily get consigned to the bin.

I had such a problem and realised that if I could roll the tube up easily and tightly more of the contents would come through the nozzle, saving a little of the cost, instead of sending it to landfill part used. This was for an NHS prescribed medication, which I understand is quite expensive, so it is as well to get the best from each tube.

A little thought came up with a quickly made key, hollow down the centre, with a slot for the end of the tube and cross drilled for a turning aid.

I used a scrap of ⅜ inch diameter brass rod, 2½ inches long, from the odds'n'ends bin, and for the handle a 2 inch long piece of 3/32 inch steel wire (it started life as a panel pin) was silver soldered in place through a cross drilled hole.

Just a few words about construction. I slotted the side of the rod for 2 inches using a 1/16 inch diameter end mill, cutting 3/32 inch deep from a pre-drilled hole at the closed end. I have since made several and, learning from experience, now offset the slot from centre by a whisker. This leaves an angled side to the slot which gives a better grip on the seam at the end of the tube.

Once done I hold the slot under a jaw of the three jaw chuck while I centre and drill ¼ inch diameter for 2⅛ inches from the open end. A touch with a Swiss file removes any burrs and slightly rounds the open ends.

Cross drilling for the 'twister' or handle and silver soldering followed by a quick clean up completes the job.

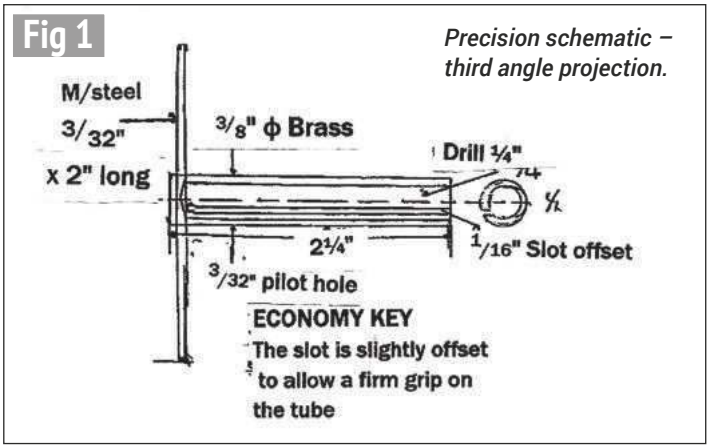
To use, slide the crimped end of the tube into the new key, gently tighten by rolling up the tube, with the cap on. Stop as soon as there is resistance - the tubes are not pressure vessels and, especially if plastic, can burst. I have had a couple of chain store lookalike plastic tubes which needed only very light pressure before they burst - be warned as you otherwise may have a mess to clean up.

Demonstrate to the household and enjoy the praise.

I reckon, used with a tube of Germolene, which I need to apply daily (too much information, Ted... Ed.), to get an extra three or four days use from a tube which over a year adds up to a good saving, which can be used to buy bits for more interesting jobs.

ME

Simple but effective – the key as made.



By squeezing the tube it is possible to get almost 100% of the contents.

London Model Engineering and Modelling Exhibition 2019

John Arrowsmith recalls highlights of the recent exhibition held at Alexandra Palace.

Continued from p.423
M.E. 4608, 15 March 2019

The Steam Apprentice Club display had lots of information about their aims.

Trying to attract younger people into model engineering is not an easy task but the **Steam Apprentice Club**, who are part of the **National Traction Engine Trust**, are making a major effort to do just that. Their stand here displayed all the necessary information about their aims with lots of information and models to show what can be achieved. Over 50 new young members were recruited at last year's Great Dorset Steam Fair so they must be doing something right (**photo 15**). Both the **Northern Association** and the **Southern Federation** provided a useful selection of information and details regarding boiler tests and insurances etc. which are so necessary these days. The **Society of Model and Experimental Engineers (SMEE)** again had an interesting stand mixing archive models with up to date machining facilities. The Society's Training Day programme attracted a

Examples of stationary engines and boilers made during the SMEE training programme.

This young lady is being shown the basic operation of the centre lathe on the SMEE stand.

Always plenty of passengers for the Polly Owners Group track.

great deal of interest (**photo 16**) as did the centre lathe demonstration. Lots of visitors tried their hand at using the machine (**photo 17**).

The **Polly Owners Group** provided their usual portable track facility which enabled many people to enjoy a short ride behind a steam locomotive (**photo 18**). An attractive display of various Polly models was also part of their display. Among the other working sections, the **Tamiya Truckin' Group** had an excellent layout with lots of activities with large trucks being manoeuvred around the road system. Soil loading was also taking place with a range of different machines (**photo 19**). The **British Model Flying Association** regularly attend this exhibition and their colourful display, both static and flying, contributes a great deal to the activity zone. Their construction table is always well patronised and provides a good opportunity for anyone to have a go at building a simple aircraft.

An interesting presentation from the **Ickenham & District SME** (**photo 20**) showed some excellent examples of good workmanship, construction and finishes to the models under construction, Peter Partington's Foden rear axle being typical of the quality on show (**photo 21**). The **Romford MEC** (**photo 22**) again produced some well-made models including some nice marine craft, stationary engines, locomotives and a *Minnie* traction engine. The de Winton battery locomotive being built by Dave Budd will be a fine model when complete. From the **Welwyn Garden City SME** (**photo 23**) came a real mixed selection of marine craft, stationary

An aerial view of the Tamiya Truckin' road layout and excavation areas.

A large range of scales on the Ickenham & District SME.

A well-made and finished rear axle for a Foden steam lorry was built by Peter Partington from the Ickenham Society.

The display by the Romford MEC.

»

Part of the well filled display by the Welwyn Garden City SME.

An attractive 0-6-0 kit built locomotive from the Welwyn Garden City club.

engines, locomotives and road vehicles to demonstrate the wide range of members' interests, the little kit built saddle tank being a case in point (**photo 24**). **The Society of Ornamental Turners** do provide something quite unique to the exhibition with their working display of fascinating machines. The complexity of the set-ups is a work of art in itself and visitors really do enjoy seeing these machines at work.

The smaller gauges also made a major contribution to the show with the **Gauge 1 MRA** 'INVICTA' track attracting keen spectators the whole weekend (**photo 25**) with their large range of locomotives and rolling stock. An innovation this year enabled members of the public to have a go at controlling a live steam locomotive on a short length of track. It seemed to be working very well

The 'INVICTA' track of the G1MRA always had lots of spectators.

A Darjeerling Class B drifts past the Raj Hotel on the Indian Hill layout.

Plenty of steam from the little tram engine on the Whiteleaf Light Railway layout.

for them. **The East Surrey 16mm Group** presented their Indian Hills Railway, which is based on a typical Darjeeling Railway scene. There was lots of colourful rolling stock and scenery combined with Class B's and Garrett's as motive power (**photo 26**). On the **Buckingham Garden Railway Society** the Whiteleaf Light Railway layout always had a train in motion to entertain the visitors (**photo 27**). There was a representative selection of models on the **Gauge 3 Society** stand. These well-made examples in 2½ inch gauge are in the scenic area

An attractive GWR small Prairie with a mixed train on the Gauge 3 Society display.

An eclectic mix of models from the Hanwell Model Society.

The sleek lines of the Model Hydroplane Club.

Impressive naval power from the Surface Warship Association.

of this gauge (**photo 28**).

There was a large display by members of the **Hanwell & District Model Society** which covered a variety of boats and ships alongside road vehicles and one or two novelty items like the banjo playing skeleton automaton (**photo 29**). The fast hydroplane boats featured on the **Model Hydroplane Club's** stand (**photo 30**) showed a small selection of carbon fibre components which are now available for building this type of craft. There was a fine group of warships on the **Surface Warship Association's** display in a number of different scales. The fine workmanship and details were much admired (**photo 31**). More fine marine craft were to be found on the **Victoria Model Boat Club** display (**photo 32**) with exhibits ranging from warships to fast hydroplanes. The **Moorhen MBC** (**photo 33**) had the traditional steamships and warships along with a very well-made paddle steamer on show.

In concluding my notes I would like to thank everyone who took part in this exhibition. My apologies if you are not mentioned but as always space is at a premium. Rest assured though that your efforts were just as much appreciated by all. I hope this brief review provides an overall picture of a fine exhibition. I trust you will all attend again next year.

ME

The Victoria Model Steamboat Club covered a variety of prototypes.

A range of stylish steam ships from a bygone age.

PART 36

Lathes and more for Beginners

Graham Sadler grinds some tool bits.

Continued from p.439
M.E. 4608, 15 March 2019

Fig 37

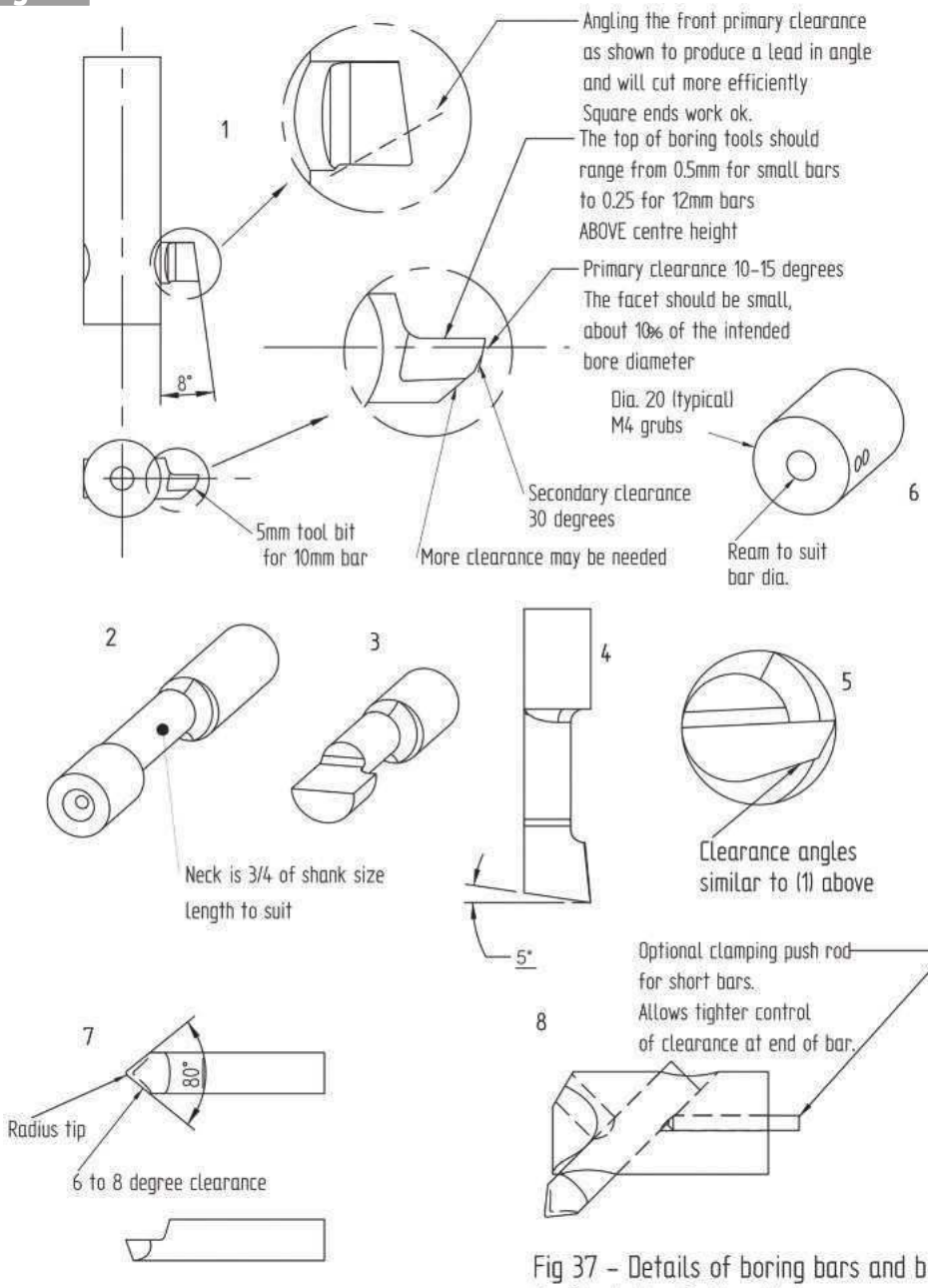


Fig 37 – Details of boring bars and bits

1) Standard bar for through holes
2-5) Stages in producing Silver steel solid bars
6) Machining jig for use in four jaw chuck
7) Bit for angled end cutting bar
8) Angled bar and tool bit

Solid boring bars, commercial and shop made

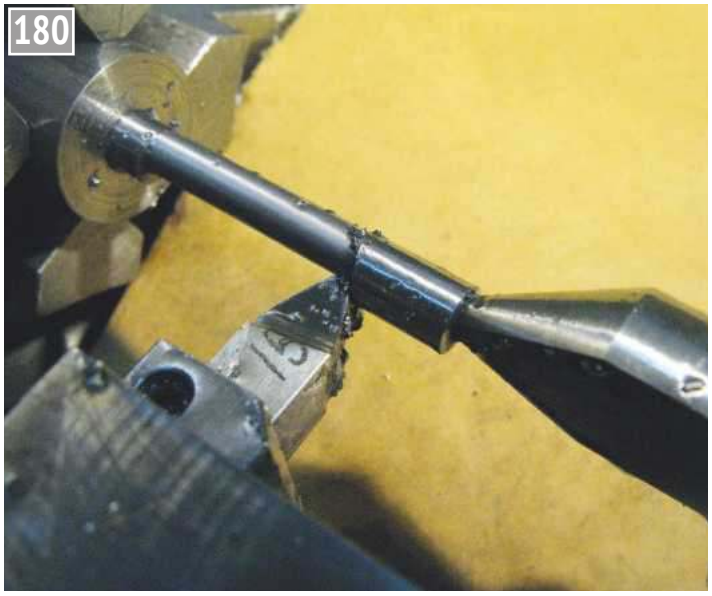
Before we start on the latter, make a holder by using a slug of 16 to 20mm diameter material, face, drill and ream 6mm and fit two grub screws close to the end, as shown in **fig 37** (item 6 – figure reproduced from last time). Once this is made and set up, you will be able to make a set of small tools without the constant faff of resetting the eccentricity - this is where industry beats us with their quick setting time by using a lot of holding jigs. I just did a ten minute milling job but setting and breaking down took almost two hours!

To make silver steel 6mm bits we start by gripping the holder in the four jaw chuck and using the same method as we used for the eccentric sleeves. We want to end up with a total eccentricity of 1.5mm so we remove 25% of the diameter of the bar to create the shank. Using tailstock support with a BS1 centre drilled hole (you could make an extended centre from 8mm silver steel to be held in the drill chuck for this - harden and temper to brown). Without this support, the fragile bar will deflect under cutting. Do leave enough length on the head of the bar though to remove the centre! I found I needed 5mm to remove the centre hole plus 5mm for the tool head, plus 10mm for tool clearance, so my 25mm long bar had 40mm projecting from the holder.

Turn the neck until the back turning almost touches the original edge of the bar. I did a test on the end of the bar first to check the offset. Use a speed of 77-1100 rpm and a fine feed of 0.0025 inch or 0.63mm (**photo 180**). Make bars of a range of lengths. It is easier to make one on each end of a stock bar then finish both before moving on. Using a square file, which gives better visibility, file the top of the cutting face with the head in the left side of the vice - remember it's a left-hand tool and make sure the shank is correctly orientated - until it measures 0.4mm more than half the bar (3.4mm). Here, the recently discussed 'Sadler's patent' plastic vice jaws are a boon - if the head is held in the correct position the vice can be used as a fence.

Next, use a small, fine, round file to blend the flat into the shank (**photo 181**). Carefully file the underside of the head to about half way to the shank, then add the clearances as outlined above. **Figure 37**, items 2 to 4 show the steps, while item 5 shows the form we are after. The ends can be hardened and the ends tempered to a mid straw colour leaving the shanks blue. When tempering, heat the root of the shank and let the colours slowly flow to the tip (**photo 182**). Finally hone with an oilstone and lightly round the cutting point.

Don't forget the silver steel tools should be used at 60% of the cutting speed for HSS tooling but, as we are dealing with holes of about 8-10mm diameter, they will be turning fast anyway. For smaller holes down to 6mm firstly reduce the diameter of the 6mm silver steel to 5mm, then proceed as above but leave a neck of 3.75mm or even file the lot and don't bother with the machining after reducing the top diameter. George Thomas actually designed a smaller tool-post holder, for 3/16 inch (5mm) and 1/8 inch bits. This is a bit of overkill as these can be easily fitted into the standard 6mm holder. I made the smaller version but it has hardly been used!



Turning the neck of a 6mm bar with tailstock support. There's enough extra length on the head to remove the centre later.

Filing the head on the left of the vice. The plastic jaws make this easy and they can also be used as a filing fence.

Finish grinding solid tools

Grinding these bits is exactly the same as finishing our shop made versions. As these bars are expensive and there is not much material on them one has little room for error so I advise you to make up some short dummies from mild steel and make your mistakes on

Tempering colours on the bar.

Setting the bar true prior to finish grinding.

them. You will need several attempts before being able to attack the real one!

Assemble the sleeve into the jig with the sleeve graduation aligned with the zero division on the holder. Insert the tool and set vertical against any convenient face (**photo 183**). Set the grinder slider to zero and grind the top face. Here we have to use the side of the wheel, similar to **photo 184** but with the holder on its side face. I have previously stated the danger of this practice but in this case we are removing only a tiny amount of material with very delicate cuts so the risk, while still there, is minimal. The carrier is rotated to the give the clearance angle of 12–15 degrees, rotated clockwise from the back. We need a lot more clearance with bars working in small holes.

Set the slider to 5 degrees anticlockwise and grind the front clearance. Care is needed here when working on the longest bar as there is a lot of overhang, but one can always reverse the holding block with the tool in the wrong end... Do some practice positions with the grinder switched off to get the hang of things and don't forget to use marker on the face being ground so the bit being cut is obvious.

Now we rotate the slider to 5 degrees clockwise to grind the primary clearance, removing enough to make a flat of a maximum width of 1mm. I found that just holding the slider in a fixed position and sliding the holder along the fence was enough to accomplish this and just adding pressure to the left was enough to add a cut - trying to move the slider does not have the required sensitivity. A secondary single or multiple clearance of up to 45 degrees can be added to ensure the bar does not foul the bore.

Grinding the primary clearance. Extreme caution is required whenever the side of a wheel is used so this is not advised, except where very light whisker cuts are taken.

The silver steel versions can be treated in the same way but take it very slowly and gently as it's so, so easy to overheat them and draw the hardening temper. If you get ANY colouration at all then it's a re-harden and tempering job. Not difficult, but a frustrating longer halt to progress on the real project in hand. Hone the tool and use a slip stone to round the tip being careful not to round in the wrong direction. Hone the top face, but take care with the clearances as its easy to round the edges. This applies to all of the cutters in this section.

Photograph 185 shows the finished tool, but here the primary clearance (black marker) is too wide as it only needs to be 0.75 to 1mm wide. Using the setting/checking washers are a great aid prior to going onto the machine. When setting these small boring tools, it is always a good idea to have them above centre height. I use a 15 thou shim under them on the lathe bed to stand the centre height gauge on. It should be noted that with all boring, as the hole gets bigger, the top rake provided by setting the tool high is reduced while clearance under the tool increases.

Finally, **photo 186** shows the tool working in a 7.5mm hole. One thing I will do when needing to bore a critical component is to set the boring tool and check it is cleanly cutting in a bit of scrap before starting on the actual component and then it can be used with assurance it will cut when needed on the project.

●To be continued.

NEXT TIME
We will talk about milling in the lathe.

Finished tool showing second and third clearance angles. I wasn't happy with this and it was returned for more treatment. The primary (in black on the right) is far too wide. Note the rounded tip.

Testing the bar in a 7.5mm hole - note clean finish!

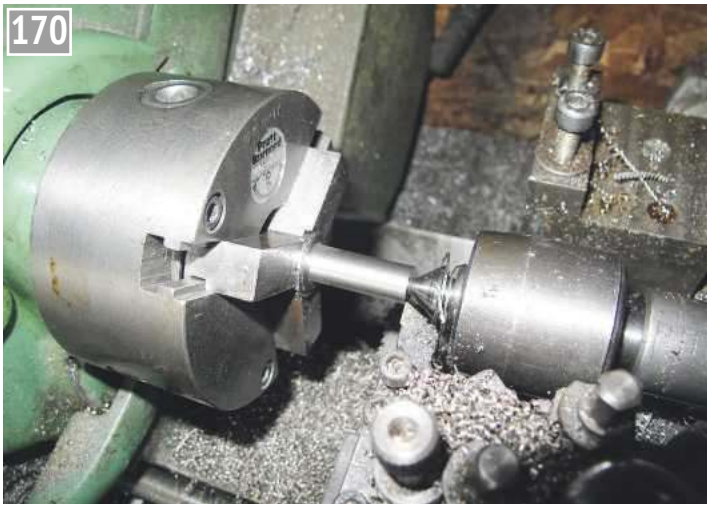
Quarter Scale Bentley BR2 Rotary Aero Engine

PART 11

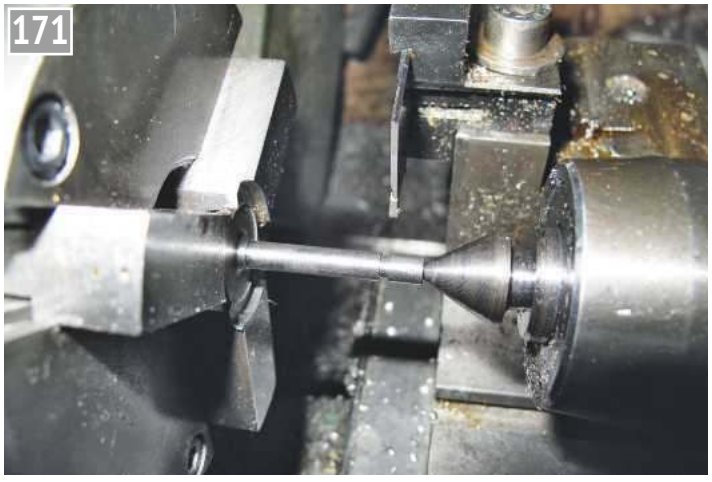
Mick Knights machines the valves and valve seats.

Continued from p.363
M.E. 4607,1 March 2019

Back to conventional machining and we'll start with the valves and valve seats. The valves are machined from 303 stainless and the seats from bronze; both are straightforward batch turning operations and, as with all batch machining, it's always prudent to make a spare in case of any over enthusiastic machining! The individual billets for the valves are faced to overall length plus 5mm of service stock which will carry a centre drilled cone. The first operation is to rough turn the valve stem leaving sufficient stock to be able to turn the shoulder radius (**photo 170**). Once the stems are finished and polished to a close sliding fit to the 5mm guide holes in the cylinder head the corner radius can be generated. Rather than using a small diameter dowel pin, favoured in both versions of this build, I intend to use circlips to secure the valve stems inside the valve spring retainers, so a 0.062 inch wide groove is machined in the stem (**photo 171**) (There will be the need to change this cunning plan



Rough turning the valve stem.



The circlip retaining groove.

Turning the seating angle.

Stem faced to finish height.

Parting the valve seat to width.

Valve seat counter bores.

Outside diameter turned true to the bore.

Valve seats fitted to all the cylinder heads.

a little further on!) The seating angle is at 45 degrees; once the compound slide is set by eye to the 45 degree calibrations the setting shouldn't be altered until the valve seats have been fitted to the cylinder heads and machined *in situ* at the same 45 degree setting. This will cut down on the amount of lapping required to produce a gas tight seal between the two (**photo 172**). Finally, the service stock is faced away to leave the valve stem at finish height (**photo 173**).

The bronze valve seats are only 0.090 inch thick and have a section of 0.078 inch so care needs to be taken in their manufacture. I centre drilled the bar and used a revolving centre as support while parting the seat to finish width (**photo 174**). These blanks can then be held in soft jaws and taken to 0.020 inch below their final internal diameter with a drill, before finishing with a suitable boring bar. The valve seat counter bores in the cylinder heads were generated on the CNC mill (**photo 175**) and all fall within a 0.002 inch tolerance band, so each valve seat's outside diameter needs to be machined to suit each individual counter bore in order to ensure the 0.001 inch of interference. In order to hold the seat true to the inside diameter I faced a suitable piece of tube and held the seat in position by using the revolving centre as a pressure pad. **Photograph 176** shows the finish turned outside diameter. Once secure, the outside diameter was turned to its finished diameter and pressed into its counterbore. **Photograph 177** shows all the valve seats in position.

The cylinder head machining fixture is used to hold the head while the 45 degree valve seating face is turned. The fixture was set in the independent four jaw chuck and the head located in the fixture in the usual way (**photo 178**). There may be a slight difference in the position of individual valve seats to the valve stem guide holes and as the seating face needs to be true to the valve stem guide in the head, the stem guide bore is clocked true by adjusting the independent four jaws (**photo 179**).

With the valve stem guide set true, the seating face was turned and as the compound slide hasn't been reset since the valves were turned, the mating angle will be identical, which should mean the minimum amount of lapping will be required to achieve a gas tight fit between the two.

At this stage I'd like to have a word about the valve springs. On the original engine, as well as the Blackmore version, volute springs were used. These springs, instead of compressing like a concertina, compress in on themselves. There is a method of producing a batch of these springs described in the Blackmore book. This involves producing a stepped mandrel, which is held in a slowly rotating lathe spindle while a strip of spring steel is heated and wound onto the mandrel. This method obviously worked, so rather than compromise the finished appearance of the engine by using ordinary compression springs I decided to make a batch of volute springs. I have, of course, produced compression springs by winding piano wire onto a

Cylinder heads mounted on the machining fixture.

Clocking the valve stem bore true.

First volute spring.

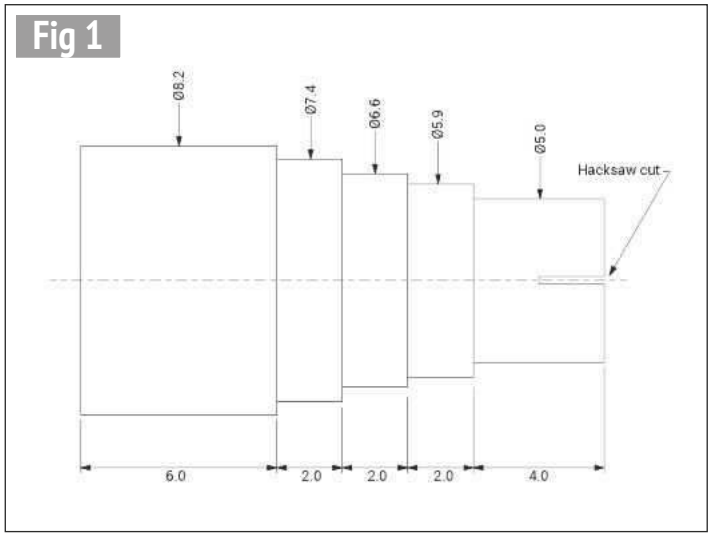
Finished volute springs.

rotating mandrel, but winding spring steel strips onto a rotating mandrel while heating it to red hot would require some R&D experimentation!

To start with I thought a tapered mandrel, rather than a stepped one, would prove easier to lay the red hot spring steel strip onto while the carriage advanced via the screw cutting gear box - but this didn't prove to be the case and, as I needed to produce springs pretty much to the size shown, I turned up a mandrel to the dimensions in the book. I was using the same thickness of spring steel, 0.3mm, but the width was different. Blackmore used 4mm wide while I was using 6mm. It wasn't until I had successfully wound the first neat spring I realised why this might have been. More on this later. There are several on-line outlets that supply clock suspension spring steel strip; I bought mine from www.clocks.co.uk which, at the time of writing, was £4.20 a metre. What with R&D experimentation and a few misshaps, I needed a total of 5 metres to produce twenty decent springs. The heat source was my butane plumber's blow torch.

The first thing that became obvious was the need to keep the strip under constant tension. To achieve this I milled a 0.3 deep by 6mm wide slot in a piece of brass and clamped it in a quick change tool holder. The tension can be increased by tightening the four Allen screws until the strip can just be pulled through by hand. The slowest back geared speed on my lathe is 32 rpm. This proved far too quick to allow heating the strip and laying it evenly on the mandrel, so I secured a couple of tommy bars in the body of the collet chuck so I could rotate the spindle by hand with the carriage engaged at the coarsest screw cutting setting of 8 tpi. The Blackmore method suggests a setting of 12 tpi but I found this didn't produce sufficient tension to the finished spring.

After a couple of false starts I also realised that the strip needed to have a sharp, 90 degree bend to locate in the slot on the mandrel to avoid the strip bellowing on the first couple of revolutions. I did this by having the end of the strip located half way in the slot, heating it to a red heat and gently tapping it with a light hammer to create the tight bend. It was then relatively straightforward to keep the strip at a constant red heat. Wind the spindle backwards while the engaged carriage is moving forward, laying the strip evenly along the steps of the mandrel (**photo 180**). This produced a pretty good-looking spring but the bottom diameter was too big to locate in the cylinder head registers. After a bit of trial and error, modifying the step depths and diameters, I produced a spring pretty close to the sizes I needed. It then took only a couple of hours to produce a batch of twenty springs. Another useful skill learnt and added to the armoury (**photo 181**)! The mandrel is shown in **Fig 1**. Using a 6mm wide x 0.3mm thick spring steel strip produced a volute spring with a base diameter of 9.5mm and



Volute spring forming mandrel.

Machining the spring registers.

Setting the machining fixture true in the dividing head.

Starting the tap by hand.

a 6mm diameter hole to clear the valve stem.

The right-angled locating tab used to wind the strip onto the mandrel was of course still inside the small end of the spring. I removed this by scoring the bend with the edge of a three-square diamond file and then moving the tab backwards and forwards until it fractured leaving a clean hole. These days, diamond files can be purchased online for only a few pounds.

Once the bottom diameter had been squared off on the side of a grinding wheel and I started to try it out on the cylinder head assembly it became obvious that the spring can't compress beyond the thickness of the actual width of the strip, which is 6 mm. This would not allow the full travel of the valve or allow the cam follower to crest the cam lobe so, by using a 4mm thick strip, this would give the extra 2mm of travel required. Sourcing anything other than 6mm strip proved to be a problem and so a different method of securing the spring had to be the answer. I did away with the spring retaining cup and circlip that I had already produced and had intended to use to retain the valve spring and replaced it with an E-type circlip. I also deepened the locating groove in the cylinder head to 2mm rather than the initial 1mm (**photo 182**). This had the desired effect and allowed the valve to travel to its intended limit with some movement to spare. Of course, if you intend to use compression springs none of this extra work should be required.

The final machining operations to the cylinder heads can now be carried out, starting with the four threaded holes which secure the inlet manifolds. These holes are tapped M2.5, or 7BA if you prefer, but for all intents and purposes they are identical and it's far easier to source metric fixings.

The twin spark plug holes are pitched out at 22.5 degrees from the centreline. This operation entails setting the machining fixture true to the zero position of the dividing head (**photo 183**). I elected to use Rim Fire plugs, as these have a long enough thread to reach right into the combustion chamber. The thread is ME ¼ x 32 tpi. I sourced these from cncengines.com which, even when the carriage from the USA was taken into consideration, proved the cheaper option when purchasing eighteen, but to take the sting out of the costs even further I suggested to my nearest and dearest that if they were at a loss of what to get me for Christmas they could pay for as many spark plugs as they wanted.

Rotating the dividing head to the first position, the hole is centred, drilled at 5.6mm and finally the tap is started by hand (**photo 184**). When all nine holes are completed at this setting, the process is repeated for the second hole.

●To be continued.

NEXT TIME
We need to make a set of eighteen fuel/air inlet manifolds – no minor undertaking!

ME Vertical Boiler - Fittings PART 27

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** makes the gas burner body and the gas tube.

Continued from p.426
M.E. 4608, 15 March 2019

Overview

The last major part required before you can watch your steam plant actually running is a means of heating the water to produce steam. I'm going to describe first a simple easy to make burner that will use the *B20 boiler base* already made that is attached to the firebox (**fig 82**). If for whatever reason you do not like the idea of actually making the gas burner I will describe the adaption required to fit a commercial two inch diameter ceramic burner to the boiler base.

Regardless of whether the burner is made or purchased, the gas container, including a means of controlling the firing rate, pipework and fittings required to connect it to the burner are the same, these being the last assemblies requiring construction.

If you will be using a 'bought-in' ceramic burner, most of what follows will be of little interest but we will return later to discuss the fitting of the commercial burner.

Table 7 lists the materials required for either option.

Fig 82

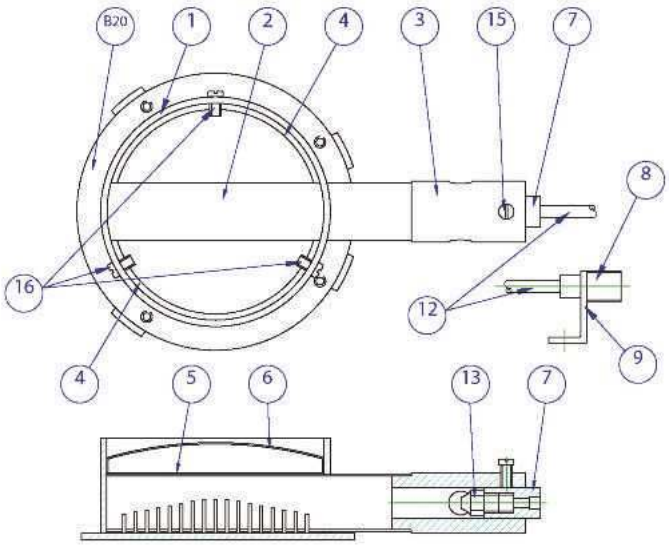


Fig 82 - Gas Burner
Item Location & Reference

Gas burner body – Item GB1

16SWG Brass (**fig 83**)

Make a former in wood (softwood is okay) or two pieces of chipboard/plywood glued or screwed together and turned to form a 24mm length of diameter 55mm, using the methods described previously in the boiler construction section.

Mark out a rectangle 25 x 178mm on 16SWG brass sheet. After cutting out (remember to keep the line just visible), file to the line.

Mark the three 2.5mm hole positions as shown on the drawing, centre punch and drill. Using a triangular needle file, opposite the hole positions drilled, file three nicks 0.1mm deep across the material thickness.

Anneal the strip and, using the former, shape the blank into a cylinder using the same methods as described for the firebox.

Silver soldering ends together

Remove from the former and clean up the area around each of the two ends with abrasive paper before applying flux to the end/inside area. Using a single turn of either soft iron or copper wire, hold the ends together by twisting the ends of the wire together.

Position the cylinder on two fire resistant blocks placed parallel to each other set about 40mm apart with the joint at the bottom. Lay a 20mm length of 1.5mm silver solder (38–40%) along the joint and

Silver soldering burner body ends.

Boring burner body for gas tube.

Tolerances:
Non functional (i.e. parts not a fit or match) ±0.1mm
Functional (i.e. parts having to match) ±0.02mm

brush over with flux. Direct the flame on the underside of the joint between the gap with an occasional pass over the top part of the cylinder but avoiding direct contact with the silver solder. When the flux boils off, check to make sure the silver solder has not been moved away from the joint repositioning it with your scratch stick if necessary (**photo 155**).

Continue heating until the flux becomes transparent, the silver solder 'slumps' and then flows along the length of the joint, encouraging it the full length if necessary using the scratch stick. Allow to cool, remove the wire, place in the pickle for 10-15 minutes, drain and leave to soak in clean water for 15-20 minutes. True up the end surfaces by rubbing on a sheet of abrasive paper laid on a flat surface.

Drilling in the mill

Push the former through the cylinder to bring it truly round. Clamp the blank (with the former still in position) in the milling vice - with the joint at the bottom, the face having three nicks against the fixed jaw and the face having three drilled holes against the moving jaw. Zero the spindle central to the blank on the X axis and clamp the slide. Zero the spindle to the fixed jaw on the Y axis, zero the Y axis feed dial and then move the work 8mm towards the column. Clamp the slide. Centre drill, drill 4mm, 8mm and 13mm before boring to 15mm diameter. Remove and deburr (**photo 156**).

Silver soldering the gas burner body to the boiler base

Place the boiler base and gas burner body in the pickle for 10-15 minutes, drain and rinse in clean water. Make up a ring of 1.5mm silver solder (38–40%) to fit inside the body. Place the boiler base onto fire resistant blocks set parallel about 50mm apart, with the pair of ears wider apart resting on one block and the pair of ears closer together resting on the other. Onto this place the gas burner body with the face having the three nicks and 15mm diameter hole against the base, so that it lays concentric to the outside diameter of the base. The 15mm hole should be positioned radially so that it falls midway between the pair of ears that are closest together.

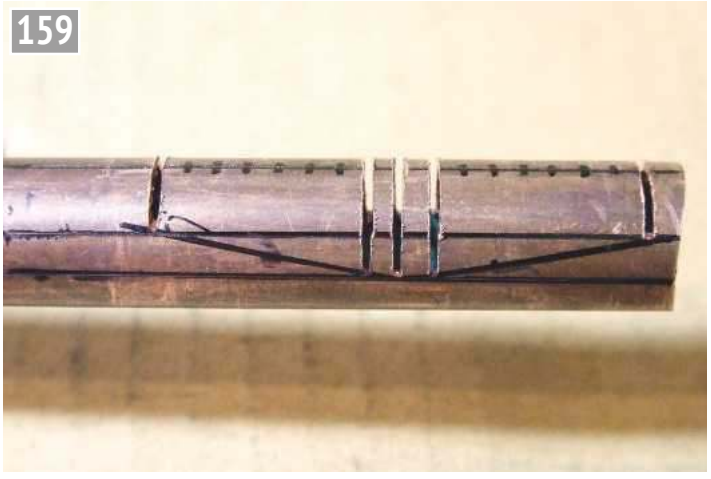
Apply flux to the area around the inside and outside of the body where it contacts the base and install the silver solder ring applying additional flux over the ring. I found a couple of short ends of angle were ideal

Table 7

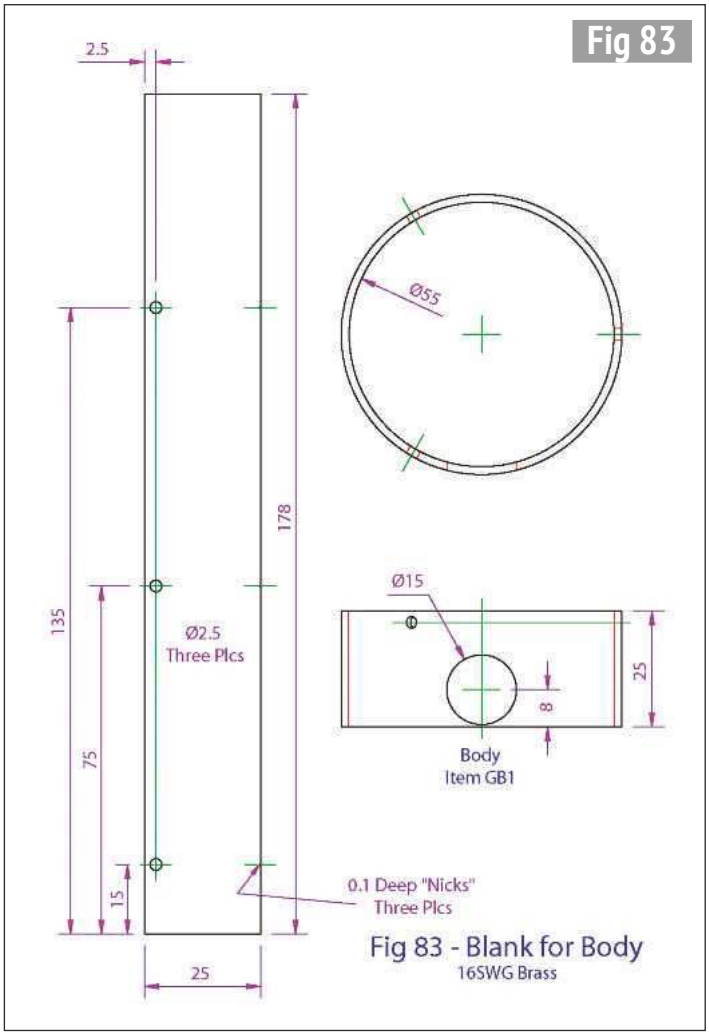
Item	Description	Material and Blank Size
Parts Required for User Constructed Radiant Gas Burner		
B20	Use B20 Base	N/A
GB 1	Body	16SWG Brass
GB 2	Gas Tube	15mm Domestic Copper Water Pipe
GB 3	Mixer Block	5/8" diameter Brass
GB 4	Spacer x 2	16SWG Brass
GB 5	Disc Diffuser	From Stainless 30 Mesh
GB 6	Dome Diffuser	From Stainless 30 Mesh
GB 7	Jet Holder	10mm diameter Brass
GB 8	Gas Pipe End Fitting	10mm diameter Brass
GB 9	Gas Pipe End Fitting Mount	16SWG Brass
GB 11	Heat Resistant Millboard Sheet	Purchased Item (275 x 200 x 6mm)
GB 12	Connection Pipe	1/8" x 22SWG Copper Pipe
GB 13	Gas Jet	No 8 Purchased Item
GB 14	Gas Valve for EN417 Cartridge	Purchased Item
GB 15	Lock Screw	M3 x 6 Stainless Steel Screws
GB 16	Diffuser Retaining Screws	Three M3 x 5 Stainless Screws
Alternative Items Required to Install Purchased 2" Ceramic Burner		
GB 10	Ceramic Burner Mount	From ⅜" x ½" Brass
GB 17	Securing Bolts	Two x M4 x 25 Screws
GB 18	2" Ceramic Burner	Purchased Item

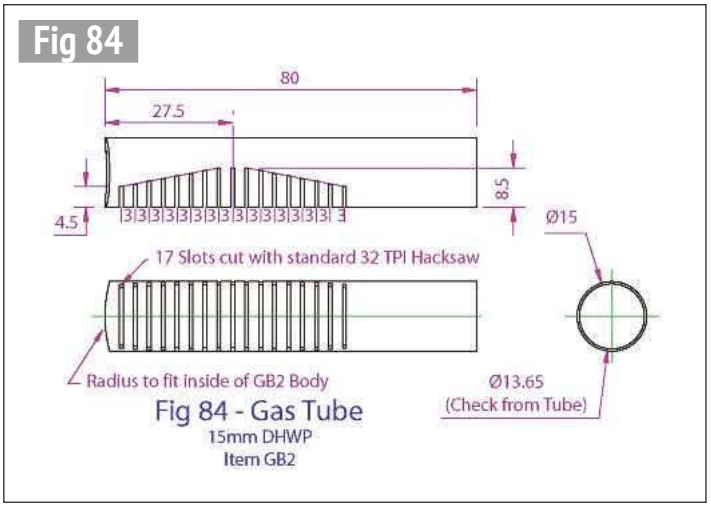
Silver soldering burner body to base.

Fillet formed at joint.



Reference sawcuts.





in providing a little weight to prevent any movement whilst allowing full access for the flame. Direct the flame on the underside of the base and around the outside of the body avoiding direct contact with the silver solder and keeping to a minimum the time when the flame is directed at the joint in the body (**photo 157**).

When the flux boils off, check to make sure the silver solder has not been moved up, repositioning it with your scratch stick if necessary before continuing. The addition of the three 'nicks' should result in a smooth even fillet being formed around the outside of the body joint with the base (**photo 158**). Allow to cool then clean up as before.

Gas tube – Item GB2

15mm DWP (**fig 84**)

This item is made from a length of 15mm domestic water pipe which initially needs to be about 100mm long. The ideal means of holding it is in a collet chuck but if this is not available turn a 30mm length of hard plastic or metal to fit inside the bore so that the tube may be held firmly in a vice without crushing. Push it through the 15mm diameter hole bored in the side of the burner body and file the end to conform to the radius of the inside of the body.

When you have achieved this hold the tube and body together and mark a centreline on the top surface of the tube using a fine permanent felt tip marker pen. Place the tube on a flat surface with a centreline uppermost. Mark a line 4.5mm down from the top surface of the tube on both sides for a length of about 60 mm. Repeat, marking a second line 8.5mm down from the top surface.

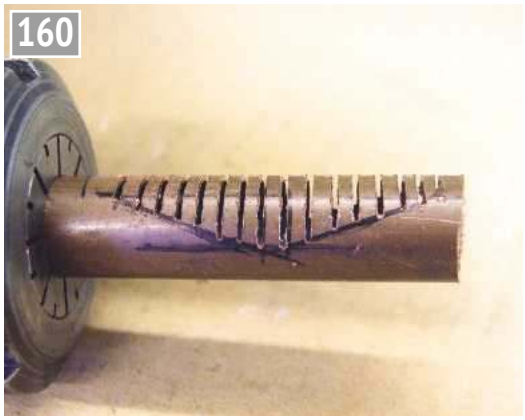
Hold the tube horizontally in a bench vice with the centreline uppermost. Refer closely to **fig 84**. Mark the tube across its diameter 27.5mm from the end face. Either side of this, at 3mm intervals, mark eight further marks across the diameter. Starting at the central mark (27.5mm from the end face), using a standard 32TPI hacksaw blade make a cut across the tube stopping at the 8.5mm line on both sides. Repeat at the 3mm marks either side, producing three cuts 3mm apart all stopping exactly at the 8.5mm depth lines on both sides of the tube. At the end two marks ONLY, make two cuts across the tube stopping at the 4.5mm depth line on both sides.

Using a permanent fine tip marker pen, mark guidelines from the end of each 4.5mm deep cut to join up with the outermost of the three 8.5mm deep cuts (**photo 159**). Saw at each of the 3mm marks (along the length) down to these guidelines resulting in 17 slots, 4.5mm deep at the ends increasing in depth to the three at 8.5mm deep at the centre (**photo 160**).

Trial fit the gas tube in the body to confirm the slots fall equally within the inside diameter of the body (**photo 161**). Trim the tube to 80mm long overall. Deburr thoroughly inside and out.

●To be continued.

NEXT TIME
We shall make the diffusers and the spacer needed to support them.



Gas tube slots completed.

Checking gas tube in body.

NEW DATE • NEW VENUE • NEW FORMAT

MODEL ENGINEER COMPETITION

Since 1907

10-12 May 2019

National Model Engineering and Modelling Exhibition (Doncaster Racecourse)

OFFICE USE ONLY

CLASS	ENTRY NO.

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.

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? _____ Camping Required? Yes ❑ Vehicle Registration _____

*Required for competition entries only

MODEL DETAILS – PLEASE TICK BOX IF MODEL IS FOR LOAN ❑ RUNNING OUTSIDE ❑

*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.

Further details of the National Model Engineering Exhibition can be found at **www.thedoncastershow.co.uk**

PHOTOCOPIES OF THIS FORM ARE ACCEPTABLE

N.B. Please make a copy of this form and any photographs enclosed for your own reference.
Please note that the organisers will not accept liability for any loss of documents or photographs submitted with this form.

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).
A4K Mechanical propelled road vehicles built or modified from a kit.
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.
BK1 Working steam locomotives built from a kit.
BK2 Working locomotives other than steam built or modified from a kit.

Marine Models

Cl 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 penod - 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

Dl 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 q 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 Engineer Magazine 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

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.

Shanjan Usman on Ben *at Leeds SMEE (photo courtesy of Jack Salter).*

My cup runneth over, Not! As I sit here on 31st January, I have five newsletters to review. This is not enough for three pages of absolute dross, so let's see what the postman brings...

I have, with great regret, to announce the passing of a revered friend. Always there when required, did the job without fuss and performed it as promised. Now gone to that great printed circuit board in the sky - my trusty ANTEX X25 soldering iron. I must have had it 40 years, abused it, ignored it, fitted all manner of 'bits', some of which I made myself. It has built receivers, transmitters, test equipment, fitted plugs and sockets, indoors and out, mended clocks, made railway trucks and locomotives, and their control gear. I'll miss you, but fortunately, Amazon sell the updated version. So begins the third phase of my soldering life. (The first was a Henley Solon, which I still have!)

In this issue: collapsed arches, the next restoration, a chauffeur, shopping, a Waterloo, a 'Gandy Dancer', The Southlanders, an Honour, a Fly-in, and a versatile model engineer.

Welling & District Model Engineering Society *Magazine*, Feb-March, has a curious picture decorating its front cover, suggesting, maybe, that meat pies are aquatic, or amphibious... An article from 20 years ago, when this great organ was but a single page (not Wenceslas-style), is about fitting firehole doors to a boiler without drilling directly into the backhead, by a certain R Underwood. The author claims not to have a deep and abiding faith in sealing the threads against boiler pressure and so the firehole door assembly is attached solely by friction in the firehole, and very secure has it since proved. Mr U (not Mr Wu...) remembers volunteering on the Glos-Warks railway and, when visited by an American friend, suggested they go. A sad tale is related of the building of Toddington viaduct in 1903, in which arch no. 10 collapsed whilst under construction, bringing down a 14 ton steam crane. The driver, one Smith, who survived, was laid briefly under arch no. 9, as his rescuers searched for any other casualties. This was not Mr Smith's lucky day, however, as arch no. 9 also collapsed and, as he was being dug out, so did no. 8. This time he did not survive. Another item by Mr U concerns several cliff lifts designed by George (later Lord) Marks, which were built at Babbacombe and points east, in this case promoted by Sir George Newnes, who was involved with the L&B. Bob goes into some detail about Marks and his achievements. Editor Tony Riley writes on *Preston*, an E. Borrows 0-4-0WT now preserved at the Ribble Steam Railway. Unusual, in that the valve gear is behind the rear axle. It is a smaller and somewhat different version of the well-known *Bellerophon*, built by Evans's Haydock Foundry and now at Foxfield.
W. www.wdmes.co.uk

Bradford Model Engineering Society's *Monthly Bulletin* for February says they will not be attending the Oldham MMEX event due to insufficient support from the membership. A tip for those who have difficulty with knurling using a clamp tool - reduce the diameter to be knurled by π/2 times the knurl pitch. Peter Nichols was given a Stuart 10V

Injector tester by Geoff Shackleton (photo courtesy of Nigel Bennett).

trunk guide, so he fabricated a base and crankshaft, bought a 4V trunk guide, and built a vertical engine with a No. 9 cylinder, which was designed for a horizontal engine! He has Imperial drawings, a metric lathe and used metric, ME and BA screws, so he pities anyone trying to restore it in 100 years time... Phil Proctor rebuilt an old music box, making new teeth for the comb and then tuning it, a skilled operation. The Santa Specials raised just over £200 for Friends of Northcliff. Bradford Industrial Museum is to hold a Modelmania exhibition this summer. (Sounds interesting! BIM is a good day out anyway-Geoff.)
W. www.bradfordmes.co.uk

Leeds Lines, February, from **Leeds Society of Model & Experimental Engineers**, pictures Shanjan Usman on *Ben*, at the Boxing Day meet, at which a large number of members attended. The weather was like unto an autumn day and locomotives were queueing up to run (**photo 1**). **Gauge 1 Yorkshire** visited Leeds SMEE at Eggborough in November, where one model was a 4-cylinder 'Duchess'. It ran perfectly, a great achievement in 45 mm gauge, when even a 5 inch gauge version is quite a complex model.
W. www.gauge1north.org.uk/Gauge-1-Yorkshire-Group.php

This 'Chinese laundry' device is an injector tester, by Hon. Sec. Geoff Shackleton, and attracted much interest when testing on post-Christmas Mondays, indoors due to the weather. The chauffeur* is Steve Russell and the boiler normally uses a propane gas burner (**photo 2**).
W. www.leedssmee.btck.co.uk

Port Bay Express, February, from **Portarlington Bayside Miniature Railway**, has Norm Houghton writing on Ipswich, near Brisbane, and its goods transport, using rail and river, as it is 40km inland. Passenger numbers continue to increase, up 62% in January, over that of a year ago. Lastly, two possibly sexist diagrams explain the differences in shopping habits between men and women. I shall leave it to your imagination to visualise them.
W. www.miniaturerailway.com.au

Guildford Model Engineering Society announce that they will not be holding a Garden Railway Show this year but many exhibits will feature in their Gala Weekend, 6/7th July.
W. www.gmes.org.uk

On Track, February, from **Richmond Hill Live Steamers**, in Toronto, reports that the CNR Consolidation (2-8-0) that was parked at Memory Junction, Brighton, Montreal, has gone missing, but we know where! Member Don Mason now owns it and moved it to Uxbridge on three low-loaders (photo 3)! This is Joe Foster's Waterloo traction engine (**photo 4**). Waterloo, of Ontario, built traction engines etc. between 1880 and 1925.
W. www.richmond-hill-live-steamers.tripod.com

Ryedale Society of Model Engineers *Monthly Newssheet*, January, bears a picture of a fine crop of molehills (remember The Southlanders?) with the caption, 'It's a pity they don't eat apples!'. Dave Myers photographed a BR Mk1 brake carriage. I defy you to say whether it is not full scale! A passer-by asked to take a photograph for her father, who liked railways. Apparently, he built the Docklands Light Railway! (Not personally, you understand...)
W. www.rsme.org.uk

Another great missive from the **Society of Model & Experimental Engineers**, *The Journal*, February, says that 41 new members were acquired last year, thanks to the excellent publicity, training courses, lectures, exhibition stands, *The Journal* and website. Barry Glover, a long-term Australian member, has been awarded the OAM, Medal of the Order of Australia (=MBE) in the New Year Honours List. There have only been two MBEs in the model engineering world to date. Barry has won several Certificates and a Bronze medal at past *Model Engineer* exhibitions. Following Roy Darlington's death, his brass bell has been presented to the SMEE, named in his honour, and will be used to summon members to the start of meetings. Gareth Hughes writes an interesting reply to the previous article on machine maintenance. A broken cross slide endplate on Guy Gibbons's Myford forced him to make a replacement, which proved extraordinarily successful. A surprise item

Don Mason's Consolidation at Montreal, RHLS (photo courtesy of Eric Motton).

Joe Foster's Waterloo traction engine (not a Case) (photo courtesy of Eric Motton).

F150 cared for by Myles Manihera (photo courtesy of Peter Anderson).

'on the table' was a copper heatsink for a powerful amateur radio microwave transmitter, being made by Stewart Bryant. Neil Reid describes a small adjustable square for the setting up of items in one of a number of different vices in his possession.
W. www.sm-ee.co.uk

Bracknell Miniature Railway will be celebrating their 50th Anniversary on 7th April. No other details have been provided and their website is not very helpful, apart from stating their locations, at Pinewood Leisure Centre and Jocks Lane. They are to host LittleLec later in the year.
W. www.bracknellrailwaysociety.co.uk

Blast Pipe, February, the joint newsletter from **Hutt Valley and Maidstone Model Engineering Societies**, advises that it will be Maidstone's 50th anniversary in mid-February and they are celebrating. We are exhorted to bring models, family, etc. Bob Newbury has a 3 inch scale 1906 Burrell traction engine but no crew! 3D printing to the rescue! There is now a mini-Bob and a mini Mrs Bob, to look after it and keep it entertained. Myles Manihera is custodian of 1953-built 'F150'. His grandfather Herbert Hall built it, to 7 inch (not 7¼) gauge and used it on a track at the farm. A new boiler was fitted in 1997 and Myles is to regauge it for 7¼ inch. Herbert built three other locomotives, including a 15 inch gauge 'Fa' (**photo 5**).
W. www.hvmes.com

Sutton Model Engineering Club's *Newslink*, winter, saw a first for the society, in that they gave rides to their first set of triplets. This was at the Diamond Centre event, and it was noted that the Mayor of Sutton insisted on

Cliff's 'Gandy Dancer' at MESNI (photo courtesy of Terence Aston).

queueing for his ride - most gratifying! Colin Harwood has taken over as editor, as well as being webmaster, and he is revamping both the newsletter and the website. Alan Fyson has revealed that he is building a 7¼ inch gauge 9F, which he may never finish, and cannot yet work out how to move it... Brian Tapp relates a tale of flying with his wife to Lens, in France, for a meeting, in a Cessna 150 (high wing, single engine), which turned out to be rather eventful. Radio and then navigation instruments failed and on their return they had to land at an unauthorised location due to a shortage of fuel. This landing involved the police and meant that there was a conflict regarding the 'morrows trip out with the children. The constabulary informed them that what happened tomorrow was not of their free choice... 'Next time, go to Wisley Gardens' was the suggestion. An item on springing was described by Eric Upchurch, using some unorthodox methods, involving a cereal packet and a 'Mole' wrench. Producing fuel from CO2 in the atmosphere is the process being followed by a company in Vancouver (www.carbonengineering.com) - and it works too! Pilot plants are currently producing about one barrel of fuel per day, says Richard Burkett. See also YouTube. Paul Smith suggests a holiday park in Hemsby, Norfolk where model engineers can have a 'busman's holiday' playing trains. Brian Tedder has died. Apart from his great sense of fun, he built several models, including a galleon two feet in length, several helicopters, five boats, including a Roman galley with rows of oars, and a functioning steam boat, plus lots of very good paintings, displayed around his house, and a similar number of jigsaws from fancy woods. To cap all this, he was a clever magician too.
W. www.suttonmec.org.uk

The Link, from the **Model Engineers' Society (NI)** says that Cliff has made a 'Gandy Dancer' (pump action trolley) which chairman, John Mathews, says is harder to use than it looks. Several members found it an excellent form of exercise which could be beneficial in working off the results of holiday sloth and gluttony... Here is Chris Heatley, he was once a weak man... Meanwhile, Phil Lockett has been finding that choosing springs isn't so easy. He acquired a 7¼ inch gauge wagon with very soft springs and, in finding harder ones, discovered all manner of pitfalls in not allowing for the wagon weight, compression space and total movement and now the ride is too hard. So, funds permitting, more springs will be bought. Until then, he knows where all the track irregularities are!
W. www.mesni.co.uk

And finally, I have been practicing my ventriloquism and find that I have become very good at it, even if I do say so myself.

* Translation: 'The man who tends the fire'.

ME

Contact:
geofftheasby@gmail.com

MARCH

28 **Cardiff MES.** Talk: 'Old Cardiff' – David Green. Contact Rob Matthews: 02920 255000.

28 **Newton Abbot & District MES.** Presentation by Peter Jennings from GWR Didcot on the Railmotor. Contact Ted Head: 07941 504498.

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 **Cardiff MES.** Steam Up & Family Day. Contact Rob Matthews: 02920 255000.

31 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

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 John-ston: 0208 4490693.

5 **Portsmouth MES.** Club night – 'A Piece of Time', 7.30pm, Tesco Fratton Community Centre. Contact Roger Doyle: doyle.roger@sky.com.

5 **Rochdale SMEE.** 'Boiler Testing' – FAJ and Bob Hayter, at Castleton Community Centre, 7.30pm. Contact Rod Hartley 07801 705193.

6 **Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.

7 **Cardiff MES.** Open Day. Contact Rob Matthews: 02920 255000.

7 **Guildford MES.** SMSEG open meeting, 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk

7 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

7 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

7 **Oxford (City of) SME.** Running Day, 1.30pm-5pm. Contact: secretary@cosme.org.uk

7 **Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle:

7 **Welling DMES.** Public running at Falconwood 2-5pm. Contact Martin Thompson: 01689 851413.

8 **Bedford MES.** Talk: 'Model Steam Tales' – John Shawe, 7.30pm Summerfields Miniature Railway MK45 3BH. Contact: meetings@bedfordmes.co.uk

9 **Romney Marsh MES.** Track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.

10 **Bedford MES.** Public running, from 10.30am at Summerfields Miniature Railways. Contact Brian Walton: 07498 869902.

11 **Sutton MEC.** AGM. Contact Paul Harding 0208 2544749.

14 **Guildford MES.** Public Open Afternoon 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk

14 **Leeds SMEE.** Public running, Eggborough track from 10am, and awarding of Leeds trophy. Contact Geoff Shackleton: 01977 798138.

14 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

14 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

14 **Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com.

14 **Sutton MEC.** Sunday track day from noon. Contact Paul Harding 0208 2544749.

14 **Westland & Yeovil DMES.** Track running day 11am – 4.30pm. Contact Bob Perkins: 07984 931993.

16 **Romney Marsh MES.** Track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.

17 **Bristol SMEE.** 'On the Table' – talk about your project. Contact Dave Gray: 01275 857746.

17 **Leeds SMEE.** Meeting night – 'Gas Turbines Large and Small' – Nick Haworth. Contact Geoff Shackle-ton: 01977 798138.

19 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

21 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

21 **Romney Marsh MES.** Easter Sunday track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.

21 **Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.

21 **Welling DMES.** Public running at Falconwood 2-5pm. Contact Martin Thompson: 01689 851413.

21/22 **Bedford MES.** Public running, from 10.30am at Summerfields Miniature Railways. Contact Brian Walton: 07498 869902.

21/22 **Cardiff MES.** Open Days. Contact Rob Matthews: 02920 255000.

21/22 **North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.

21/22 **Oxford (City of) SME.** Running Days, 1.30pm-5pm. Contact: secretary@cosme.org.uk

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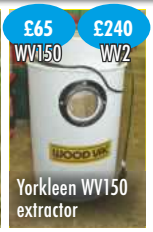
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