

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

Vol. 224 No. 4638 • 8 - 21 May 2020

MODEL ENGINEER

Join our online community www.model-engineer.co.uk

COVER FEATURE

Young Engineers



Don
Ashton

Bearing
Puller

Wheezeless Whistles



NEW STORE
NORTHAMPTON
OPENS IN APRIL!

Clarke

METAL LATHE

- 300mm between centres • LH/RH thread screw cutting • Electronic variable speed
- Gear change set • Self centering 3 jaw chuck & guard • Power feed



£579.00
£694.00 INC. VAT
CL300M

Machine Mart

65 SUPERSTORES NATIONWIDE

WHERE QUALITY COSTS LESS

NEW 508 PAGE

CATALOGUE
GET YOUR FREE COPY!

IN-STORE
PHONE
0844 880 1265

ONLINE
www.machinemart.co.uk



Clarke

MILLING DRILLING MACHINE - CMD300

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



£599.00
£718.00 INC. VAT
CMD300



£399.00
£478.00 INC. VAT
CMD10

MICRO MILLING & DRILLING MACHINE

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

MODEL	MOTOR	SPINDLE SPEED	EXC. VAT	INC. VAT
CMD10	150W/230V	100-2000rpm	£399.00	£478.00
CMD300	470W/230V	0-2500rpm	£599.00	£718.00

Clarke

CONTRACTOR

18V BRUSHLESS COMBI DRILLS

- 2 forward and reverse gears



£109.99
£131.99 INC. VAT
CON180LI

*Was £191.99 inc. VAT

MODEL	VOLTS	BATTS	EXC. VAT	INC. VAT
CON180LI	18V	2x 2.0Ah Li-Ion	£109.99	£131.99
CON180LI	18V	2x 4.0Ah Li-Ion	£139.99	£167.99

CLARKE

BOLTLESS QUICK ASSEMBLY STEEL SHELVING

- Simple fast assembly in minutes using only a hammer



£29.99
£35.99 INC. VAT
ASSEMBLES AS BENCH OR CORNER UNIT

CHOICE OF 5 COLOURS
RED, BLUE, GREY, SILVER & GALVANIZED STEEL

EXTRA 10%
WHEN YOU BUY 4 SHELVING UNITS
SAVE AT LEAST £23.99 INC. VAT

150 PER SHELF
350 PER SHELF



£164.99
£197.99 INC. VAT
CFC100

Fully tested to proof load

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

21226 732297
0121 358 7977
0121 7173433
01204 365799
01274 390962
01273 915999
0117 935 1068
01283 564 708
01233 322675
029 2046 5424
01228 591666
01242 514 402
01244 311258
01206 762831
024 7622 4227
020 8763 0640
01304 373 344
01332 290 931
01302 245 999
01382 225 140
0131 659 5919

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



£229.00
£274.00 INC. VAT
CONVERT 230V 1PH TO 400V 3PH PC60

MODEL MAX. FUSE EXC. VAT INC. VAT

MODEL	MAX. FUSE	EXC. VAT	INC. VAT
PC20	2HP	£229.00	£274.00
PC40	3.5HP	£269.00	£322.80
PC60	5.5HP	£319.00	£382.80

CLARKE

ENGINEERS BENCH VICES

- A range of fixed and swivel vices with top quality cast iron construction



£19.99
£23.99 INC. VAT
CMV140

MODEL JAW WIDTH BASE EXC. VAT INC. VAT

MODEL	JAW WIDTH	BASE	EXC. VAT	INC. VAT
CV75B	75mm	Fixed	£19.99	£23.99
CV100B	100mm	Fixed	£20.99	£25.19
CV100B	100mm	Swivel	£26.99	£32.39
CV125B	125mm	Fixed	£31.99	£38.39
CV125B	125mm	Swivel	£38.99	£46.79
CV150B	150mm	Fixed	£49.99	£59.99
CV150B	150mm	Swivel	£54.99	£65.99
CMV140	140mm	Swivel	£79.99	£95.99

CLARKE

PROFESSIONAL TOOL CHESTS & CABINETS

- The ultimate in tool storage



£72.99
£87.99 INC. VAT
CBB203B

EXTRA WIDE 56" CHESTS/CABINETS IN STOCK

MODEL	DESCRIPTION	EXC. VAT	INC. VAT
CBB203B	3 Dr step up	£72.99	£87.99
CBB209B	9 Dr Chest	£129.99	£155.99
CBB210B	10 Dr Chest	£139.99	£167.99
CBB213B	3 Dr Cabinet	£199.99	£239.99
CBB215B	5 Dr Cabinet	£199.99	£239.99
CBB217B	7 Dr Cabinet	£249.99	£299.99

CLARKE

CRANES

- Fully tested to proof load



MODEL DESC. EXC. VAT INC. VAT

MODEL	DESC.	EXC. VAT	INC. VAT
CFC100	1 ton fold	£164.99	£197.99
CFC1000LR	1 ton long reach	£229.00	£274.80

Clarke

MMA & ARC/TIG INVERTER WELDERS

- PRICE OUT NOW FROM £79.99
- £95.99 INC. VAT



£79.99
£95.99 INC. VAT
MMA80

MODEL MIN/MAX OUTPUT CURRENT (A) ELECTRODE DIA. (MM) EXC. VAT INC. VAT

MODEL	MIN/MAX OUTPUT CURRENT (A)	ELECTRODE DIA. (MM)	EXC. VAT	INC. VAT
MMA80	20A-80A	1.6-2.5	£79.99	£95.99
MMA140	20A-140A	1.6-3.2	£99.00	£118.80
AT133	10A-130A	2.5/3.2	£129.99	£155.99
AT162	10A-160A	2.5/3.2/4.0	£149.99	£179.99
MMA200	20A-200A	1.6-4	£139.00	£166.80
AT135	10A-130A	2.5/3.2	£169.99	£203.99
AT165	10A-160A	2.5/3.2/4.0	£199.99	£239.99

*Was £117.60 inc. VAT #was £142.80 inc. VAT

#was £190.80 inc. VAT

CLARKE

DRILL PRESSES

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



£69.99
£83.99 INC. VAT
CDP152B

MODEL MOTOR SPEEDS (W) EXC. VAT INC. VAT

MODEL	MOTOR SPEEDS (W)	EXC. VAT	INC. VAT
CDP152B	350/75	£69.99	£83.99
CDP102B	350/75	£79.99	£95.99
CDP152B	450/112	£149.99	£179.99
CDP202B	450/112	£189.00	£226.80
CDP108	370/112	£199.99	£239.99
CDP352F	550/112	£229.00	£274.80
CDP452B	550/112	£239.00	£286.80
CDP502F	1100/112	£569.00	£682.80

CLARKE

3-IN-1 SHEET METAL MACHINES

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



£239.00
£286.00 INC. VAT
SBR610

MODEL BED WIDTH EXC. VAT INC. VAT

MODEL	BED WIDTH	EXC. VAT	INC. VAT
SBR305	305mm (12")	£239.00	£286.00
SBR610	610mm (24")	£449.00	£538.00
SBR760	760mm (30")	£529.00	£634.00

CLARKE

HYDRAULIC LIFTING TABLES

- Ideal for lifting & moving models
- Foot pedal operated



£299.00
£358.00 INC. VAT
HTL500

MODEL	MAX. LOAD	MIN-MAX TABLE HEIGHT	EXC. VAT	INC. VAT
HTL300	300kg	340-900mm	£299.00	£358.00
HTL500	500kg	340-900mm	£319.00	£382.80

Clarke

MIG WELDERS

- Quality machines from Britain's leading supplier
- See online for included accessories



£194.99
£233.99 INC. VAT
135TE

MODEL MIN-MAX AMPS EXC. VAT INC. VAT

MODEL	MIN-MAX AMPS	EXC. VAT	INC. VAT
PRO90	24-90	£194.99	£233.99
110E	30-100	£229.99	£275.99
135TE Turbo	30-130	£249.99	£299.99
151TE Turbo	30-150	£289.00	£346.80
175TECM Turbo	30-170	£449.00	£538.80
205TE Turbo	30-185	£489.00	£588.80

CLARKE

TURBO AIR COMPRESSORS

- Superb range ideal for DIY, hobby & professional use
- "V" Twin Pump



£89.99
£107.99 INC. VAT
8/260

MODEL MOTOR CFM TANK EXC. VAT INC. VAT

MODEL	MOTOR	CFM	TANK	EXC. VAT	INC. VAT
8/260	2HP	7.5	24ltr	£89.99	£107.99
7/250	2HP	7	24ltr	£94.99	£113.99
11/260	2.5HP	9.5	24ltr	£109.99	£131.99
8/550	2HP	7.5	50ltr	£119.99	£143.99
7/510	2HP	7	50ltr	£119.99	£143.99
11/550	2.5HP	9.5	50ltr	£139.99	£167.99
16/550	3HP	14.5	50ltr	£199.99	£239.99
16/1050	3HP	14.5	100ltr	£249.99	£299.99

CLARKE

INDUSTRIAL ELECTRIC MOTORS

- Range of single phase motors suited to many applications • All totally enclosed & fan ventilated for reliable long-term service



£59.99
£71.99 INC. VAT
HP

HP SHAFT SPEED EXC. VAT INC. VAT

HP	SHAFT SPEED	EXC. VAT	INC. VAT
1/5	4 pole	£59.99	£71.99
1/2	2 pole	£69.99	£83.99
3/4	4 pole	£79.99	£95.99
1	2 pole	£79.99	£95.99
2	2 pole	£94.99	£113.99
3	2 pole	£119.99	£143.99
4	2 pole	£139.99	£167.99

CLARKE

GRINDERS & STANDS

- Stands come complete with bolt mountings and feet anchor holes



£35.99
£43.99 INC. VAT
GRT40

Kit includes: • Height adjustable stand with clamp • Rotary tool

Clarke

NO GAS/GAS MIG WELDERS

- Professional type torch with on/off control • Thermal overload protection • Turbo fan cooled
- Easy conversion to gas with optional accessories



£124.99
£149.99 INC. VAT
MIG102NG

MODEL MIN/MAX AMPS EXC. VAT INC. VAT

MODEL	MIN-MAX AMPS	EXC. VAT	INC. VAT
MIG 102NG	35/90	£124.99	£149.99
MIG 106	40/100	£159.00	£190.80
MIG 145	35/135	£179.99	£215.99
MIG 196	40/180	£219.99	£262.80
MIG 240	50/240	£399.00	£478.80

CLARKE

ARC ACTIVATED HEADSHIELDS

- Activates instantly when Arc is struck • Protects to EN379 • Suitable for arc. MIG, TIG & gas welding



£37.99
£45.99 INC. VAT
GWH4

SEE FULL RANGE IN-STORE/ONLINE

CLARKE

ANGLE GRINDERS

- INC. DISC & HANDLE



£24.99
£29.99 INC. VAT
CAG800B

MODEL DISC (MM) MOTOR EXC. VAT INC. VAT

||
||
||

MODEL ENGINEER

Published by MyTimeMedia Ltd.
Suite 25S, Eden House, Enterprise Way,
Edenbridge, Kent TN8 6HF
www.model-engineer.co.uk

SUBSCRIPTIONS

UK - New, Renewals & Enquiries

Tel: 0344 243 9023

Email: help@me.secureorder.co.uk

USA & CANADA - New, Renewals & Enquiries

Tel: (001)-866-647-9191

REST OF WORLD - New, Renewals & Enquiries

Tel: +44 1604 828 748

Email: help@me.secureorder.co.uk

CURRENT AND BACK ISSUES

Tel: 01795 662976

Website: www.mags-uk.com

EDITORIAL

Editor: Martin R Evans

Tel: +44 (0)7710 192953

Email: mrevans@cantab.net

Assistant Editor: Diane Carney

Club News Editor: Geoff Theasby

PRODUCTION

Designer: Yvette Green

Illustrator: Grahame Chambers

Retouching Manager: Brian Vickers

Ad Production: Andy Tompkins

ADVERTISING

Advertising Sales Executive: David Holden

Email: david.holden@mytimemedia.com

MARKETING & SUBSCRIPTIONS

Subscription Manager:

Kate Hall

MANAGEMENT

Group Advertising Manager: Rhona Bolger

Email: rhona.bolger@mytimemedia.com

Chief Executive: Owen Davies

mytimemedia
print & digital media publishers

© MyTimeMedia Ltd. 2020

All rights reserved ISSN 0026-7325

The Publisher's written consent must be obtained before any part of this publication may be reproduced in any form whatsoever, including photocopies, and information retrieval systems. All reasonable care is taken in the preparation of the magazine contents, but the publishers cannot be held legally responsible for errors in the contents of this magazine or for any loss however arising from such errors, including loss resulting from negligence of our staff. Reliance placed upon the contents of this magazine is at reader's own risk.

Model Engineer, ISSN 0026-7325, is published fortnightly by MyTimeMedia Ltd, Suite 25S, Eden House, Enterprise Way, Edenbridge, Kent, TN8 6HF, UK. The US annual subscription price is 132USD. Airfreight and mailing in the USA by agent named WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Periodicals postage paid at Brooklyn, NY 11256. US Postmaster: Send address changes to Model Engineer, WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Subscription records are maintained at DSB.net Ltd, 3 Queensbridge, The Lakes, Northampton, NN4 5DT. Air Business Ltd is acting as our mailing agent.

 <http://www.facebook.com/modelengineersworkshop>

 <http://twitter.com/modelengineers>



When you have finished with this magazine please recycle it.

Paper supplied from wood grown in forests managed in a sustainable way.



ISSUE IN THIS ISSUE IN THIS ISSUE IN THIS ISSUE

Vol. 224 No. 4638 8 - 21 May 2020

672 SMOKE RINGS

News, views and comment on the world of model engineering.

673 SOUTHERN FEDERATION AGM

John Arrowsmith spends the day at Swindon and helps celebrate the achievements of our young engineers.

676 NEWS FROM CARDIFF

Mike Denman provides an update on the major track work at the Cardiff club.

677 OBITUARY

Paul Carpenter celebrates the life of Don Ashton.

678 MASTERING NON-FERROUS METAL CASTING

Gerald Martyn decides to cast his own non-ferrous castings.

682 WHEEZELESS WHISTLES

Bob Bramson shows how you can get the whistle without the wheeze.

686 GARRETT 4CD TRACTOR

Chris Gunn adds the exhaust pipe and blast nozzle to the chimney.

690 THE AMERICAN LOCOMOTIVE

David Rollinson traces the development of the locomotive that crossed the prairies.

694 THE MIDDLETON DOUBLE SIDED BEAM ENGINE

Rodney Oldfield constructs the latest stationary engine from Bob Middleton.

697 BALLASTED TRACK TAMPING TOOL

Brian Baker shows that the job of boosting your ballast need not be a back-breaker.

698 A SMALL BEARING PULLER

Graham Asbury makes a bearing puller that can work in a tight space.

701 THE BARCLAY WELL TANKS OF THE GREAT WAR

Terence Holland describes and constructs two appealing, century old locomotives.

705 POSTBAG

Readers' letters.

706 THE WATT GOVERNOR

Mitch Barnes traces the development and workings of the so-called 'Watt' governor.

710 A NEW GWR PANNIER

Doug Hewson embarks on a mission to improve LBSC's half century old GWR Pannier Tank design.

714 CLUB NEWS

Geoff Theasby compiles the latest from model engineering clubs around the world.

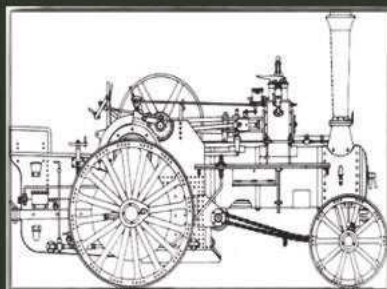


ON THE COVER...

The Southern Federation Junior Engineer award winners at Swindon - the little man in the big hat didn't receive an award (photo John Arrowsmith).

LIVE STEAM MODELS LTD

Drawings & Castings for a range of
3" – 6" Traction Engines
including
Burrell, Foster, Fowler,
Marshall, Ruston-Proctor.



Full Engineering Services, Technical
Support and Wheel Building available.
Laser Cut Horn Plates, Tender Sides
and Wheel Spokes.

Comprehensive Range of Model Engineering
Materials. BA and BSF screws, nuts, bolts and
rivets, boiler fittings and accessories.

Phone - 01332 830 811

Email - info@livesteammodels.co.uk
or visit

www.livesteammodels.co.uk



PARKSIDE ELECTRONICS

www.parksiderailways.co.uk 01282 613646

Southfield St, Nelson, Lancs, BB9 0LD

Manufacturer and supplier of

Motor speed controllers, Motors, sprockets and chains, gears,
bearings, springs, bespoke control panels, pneumatics.
Bespoke electric and IC loco - complete and part - design

New range of 5" gauge bogies, chassis and locos

All chassis and locos are ready to run just add batteries

Powder coated with choice of body colours

Parvalux 150W motor on each axle

60 or 100A controller fitted as needed

Roller bearings in the axle boxes

Compression spring suspension

All can be operated from either end and be run as multiple units



Folded Bogie - £440

2x motors



Powered starter chassis £670

2x batteries - 2x motors



"Elf" £1050

2x motors

2x batteries

60A controller



"Pixie" £1350

3x motors

2x batteries

100A controller



"Imp" £1650

4x motors

4x batteries

100A controller

WAGON KITS & PARTS



GWR Lorient-M Complete Kit

Kit includes all laser cut steelwork,
Laser engraved ply wood "planking"
Fully machined buffers and axle boxes
with ball race bearings.

Suspension and draw-hook springs

CNC machined wheels and axles

5" gauge version:

£329.00

7 1/4" gauge version

£429.00

These kits are designed to be
tig-welded together, but could
also be silver-soldered.

Only extras required are rivets,
screws/nuts, glue and paint.

Wheels

17D make a
large variety of
wheels and axles



Contact 17D:

Email: sales@17d.co.uk

Tel: 01629 825070 or 07780 956423



5" g. Wagon Chassis Set £139.00

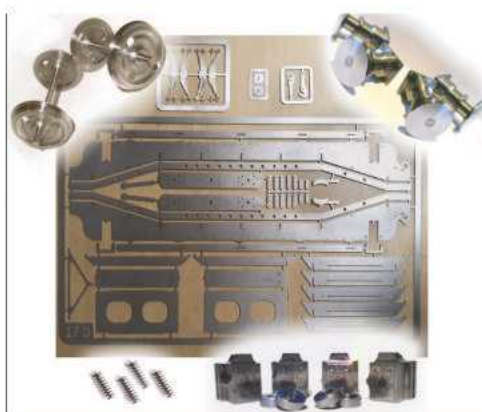
also available in 7 1/4 g. version £195.00

Wagon Buffers:



A range of buffers
available in 5" & 7 1/4"

from around £45 a set of 4



Prices ex-works & excluding VAT



MINIATURE RAILWAY SPECIALISTS

LOCOMOTIVES, ROLLING STOCK, COMPONENTS

CNC MACHINING SERVICES

www.17d-ltd.co.uk

17D Limited, Units 12 & 13 Via Gellia Mill, Bonsall, Matlock, Derbyshire, DE4 2AJ

any age, size or condition considered - any distance, any time

ALL STEAM LOCO'S WANTED



ALL PART BUILT MODELS WANTED
ALL WORKSHOPS CLEARED SWEEP CLEAN

All 5" Gauge Loco's Wanted

Hunselt, Simplex, Speedy,
BR Classes 2, Horwich Crab,
BR 8400 tank, Maid of Kent,
Black Five, Jubilee, Royal
Engineer, B1 Springbok,
Torquay Manor.

All 7 1/4" Gauge Loco's Wanted

Hunselt, Hercules, Jessie,
Romulus, Dart, Bridget,
Holmeside, Paddington, GWR
Mogul 43xx, GWR King, Black
Five, A3, B1, etc.

All 3 1/2" Gauge Loco's Wanted

Titch, Juliet, Rob Roy,
Firefly, Jubilee, Maisie,
Doris, GWR Hall, Britannia,
Hielan Lassie, Etc.

**ALL
TRACTION
ENGINES
WANTED**

Minnie, Burrell, Royal Chester, etc.

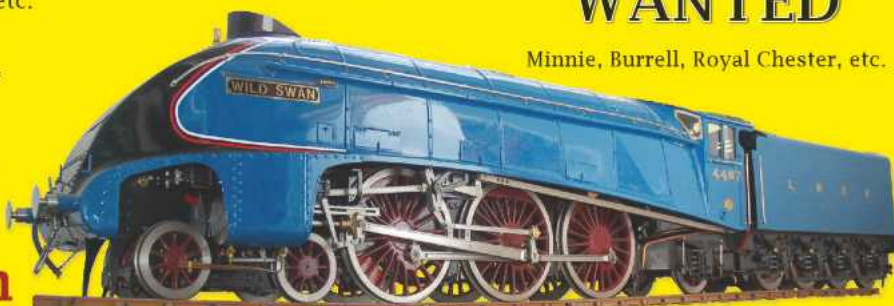
For a professional friendly service,
please contact:

Graham Jones M.Sc.

graham@antiqusteam.com

0121 358 4320

antiqusteam.com



MAXITRAK.COM

The best of model rail and road.

Tel: 01580 893030 Email: info@maxitrak.com

40 Years
Experience

Authentic Live Steam!



Crane,
Showman's &
Steam Roller
conversions
available.



3/4" Scale
Allchin From £1,250



**TIG
Welded
Boilers**

PROMPT MAIL ORDER

TEL: 01580 890066

maidstone-engineering.com

30 years experience providing fittings, fixings, brass, bronze, copper and steel
Browse our website or visit us at 10-11 Larkstore Park, Staplehurst, Kent, TN12 0QY

DIRECT DEBIT SUBSCRIPTIONS (uk only)

Yes, I would like to subscribe to *Model Engineer*

- ☐ Print + Digital: £18.25 every quarter
☐ Print Subscription: £15.25 every quarter (saving 41%)

YOUR DETAILS must be completed

Mr/Mrs/Miss/Ms Initial Surname
 Address
 Postcode Country
 Tel Mobile
 Email D.O.B

I WOULD LIKE TO SEND A GIFT TO:

Mr/Mrs/Miss/Ms Initial Surname
 Address
 Postcode Country

INSTRUCTIONS TO YOUR BANK/BUILDING SOCIETY

Originator's reference 422562 
 Name of bank
 Address of bank
 Postcode
 Account holder
 Signature Date

Sort code Account number

Instructions to your bank or building society: Please pay MyTimeMedia Ltd. Direct Debits from the account detailed in this instruction subject to the safeguards assured by the Direct Debit Guarantee. I understand that this instruction may remain with MyTimeMedia Ltd and if so, details will be passed electronically to my bank/building society.

Reference Number (official use only)

Please note that banks and building societies may not accept Direct Debit instructions from some types of account.

CARD PAYMENTS & OVERSEAS

Yes, I would like to subscribe to *Model Engineer*, for 1 year (26 issues) with a one-off payment

UK ONLY:

- ☐ Print + Digital: £77.99
☐ Print: £65.99

EUROPE & ROW:

- ☐ EU Print + Digital: £104.99
☐ EU Print: £92.99
☐ ROW Print + Digital: £104.99
☐ ROW Print: £92.99

PAYMENT DETAILS

☐ Postal Order/Cheque ☐ Visa/MasterCard ☐ Maestro
 Please make cheques payable to MyTimeMedia Ltd and write code ME4638P on the back

Cardholder's name

Card no: (Maestro)

Valid from Expiry date Maestro issue no.

Signature Date

TERMS & CONDITIONS: Offer ends 22nd May 2020. MyTime Media collects your data so that we can fulfil your subscription. We may also, from time to time, send you details of MyTime Media offers, events and competitions but you always have a choice and can opt out by emailing us at unsubscribe@model-engineer.co.uk. Please select here if you are happy to receive such offers by email ☐ by post ☐ by phone ☐ We do not share or sell your data with/to third parties. Details you share with us will be managed as outlined in our Privacy Policy here <http://www.mytimemedia.co.uk/privacy-policy>. Please visit www.mytimemedia.co.uk/terms for full terms & conditions.

POST THIS FORM TO:

MODEL ENGINEER SUBSCRIPTIONS, MYTIMEMEDIA LTD,
 3 QUEENSBRIDGE, THE LAKES, NORTHAMPTON NN4 7BF

CODE ME4638P

**HURRY
OFFER
CLOSES**
 22nd MAY
2020



PRINT + DIGITAL SUBSCRIPTION

- 26 Issues **delivered to your door**
- **Great Savings** on the shop price
- **Download** each new issue to your device
- A **75% discount** on your Digital Subscription
- Access your subscription on **multiple devices**
- Access to the **Online Archive** dating back to August 2001



PRINT SUBSCRIPTION

- 26 Issues **delivered to your door**
- **Great Savings** on the shop price
- Never miss an issue

SUBSCRIBE TODAY

MODEL ENGINEER

DIGITAL
SUBSCRIPTIONS
AVAILABLE ONLINE!

SUBSCRIBE TO MODEL ENGINEER TODAY AND SAVE!

SAVE up to 41%**

Model Engineer is a great way to stay informed of everything to do with working mechanical models. With over 100 years of experience to draw on, Model Engineer covers everything from classic steam locomotives to cutting-edge modern developments in scale engineering. Regular content includes constructional articles, features on the best techniques and tools available and profiles of full-size modelling subject prototypes. Model Engineer magazine publishes 26 great issues a year.

**So subscribe today,
make great savings
and never miss
an issue!**



SUBSCRIBE SECURELY ONLINE



<https://me.secureorder.co.uk/MODE/ME4638P>

CALL OUR ORDER LINE



0344 243 9023

Lines open Mon-Fri 8am – 8pm GMT & Saturday 9.30am – 3.30pm GMT

Quote ref: ME4638P

Calls are charged at the same rate as standard UK landlines and are included as part of any inclusive or free minutes allowances. There are no additional charges with this number. Overseas calls will cost more.

VE Day

The publication date of this issue happens to coincide with VE Day, 75 years ago – arguably the second happiest day of the twentieth century, after the Armistice of 1918. It would therefore be remiss of me to let the occasion go by uncelebrated.

VE Day, combined with VJ Day a few weeks later, represents, I believe, the end of the most morally repugnant war in human history – so far. War, certainly, is a thing to be avoided if at all possible, even though it is sometimes unavoidable when humanity is faced with evil tyrants such as Adolf Hitler.

World War Two, though, left the biggest stain of all on our history, with the blanket bombing of each other's cities by the British and the Germans, the appallingly evil concentration camps and, arguably, the use of nuclear weapons against the Japanese. I say 'arguably' because it is very likely that, in fact, many lives, possibly millions, both American and Japanese, were saved by bringing the Pacific war ('Pacific' – what irony!) to an abrupt end. War, perhaps more so than other situations, often presents us with dilemmas to which there is simply no right answer. I cannot envy anyone who is put into the position of having to make these decisions.

Don Ashton

It is with great regret that we have to report the death of Don Ashton, on Easter Sunday. He was, of course, a major figure in the world of model engineering and will be very much missed. He had been unwell for several years but eventually succumbed to covid-19. Paul Carpenter looks back on his life and achievements on page 677.

To say these things about the war, though, is not at all to deny the way it brought out the very best in countless people. There are so many well-known examples of personal, and collective, heroism and self-sacrifice that there is no need to rehearse them. They also are part of our history, but they illuminate, rather than defile, the record. A few of these heroes are still with us, but they must necessarily now be in their nineties. Consequently, there will be very few more occasions, like today, when we can remember them and express our gratitude for their courage and fortitude. Some are even still fighting for us, in our current conflict, like Captain Tom, who has raised such an impressive sum, at the age of 100, for our NHS.

Heroism isn't confined to wars though. The coronavirus crisis has also brought out the best in so many people. Many of those working for the NHS do so at great personal risk and make us realise how lucky we are to have such people in the frontline of our healthcare

system. Then there are the NHS volunteers who do all the 'mundane' jobs – transporting equipment, medicines and patients from place to place and keeping in contact with vulnerable people. The result of the appeal for volunteers was an 'army' of 750,000 and recruitment had to be suspended because the appeal was overwhelmed. Generosity extends not only to time but also to money. Captain Tom has proved that you don't need to present a TV spectacular to raise millions of pounds for a good cause – a walk around the garden can be just as inspiring.

These are the true heroes, not the footballers or media personalities, whose celebrity is so fragile. Perhaps when this crisis blows over, as it must, we will all have gained something valuable from it, and will recognise who the true heroes are and what it is that really makes the world go round.

Fairlie Minim

I wonder if anyone knows the whereabouts of Rodney Weaver's 7¼ inch gauge Fairlie Minim. This rather unusual locomotive was last seen running on the Echill's Wood Railway. Does anyone know where it is now?

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

Thermodynamic Temperature

I have been asked to clarify the Carnot efficiency calculation given in John Olsen's letter in issue 4635 (27th March). The calculation is correct but it is perhaps not made clear that the temperatures used in the calculation, as for all calculations in thermodynamics, must be in Kelvins not degrees centigrade. Although the temperatures are quoted in degrees centigrade in the letter, they are correctly converted to Kelvins to obtain the result, although this is not made explicit. The Kelvin, of course, is the unit for the thermodynamic scale of temperature, zero Kelvins representing absolute zero. The Kelvin unit is defined as the same size as a degree centigrade but the scale is offset so that 0°C is the same as 273.15K.



MARTIN EVANS
Editor



DIANE CARNEY
Assistant Editor



YVETTE GREEN
Designer



Winner of the Southern Federation Trophy and Polly Model Engineering prize was Matthew Kenington from the Hereford SME.



Young Engineer of the year Matthew Kenington with his 5 inch gauge driving truck.

Southern Federation of Model Engineering Societies AGM

John Arrowsmith reports from the Steam Museum in Swindon.



This meeting of the SFMES was held at the Steam Museum in Swindon in the prestigious Daniel Gooch theatre. This was an excellent venue for the attending delegates - plenty of free parking, a superb buffet lunch and, before the proceedings got under way, free entry into the famous museum of the Great Western Railway. There was a good atmosphere in the room with

the conversation centred on the present coronavirus problems and how they might affect everyone.

Before the official AGM started there was a very pleasant award ceremony for the Young Engineers Trophy. The Southern Federation Trophy and Polly Model Engineering Prize for 2020 was awarded to Matthew Kenington, a 14 year old member of the Hereford SME,

for his work and achievements during the last 12 months (**photos 1 and 2**). In addition to this prize three other awards were made to young engineers for their work over the year. From the Eastleigh Young Engineers club, Ryan Philo was presented with a Southern Federation Special award for his work and club involvement (**photos 3 and 4**). Two more young people from the Hereford SME, James



Receiving his special award from Andy Clarke is Ryan Philo from the Eastleigh Young Engineers club.



Ryan Philo proudly shows off his award backed by his range of models.



James Knight from Hereford SME receives his award from Southern Federation President Brent Hudson.



James Knight with his unfinished 7 1/4 inch gauge battery powered locomotive.

Knight (photos 5 and 6) and Tom Williams (photos 7 and 8), also gained Special Southern Federation acknowledgement for their individual work and club commitments. All these young people presented examples of their work for the attending delegates to inspect (photo 9) and it was pleasing to hear the very favourable comments made about the standard of workmanship.

In his address to the audience, Mike Chrisp, the Awards Officer for the Southern Federation stressed how important it is to

encourage young people into the model engineering world simply because, as he said, the age profile of every club is increasing and without a regular influx of younger age groups the clubs will struggle to maintain their viability. He also mentioned the lack of female involvement in the competition and in clubs as well and wondered how this imbalance could be improved. All these young people are really involved with their clubs, who give them all the support they need, as do their families, because this support

is important for them to progress. It was also gratifying to hear of other clubs who are at last beginning to recruit young people into their ranks - I hope it continues.

Before the main meeting there was an open forum workshop organised by Dr. Paul Naylor on the future of the Southern Federation of Model Engineering Societies, where all the delegates were invited to take an active part. With a series of relevant questions and details it sought to see how the Federation might change to suit the changing needs of

model engineering. It noted that the Southern Federation is becoming increasingly aware of the changes in the demographics of the hobby with the number of 'hands on' model engineers getting smaller by the year. There are more commercial products available, more relevant legislation, more pressure on clubs to generate income in order to pay their ever rising costs, the use of computer technologies and methods and a reduction in the availability of relevant training for the hobby. It suggests there is an opportunity for the Southern Federation to update its services to its affiliated clubs to reflect this changing world. This could be with provision of awareness and training of all aspects of club management and related activities with more links to other model engineering services and activities. The 2020 AGM was seen as a watershed and the workshop was included to try and attempt to redefine the strategy and recognise the opportunities and threats. It attempted to focus decision-making on the affiliated clubs' feedback. It was felt that this participation would perhaps materially affect the future direction of the Southern Federation, perhaps even its continued existence.



Brent Hudson presents Tom Williams from Hereford SME with his award.



Tom Williams with his 7 1/4 inch gauge 'Pedalino' constructed over the last 12 months.



The display of models and work completed by the young engineer award winners.



The group of young engineers with awards officer Mike Chrisp, instructors, mentors and parents.

It was a useful and interesting exercise which all of the delegates actively engaged with. How this will determine the way the Southern Federation operates in the future remains to be seen.

The main meeting then proceeded through the familiar program of matters arising from last year's meeting, acceptance of minutes and the Chairman's and Treasurer's reports, with the usual safety officer and appointment of officers for 2020-21 completing the official business. All the existing officers were re-elected to their posts as no new volunteers

were forthcoming. As the attendances at the regular spring and autumn rallies have been declining, this year there will only be one official Southern Federation Rally which will hopefully improve the participation of members. This year it is to be held at the Reading SME on Saturday 26th September from 9.30am to 5pm. the contact for entrants is pjharrison31@btinternet.com The award for the Australian Association of Live Steamers trophy will be presented at this event for the best working example of a Commonwealth prototype locomotive in gauges from 2½ through to 7¼ inches. That



The group of happy young engineers poses with one of the engineering greats, Isambard Kingdom Brunel, at Swindon.

is, of course, if the present restrictions have been lifted at that time. The address of the Reading SME is 82 Bath Road Reading RG30 2BE.

The meeting concluded with Tony Wood from Walker Midgley Insurance Brokers presenting his report on the claims and trends of the past year. He did announce that the current insurers Royal Sun Alliance will no longer be

the cover group but another company has taken over so that continuity for clubs should be seamless.

With all the business concluded the Chairman thanked all the delegates for their attendance and indicated that the results from the workshop questionnaire will be available as soon as they have been collated.

ME

News from Cardiff

Mike Denman reports on a busy summer at Cardiff.



The new track extension passes between the tram line and the station.

Through the summer of 2019 members of Cardiff MES continued to develop their site between the public running days. The extended loop of the seven and a quarter mixed gauge ground level track that runs around the outside of about two thirds of the original line is close to completion (**photo 1**). Some new semaphore signals will be needed too. The job required 28 four metre track panels and 15 six metre track panels to be built on site. With other sections there was a total of 630 metres of rail, 1070 sleepers, 6300 chairs, 282 fishplates and hundreds of nuts and bolts.

The tramline closed early in the season so work could begin realigning the track and overhead wire, mainly to clear a route for the ground level extension. The tramline's wooden sleepers were replaced with 420 concrete ones. The 440 metres of rail were fixed by 1680 clamping plates with the necessary fishplates and bolts.

Five new points were made for both projects. The tram points are in place and the ground level ones will be laid during the closed season. Both

projects involved the removal of in excess of 200 tons of soil and laying 152 tons of stone track bed and ballast and an immense amount of manpower. The Society's mechanical digger certainly repaid the investment. A new pathway for access to the repositioned tram station is another job for the winter months (**photo 2**). The public will be treated to the new journey experiences from the 2020 season.

On the engineering side the rebuilding is continuing of the Society's Hunslet 0-4-0 seven and a quarter inch steam locomotive running on 6 inch wheels. A member first built it about fifteen years ago but much has been changed by the rebuild. Hardly anything from the original drawings now applies. New cylinders have been machined in our workshop and the brakes refitted as well as other smaller jobs. The tender that will be coupled to the locomotive is not the original and needs some cosmetic attention but all should be finished for the 2020 season.

The Hunslet team has shared their time with refurbishing the raised level

riding cars. The 12 units were designed in the club. Construction of the body shells and the painting in a smart blue and grey livery was contracted out. Underneath, the braking system has been modernised so that the vacuum cylinders and reservoirs are combined in a single unit. The bogies, including their wheel bearings, will be fully checked during the closed season and, from lessons learned over the seven years of operation, a programme of replacing the bearings will take place. The new ones will carry both radial and axial thrust giving a better ride and reduced wear. The axial thrust feature is the new future.

The Society's 29th annual rally held over the weekend of 8th/9th June was as popular as ever with guests travelling from far and wide. There were plenty of guest locomotives and visiting model traction engines as well as visitors coming along to view the excellent stock on show. It's a weekend where the jobs on hand can be forgotten for a few days and the hobby itself indulged and enjoyed.

ME



The tram line benefits from new concrete sleepers.

Obituary: Don Ashton

The world of model engineering lost one of its real giants when Don Ashton passed away on Easter Sunday. He was three days short of his 81st birthday and had fallen victim to the dreaded covid-19.

To do justice to the achievements of Don would require a book of many chapters as he did so much and helped so many people in different ways and fields of activity.

Grammar school educated, he spent his early years with Dad and brother Eddie at Irlam Locks watching the ships on the Manchester Ship Canal and becoming friendly with the tug skippers. They were often invited aboard for a trip to the next lock and this led to Don eventually taking a job on the tugs and becoming an expert on them.

Don joined the Manchester Locomotive Society and met lifelong friends and engineers Alan, Gerry and Phil. They formed the Manchester Locomotive Company and together built many fine locomotives. It was here that Don first encountered the 'black art' of valve gears and embarked on his lifelong quest to master them. Around this time, he also became the Chairman of Urmston MES, where he spent many years at the club. He was instrumental in developing its great facilities and club spirit.



Don Ashton (photo Lise Sharkey).

Don was always passionate about music and studied piano. He learned saxophone and joined the Norman Clare band. Norman was an expert instrument repairer and Don wrote the band arrangements and worked for Norman repairing instruments.

He attended Teacher Training College and became the metalwork teacher at Urmston Grammar School.

Don and Eddie then opened their own instrument repair shop in Cadishead. The business became very successful as Manchester was full of orchestras and musicians. Their excellent workmanship led to contracts with the Royal Northern School of Music.

Don was a greatly respected arranger and composer and ran music summer courses for many years. His insightful and

subtle observations inspired musicians and one former pupil is now Assistant Head of Music for Wigan. He worked voluntarily with staff for Wigan Music Services and produced many fine bands.

In 2010, he brought all his ingenuity to the full size locomotive world when he became the brains behind the 'Night Owl' project (www.4709.org.uk) His quiet brilliance shone for all to see and he really enjoyed himself! Everyone learned from Don – he even improved Swindon valve gears!

He was forever solving people's valve gear difficulties, writing two master books on the subject, as well as music. He was writing a dissertation for his doctorate in music which sadly was stalled by lack of funding.

Don was ever patient, kind and generous, freely giving his time and knowledge to anyone who asked. Always understated, modest and unassuming, Don was a thorough gentleman and a great friend. His sense of humour was wonderful and he always saw the funny side of life with his energy and enthusiasm. He is a great loss to our engineering and music worlds.

If you have a story about Don, please share it with us.

Paul Carpenter



The Manchester Locomotive Society - Don is on the right (photo Gerry Clarke).



Don with Paul Carpenter (4709 project engineering manager, left) and Si King ('Hairy Biker', right).

Mastering Non-Ferrous Metal Casting

PART 3

Gerald Martyn has a go at making his own non-ferrous castings.



Continued from p.622
M.E. 4637, 24 April 2020

BOOKS LIST

Foundry Work for the Amateur, by B. Terry Aspin. Pub. Special Interest Books.

How to Cast Small Metal and Rubber Parts, by William A. Cannon. Pub. Tab Books.

The Complete Handbook of Sand Casting, by C. W. Ammen. Pub. Tab Books.

SUPPLIERS LIST

I have no link with any of these suppliers except as a satisfied customer:

John Winter

All the essentials such as sand, flux, core binder, bricks, safety kit, metal etc. Occasional advertiser in *Model Engineer*.
www.johnwinter.co.uk/foundry/model-engineering

Artisan Foundry

On-line shop for the essentials, and particularly Superwool, furnace building and metal casting courses.
www.artisanfoundry.co.uk/product_info.php?cPath=28&products_id=81

Vaghans (Hope Works)

Foundry and blacksmith tools and equipment
www.anvils.co.uk



Completed 5 inch gauge LSWR 'Metropolitan' tank locomotive.

I did not intend to spend much time describing the moulding, melting and pouring process but many of the problems are best described where they happen, so I will run through it now.

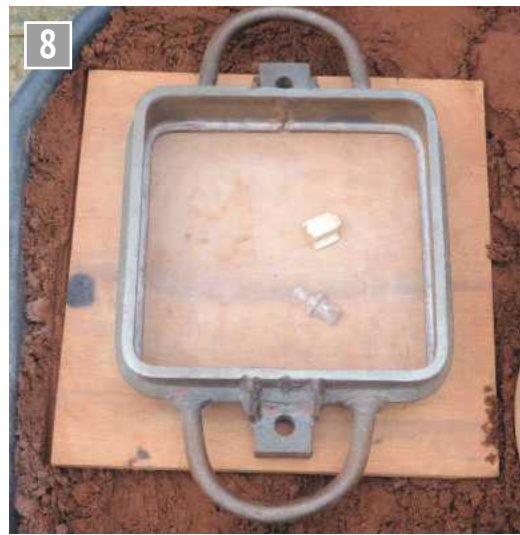
There is more than one way to skin a cat (they say) and the different books give different methods for forming

moulds, heating and pouring. So, before an expert out there writes in to say I'm doing it all wrong then I must say that this is my version of the process and it works for me. As I am a learner and only cast metal occasionally then I've made a checklist to use on the job. This will be the basis for the sequence of pictures and text.

The parts being cast are axleboxes and buffer stocks for my latest project, a batch of 5 inch gauge wagons. You may think these are available to buy but this is not the case if you are modelling old LSWR wagons, which are not the same as anyone else's. Then there is the cost. When using scrap metal these are costing



The patterns.



Both patterns laid in the drag.

about 40p each for the gas and when using purchased metal then less than £2. They are sand cast so, of course, need fettling and machining but making things is one of the foundations of our hobby (isn't it?). The main driver to make them this way, though, rather than fabrication as I have done previously, is that it's fun.

The furnace is all set up with the crucible in place and the burner ready to light, the gas bottle well away at the end of its hose, any sheltering windbreak set up (I use an old cotton beach windbreak when necessary), the metal is in the crucible or ready, tongs laid out, leather apron, face shield and gauntlets all handy, fluxes to hand, sand spread out in the tray and tools ready. It's time to start. I don't light the furnace immediately; it doesn't take long to heat up and trying to prepare moulds in a race with it can lead to mistakes.

Start by laying the drag top side down on the board. It's so easy to get this wrong and when it is turned over to discover that the cope doesn't fit then there's no alternative other than go back and start again. The patterns I am using are two-part, with tops and bottoms aligned by location pins (**photo 7**) because the widest part is towards or at the middle. In order to remove a pattern from the sand cleanly then it's fairly obvious that it can't be wider below the sand surface than it is at the surface, so patterns are split so that the widest part can be at a surface - the split-line. I'm casting both components in one flask with one sprue. Place the bottom (non-pinned) pattern parts flat (split-line) side down on the board allowing space for a pouring sprue and feeder gates (**photo 8**).

Shake parting powder across the board and patterns (**photo 9**). This stuff comes in a big tub and a small quantity is put into a calico bag which is shaken over the mould to achieve a fine even layer.

Sieve sand over the patterns (**photo 10**) to cover them well



Powdering.



Sieve the sand over.



Ramming the full drag.



Strike-off.

and then press it down gently by hand.

Fill the drag with sand and ram it down carefully, paying attention to getting it firm also around the edges of the drag, which should have some form of lip or register to hold the sand in place. Completely fill the drag with rammed sand to above the top edge (**photo 11**). Strike off flat with the batten (**photo 12**).

Put several holes in, around and over the patterns and where the sprue will be (**photo 13**). These vent holes allow steam to escape and are forgotten at your peril. Try not to go all the way through the sand, though it's not a serious problem if you do. In the photograph my finger is acting as a depth stop, which



Vent.

unfortunately obscures the wire somewhat. If one is put through to the pattern then it may part-fill with metal, but this is easily snipped off.

Carefully turn the drag over and lay it back on the board to expose the top face and patterns. Position the cope then add the top parts of the patterns, shake more parting powder over the surface and position the sprue stick (**photo 14**).

Note that there are alternative ways of making sprue holes and cutting one using a tube after moulding is commonly recommended as it allows striking-off a flat top face before cutting the hole. With my method when turning the cope onto its top face to extract the patterns and do work on it then it is necessary to be very careful because the sand can't be properly supported on a board in the way that is possible if the face is flat.

Carefully sieve sand in over the patterns (**photo 15**) and around the sprue stick, and press down with the fingers (**photo 16**). Carefully fill the mould with sand without displacing the sprue stick and ram down as described above (**photo 17**). Use the pointing trowel to press down and smooth it off near to flat (**photo 18**). Add vents, as described above, then gently wiggle the sprue stick out.

Gently ease the cope off the drag (**photo 19**), lift it clear and place it carefully on its edge. If the top parts of the pattern have stayed with the drag (as usually happens with these two) then use the teaspoon to prepare an inlet scoop/funnel to pour into and half the feeder cavity at the bottom of the sprue and half gate channels if desired.

If the patterns are still in the cope then lay it gently pattern face up on a bed of sand. I now usually reinforce the sand around the pattern by gently brushing water onto the sand around its edges using a soft brush. This provides locally more of the surface tension that is holding the whole affair



Position the cope and sprue stick.



Sieving the sand in.



Pressing down sieved sand.



Ramming the full cope.



Trowelling.



Lift the cope.

together. This and the next couple of stages are similar to, and more easily photographed, in the drag so are shown in the sequence later (**photos 20 to 23**). Tap the point of the rapping bar gently into the

middle of the pattern and then tap it sideways and fore-aft to ease the pattern in the sand. Gently lift the bar and pattern out and lay the pattern aside. Take a deep breath! Using the teaspoon cut half the feeder

cavity and half-gates as above. Put the cope gently on edge and cut the inlet scoop/funnel. In all cases gently blow out and away any loose sand and perhaps use a finger to firm it in the sprue and gates (not in

the mould itself). If necessary, it may be possible to repair damage to the mould itself using the teaspoon or one of the specialist moulding tools, otherwise if it will lead to a bit of 'plus metal' then I just leave it. Any loose sand within the mould cavity must be removed, however. Now put the cope gently aside.

Turning to the drag now, reinforce around the pattern by brushing water on as above (**photo 20**) then gently tap in the rapping bar and rap (**photo 21**), then remove the pattern gently from the sand using the bar (**photo 22**). In the photograph I am using the chisel handle to do the rapping but for larger patterns I may use a small hammer.

I always cut a pouring cavity and gates in the drag irrespective of whether I have put halves of these in the cope. Using the teaspoon cut a feeder cavity below the bottom of the sprue and carefully cut the gate channel from the pattern hole to this cavity (**photo 23**). Always cut away from the mould cavity to minimise damage.

If necessary, repair any damage to the mould itself, and anyway carefully blow out any loose sand. **Photograph 24** shows the finished moulds.

Carefully lift the cope and put it gently back onto the drag using its locating pins as a guide.

Take another deep breath!

Leave the mould box on its board but put a layer of sand around it to protect the wood from hot metal. It is now ready for pouring (**photo 25**). Eagle-eyed readers may notice a lack of vent holes in the cope sand. Well, what with trying to do the job and direct the photography this little step was missed but, fortunately, the parts turned out well. It just goes to show how variable the process can be because on other occasions I've not been so lucky.

After a few goes at all this then I agreed with myself that starting work to remove the pattern from the drag would be fair time to start warming the furnace, so it's been sitting



Reinforcing the sand.



Rapping.



Lift pattern.



Cutting a gate in the drag.



there getting warm for a while with some metal already in the crucible. Now it's time to turn the gas on full.

●To be continued.

ABOVE: The two halves of the finished pattern.

RIGHT: Ready for the metal.

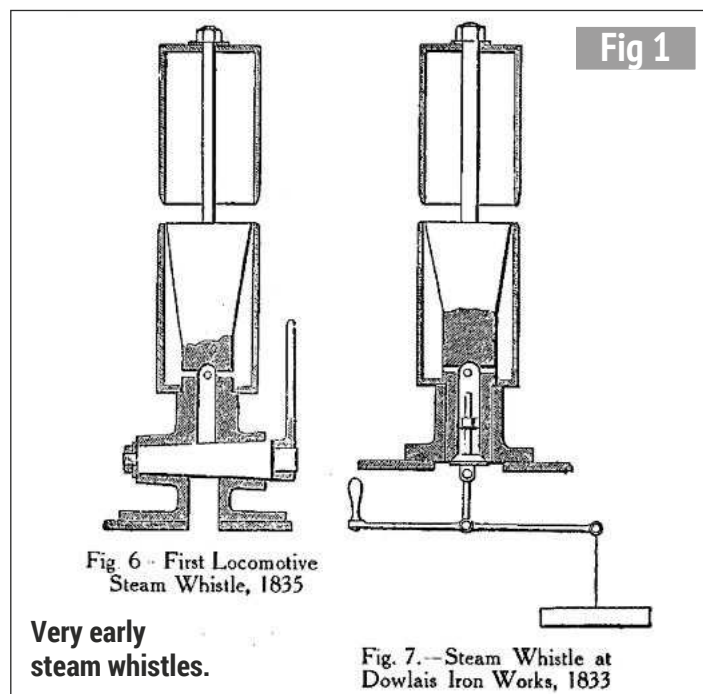


Wheezeless Whistles

Bob Bramson shows how to take the wheeze out of a whistle.



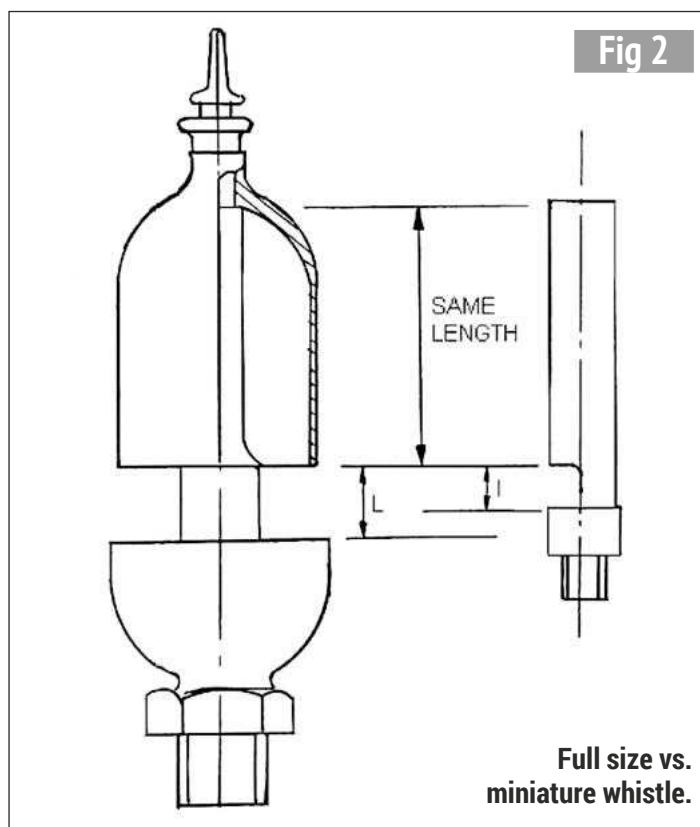
To most people, the appeal of the steam locomotive derives from its sight, its smells and its sounds. The steam whistle is perhaps the most evocative of locomotive sounds and with its single or multiple tones its discharge will turn heads and thrill most everyone within its audible range. It may be of interest to readers that the steam whistle's origin was in 1833, an idea by one Thomas Turner who designed a steam road locomotive. The first working whistle is attributed to William Stephens, a workman at the Dowlais Iron Works in South Wales also in that year (fig 1). Its use soon became standard on all steam locomotives. Its primary role is, of course, to provide an audible warning or signal but the sound it emits is always capable of arousing the human emotions. In models this is often far from the case. Perhaps due to lack of understanding of the principles



involved, the performance of the average miniature whistle is beset with wheeziness, overblowing or dull and lifeless tones.

Just before the December 2009 *Model Engineer* Exhibition, I was asked to demonstrate whistles on the SM&EE stand using my electric test boiler to provide the steam supply. This request came right out of the blue and I agreed to make some whistles for demonstration at the show. It just so happens that I had needed to solve the problem of 'Wheezing Whistles' several years previously (when I completed my 5 inch gauge B1 *Roedeer*) and was surprised at the amount of interest that was shown at the exhibition and the number of people who reported difficulties in making these instruments work successfully. This, together with recent developments, has prompted me to rewrite this article, which I hope will be of interest to devotees of miniature steam engineering.

Let's start with a bit of simple physics. The model engineer seeks to scale full size and in so doing reaps certain benefits and also certain disbenefits. When



considering the construction of miniature vacuum ejectors, injectors, turbines and whistles the question of steam velocity is high on the agenda. It is second nature to thermodynamicists to know how the velocity of steam varies against pressure. This fact, however, may not be well appreciated by people in other walks of life, so might I explain in very simple terms that the velocity of saturated steam escaping into air at zero pressure is, naturally, zero. Raising the pressure to just 10 psi, the steam has attained approximately the speed of sound and, at around 40 psi, twice the speed of sound. As the pressure rises further the rate of change of velocity reduces significantly such that at the pressure ranges encountered on full size locomotives it is almost constant. It should be rather obvious that the model engineer needs to consider how to deal with this phenomenon when making miniatures which depend on steam flows over the range of pressures which normally apply, say 30 to 120 psi. The other fact that applies, and is critical in any steam driven entity, is condensation. What's all this got to do with a simple whistle you ask? Well, just about everything!

If you consider a full size locomotive whistle, the steam slot height is around 2 inches in length, shown as L in **fig 2** (left). This is to enable it to function properly at the working pressure and its associated steam velocity. As the pressure reduces, the steam slot height must also reduce to reflect the reduction in steam velocity. The miniature version shown in **fig 2** (right)

Table 1. Slot length vs. working pressure

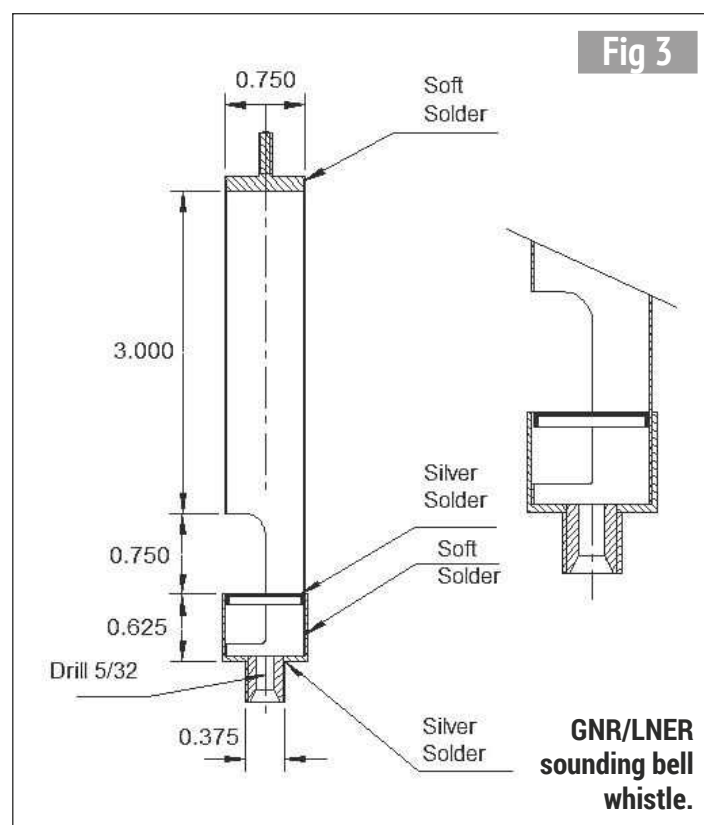
Working Pressure - psi	Slot Length - inches
50	0.4
80	0.6
100	0.75
120	0.875

has to have a slot length L reflecting the steam velocity associated with the lower pressures involved. A mouth blown whistle has a slot height of about $\frac{3}{16}$ inch. **Table 1** shows the relationship of slot length L in inches against pressure in psi. It is thus most important that this is incorporated in the design and construction of miniature whistles.

One of my friends once told me that hot weather assured a 'good whistle day' and cold weather a 'good injector day.' Well I don't altogether agree with this since, with deference to 'physics', the grand master, it is possible to make the best of the situation using its principles. I am truly amazed that so many whistles which you see appended to miniature steam driven models are made of unbelievably thick yellow metal. These personify the ultimate in steam condensing apparatus! There is no hope for such monstrosities. Many people have said to me that their whistles work perfectly well on air but were useless on steam. Hardly surprising, as the steam simply condenses and the velocity energy dissipates instantly upon contact with the great bulk of cold metal.

So, having incorporated the right slot length, the next thing to do to ensure a 'Wheezeless Whistle' is to reduce the effect of condensation. This is achieved by using very thin sections for all the parts of the whistle and – yes - also the steam supply pipe work that feeds it. In full size, the whistle is mounted directly on the boiler or other hot surface but on a model locomotive it has of necessity to be mounted somewhere away from a hot source.

One remedy that a revered model engineer friend of mine employed was to use superheated steam to work the chime whistle on his little locomotive *Petrolea*. This certainly did work, although I believe he found that the supply tubing tended to burn out due to the intermittent steam flows. All you need to do



is to take the steam from the driest source in the boiler and if the whistle is remote from the control valve, feed it with steam through well lagged pipes. In the past, I have used electrical heat shrink in two layers which seemed to work reasonably well once the initial condensation had been cleared - more on this subject later. The bore of the valve and steam pipe should be comparatively large, such that the pressure drop at the whistle is minimised.

For the whistle itself, the dimensions shown in **fig 3** are offered as a working design for either a 5 inch or $7\frac{1}{4}$ inch gauge locomotive and the sound will resemble a typical LNER bell whistle. Some important points are:

- * The ratio of the tube diameter to the slot length should be between 1:1 and 1.5:1.
- * The pitch of the note is proportional to the length of the tube from the contact tip of the aperture to the inside of the cap.
- * The volume of sound depends on the energy you put into it and is influenced by the diameter of the tube.

- * A $\frac{3}{4}$ inch diameter tube will generate all the sound volume you need in $7\frac{1}{4}$ inch gauge.
- * The contact edge of the steam slot should be perpendicular to the flow of steam, sharply finished but not tapered.

It will be noted that the deflector plug is the same diameter as the internal diameter of the tube and thus the steam slot gap is the same as its thickness. Many people resort to gaps only 0.005 inch. This is not only unnecessary but is undesirable as most of the velocity energy is destroyed in the throttling process at the slot. This remedy reduces the pressure and velocity but, since it raises the steam temperature, it tends to counter the condensation loss which suits the small apertures traditionally employed, although it also results in a dull, lifeless tone. When the steam hits the deflector plug, it tends to condense, so machine out as much of the redundant material as possible.

It should also be apparent that a whistle is in fact a

musical instrument and its timbre is materially affected by the hardness of the whistle bell. Since my wife is a bell ringer, as no doubt are some model engineers or their 'nearest and dearests', I am aware that nearly all church and hand bells are made out of tin rich copper alloys to give them their tonal qualities. This might be considered overkill for a little whistle and, to obtain good results, hard brass tube is quite satisfactory. Dear old LBSC used to specify 'Treble' tube i.e. tubes that had been drawn three times to impart greater hardness and stiffness. I have not seen this material advertised since the early sixties but I have been fortunate in obtaining supplies of something similar from a friend of mine in Taiwan. The essential requirement is that the tubes are thin. A ½ inch diameter tube should be no thicker than 0.015 inch (28 swg) and ¾ to 1 inch, 0.020 inch (25 swg).

This type of whistle is best mounted in a warm draught free environment, say between the front end of the frames on a locomotive. Support for the tube is provided by a threaded extension shown at the top of fig 2 at the cap and via a light support stay to secure it to some adjacent structure. The steam pipe end should be left free. It is not desirable to clamp the whistle as this will prevent it from resonating and promote still more condensation. Any condensate must be allowed to drain out of the voice slot which should be set at a slight angle to facilitate this.

Fans of different railway companies will no doubt wish to install a prototypically sounding whistle. The frequency of a whistle depends on the effective length of the tube. This, over the range that model engineers are concerned, is a linear relationship and it is thus a comparatively simple matter to tune to a particular musical note. The graph and formula in fig 4 can be used to

approximate the tube length to suit a desired frequency. To achieve best result it is desirable to tune a new whistle against a frequency source (I use a music centre keyboard), this being achieved using an air tight plunger in an over length tube in the manner of a Swanee kazoo.

Some tube lengths to suit various popular whistle tones are as follows:

GWR Warning (thin body):

3⅞ inches

GWR Signal (wide body):

4⅞ inches

SR Hooter: 4½ inches

Stanier LMS Hooter –

185 Hz F#: 10 inches

GNR/LNER High Pitch:

3 inches

When Sir Nigel Gresley was designing his P2 2-8-2 locomotives the story goes that he visited the 15 inch gauge Romney, Hythe and Dymchurch Railway in Kent, which had fitted Crosby chime whistles to their 4-8-2s, and was very impressed with the sound. He had also travelled in the USA where chime whistles were a standard fitting. He readily decreed that the new locomotives should be fitted with voices having similar

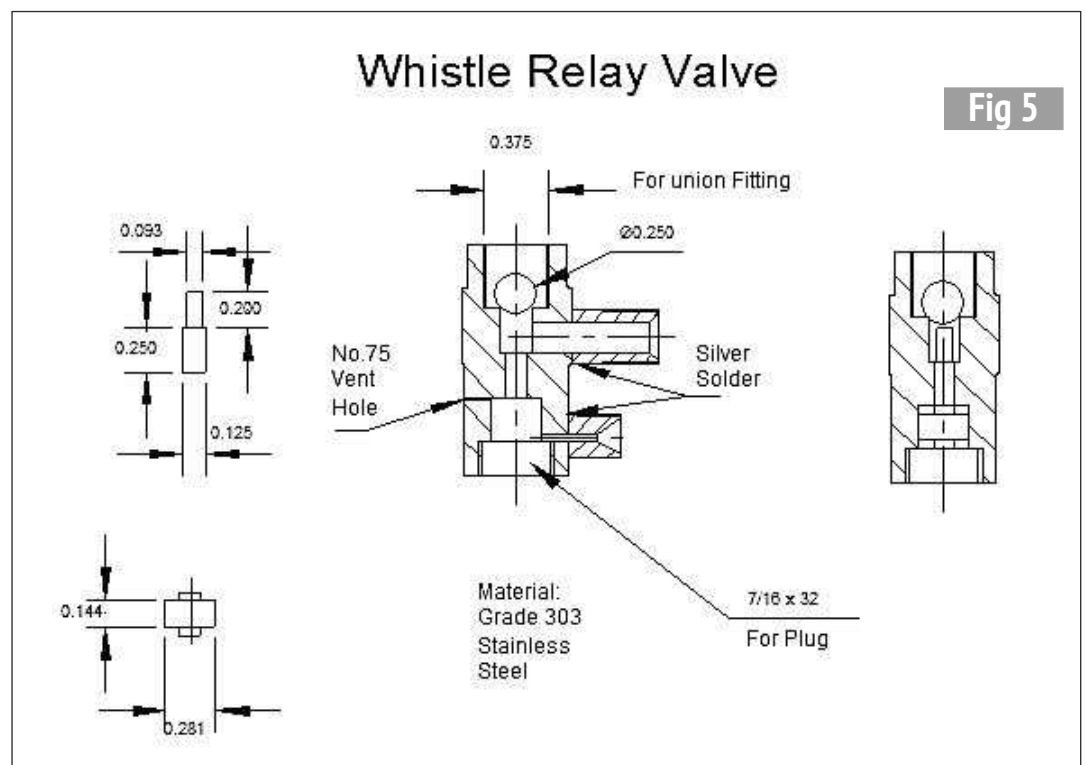


tones. Thus was born their use on British mainline railways. The A4 chime or, more correctly, Tri-Tone, comprised C(4) F(4) and A ♭ (5) although other tones were used.

LNER Chime: C, 523.28 Hz - 6.53 inches, F, 698.48 Hz - 5.08 inches, A ♭, 830.64 Hz - 3.99 inches

BR Chime (Crosby): F#, 370 Hz - 7.8 inches, C#, 554.4Hz - 6.27 inches, A, 880.00Hz - 3.58 inches

Chime whistles for miniatures can either be made with individual pipes or segmented within one large diameter pipe. For miniature locomotives up to 7¼ inch gauge, it is easier to make the whistle with individual pipes since the condensation losses will be less. For larger locomotives of 10¼ inch gauge and the bigger traction engines, the segmented monotube design is more appropriate. One thing to appreciate is that



large whistles do use a fair amount of steam which will be apparent if used on the smaller models.

I am pleased to commend an excellent article by D. A. Gulliver-Brown on *Making Chime Whistles* which appeared in *Model Engineer* (20th June 1969) wherein comprehensive detailed instructions were published. **Photograph 1** shows a practical design for three note A4 style chime whistles similar to his design. It should be noted that the diameters of the steam entry holes into the whistle chambers are different. This is to balance out the sound levels of the whistle pipes such that no particular note dominates. For $\frac{5}{8}$ inch diameter pipes the short tube's base should be drilled No. 36, the medium, No. 32 and the long one, No. 30.

Since a reasonably skilled model engineer should be able to produce a perfectly good whistle I don't feel it necessary to include full instructions save to suggest that a jig is a useful adjunct to form the voice slot in the thin section tubing, illustrated in **photo 2**.

Earlier on I mentioned about condensation losses in long pipes that feed steam to whistles. As a member of the SM&EE, for me the experimental side of model engineering has always played a big part in the enjoyment of our hobby. When I set out to build the boiler for my $\frac{1}{8}$ scale LNER C1 Atlantic, I decided to feed the steam directly from the dome via an internal steam pipe to the front of the boiler. At the time I must confess that I had no idea how the system could be operated remotely from the cab. Recently, on a longish train journey, I borrowed a pen and paper from my wife and started sketching. The result was a steam operated relay valve designed to fit under the front of the smokebox saddle which has a conveniently flat base from which to mount it. The idea was that when it is desired to sound the whistle, a normal turret type valve would pass 'signal' steam approximately



A selection of A4 chime whistles.



Use a hardened jig to make it easy to cut out the voice slot.



Completed whistle relay valve.

36 inches to the relay valve (**photo 3**) to pressurise a small piston. This in turn tips a ball valve off its seat to work the whistle – *simples!*

When I returned home, I just had to make a prototype and see if it would work. I selected grade 303 stainless steel for all the working components since the valve would always have water in it when in storage and, anyway, stainless works much better for steam valve seats. Photograph 3 shows the finished valve ready for testing. I duly connected it up to my electric test boiler and gave it a try. Imagine my consternation when after it was activated it wouldn't stop! Visions of aggravated neighbours flashed

through my mind then I quickly realised that the steam had condensed in the signal pipe and locked the system open hydraulically. The solution was achieved by simply releasing one of the union nuts on the remote actuating valve and hey presto, the whistle ceased. Phew, no irate neighbours! Not only did it do the trick but by passing the escape of steam from the actuating pipe, this could readily provide a show of steam from a dummy whistle. On the test rig, the valve works perfectly but, as ever, it needs to be proved on the locomotive under service conditions which is about a couple of years away all being well. The leading dimensions for this

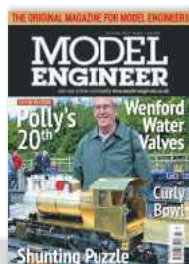
valve are shown in **fig 5**.

For readers with iPhones or PCs you can view a short video of a test run with the relay valve on YouTube www.youtube.com/watch?v=heUtkGuGFOY This shows the performance of the whistle at 30, 50 and 100 psi. The poor response at low pressure should be capable of improvement following a small modification.

I feel sure having made many whistles to the above designs this article includes all the necessary ingredients for making a whistle which will sound clearly and with good audible tone first time, every time.

ME

If you can't always find a copy of this magazine, help is at hand! Complete this form and hand in at your local store, they'll arrange for a copy of each issue to be reserved for you. Some stores may even be able to arrange for it to be delivered to your home. Just ask!



Subject to availability

Please reserve/deliver my copy of *Model Engineer* on a regular basis, starting with issue _____

Title _____ First name _____

Surname _____

Address _____

Postcode _____

Telephone number _____

If you don't want to miss an issue...

Just ask!

Garrett 4CD Tractor

in 6 inch scale

PART 69

Chris Gunn
fits the
exhaust pipe
and blast
nozzle.



Continued from p.569
M.E. 4636, 10 April 2020

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

Exhaust pipe and blast nozzle

While I am at the chimney end, I will deal with the exhaust pipe assembly. As I mentioned last time, the hole for the exhaust pipe was drilled on the centreline of the chimney base. The exhaust hole in the block was positioned as shown on the drawing, which is not on the centreline of the engine; this is due to the fact that the engine is a compound, meaning one cylinder is bigger than the other which throws everything off centre. The exhaust pipe is $1\frac{1}{16}$ inch off centre, and the hole in the block is tapped 1 inch BSP, so I intended to use a piece of 1 inch BSP pipe for the exhaust pipe. I did not feel I had enough length in the pipe to successfully put an $1\frac{1}{16}$ inch joggle in it, as I would not be able to screw this in when the block was *in situ*, as it would foul on the boiler. I elected to make a short piece of pipe with an oval flange on the end which I could screw into the block,



then make a straight piece of pipe with an oval flange welded on at a slight angle so it lined up with the hole in the chimney base. I would then make a sleeve for the pipe to pass through into the chimney base. The end of this would be also threaded 1 inch BSP and then I could screw a standard 1 inch elbow on the end, into which I could insert a plug which would carry the blast nozzle. I would arrange this so I could play about with a couple of different size nozzles when the time came to run it on the rally field.

Another reason to adopt this arrangement was to give me the opportunity to disconnect the exhaust pipe and fit a blanking plate when the time came for an hydraulic test. Water will inevitably leak past the valves and plugs in the block, in my experience, especially when testing an engine which runs as a compound at 225 psi which means the hydraulic test pressure is just shy of 340

pounds per square inch. This slight leaking can be stopped by the exhaust blanking plate.

I have a friendly pneumatic engineer local to me who fortunately attends many of the local rallies, so I was able to get a couple of pieces of 1 inch pipe each threaded at one end, plus an elbow and a couple of plugs.

The short piece was screwed into the block and I cut it back a little to length then cleaned off the zinc coating on the plain end so I could weld it. I made three oval flanges, one with two M8 tapped holes in it, one with two M8 clearance holes in it, and bored to fit the 1 inch tube, and one with the M8 clearance holes but with the centre hole left blank for the test.

I made sure I could rotate the flange on the short piece of tube past the boiler barrel so I could screw the assembly in when completed. Once this was done I welded the flange to the pipe, turned it over and welded all around the joint and cleaned it up.

I filed the flange with the hole for the tube in it slightly oval on opposite faces so the tube could sit at an angle. I then assembled everything, passing the exhaust pipe through the bush I had made to fit in the chimney base, and adjusted the length of the longer tube until the elbow was in the middle of the chimney base. There is enough room to add the elbow and screw it on after the tube has been inserted. The exhaust pipe then lay at a slight angle to take up the $\frac{11}{16}$ inch off-centre position of the hole in the cylinder casting. Once everything was correct I brought the welder to the engine and welded the flange onto the longer section of pipe. I could not get at it all so it was disassembled and thanks to the bush which is slipped out of the chimney base, the pipe can be swivelled enough to clear it so it can be removed. Then I was able to weld all the way round the flange and clean it up. **Photograph 596** shows the completed exhaust pipe and the chimney base sleeve.

As I mentioned above, I used a standard iron elbow on the end of the exhaust pipe to direct the exhaust up the chimney and fitted a standard commercial plug which I drilled and tapped, to accept a commercial brass fitting modified to act as a blast nozzle. I had a good idea from another builder as to what dimension to make the nozzle,

so made one to that size plus four more. They were easy to make as I just silver soldered a piece of tube into a standard Enots fitting and opened it out to suit. I made five in all, and have gradually been working my way through them. I found the first ones were too sharp, and were drawing the fire too much, even on tick over. I gradually increased the size by $\frac{1}{32}$ inch at a time and the one in there now was tested on its first outing and seemed to keep the pressure up - but it is a little too soon to be certain. I have one more slightly bigger as yet unused. I will carry the others in the tool box in case I need to sharpen the blast up a bit. **Photograph 597** shows the blast pipe nozzles made so far. The eagle eyed may spot that the smallest one on the right is a standard commercial hose connector.

The nozzle is easy to change by removing the chimney, then removing the plug with the tube soldered in it and replacing it. Once I am happy with the size, I will recycle the old ones, so I have a spare or two the correct size, as they will wear away. **Photograph 598** shows the arrangement inside the base of the chimney. To the bottom of the picture is the smaller blower nozzle and to the top, the blast pipe and its nozzle. I was amazed to see that flakes of rust are falling off the inside of the chimney already after perhaps only a dozen steamings!



Blast pipe nozzles.



Finished exhaust pipe.

Blower

While we are at this end of the engine it is sensible to look at the blower assembly. Garrett seemed to make provision for the steam supply to the blower to be taken from a hole in the front of the block which communicates with the steam pocket under the cylinders. Some manufacturers made provision for the blower to be operated from the footplate and steam taken from the turret. My 6 inch Foden was like this and quite handy it was too. The steam is then fed from the backhead through to the blower nozzle. My 4 inch Garrett has a blower valve located in front of the block, so I have to get off the engine if I need the blower on, which is sometimes inconvenient. I decided I

wanted to operate the blower on the 4CD from the footplate and I made the decision to pick up the steam supply where Garrett had intended and fit a lever operated valve with the 'business end' on the backhead. I would use a commercial ball valve for this.

The blower steam hole is centred in an oval boss on the front of the cylinder block, so I made a small oval gland to pick up the hole and the two bolt holes. This boss of the gland was tapped $\frac{1}{8}$ inch BSP. From there I was able to connect it up using standard commercial fittings right through to the inside of the chimney. I have accumulated quite a collection of these over my engineering career as they really do come in handy. Nothing went to the scrap with any fittings left on



Blast and blower nozzles.



Blower valve.



Blower fittings.



Blow downs.

it. These are mostly Imperial Enots compression fittings, still available today from any pneumatics supplier or well-known auction sites. Push on fittings are not suitable for steam use. **Photograph 599** shows the ball valve and associated fittings which take the steam through to the chimney base.

At the chimney base end I used a bulkhead fitting to get from the outside to the inside of the chimney base (**photo 600**).

On the inside of the base I used a standard steam elbow as the blower nozzle. However, when I was testing the engine I found that this used much too much steam unnecessarily, so I silver soldered a smaller diameter brass jet into a standard plug, so the hole can be simply

adjusted as required. I made a couple so I had a spare as these nozzles will wear too. The finished jet can be seen in photo 598. Once the valve and piping were complete, I made a lever from a scrap of 3mm thick stainless and the bore of the lever was matched to the one that came off, which had a 'D' shaped hole in it. I drilled a smaller hole and filed it out to the 'D' shape. The other end of the lever was drilled 3.3mm and I made a small clevis from 8mm square stainless, then made a template for the rod using a gas welding filler rod, which is easy to bend and re-bend until it was correct. The rod followed the path of the drain cock rod. I measured the length of the welding rod, and cut a piece of 6mm stainless rod, threaded each end, and then bent it to match the



Full size displacement lubricator.

welding rod. I had to drill extra holes in the spectacle plates to allow the rod to pass, and I was able to get in to the front one using a long series drill and my right angle air drill. Once the rod was threaded through I added a brass knob. The blower control is quite close to the drain cock rod so

I intend to stamp or engrave a 'B' on the end to distinguish it.

There are a few more details I could deal with at this stage.

Blow-down and displacement lubricator

I fitted the two blow-down valves in the front end of the boiler as I was aware that these



Half size displacement lubricator.

would be impossible to fit after the belly tank was installed as there was not enough clearance. **Photograph 601** shows the two commercially made blow-downs in position. Once again, the eagle eyed

will notice that this picture was taken with the damper operating lever on the opposite side to where it finished up (before I had realised I could not wriggle the rod through the clutter on that side!).



Completed mud hole.

I made a dummy displacement lubricator from a picture of a full size example I photographed (**photo 602**). **Photograph 603** shows the half size version. I did not fit mine to an up-stand like the full size; it is screwed into a blind hole in the top of the block.

My boiler was not fitted with a mud hole (as I may have mentioned before) but with a dummy mud-hole ring. In order to make it look more authentic I drilled and tapped the two mud-hole door clamps in the centre of the boss and made a couple of dummy studs and screwed them in until they touched

the boiler shell. The ends of the clamps were drilled and countersunk for M3 screws, then these holes were spotted through into the dummy mud-hole ring and the holes tapped M3. The dummy clamps could then be attached to the mud-hole ring and the holes filled before painting. I believe that boilers are now being supplied with real mud holes, so the procedure will be different. The mud hole will be drilled and tapped for studs that will be used in conjunction with the clamps to secure the mud hole in position (**photo 604**).

●To be continued.

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

- **Syosky**
Mike Nicholson builds a 1:18 scale model of a Russian WWII motor torpedo boat.
- **Wahya**
Luker shows how you can build your own 5 inch gauge model of an American 4-4-0 locomotive.
- **Beam Engine**
David Haythornthwaite adds the valve links and crosshead to his Model Engineer beam engine.
- **Garden Rail**
John Arrowsmith visits the garden rail exhibition at Leamington Spa.

Content may be subject to change.



ON SALE 22 MAY 2020

The American Locomotive

PART 3

David Rollinson traces the development of the American railroad locomotive.



Continued from p.637
M.E. 4637, 24 April 2020

Fireboxes

The large diameter driving wheels of the American-type 4-4-0 forced designers to adopt a narrow firebox that would fit between the frames and accommodate an ash pan between the two driving axles. The result was a wood-burning boiler with poor fuel economy, high maintenance requirements and a short operating life when compared with contemporary British and European examples. In a *Miners Journal* of 1859 a correspondent wrote: 'Sufficient experiments have been made in the last year, to demonstrate the great superiority of coal as a fuel for Locomotives....' After the general introduction of coal firing, fireboxes remained narrow but became longer with the crown bars now placed across, rather than lengthwise, on the firebox top.

With coal gaining momentum in all regions by 1860, an increase in firebox size was the most fundamental change made to boilers fitted to the eight-wheelers. The search for a grate that could survive the use of either soft or hard coal produced a number of designs until a style was found that would work efficiently in the deep firebox of the engines. While preferring soft coal, which was the common fuel, the grates could burn good quality anthracite when available.

One issue with the long and narrow fireboxes on the American-type locomotives was that the fire grate was, as can be seen in the boiler cross sections, quite deep below the boiler barrel. While this construction provided

room for a grate and a deep fire, it was inefficient in steam production. Much of the combustible gas that was produced by the fire did not get burned within the firebox to produce heat before it was pulled into the boiler tubes. This rapid removal of hot gasses also left the top and upper sides of the firebox cool, reducing further the steam raising capacity and causing problems with the boiler itself. To help slow down the movement of the gasses a rudimentary brick arch was fitted to a locomotive firebox in America in 1854. While its operating life was short, it was effective in increasing the steaming capacity of the host boiler. In 1857 brick arches were being used on the Boston & Providence Railroad, but the type of bricks used, and their setting, made them impractical. Eventually a practical brick arch was introduced, although not to universal approval. However, as coal firing became common the public began to complain about the amount of smoke being produced, especially from engines burning soft coal. It was found that the use of brick arches, when coupled with improvements in firing techniques, provided sufficient steam with the minimum smoke.

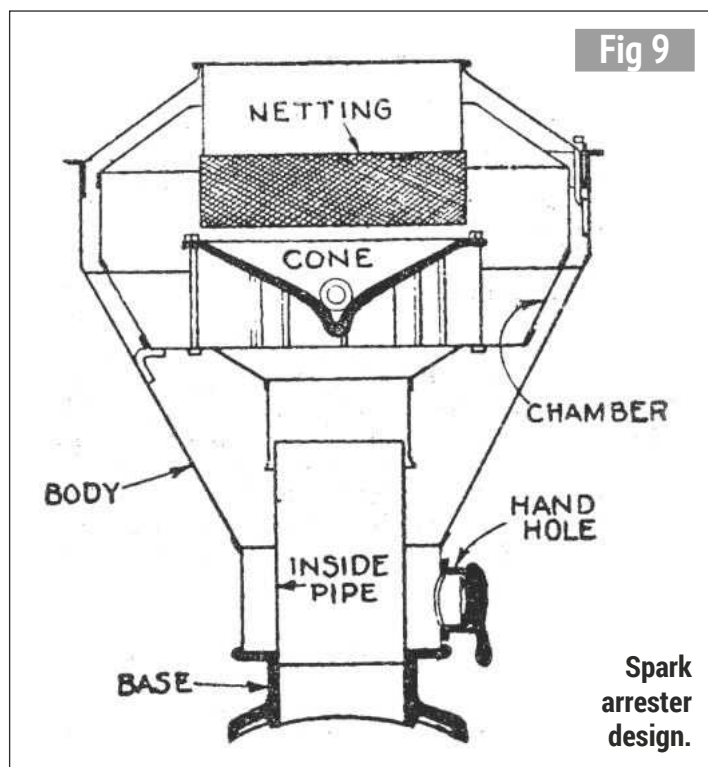
Winters along the north eastern shores of America can be cold, but are positively mild compared with those found in the great Central Plains, where prolonged winter temperatures can fall to -51 degrees C. As the railroad made its way west it entered a new environment that made the use of boiler insulation essential.

The loss of heat from the boiler was recognised early in the evolution of the steam locomotive. An insulating cover of wood strips, secured by iron or brass bands, was the first type of boiler insulation. Early images of the eight-wheeler show the boiler barrel covered with hardwood strips, usually 2 – 3 inches thick, secured by brass bands. The firebox sides and backheads were never insulated. Even when varnished, the wooden strips deteriorated quickly, leading to the use of imported 'Russian iron' as a cladding over the wood. This thin metal cover protected the wood, its blue/black finish adding to the visual appeal of the locomotive. It was usually secured to the boiler using iron bands. As rolling mill technology developed in America, a similar material became available, replacing the imported material. Eventually felt began to replace the traditional wood on better quality locomotives. Applied in layers, the felt was treated with a mixture of alum, soda and lime to prevent it burning. By the 1880s the 4-4-0s would have been lagged with either asbestos or magnesium.

Smokeboxes

Both round and 'D' shaped smokeboxes were used on early American-type locomotives. Later designs used the round type, with the bottom of the box being supported on a saddle cast *en bloc* with the two outside cylinders. The need to include spark arresters in the exhaust system became evident in the earliest days of American railroads, when wood-burning engines began

Fig 9



setting fire to the landscapes they passed through. On his 1842 tour of America, Charles Dickens noted that the locomotive hauling his night-time train produced 'a whirlwind of bright sparks, which showered about us like a storm of fiery snow'. As compensation costs for burned fields and buildings mounted, dozens of spark arrester designs were patented and trialled by engine builders. Eventually, a more complicated internal arrangement (fig 9) replaced the simple wire mesh covers first fitted to the top of the stack (chimney), proving reasonably effective for both coal and wood burners. More complex systems were incorporated inside the smokebox, but none were completely effective as all of them contributed to a reduction in smokebox draught. Eventually the straight stack was introduced when coal became the usual fuel. Blast pipes of the usual type were fitted, although attempts to perfect a variable exhaust, as they were called in America, persisted for many years. They did not find universal acceptance and had been discounted as being ineffective by 1870.

Superheating was never used on the eight-wheelers.

Feed pumps

Most steam locomotives operating in America used a single action force feed water pump well into the late 1800s. Called 'the most cantankerous mechanism on the locomotive', the pumps were usually driven from the crosshead or, less common, an eccentric on a driving axle. This type of horizontal pump worked reasonably well until train speeds increased, at which point they became less effective at putting water into the boiler. These pumps also had a habit of freezing in the winter, despite being fitted with heating coils, and found it difficult to cope with the hard, sediment-contaminated feed water they were usually offered. But their biggest disadvantage was that they only worked when the locomotive was moving. It was not uncommon for engines to be uncoupled from their trains and run light, up and down the track, to replenish the boiler!

Even though injectors were available from about 1860, they were not well received by enginemen and usually a mechanical pump continued

to be fitted. It was only in the 1890s that locomotives were being built with injectors only. While steam pumps of the 'Worthington' pattern found universal use in American steam plants and ships, they were never accepted for locomotive work.

Safety features

It is interesting that the builders, mechanics and engineers connected with the American locomotive could be so innovative when it came to design and construction, yet at the same time equally as conservative when it came to aspects of operation that were related to safety. In addition to the issue with brakes mentioned earlier, another prime example of this attitude related to the use of gauge glasses for showing boiler water levels. Early locomotive boilers were fitted with three try cocks somewhere on the back head, as seen on the *William Crooks* cab photograph. These try cocks only showed the level of water at the time when they were opened; if there was no water showing when the lowest one was operated it was likely too late to add water, as by that time the crown sheet was uncovered. Boiler explosions were both numerous and deadly in America throughout the mid and late 1800s; locomotive boilers were not excluded from contributing to this carnage and in many instances a shortage of boiler water was the culprit. Even though a glass water gauge had been demonstrated as being practical by 1831, the great antipathy shown to them by all levels of railroad men kept them out of locomotive cabs until the late 1800s when their use was legislated. The objection raised against their use was in part due to their expense, combined with the fear of unreliable reading due to water foaming.

Contrary to the use of gauge glasses, steam pressure gauges found early favour with footplate crews. Steam pressure began at 50 psi on

the early pre-4-4-0 engines, but quickly rose to 90 or 100 psi by the 1830s. Increases came incrementally, partly as a result of the improvements in boilers' materials and construction, so that by the 1870s the eight-wheelers were operating at 120 psi, and pressure gauges were, according to the *Master Mechanics Report* of the time, universally used. When NYC RR No. 999 entered service in 1893 she had a boiler pressed to 180 psi, although generally regular 4-4-0s were operating at 150 pounds per square inch. At these pressures footplate crews understood the contribution the pressure gauge made towards efficient running.

Tenders

The tender for Stephenson's *John Bull*, built for the Camden and Amboy Railroad in 1830, was a four wheel flat car fitted with a wooden barrel for water and a wooden platform for fuel. This rudimentary layout, typical of those used in England at the time, was soon replaced by one resembling a garden shed on wheels, the shed being used to protect the brakeman. As *John Bull* was not expected to travel any distance, water and fuel did not require a large tender, a situation that was going to change quickly as the rail network expand westwards.

The use of wood fuel required trains to make frequent stops to 'wood up' at one of the many wood sheds located along the line. Both hard and soft woods were used as boiler fuel on the eight wheelers, depending on the territory they were passing through. The rule of thumb used in the mid-1800s was that 2,000 lbs of soft (bituminous) coal was of equal calorific value to 5,200 lbs of wood. The 2,000 lbs of coal took up 40 cubic feet of tender space, while the 1¾ cords of wood needed 224 cubic feet. On its first passenger run of ten miles in 1862 the *William Crooks* had consumed the two cords of wood in its tender before reaching the

first wood shed located along its route. Reportedly, the train crew had to rip up wooden fencing to make enough steam to proceed. Such was the demand for wood for locomotive fuel that by the 1850s Pennsylvania's railroads had consumed a staggering 40 million cords of original forest, in the process pretty well denuding the State of trees.

Evolution from the early flat carts to a more substantial four wheeled metal tender with a built-in water tank and designated wood storage space was evident with the 4-2-0 locomotive *Lafayette*, built by Norris in 1837. A decade later, *Tioga*, also from Norris, had a six wheel tender. As locomotive size increased, so did the need for more water and fuel, resulting in the typical 1850s rectangular tender mounted on two four wheel bogies. The water tank at the rear of the tender began to feature the typical 'U' shape and the fuel storage space became more formalised. This type of tender (fig 10) shows the general construction of the under frame, bogies and water scoop. Water availability

remained a challenge throughout much of the American railroad system into the late 1800s. Either tender capacity had to be increased or, on longer runs between major rail centres, water pick-up troughs installed. The New York Central, which ran express passenger services out of New York on multi-track roadbeds, began using tender water scoops in 1870. Needless to say No.999 was fitted with a scoop when first built to replenish its 3,500 gallon tender tank.

Paintwork

To non-American eyes, the brightly painted and decorated American-type locomotives of the latter half of the 19th Century are a distinct contrast to the restrained finish that was used on their local railway. Seemingly extravagant, the bright paintwork, ornamentation and excess of polished brass had a practical purpose. For the early locomotive builders the appearance of their locomotives offered an example of the work they could produce. For the locomotives'

owners it helped promote the new form of transportation and showed pride of ownership. As many parts of the eight-wheelers were of cast iron, paint provided a more attractive finish while helping to protect the metal. Such was customer demand for a special finish that Baldwin Locomotive Works developed a 'style book', which specified not only the level of finish to be provided (there were four classes) but listed the available style of lettering, decoration on such fittings as sand domes and wheel centres, or paint colours for each class. In effect, each locomotive was 'customised' for the owner. Apparently the increasing cost of 'individualising' the locomotives became so expensive that by the 1890s a plain black finish was adopted by most railroads.

Demise

The American-type 4-4-0 steam locomotive owed its popularity and longevity to its high route availability, reasonable haulage capacity, simple and inexpensive construction and the ease of maintenance and

repair. It was claimed that in 1870, eighty five percent of the locomotives in service in America were eight-wheelers, and even a decade later sixty per cent of Baldwin's output was of this type. The early 1880s saw the beginning of the end for the 4-4-0 as freight movements increased on American railroads, the need for more powerful engines seeing them replaced by 2-6-0s or 2-8-0s. Although by this time relegated to light passenger work, even this was eventually lost when new, and heavy, passenger coaches on faster schedules became the norm.

Used for half a century, and with over 25,000 reportedly built, the American-type 4-4-0 was pivotal in establishing the American West and helping the country to become a 20th Century industrial powerhouse.

ME

REFERENCE

Audels Engineers and Mechanics Guide No. 3, 1823.
The Evolution of the American Locomotive by Herbert Walker, 1897.

A typical tender.

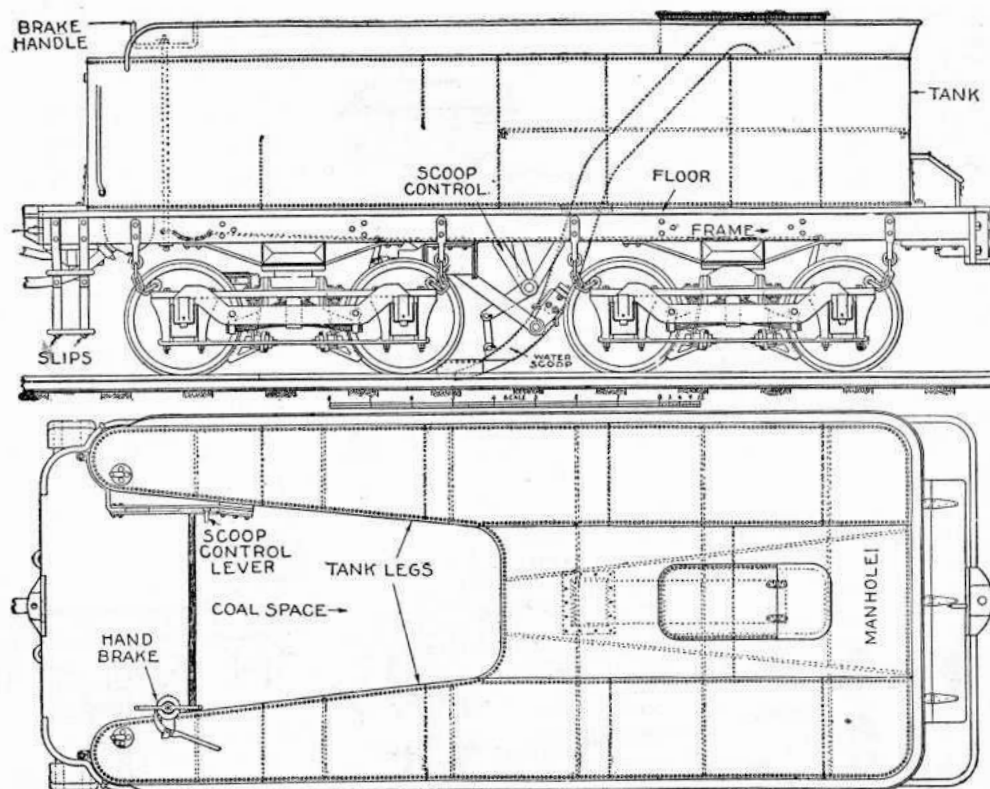


Fig 10

FIGS. 1,955 and 1,956.—Plan and elevation of locomotive tender showing construction details and names of parts. Among the details shown is the water scoop (seen in elevation in fig. 1,955), for replenishing the supply without stopping.

Why not try 6 issues for £1?



PRINTED, DIGITAL or BOTH!

- Get your first 6 issues for £1 (saving £24.20)
- No obligation to continue
- Pay just £2.35 for every future issue (saving 44%) if you carry on**
- Delivered conveniently to your door
- Significant savings on **DIGITAL** only and **BUNDLE** options available

If you have enjoyed this issue of **Model Engineer**, why not claim the next **6 issues for just £1**? Model Engineer offers comprehensive knowledge and advice on various engineering subjects from an array of contributors, ranging from historical articles to the latest show reports.

3 SIMPLE WAYS TO ORDER BY PHONE

0344 243 9023

ONLINE

me.secureorder.co.uk/MODE/
641FP

POST

Complete this form and return to:

Model Engineer Subscriptions,
MyTimeMedia Ltd,
3 Queensbridge,
The Lakes, Northampton,
NN4 7BF

GET 6 ISSUES OF MODEL ENGINEER FOR £1

☒ Yes, I would like to subscribe to Model Engineer with 6 issues for £1 (UK only)

I understand that if I am not 100% satisfied, I can cancel my subscription before the third issue and pay no more than the £1 already debited. Otherwise my subscription will automatically continue at the low rate selected below.

YOUR DETAILS (MUST BE COMPLETED)

Mr/Mrs/Miss/MS..... Initial Surname

Address

..... Postcode

Country..... Tel

Email

INSTRUCTIONS TO YOUR BANK/BUILDING SOCIETY (please select option)

☐ **PRINT ONLY:** £1 for 6 issues followed by £15.25 every 3 months

Originator's reference 422562

☐ **DIGITAL ONLY:** £1 for 6 issues followed by £12.10 every 3 months

☐ **BUNDLE (DIGITAL & PRINT):** £1 for 6 issues followed by £18.25 every 3 months

Name of bank.....

Address of bank

..... Postcode

Account holder.....

Signature..... Date

Sort Code

Account Number

Reference Number (official use only)

Instructions to your bank or building society: Please pay MyTimeMedia Ltd. Direct Debits from the account detailed in this instruction subject to the safeguards assured by the Direct Debit Guarantee. I understand that this instruction may remain with MyTimeMedia Ltd and if so, details will be passed electronically to my bank/building society.



Please note that banks and building societies may not accept Direct Debit instructions from some types of account.

TERMS & CONDITIONS: Offer ends 17/10/2021. MyTime Media collects your data so that we can fulfil your subscription. We may also, from time to time, send you details of MyTime Media offers, events and competitions but you always have a choice and can opt out by emailing us at unsubscribe@modelengineer.co.uk. Please select here if you are happy to receive such offers by email ☐ by post ☐ by phone ☐. We do not share or sell your data with/to third parties. Details you share with us will be managed as outlined in our Privacy Policy here

www.mytimemedia.co.uk/privacy-policy

Please visit www.mytimemedia.co.uk/terms for full terms & conditions

CODE: 641FP

*Calls are charged at the same rate as standard UK landlines and are included as part of any inclusive or free minute allowances. No additional charges with this number. Overseas calls will cost more.

**Future savings based on the current annual shop price.

The Middleton Double Sided Beam Engine

PART 7

Rodney Oldfield constructs another of Bob Middleton's stationary engines.



Continued from p. 644
M.E. 4637, 24 April 2020

The main column

Deviating from the drawings once again I decided to make my main column in one piece rather than make a separate base, but again - do your own thing. To use Bob Middleton's original design for the main column, see **fig 14**.

Starting with a 2 inch diameter piece of aluminium, I centred it and then pulled it out of the chuck 5½ inches. Using a 'live' centre I turned it down to 1½ inches approximately 3.800 inches long, using a bull nose tool to get a radius at the shoulder. Leaving a ⅜ inch long piece for the top of the column, I turned it down to 1⅜ inch diameter for 3½ inches. This left me with approximately ⅞ inches for the column base.



I knurled my main column instead of fluting it.

Having no means of fluting the column I knurled mine instead (**photo 44**). Next, I drilled and tapped 2BA and parted off a little over 4⅜ inches. Reversing the column in the chuck, putting some cardboard round the 1⅜ inch diameter to protect the knurl, I faced off to exactly 4⅜ inch

long, then drilled and tapped the bottom face (I used ⅜ inch Whitworth cap screws because I had some). The only measurement that is critical is the 4⅜ inches.

Bearing support columns

Once again – doing my own thing and not following the drawing because I found it easier to turn them down from 1 inch aluminium bar - I machined them to the same length and tapping sizes as the main column as shown in **photo 45**.



The bearing support columns are the same length as the main column.



Milling out the engine platform.

Engine platform

The only piece of aluminium I had was 12mm thick so I used this. I marked it out according to the drawing (**fig 15**) except that I made the ¾ inch radius at the end 1⅜ inch radius because I thought it would look better with a ¼ inch overlap on the main column. I extended the legs from the ⅜ inch radius to 1⅜ inch with a square end so that it would match the bearings.

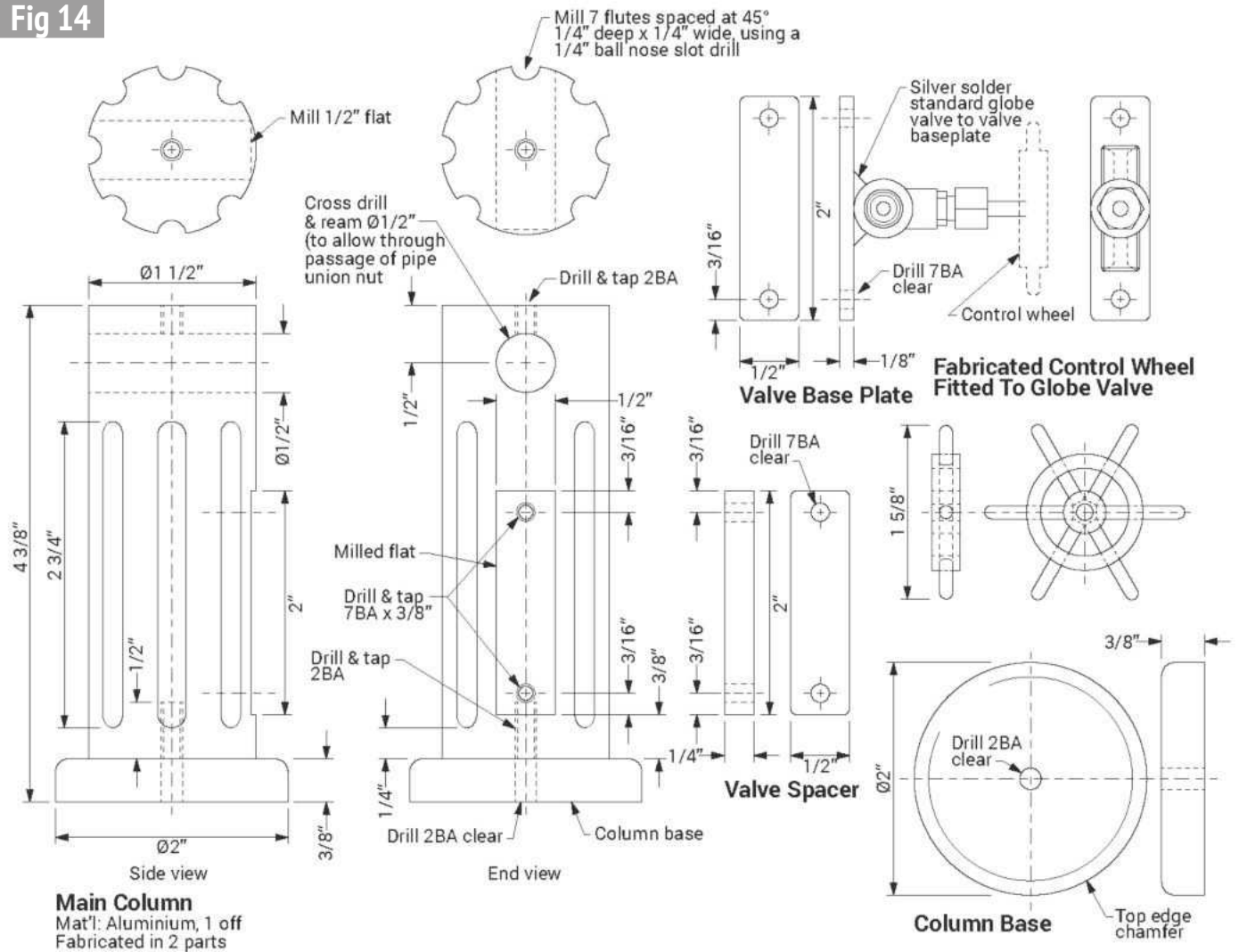
After marking it out I strapped it down square onto a piece of plywood in the miller and milled it out using a ¾ inch end mill as in **photo 46**. Then using an ½ inch milling cutter I cut the profile out as



Forming the profile of the engine platform.



Engine platform profile almost complete.

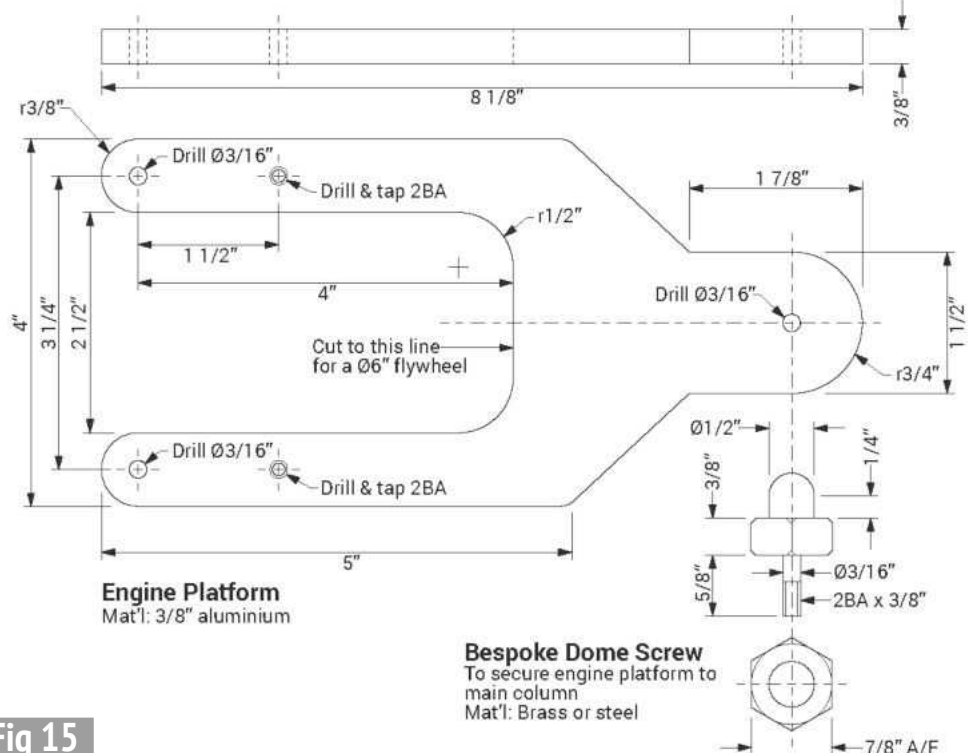
Fig 14

in **photos 47** and **48**. Then all that remains is to drill the 2BA clearance hole for the main column, round the end off and de-burr.

Next, I made my own bespoke dome screw, which secures the platform to the main column. I was fortunate enough to have a 7/8 inch hexagon stainless steel bolt which I turned down to 2BA and threaded. Then I used my own design on the top, which I was very pleased with (**photo 49**), but you can just follow the drawing if you like.



49
Making a bespoke dome screw.

**Fig 15**

Next, I screwed the three columns onto the base plate, and, as I had some 2BA grub screws I screwed them into the thin columns leaving them protruding about $\frac{1}{32}$ inch. I fastened the engine platform onto the main column with the bespoke screw, lined everything up exactly and with a soft hammer tapped the platform on top of the legs. This gave me a good back mark. I then drilled out 2BA clearance ($\frac{3}{16}$ inch).

Main bearings

Because my engine platform was 0.100 inch thicker than it should be I made the bottom bearing housing smaller than the $\frac{3}{4}$ inch size shown in the drawing (fig 16). I machined down two pieces of aluminium $\frac{3}{4} \times 2\frac{1}{2} \times \frac{1}{2}$ inches and drilled the top piece at $1\frac{1}{2}$ inch centres 2BA clearance. I lined it up with the bottom piece, spotted through and drilled and tapped 2BA. I screwed it together with 2BA screws and marked out the centre. I mounted it in the four jaw chuck and got it running square and true. (To help to get it running square I find it easier to put a parallel bar behind the job and in front of the chuck face and tap it flat.) I drilled and reamed $\frac{5}{16}$ inch - or you can bore it out - then I put a good chamfer on the edges of the bores. The profile is then cut out on the top caps. As you can see in photo 50 I rounded one off, but on reflection it looks a lot better square - also, it is much easier to do. Lastly, I drilled out the bottom housing 2BA clearance.

Bearings

I decided to make mine out of $\frac{3}{4}$ inch brass bar with collars on either end so that I know where it is and it will not float about. The turning of it is straight forward - centre, drill and ream. When it is finished make sure that the top housing nips down onto the brass bearings. Drill holes for oil.

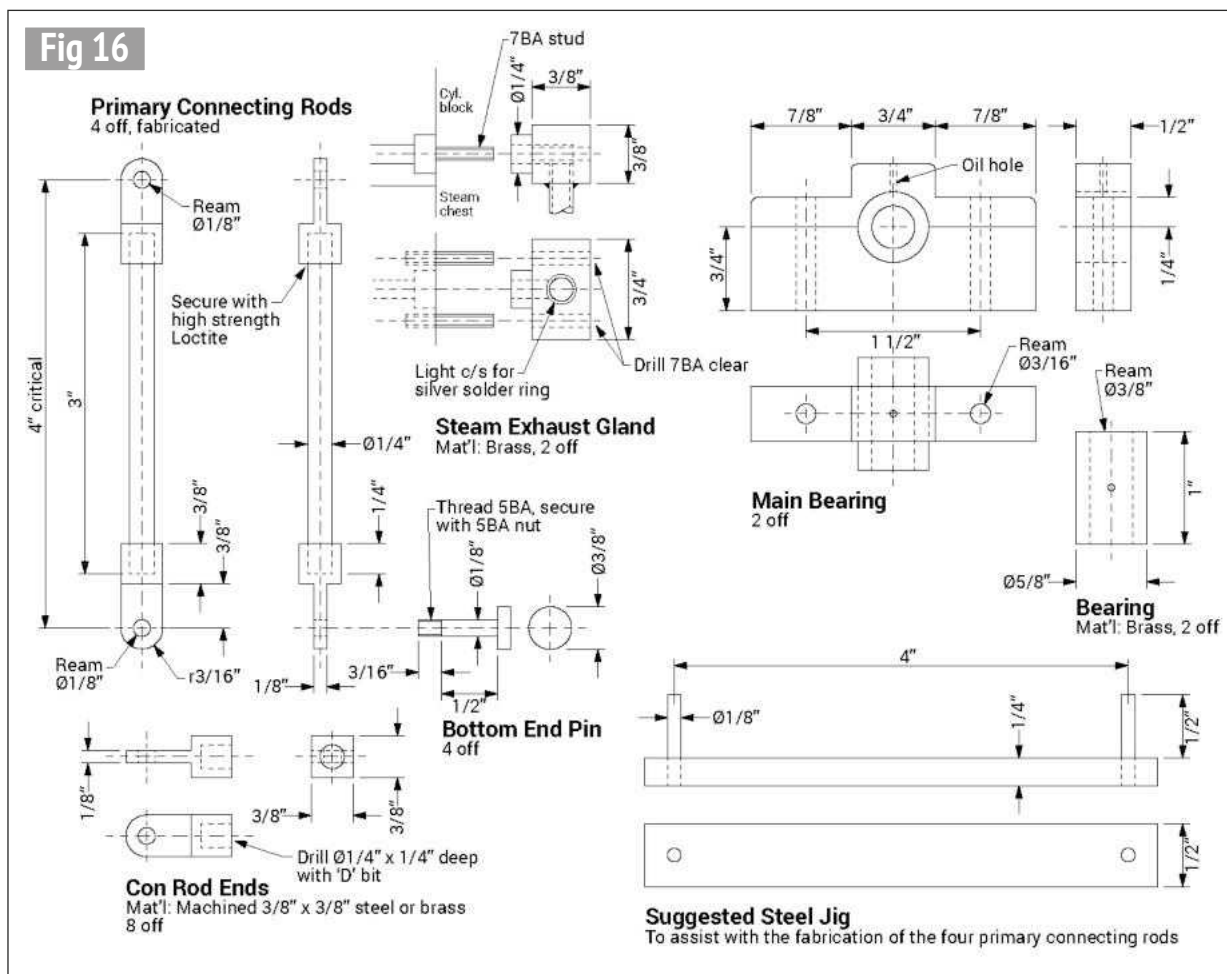
Holding down bolts

These are made out of $\frac{5}{16}$ inch hexagon stainless steel bar, or whatever you have. Turn the bar down just below the hexagon diameter, approximately 0.020 inch deep (this is to stop scoring of the paint work and

instead of using a washer) then centre, drill and tap 2BA $\times \frac{1}{4}$ inch deep. When drilling and tapping a blind hole I usually go up a number on the tapping size. Next part off at $\frac{5}{16}$ inch, turn around and with a forming tool put a dome on top of the nut. Saw off some 2BA threaded bar and with some Loctite on it screw it tightly into the nut. Mine measured $1\frac{1}{16}$ inch from under the head and $1\frac{1}{16}$ inches for the small screw but my bearing housings are 0.100 inch down on size so yours may be different. Alternatively use some bolts, cheese-heads or button-heads - it's entirely up to you.

With the three columns screwed onto the base plate, place the engine platform onto the columns and screw down through the bearing housings onto the thin column using the long screws (photo 51). Place a shaft through the bearings, nip everything up tight. Spot through the inner bearing housing holes for the second hole, drill and tap 2BA. (I did not drill through because I thought it looked neater.) Fasten all the screws tight and DO NOT move on until the shaft is running free.

●To be continued.



Main bearings.



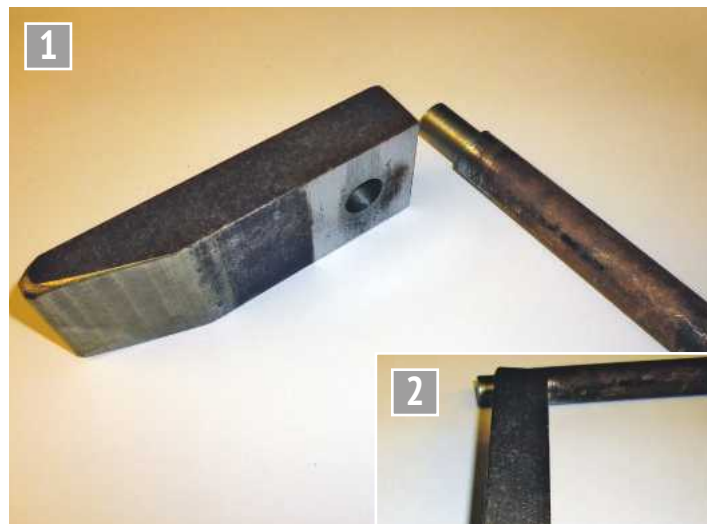
Main bearings in place.

Ballasted Track Tamping Tool

Brian Baker describes a tool used by the Canvey Club to keep their track well ballasted.



A long time ago, when the Canvey club was starting building its ground level track, we had to learn to make sure the track was level, or had the correct amount of super elevation, and that the ballast was firmly tamped under the sleepers. At that time most of us were able to bend down easily and were flexible enough not to feel it afterwards! This, alas, is not the case these days so I set to and made a couple of ballast hammers with long handles - something that I had first seen in use on the Brussels track during a visit some time ago.



Component parts of the tool.



Tool assembled.



Lift ...



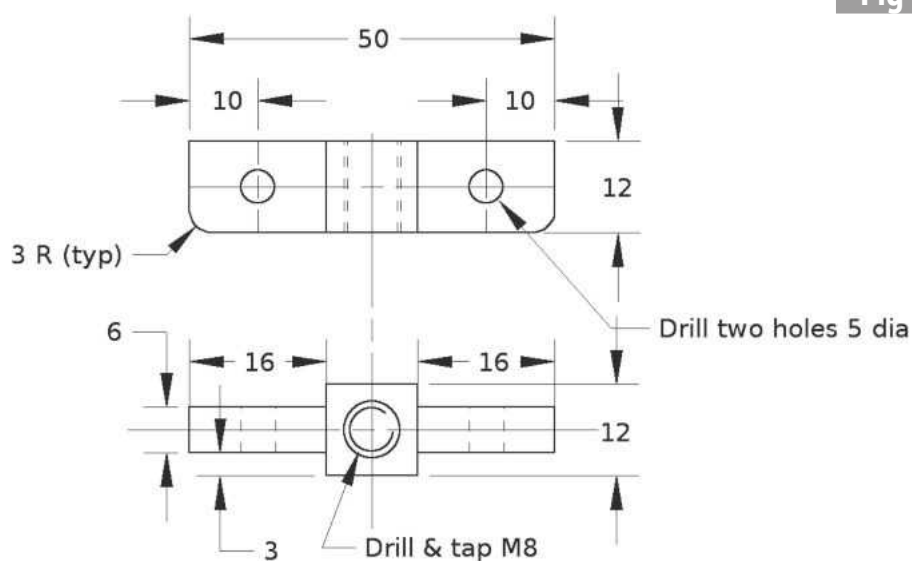
... and shove.

The hammers are simple to make; I made them both in about two hours and I am not bothering you with a drawing since you will, I am sure, make a pair to match your track and from available materials (**photos 1 and 2**). Make the handles out of material strong enough to withstand the expected usage, and long enough to use comfortably.

In use, a thin layer of ballast is spread over the track and the hammers used each side of the rail to lift the track evenly through the ballast. The ballast hammers are then used to push the ballast under the sleepers (**photos 3 and 4**). You might also consider putting a long handle on the track level that you use, then bending down is much reduced and life becomes just a little easier.

ME

As it was to be used as a one-off, the design had to be simple with minimal parts and its long term life was irrelevant as long as it pulled the bearing off without damage to either the bearing or the fan.



Part 1 – the bridge.

Quantity: 1

Material: 080A15

and some are described as having 'reversible' claws. This type of claw has the hole for attaching the links offset from the centre, to allow the claws to be used in two positions – one with shorter claws and one with longer claws. This avoids having a very long screw and the potential for the screw to bend under load when the bearing is a long way down the shaft. The curve on the claws is there simply so that the bridge piece can be made smaller and still have the links at an angle to pull the claws inwards whilst pulling a bearing. I decided to make my claws straight and use a wider bridge.

I used stock sizes of bright drawn mild steel for the main items and a length of M8 screwed rod for the thrust screw. I used M8 simply because I had it in stock and it was easier to use this than cutting the thread onto a piece of round bar. You could also use an M8 x 100mm machine screw. The steel sections that I used were 12mm square, 12mm x 6mm and 12mm x 3mm. I used short M5 bolts and nuts as the pivots.

As it was to be used as a one-off, the design had to be

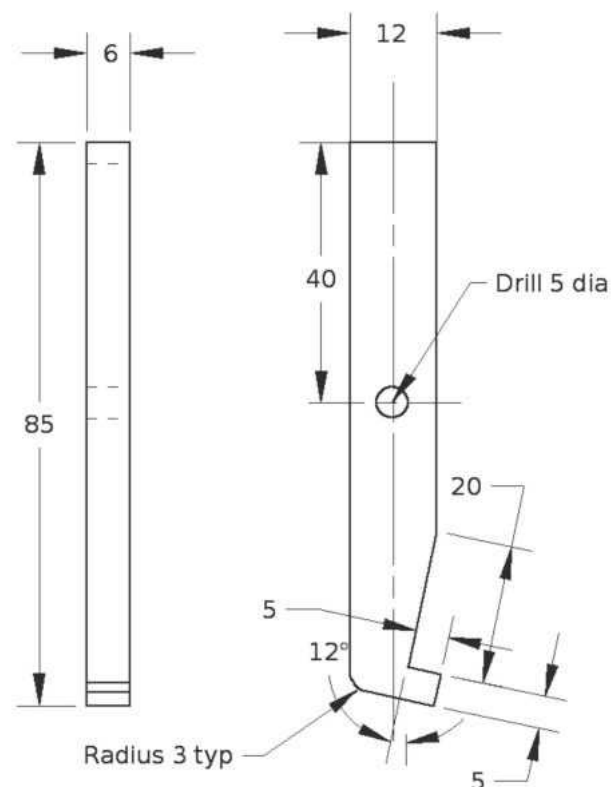
simple with minimal parts and its long term life was irrelevant as long as it pulled the bearing off without damage to either the bearing or the fan. Whilst I could obtain a spare bearing, the motor itself was a washing machine motor manufactured in Italy in 1975 so spare parts would no longer be available.

The general arrangement of the puller is shown in **fig 1**. Making the parts was relatively straightforward without any particular difficulties.

Part 1 - Bridge

I made the bridge first as in **fig 2**. The only critical bit is to make sure that the two 5mm holes are equally spaced from the M8 tapped hole and square on to the M8 hole, otherwise the puller will not be straight when it is fitted to the bearing and the shaft. I drilled and tapped the hole for the screw first and then inserted an M8 bolt and used the milling machine vice end stop against the bolt. This sets the distance for machining one end.

Once the first end has been machined, it can be turned round, set at the stop and the second end milled using the table stops to limit the



Part 2 – the claws.

Quantity: 2

Material: 080A15

cut. If you are skilled with a hacksaw and file, you can file away the bridge to the required thickness. Otherwise, mill it like I did. I drilled one of the 5mm holes and used the end stop against the bridge to set the bridge for the second hole. I used sacrificial short off-cuts as parallels under the two machined ends. The two 3mm radii on the bottom are simply to prevent the bridge marking the claws when in use. The distance between the two 5mm holes is not critical, as long as the holes are both the same distance from the M8 hole centre-line.

Part 2 - Claws

I clamped the two claws together and drilled the central hole first, as in **fig 3**, fitting a short length of 5mm rod to hold them together

in position whilst I clamped them into the milling machine vice. None of the dimensions is critical and I set the 12 degree angle using a simple protractor gauge (**photo 3**) against the fixed jaw of the milling vice. Super precision is not needed here, but with the finished claws open at 35mm, these angled surfaces are parallel to each other. I determined the 12 degree slope by drawing it out using a CAD package and reading off the angle.

I machined the ends of the claws first (**photo 4**) and then carefully ran the end mill over the top at the end to make the edge of the claw 5mm wide (**photo 5**). I moved the end mill over to start to cut the recess for the bearing. Ideally a slot drill is best here to cut the claw away but, as super



Setting the claws at 12 degrees.

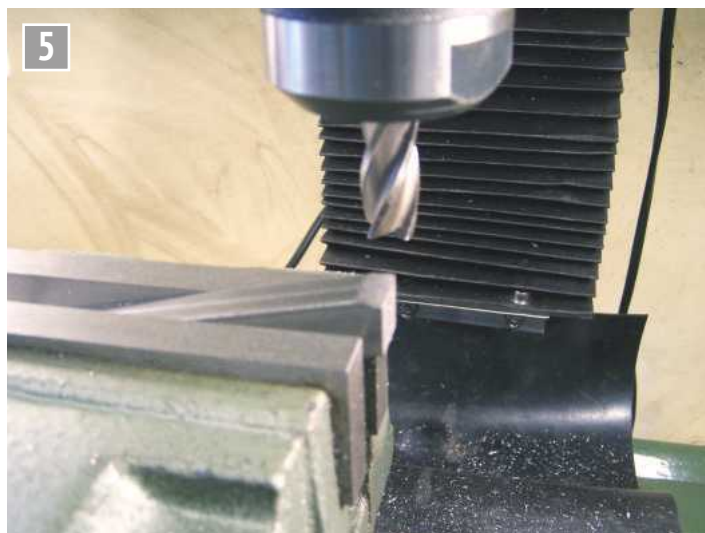
precision was not required, I used a 12mm diameter end mill (**photo 6**). The rest of the 12 degree flat is then machined (**photo 7**). The 20mm length of the angled

surface is nominal – again, no precision is needed here.

●To be continued.



The ends milled flat.



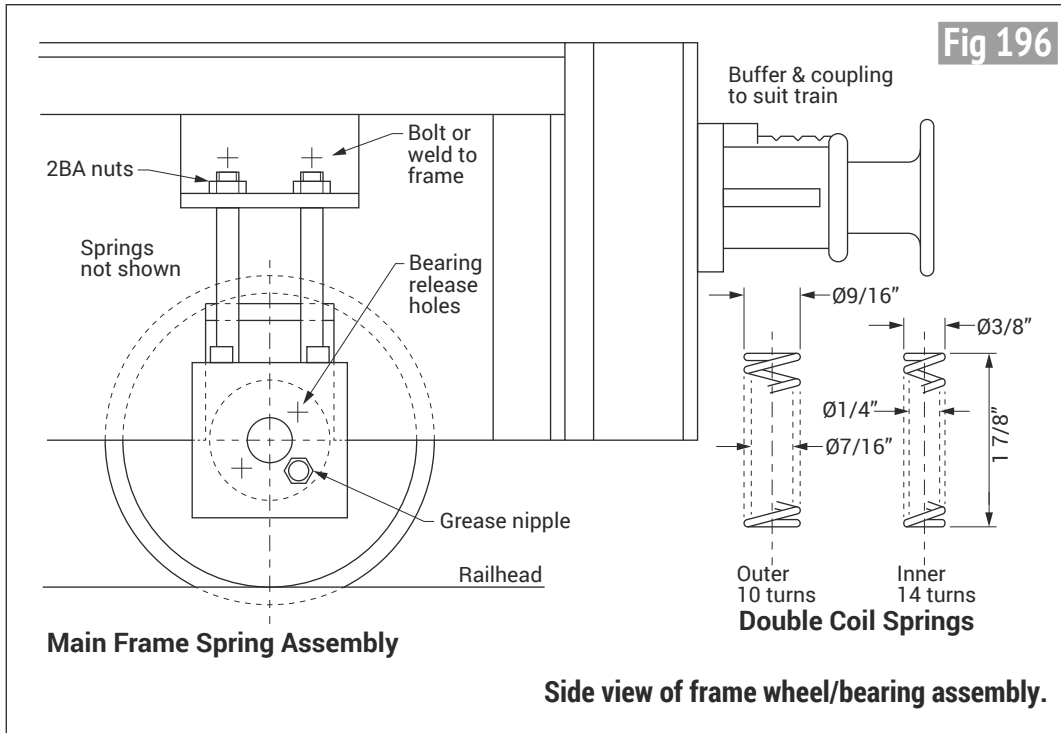
The 5mm wide flat machined on the claw.



The first slot cut to 5mm depth.



The flat fully machined.



for measurement. Due to the temporary loss of the tender there will be 'NO TRAIN TODAY' on the CLR, as Tom Rolt was informed by a small, hand-written sign at Wharf station when visiting the Tallyn for the first time almost 70 years ago (ref 59).

The pony truck

A pony truck, also known as a Bissell truck or bogie, is a leading bogie with only two wheels. Its design is attributed to an American engineer named Bissell, who patented it as long ago as 1858. The name presumably comes from its use with horse-drawn rail cars, which had a leading truck to which the horses were attached.

The components of the pony truck are shown in photo 292 and **figs 197 and 198**.

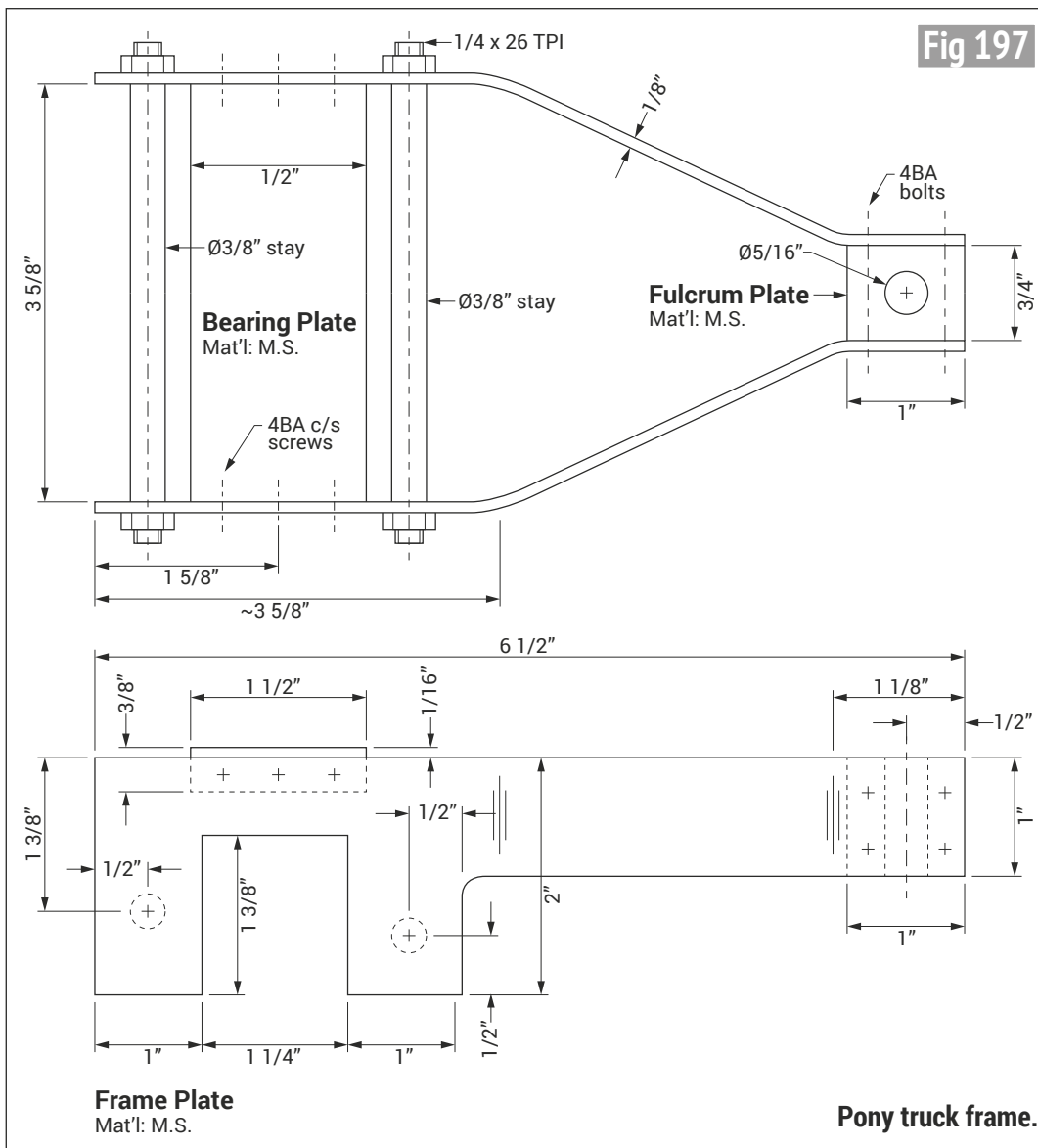
Photograph 293 is a view of the footwell showing the position of the pony truck. The frame is constructed from 1/8 inch mild steel plate.

No side control springs are detailed simply because my tender has none. However, some side control would be useful, for example, to keep the truck central when re-railing and a couple of suitable tension springs wouldn't be too difficult to fit.

The pony truck of the driving tender supports an area for the driver's feet and is shown in **figs 197 and 198**.

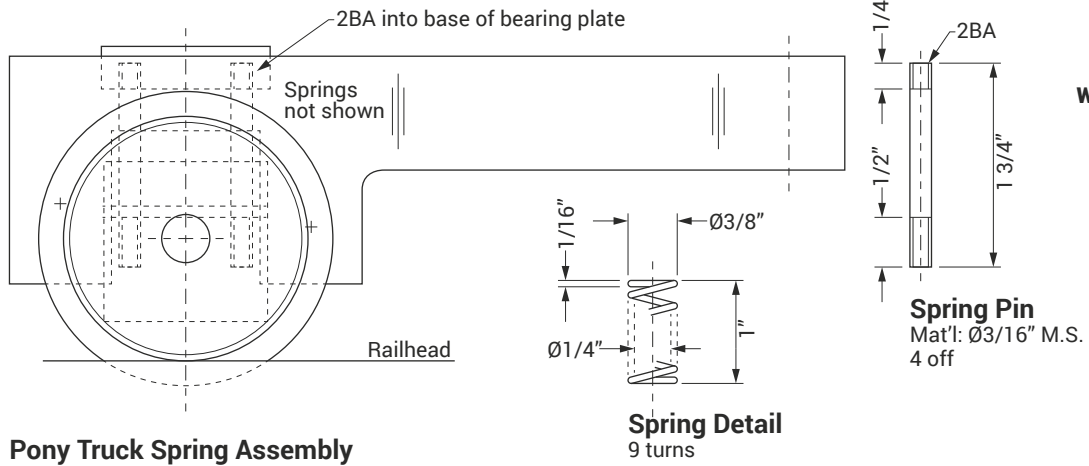
The wheel sets

With outside frames nothing fancy is required of the main wheels; just plain discs of mild steel, suitably turned – and the same goes for the pony truck wheels even though they are outside the truck frame. See **fig 199**. I recessed the face of



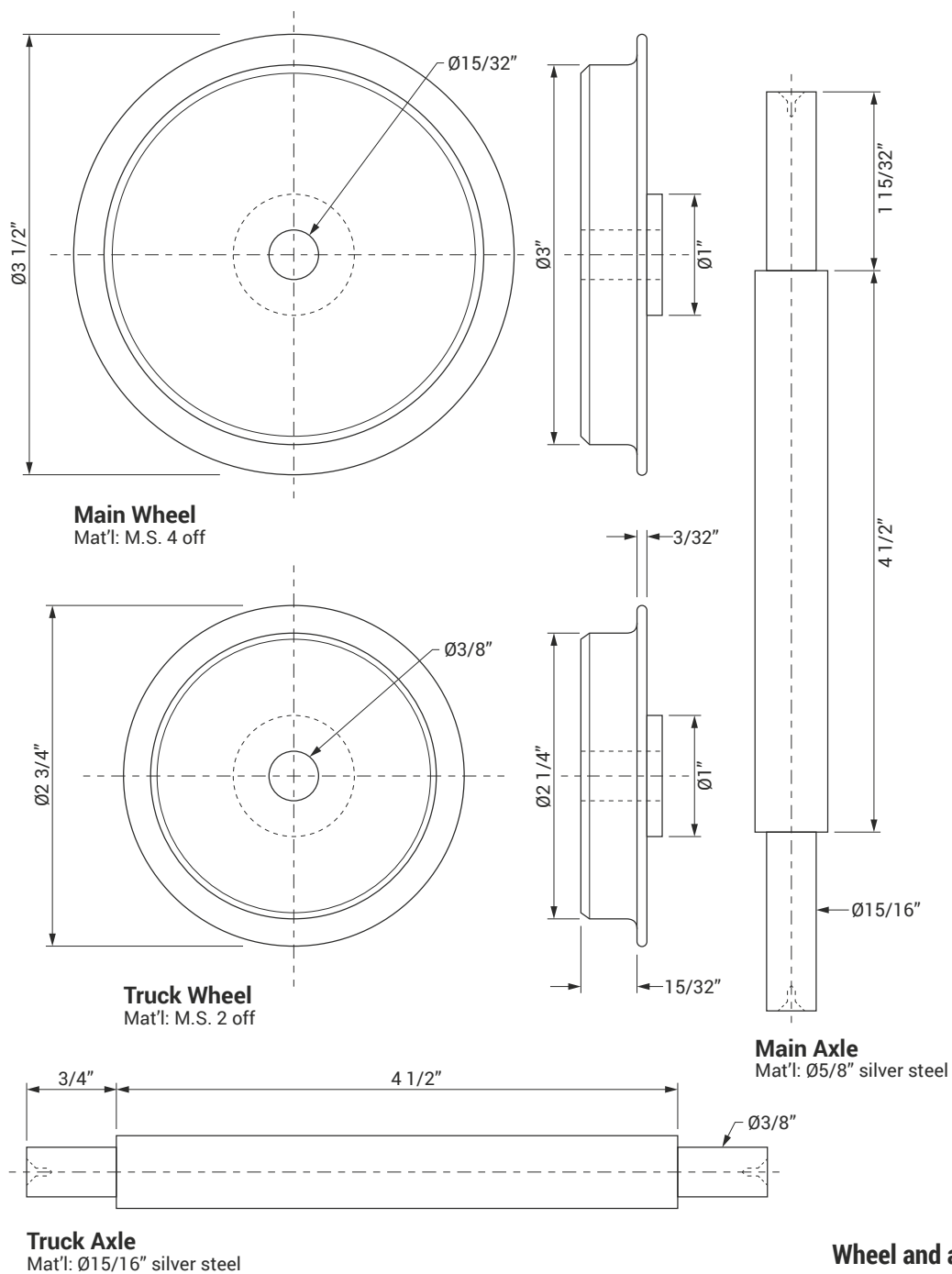
View of footwell.

Fig 198



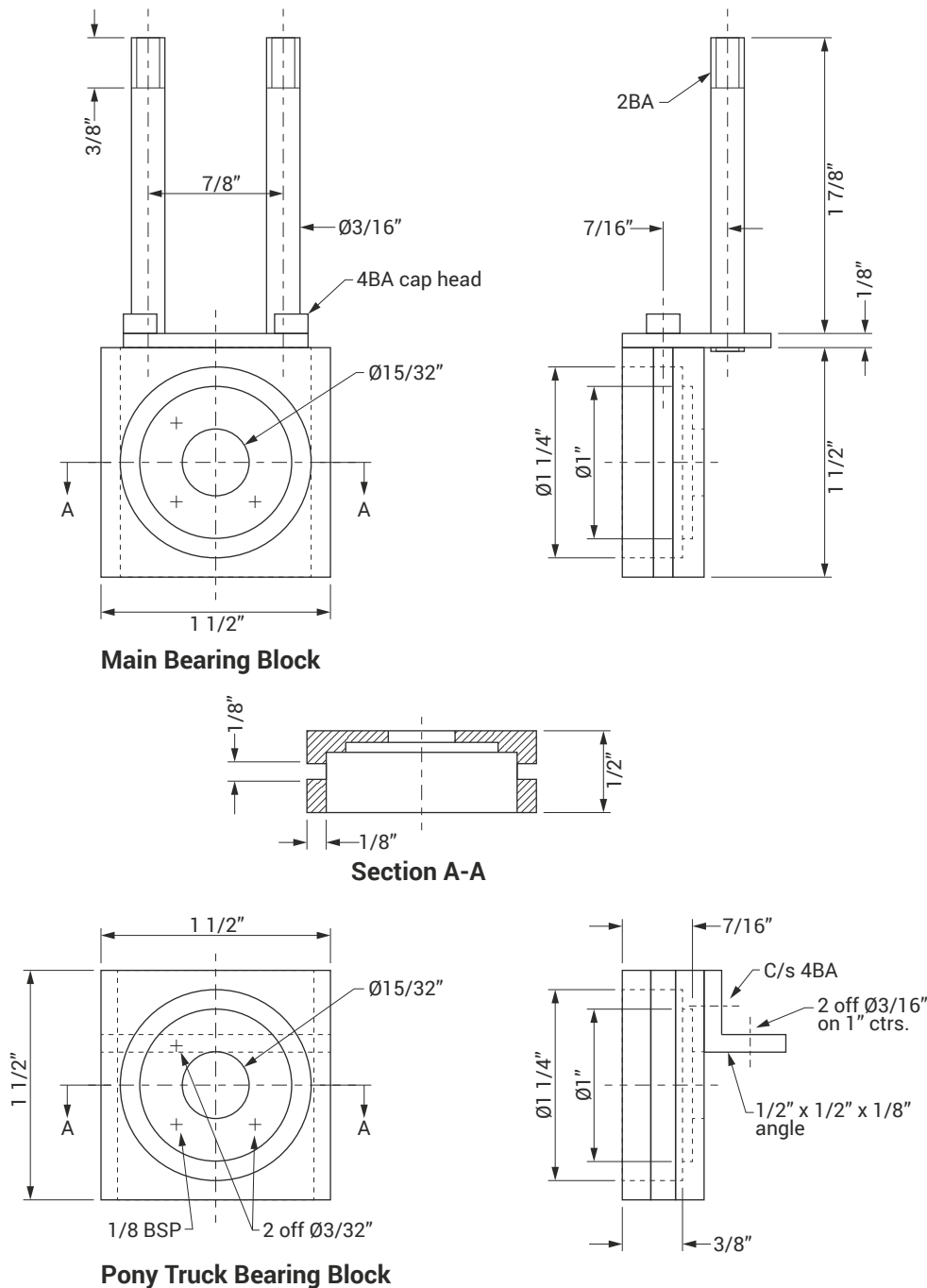
Pony Truck Spring Assembly

Fig 199



Wheel and axle dimensions.

Fig 200



Bearing details.

my wheels to take paint, but there was no point really, as the main wheels are hidden by the outside frames and the pony truck wheels are too small to worry about.

The final wheel dimensions should be based on standards that apply locally; the wheels in fig 199 are dimensioned to suit my railway, which has $\frac{1}{2}$ inch square steel rail and plenty of depth clearance through my points etc. This, of course, will not necessarily be the case on track laid with finer scale components. The 'back

to back' measurement is $4\frac{11}{16}$ inches, which is that normally accepted for five inch gauge.

One important point is that, as the tender carries the weight of the driver, it is essential that all six wheels are fitted with ball races. As noted above, the pony truck wheels are positioned outside the truck frame, whereas the main wheels are inside the main frame. The upshot of this is that the two bearing assemblies need to be on the axle before the pony truck wheel set is completed.

The bearings

The main bearings fit in brass housings (although mild steel would be acceptable), which are mounted on the outside of the frame, along with the springing.

The ball races for the main bearings and for the pony truck are identical. They fit in brass or mild steel housings $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ inch. They are $\frac{3}{8}$ inch thick with an outside diameter of $1\frac{1}{4}$ inches and an inside diameter of $\frac{15}{32}$ inch. See fig 200. Each housing is fitted with a standard grease

nipple. The big advantage of using grease nipples is that grease can be forced in and, at the same time, any grit etc. is forced out. Also, it's not a problem if greasing up is not carried out on a regular basis, as the grease stays in place where it's needed.

Grease nipples are also fitted to the wheel bearing housings on the pony truck and are accessed from the inside of the footwell. The two, diametrically opposed $\frac{3}{32}$ inch diameter holes in the housings make bearing removal easy,

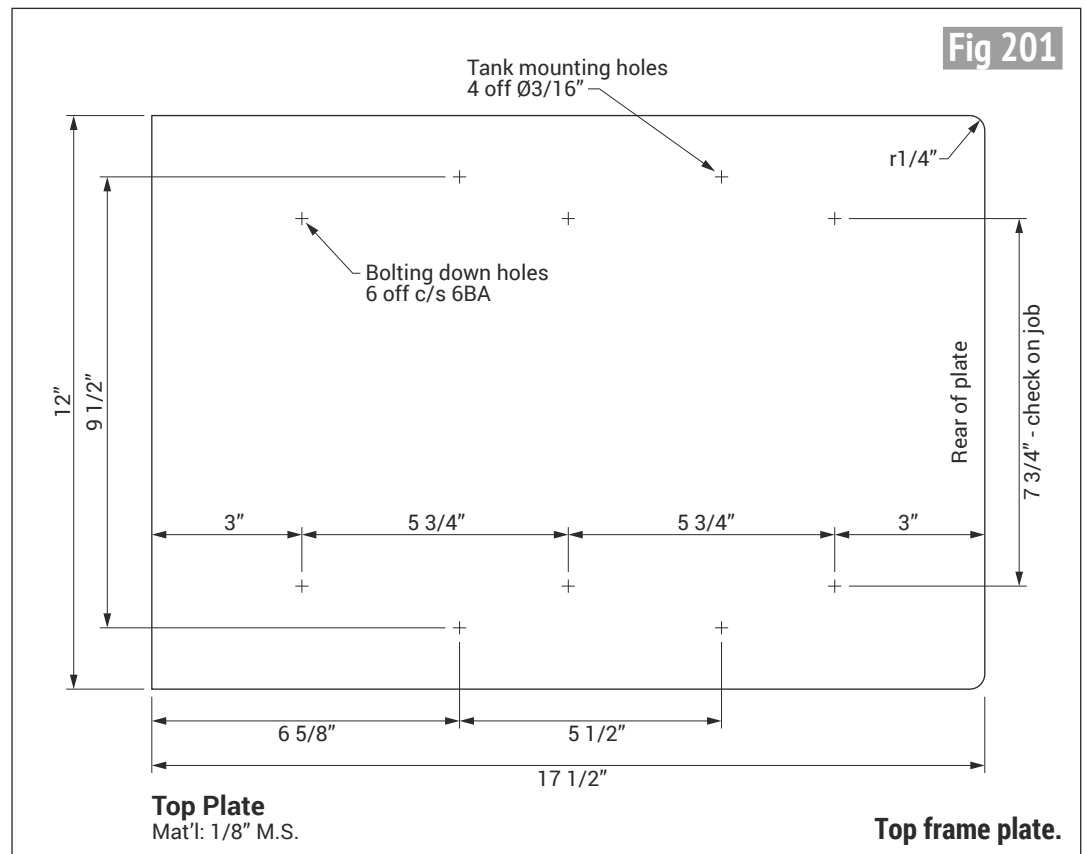
should a replacement be needed. The $\frac{3}{32}$ inch extension on the inside face of the wheel ensures that the wheel bears on the inner race of the bearing and not on the side of the axlebox. At the same time, it helps to keep the grease where it's needed.

The top of the rear tender area is covered by a plate cut from $\frac{1}{8}$ inch thick mild steel sheet – see **fig 201**. This plate supports the water tank complete with the seat for the driver as can be seen in fig 194 and provides a base for the storage area in front of the tank.

●To be continued.

REFERENCE

59. L. T. C. Rolt, *Tallylyn Adventure*, David and Charles, 1971.



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:

Martin Evans, The Editor,
Model Engineer, MyTimeMedia Ltd,
Suite 25S, Eden House,
Enterprise Way, Edenbridge,
Kent, TN8 6HF
F. 01689 869 874
E. mrevans@cantab.net

Publication is at the discretion of the Editor. The content of letters may be edited to suit the magazine style and space available. Correspondents should note that production schedules normally involve a minimum lead time of six weeks for material submitted for publication. In the interests of security, correspondents' details are not published unless specific instructions to do so are given.

Responses to published letters are forwarded as appropriate.

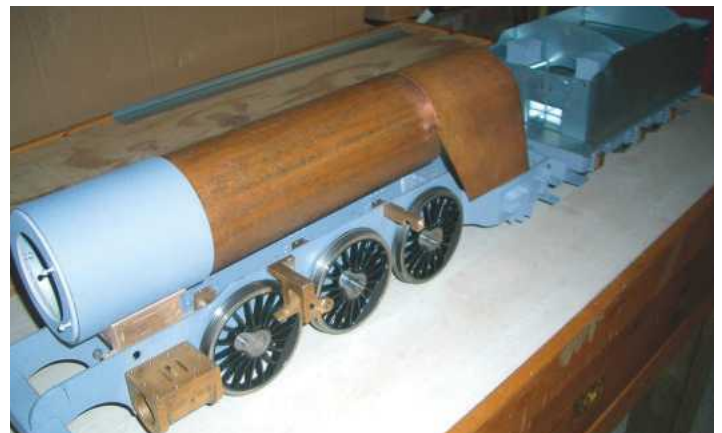
Lockdown

Dear Martin,
Well into the second week of isolation due to the coronavirus it occurred to me how fortunate we model engineers are with such a splendid hobby to fall back on.

Since retiring in 2000 my life has never been busier so, with the stay at home instructions, the radio sailing, hydrotherapy, gym exercise and bird watching have all ceased. Without a hobby most people at home will be getting under each other's feet or nerves. Comments like 'if he asks one more time what can he do to help he will end up under the patio not sweeping it'.

Should you be fortunate enough to have a garden this is a source of relief for all the family but how many times can we cut the grass? We have had the pleasure of spring flowers from iris trough to daffodils and now the expectation of hostas to fill the summer months and a considerable number of visiting birds.

Isolation for the model engineering hobbyist is a



delight, being dispatched to the workshop with uninterrupted periods for cutting, folding, turning, tapping painting etc. is very rewarding, especially when coffee and biscuits are offered in the morning and tea and cake in the afternoon. Missing my physiotherapy, I have gone into serious 'train'ing, as the photo shows.

This year's rescue project, a Gresley V2/V4, is well underway and it's proving difficult to decide which way the finished locomotive will end up; the V2 looks more attractive than the V4 *Bantam*

Cock. The number of finished components is building so quickly that this project should be finished in the late summer when normally it takes me over a year to near completion.

I believe we will get through this virus situation and continue to produce engineering projects that please both others and ourselves. Finally moving around the workshop, rather than sitting watching TV, ensures you do not end up like a locomotive with a tender behind.

Robert Hobbs

The Watt Governor

PART 1

Mitch Barnes gives a short potted history of the 'Watt' Governor which bursts a few myths before outlining how it works.



Any person thinking of images from the industrial revolution tends to look upon the iconic Watt engine governor with fascination: this intriguing and attractive device has found its way into all sorts of generic images from product logos and company badges to the title graphics of *University Challenge* for a few seasons (photos 1 and 2).

What is it and why have one?

I have often been asked what a governor is and what it does so, for the uninitiated, I shall explain.

Through a simple system of weights, levers and links, the governor throttles the amount of steam entering the cylinder and thus keeps the engine's speed fairly constant. It should be emphasised that the Watt governor regulates within a speed range rather than at an accurate speed; greater sensitivity was to come later. Utilising the principle of proportional control, effectively the rod and lever connections it has to the throttle constitute a feedback mechanism that



Perhaps the most evocative symbol of the Industrial Revolution, the 'Watt' Governor. This one's history is unknown but thankfully it is now being preserved at Kew.



A Watt type governor by Hall and Co. on their Woolf compound beam engine in London's Science Museum. The operating lever is activated at the top of the governor on this example which is of the earlier crossed arm variety.

allows it to regulate the flow of fluids (in this case steam) to maintain that almost constant engine speed.

Without a governor, an engine left to run unattended even for a few minutes can have a tendency to 'run away' and overspeed itself, or perhaps to slow down causing the machines it is driving to produce less work; bad news for the mill owner! Some pumping engines such as the magnificent Waddon cross compound horizontal engine at Kew (photo 3) pumped against a head of water in its working life and had no need of a governor because the weight of the water tended to dampen any tendency to overspeed,

but now in preservation with no load to drive against, I found maintaining consistent speed was a constant battle and so have others before me; it now sports a pedal which instantly kills the vacuum in its condenser and this rapidly deals with the problem.

While for most industries the goal of constant speed may at first just seem desirable but not life-threatening to a business, in the textile industry it was critical. This was because variation in the speed of the lineshafting that the engine drove in a textile mill could damage the cloth being produced or, at the very least, spoil its appearance. Irregular speed was especially critical

in silk mills, where variations in engine speed could ruin the regular weave of the cloth.

For the factory owner in the early days, this potential speed problem would be avoided by having a Chappie in Charge, (often referred to as an engine tender) paid to keep a weather eye on the engine and tweak it now and then. For a factory running 24 hours a day at times, this would mean employing three or even four people working in shifts because even back in those days, workmen needed sleep and time off occasionally.

Expensive...

A mechanical substitute would therefore be considered by mill and factory owners to be a rather handy and economical solution as mechanical devices rarely require holidays, even if they do need a bit of maintenance now and then. An engine tender was still required to keep a jaundiced eye on the engine but hopefully this could now be one among a selection of his duties.

Governors came in many forms, almost all utilising the operating principle of, and evolving in one way or another from, what we know as the 'Watt' Governor (**photo 4**), which is the type the public most often imagines when the device is mentioned.

The design commonly referred to as Watt's was the first that was applied to steam engines and lasted on some engines in industry for another century - and up to the present day on preserved examples. Stationary engines carried on working reliably and efficiently for decades on end, being replaced mainly when a cheaper source of motive power arrived, rather than because they were worn out. As the Victorian age trundled on, prodding progress along with it, new engines were equipped with a growing variety of innovative variations of the governor, while some earlier engines were retrofitted with more modern performance-enhancing types during their careers.



An exception to the norm: pumping against a head of water, the horizontal cross compound engine at Kew, from Waddon Pumping Station near Croydon, unusually required no governor to stop it 'running away' during its working life.

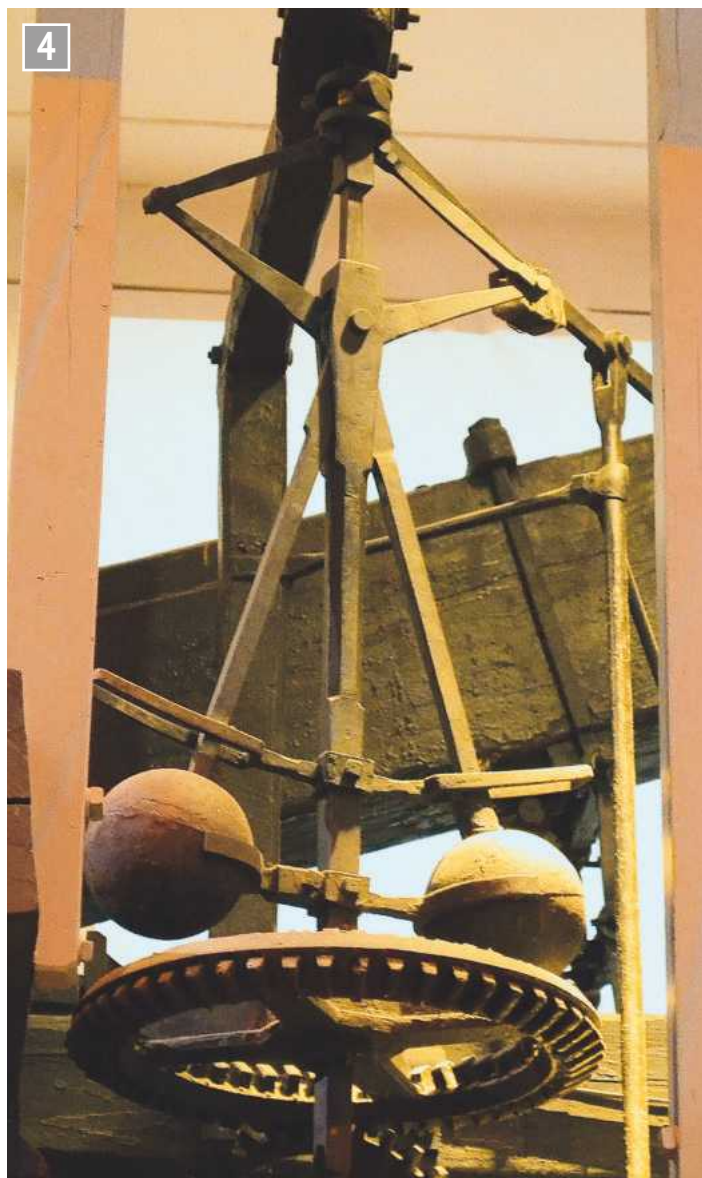
Origins

I'm not sure what the great man thought of the governor being named after him, because he didn't invent it and never claimed that he had even though it is a common urban myth still stated on certain websites and in numerous books that he did. This may be because he was the first to apply any kind of effective speed governing equipment to any steam engine.

The principle of the governor actually originated with another genius, this time of the pre-industrial age.

This was the Dutch polymath inventor, mathematician, astronomer, horologist and physicist Christiaan Huygens (1629-1695) who patented and applied its principle (of centrifugal weights moving outward in proportion to the rotative speed of a shaft they were attached to) during the 1650s to regulate some of his clocks. He didn't stop there, rest on his laurels in a comfy chair and put his feet up with a cigar though; in 1658 he invented the Pendulum Clock.

History doesn't record the origin of the governor as we know it but the actual device may have originated in Holland from Huygens' influence, as it was known to exist on Dutch windmills (10,000 of which existed during their 'golden



Almost the oldest in existence, this Boulton and Watt governor can be seen high up on the 1779 engine in the Science Museum.



An application predating the Steam Engine: here is a governor in Brixton Windmill.

age' of the 16th and 17th Centuries, according to Wm. H. Roll in his book, *The Roll Family Windmill*). Time rolled on so to speak and eventually the device crossed the North Sea to be taken up in England (photo 5).

It would appear that the governor was adopted at first with no restriction such as patents or any such hindrances to deal with; communication in those days was by horse and cart, there being no trains due for another century or so (a bit like today perhaps) so any patentee would be hard pressed to find out if anyone was using his idea, especially if he was across the sea in Holland! It didn't stop people trying it on though, of which more in a moment.

Another century or more would pass before anyone patented the governor as we know it and in fact, two separate patents were granted for the device, one of them shortly before Watt was alerted to it in 1788. In the previous year, Mr Thomas Mead, a carpenter from Port Sandwich in Kent was granted patent No. 1628; two years later a Stephen Hooper, described as 'a gentleman', of Margate, also in Kent was curiously granted patent No. 1706, both of these patents being for a device for regulating millstones and other equipment where first power is not constant. H. W. Dickinson and R. Jenkins in *James Watt*

and the *Steam Engine* state that it is thought by academics that these two patentees came up with the idea independently of each other which strikes me as odd as they are only about five miles apart. Or each of them saw it, noted no patent and decided to take a patent out for themselves.

I confess to being surprised that anyone, let alone two people living so near to each other could patent something that was already in the public domain; the governor was thought to have been known for regulating millstones in Birmingham before these two chaps came along. The Boulton and Watt Collection contains a letter of 24 December 1793 from a J. P. Dearman, stating that a Birmingham baker called Averte had been using one in his own windmill and that such devices had been in use around the area for 20 or 30 years – so 1760s to 1770s – by then.

As for who actually installed them in mills, a freelance and apparently alcoholically-challenged travelling millwright called Kingsford has been recorded as installing some of these devices in the midlands area around this time, falsely claiming to be its inventor, though there is later correspondence suggesting he may have worked for one of the patentees and was trying to make money out of the

device after falling out with his former employer.

Even though Messrs. Meade and Hooper had managed to win patents, it didn't stop other people trying it on. While neither of them were the inventors, they held those patents and despite being in the public domain by the last quarter of the 18th Century, the device still attracted attention from opportunists. A letter in the Boulton & Watt archive refers to a man called Varlo from the Hunslet area of Leeds who had travelled through the midlands in 1791, threatening to prosecute anyone using the idea, claiming he was acting as nominee or executor for an unnamed patentee. It would seem that he held no authority for these actions because the device was already patented by Meade and Hooper by then and I have found no evidence that their patents were successfully challenged by Varlo or anyone else.

How did this device become associated with James Watt?

Whenever what we know as the 'Watt Governor' was mentioned in his presence, James Watt, being a man of honesty and principle (most of the time; he copied musical instruments in his earlier desperate years and faked labels for them were found amongst his Glasgow workshop effects!) was quick to point out that he merely adapted and applied this device to his steam engines.

The earliest records regarding governors in the Boulton and Watt archive appear to show that the prototype development was tried out on their very own 'Lap' Engine, which resides in the Science Museum in South Kensington, London. This was at a time when engine builders

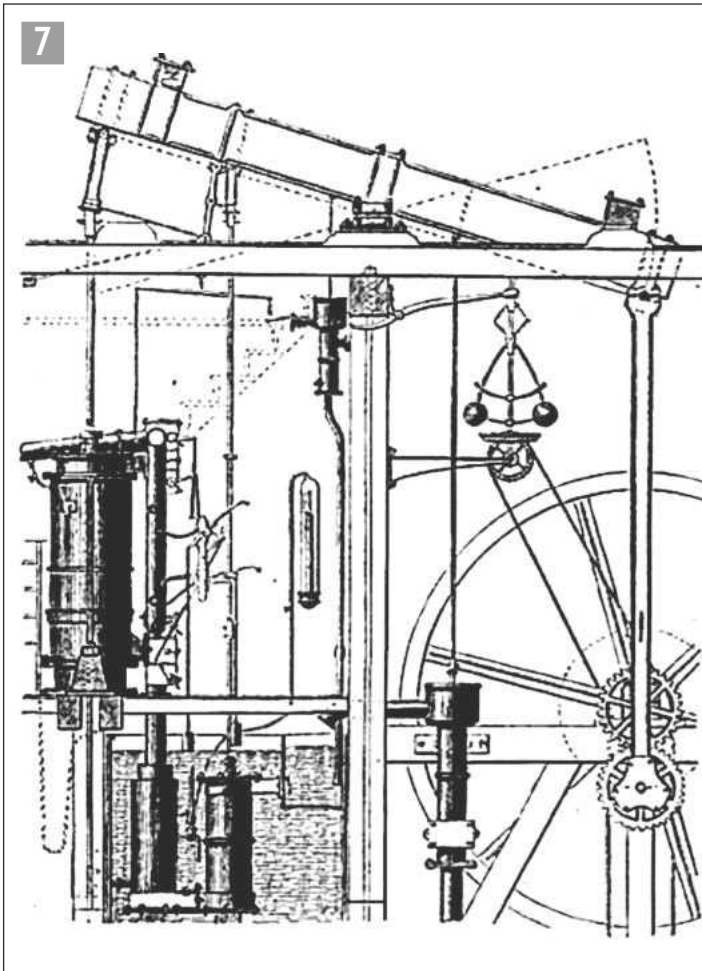
usually tried out their new ideas using their customers as unwitting guinea pigs!

The flyball governor came to Watt's attention through its use at the Albion Mill on the south bank of the Thames in 1788, some two years after the mill had opened. This was a showcase mill built for Boulton and Watt to show Londoners and others how the new-fangled steam power could do practical things such as grind flour. Here they exhibited their new rotative steam engine in a real working environment, displaying their 'Steam Mill' to the gathered crowds (it became a very popular attraction with the public) and proving that profits were available to be made – the mill produced £6,800 worth of flour every week according to Vauxhall Civic Society. It wasn't popular with the established London area millers, though, because its efficiency and economy of scale put them out of business and most if not all of the established mills closed.

Anyway, back in 1788 it is plain from their correspondence that neither



And here it is: the very first governor ever applied to a steam or any other engine, on the Lap Engine of 1788, in London's Science Museum.



Watt's engine at the Albion Mill showing its Governor installed.

Boulton nor Watt was aware of the flyball governor device when it was installed at their Mill to regulate millstones.

I would speculate that the Albion Mill governor was evidently incorporated as a matter of course by the millwrights hired by John Rennie to fit out the mill. The millwrights could well have worked from basic plans and specifications, without the intimate knowledge of either Boulton or Watt, although the former had been working on the idea since 1783, since both of these proprietors would have been far too involved with the larger issues of running their businesses to get involved with details. Like me on most of my professional jobs, or anyone conducting DIY on their home, often no drawings beyond sketches are produced for things we make; we have vague dimensions or a specification of what parts are required and make it up

as we go along. More detailed drawings are sometimes produced when something mechanical or precise needs making but even then, not always.

Ever-open to developing and adopting new or innovative ideas, Boulton noticed the millstone-regulating governor installed at their mill and included a sketch of it in a note he sent back to Watt and his able assistant, John Southern at B&W's Soho manufactory in Birmingham, encouraging them to look at using it on their steam engines too.

By the end of 1788, Boulton and Watt were experimenting with it on their 'Lap' engine at Soho (photo 6).

Within two years, Watt and Southern's version was entering what would become widespread use, copied and retrofitted to engines by other makers as well as on B&W's own products including the engine at the Albion Mill (photo 7); letters exist suggesting to clients that they can obtain a governor mechanism for

retrofit to an existing engine within a week or so. Towards the end of 1790 John Rennie requested to them that five governors should be sent south to him in London where there were customers concerned with speed regulation on their engines too.

Powered by the largest double acting engine so far built at Soho by B&W, the mill thrived for a few years – it monopolised the London flour business - until an unfortunate conflagration (common in wooden-framed buildings such as flour mills, which were lit by flames and candles) early on 2 March 1791 reduced the whole establishment to another kind of powder – ash (photo 8). This was to the delight of B&W's rivals who soon reopened some of their own mills again after a furlough of three years, hopefully employing some of the 500 who had lost their jobs in the conflagration.

●To be continued.



A contemporary print by S. W. Flores showing Boulton and Watt's Albion Mill ablaze on 2 March 1791 and indicating the glee their rivals felt about it.

A New GWR Pannier

PART 18

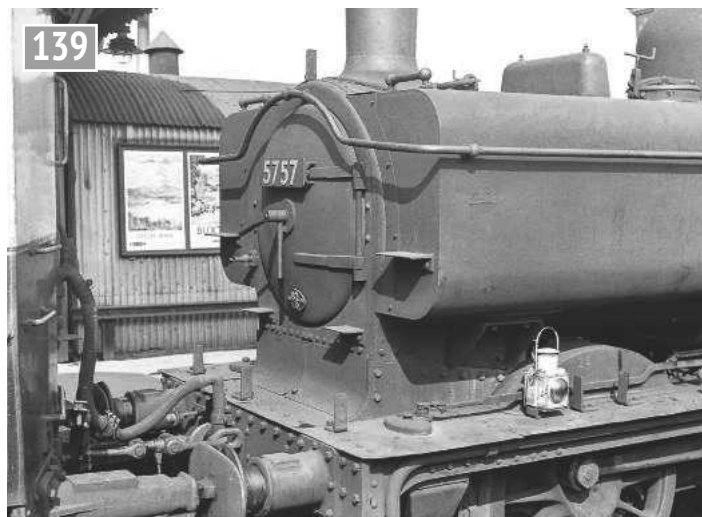
Doug Hewson decides that LBSC's well-known GWR pannier tank design needs a make-over.



Continued from p. 573
M.E.4636, 10 April 2020

Now, this is something which your pannier will not have as LBSC never described it so here it is in all its glory. You probably won't want to use it for fear of it getting into the valve gear but the linkage makes for a far more interesting model, especially the front sanders as the rodding is all on the top so even if you do not want it working it will make a very nice addition to your locomotive.

The sanders at the rear of the locomotive are worked by a vertical rod which is attached to the front of the bunker and has a large handle on top of it. The front sand boxes are operated by what seems like a comparatively flimsy little lever by the fireman's feet. I think it is very important to put all of this detail on the engine as it will certainly enhance your model. I was once on the footplate of 80079 and, at the time, it was pouring with rain. Frank Cronin, who was the driver on that turn, said to me that "We will just lay a trail of sand down as we are setting back down the hill at Bridgnorth to collect our coaches and that way we can get a good start up the hill". Hmm, I thought, that seems like a good idea, only to find that there was no sign of any sand at all but we had made a lovely job of steam cleaning



5757 showing the front sanding gear (photo *The Transport Treasury*).

the rails! The sand boxes were either empty or the sand was too wet with the rain! We ended up struggling a bit with the train and we had a couple of slips on the way up the gradient. It was at the time when there was no speed limit dropping down to Kidderminster, so we absolutely flew down there. The record was about 11 minutes from Bewdley and I think we did it in 10½ minutes on what was then the newly laid track.

Photograph 139 shows 5757 and the view of the left hand sand box from the top, and the nice little elliptical lid. On the underside of the lid is a chain with a butterfly type arrangement on the end of

it to prevent anyone losing it and this is held on with a 12BA bolt. Frank made his by cutting out layers of brass of different thicknesses to form the lids. Whilst we are talking about these lids, also note the lamp irons on the front buffer beam as the middle one is offset towards the front. This is so that the door behind the buffer beam can be opened properly without it fouling the lamp iron. Note also the old type steps on the tank front and smokebox, and the old type tank fillers but the later top feeds.

Photographs 140 and 141 show the left-hand front sand box on 9681 at the Dean Forest Railway and the general view

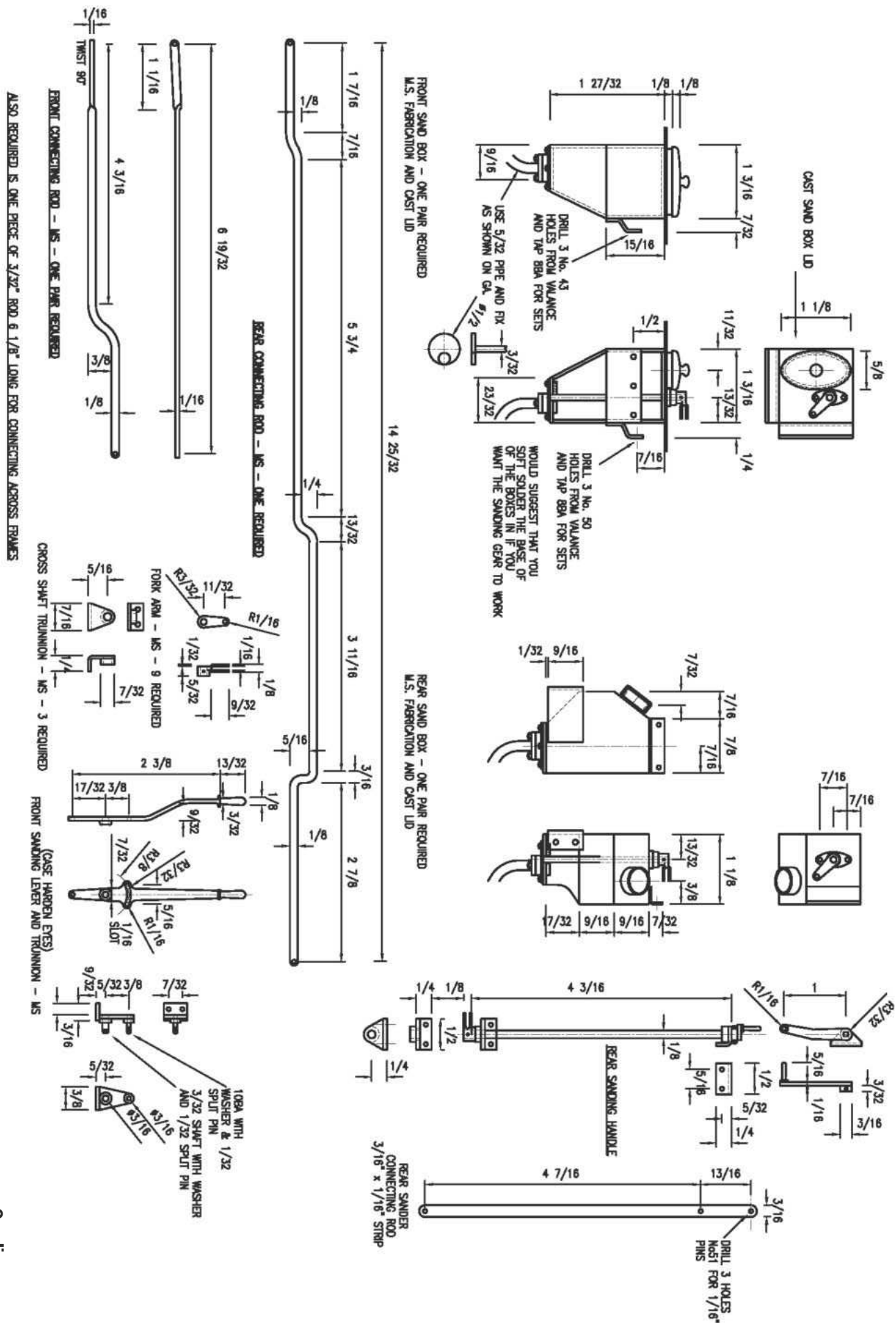


Left-hand front sand box.



Attachment of sanding pipe.

Fig 32





Sanding gear connecting rod.



Right-hand rear sand box.



Sanding gear linkage.



Linkage cross shaft.



Operating handle for the rear sanders.

of the box and the underside to show how the bottom of the box is separate and how the sand pipe is fixed to it. These translate to 12BA bolts around the edge of the box and 10BA to fix the pipe on. This view shows the way in which the bottom is fixed on.

Photograph 142 shows the end of the connecting rod which goes from either side of the engine and has the other fork joint towards the right-hand side under the footplate where it connects to the lever. **Photograph 143** shows the rear sand box - that was the best photograph I could get but at least it shows to the angle welded on to the rear which is supported by the rear step.

Hopefully, you should just be able to follow my drawings (**fig 32**) but I will try to give you a few tips as we go along. The boxes all need fabricating from 20swg steel or brass

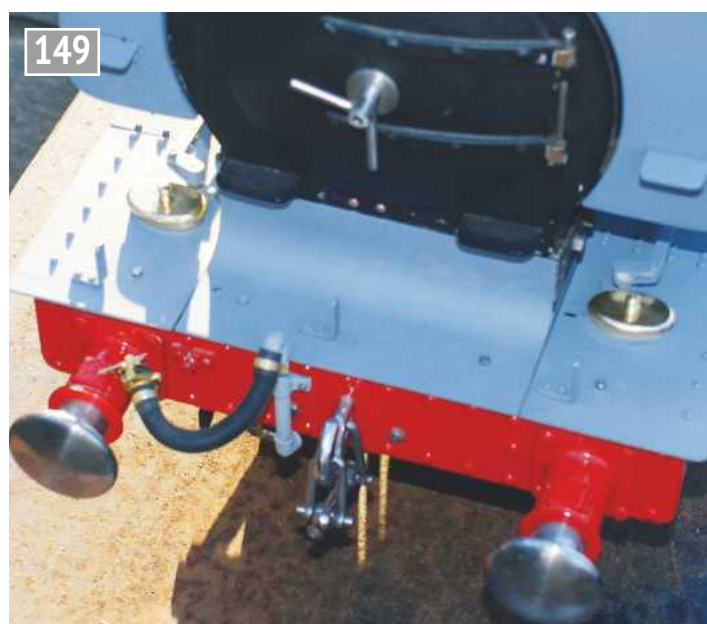
sheet. Remember, though, that brass sheet does not like paint, so I much prefer steel for these jobs. I would make a start on forming the fronts of the leading boxes and then you can lay them flat on another piece of 20swg sheet and solder all round them to make the back plate. However, if you want your sanding gear to work then I would suggest that you soft solder the bases into each box but don't forget to insert your spindle in first! That just needs a ½ inch x 16swg disc on the bottom of it. I think probably the next best thing to do is to make the little lever which operates the front sanders. I just love this kind of detail, especially. It is this kind of detail which really enhances your footplate and it is something you can mess about with whether it works or not! I would start with a piece of 16swg steel plate,



Front sanding lever on Frank's model.



Frank's model showing the sanding gear linkage.



The ends of the linkages on Frank's model.

I think probably the next best thing to do is to make the little lever which operates the front sanders.

I just love this kind of detail, especially.

It is this kind of detail which really enhances your footplate and it is something you can mess about with whether it works or not!

2 $\frac{5}{8}$ inches long and $\frac{1}{2}$ inch wide, and that should give you enough metal to screw a handle on and form the bend in it.

You will see that it is angled towards the cab side by $\frac{3}{32}$ inch. I think the best thing to do is to drill the two holes and then you can put the handle on a pivot and scribe on the curved slot. The top of the handle needs threading 10BA and then you can screw a separate handle on there and silver solder it.

Photograph 144 is the left hand supporting trunnion of the sanding gear linkage and **photo 145** is the right hand side showing the cross shaft. **Photograph 146** is the handle for the rear sanders, and the

little trunnion which supports it. Note that the trough which runs nearly the full the width on the front of the bunker is for the long poker. The handle is offset so that you don't knock your fingers when operating it. Very thoughtful! **Photograph 147** is a close up photograph of Frank's engine showing the front sanding lever connected up. **Photographs 148** and **149** are two more views of Frank's locomotive with the rodding to the front sandbox all now complete.

You now need to make nine little fork joints to fit on the tops of the spindles of the boxes, and also for the cross shaft which goes across the engine to connect the linkage to the front sand boxes.

These can all be fixed to the spindles with small taper pins, preferably $\frac{1}{32}$ inch ones or the thin end of a $\frac{3}{64}$ inch one. For the rear sanders there is a large handle attached to the front of the bunker towards the right-hand side of the engine, in fact, just behind the reverser stand. For this you will need a piece of $\frac{1}{8}$ inch rod (the good old welding rod again!) 4 $\frac{1}{2}$ inches long and all the bits attach to that.

There is a couple of trunnions top and bottom which are just small pieces of $\frac{1}{4} \times \frac{1}{4}$ inch angle $\frac{1}{2}$ inch long drilled for a couple of 10BA bolts. One has the collar inside and the other one has the collar underneath and they bolt to the front of the bunker. The

large handle for the top is just made from a piece of 16swg plate with a $\frac{3}{16}$ inch collar on the top. This has a 12BA bolt through a square to fix it. Below the footplate is a connecting rod which goes across the frames and connects all three of these to the two trunnions on the tops of the sand boxes. I am sure you will enjoy making all these little details and you should make them to enhance your Pansy anyway!

●To be continued.

NEXT TIME

We shall make the fire grate.

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



Work continues on my 5 inch locomotive, in between building other projects, both engineering and mechanical. Currently, a chain drive is being fitted to the other axle. I can't keep referring to 'it' so it needs a name. As I like the chassis so much, I will call it *Deborah*.

I was asked to check a Pure Sonus - 1XT DAB radio. 1) Check internet. It is awash with complaints about lack of servicing details, spare parts or even help, after the warranty expired. 2) Open it. Easier said than done. In particular it appears to have been wired up from the inside, the connecting wires are so short. 3) The display backlight had failed. I spent 4 hours on it and couldn't reach the display, or its LED. Verdict: expensive and a waste of time.

I was hoping to make an important announcement! A momentous event was today, 15th March, expected, but now is deferred. The Ides of March, indeed. I was hoping to announce that the electric Ground Zeppelin, my Bolide, had been driven along the garage floor under its own power! Unfortunately, it was not to be because, although the motor drove the axle pulley and the road wheels were keyed to the axle, the vital attachment of the one to the other had been omitted so the pulley rotated smoothly,

if fruitlessly, on the axle. I blame my assistant, without whom the job would have been completed in half the time... A few minutes with the drill and some shear pins sorted it and now it DOES propel itself along the garage floor. Not with me in it, though. The toothed belt is still jumping teeth under load so I decided to remake the motor mounting, using a revelation which arrived, uninvited but still welcome, as I woke up one morning.

Since the New Year I have been getting up to four calls a day from the Amazon 'phone scam. They became so predictable that I began guessing when they would ring, starting a 8.20am. Once I was within 2 minutes! Anyway, one day, I had a call from a man who spoke English without an accent, saying my computer had been hacked and was wide open to felons and malefactors and asking permission to look at it online. I queried this, since if it was open to all, why did he need my permission? Ignoring my obvious question, he asked me to press the Windows key, which I refused to do. When he asked why, I told him, "I think this is a scam". Immediately, he revealed himself to be an *alumnus* of the Frankie Boyle School of Diplomacy, displaying an extensive knowledge of English contumely and inviting me to proceed elsewhere. Strangely, those calls have not been

received for over a week now...

In this issue: an unreparable radio, a scam, unsophisticated firefighting, Fry's Irish delight, railways on high, 'No spik Hindi' and a baptism of fire.

Carrying on from my visit to the NESM in the previous issue, here is a Leyland FT3 fire engine of 1938 (**photo 1**).

And this is an East German 'Trabant' fire engine. With its cardboard body, the term 'chocolate teapot' comes to mind. This picture is the right way round, despite the notice on the wall... (**photo 2**).

Northern Districts Model Engineering Society declares Ron Collins' 'Crampton' duly finished (**photo 3**). Observers say it is built like a Swiss watch. Said to have a throaty exhaust when working hard but it also has a 'stealth mode' whereby it can sidle round the track in almost 'Whispering Bob Harris' silence. Boiler inspector Phil Gibbons writes on protecting your new steel boiler, inside and out. Laurie Morgan has three Stuart Turner No. 9 engines. He began by making one but in a fit of enthusiasm bought two more casting sets so he then decided to build a twin. He also compares prices. A casting set then (36 years ago) was £25, they are now £384. The price of a basic, machined engine is £3,000!

W. www.ndmes.org.au

Model Engineers' Society, (NI) sends *The Link*, for March, which reports that several initiatives regarding their



Leyland fire engine at NESM, Sheffield.



Cardboard fire engine, the Trabant, at NESM.



Ron Collins' 'Crampton' at NDMES (photo courtesy of Editor, Jim Clark).

move from Cultra are being followed. The Cyril Fry Model Railway Museum in Dublin is well worth a visit. Mr. Fry created over 350 precision models and ran them on his attic layout. His collection is now in the old Casino building, Malahide. So carefully built are they that he was able to brush paint his name on each one. A supplement to *The Link* describes the Society's 50 years at Cultra, and the 75 years of its existence. Their dual gauge, raised track is unique in NI and one of only two in the whole of Ireland. There are also health benefits. It has been established that having interests outside the house is beneficial to the health and well-being of those who partake - and not only the 'Men in Sheds' movement, who, predominantly male, not only live longer but are happier too. W. www.mesni.co.uk

York City & District Society of Model Engineers March *Newsletter*, begins with an item about an 1888 NE snowplough, built by Dave Ventress. This model won 2nd prize at the Doncaster exhibition a few years ago. Not only does it look good, it also clears the snow from his garden railway.

Two of the originals were based at Rosedale in the North York Moors. This was a fascinating system (I've walked the trackbeds - Geoff) and ran at an elevation of over 1000 feet above sea level. The model is planked using wooden Venetian blind slats, which are just the right size. Philip Purkiss has acquired a model steam driven workshop, built in 1936, featured in *Model Engineer* in September 1936, and which won a silver medal at the MEX of that year. It appears to have been built by Joseph Hands, Dorchester Town Clerk of that era. A familiar name to many, Stan Bray, is happily still with us and visited the London Exhibition in January. Don Paton has for sale a rolling chassis 2-6-2 intended for a GWR 4500 *Firefly*, estimated to be worth £1,000 - all proceeds for club funds. Very generous! An item on pickling (re: silver soldering, not "Aye Aye, that's shalott" - Geoff) written by Norman Billingham for the SMEE Journal is most interesting and goes into the chemistry of the matter, plus what to use for best results and what not!

W. www.yorkmodelengineers.co.uk

Willans Hill Shunter, April, from **Wagga Wagga Society of Model Engineers**, opens with Editor, Rodney Mackintosh, writing on the proposed extension to Wagga Wagga Zoo. Details of the route etc. are explained, which sounds very nice, except for the date of commencement - 1st April. Hmmm! An item on the Jerry can and its origins is written by Nigel Vaso. This is remarkably similar to the one to which I referred in *Model Engineer* 4635. The hydro-powered Cane Locomotive ceased to proceed recently, due to the hydro motor seizing, due to suspected overheating. Repositioning the motor and the air tank and relocating the exhaust pipe should see an improvement. Peter Micenko writes on the poor track-keeping of the club's 'Lima' locomotive so he investigated further. He discovered that the bogie pivot was a 'rose' bearing (rod end) which had at one time suffered an indignity to its person and was now 20mm out of position. Effectively, this meant that the leading wheels were not square to the track, hence the poor road holding. Peter then took a holiday and in his absence others checked it further and found many other defects. The engine was then stripped to a bare chassis and a bucket of bolts. But - what a sight for sore eyes now!

W. www.wwsme.com.au

Bradford Model Engineering Society's *Monthly Bulletin*, March, contains John Holroyd's talk on his visit to Indian Railways in 1981. Having obtained permits beforehand, he had no problem visiting engine sheds etc. The

signal box at Jhansi had a roof, to keep the monsoon at bay, but little else (lovely girl - Geoff) due to the heat. At Godhra a sign in the hotel, in Hindi, bore a message at the bottom, in English: 'Although these instructions are written in Hindi, they must be obeyed'. John delivered his presentation without notes or hesitation, quite a feat considering the vast numbers of slides used. He also had three watercolours on show - railway locomotives of course!

Road Vehicle News describes the Hornet Special mentioned in the previous issue. Built by Duncan Pittaway INSIDE his house, it uses a 2CV chassis found in a hedge and shortened, narrowed and inverted. Power from two 1920s Harley-Davidson engines drives the solid rear axle via eight chains and it runs on methanol. A photo from Norway is of a M.U.T.T., a post-war Jeep type of vehicle, see Wikipedia. The dashboard is a mass of instruction plates and controls, never previously seen in one place before, says RVN Editor, David Jackson.

W. www.bradfordmes.co.uk

The **Gauge 1 Model Railway Association Newsletter & Journal** for spring has been received. After the winter's work, new models and layouts are beginning to appear. My next local event is 'Tiny Trains' at Elsecar in early April, Coronavirus permitting. This 'Dignity and Impudence' photograph was taken at the Bexleyheath Show in December. Both models are to the same scale, 1:32 (**photo 4**). Peter Badcock describes a locomotive performance



'Little & Large' at G1MRA's Bexley Heath model railway show (photo courtesy of Jack Ruler).

monitor, or dynamometer. A bicycle milometer measures the speed, the draw gear is connected to a spiral spring driving a dial. This is calibrated by hanging weights on a cord running over a pulley, to convert vertical force to a horizontal one, and connected to the carriages. A tiny camera sends video of the gauge readings to the control point. To put numbers on this mechanical algebra, a 2-3kg passenger coach requires a pull of 25-50 grams on straight and level track. David Cairns writes on the Model Engineers' Fair at Centurion, Pretoria, SA. Formed as the Pretoria Live Steam Club in 1961, they now run on a 13 hectare site. This year a G1/G-Scale track has been added, although it is lifted after each session to deter theft. A not often seen locomotive, the Canadian Pacific 2-10-0 *Selkirk*, is caught at Bexleyheath. (photo 5). The G1MRA appearance at Sinsheim in 2018 galvanised several locals to start a new group, who were promptly invited to the Museum event at Neustadt, which runs the 'Little Cuckoo Train' (photo 6) - www.kuckucksbaenel.de Mike Swain was given a very sad Märklin locomotive from the 1920s for restoration.



Dick Abbott's Canadian Pacific, 5931 Selkirk at Stittsville, Ontario (photo courtesy of Rod Clarke).

Fortunately, a friend of his has one in good condition, so the end result could be envisaged. My brief review covers less than half of the content of this great 96 page publication.

W. www.g1mra.com

Tonbridge Model Engineering Society Newsletter, February, has Bernie Gower explaining that he began as an engine driver in 1951 after attaining the minimum height of 5 feet 1 inch. (He sort of grew into it, then... - Geoff) His

depot was Tunbridge Wells West, now on the Spa Valley Railway, and his introduction to the art, or craft, took place on the run to Crowborough. An anonymous writer, possibly Editor, Robin Howard, explains that the ever-growing contents of his workshop, coupled with advancing age, meant that a requirement for a given item always involves a sort of 'musical chairs', so he has obtained several trolleys and stacking bail crates, as used

by large supermarkets, which makes altering the layout rather easier.

W. www.micklow.wixsite.com/tmes

The Ryedale Society of Model Engineers February Newsletter reports a snippet from *Moors Line*, (Journal of the NYMR) concerning young Eoin Cuddy, who passed out as a signalman at New Bridge box. On his first solo turn he had a derailed 9F to deal with. Truly a baptism of fire and he came through it well. Editor, Bill, arrived at Gilling on 6th February to find the clubroom very full. On enquiry, he was told, "We thought you weren't coming"...

W. www.rsme.org.uk

Graham Copley, Newsletter Editor of **Ottawa Valley Live Steam & Model Engineers** advises that the Montreal Model Train Exposition will be held in Kirkland Arena on 20/21 June.

W. www.montrealmodeltrainexposition.com

And finally: 'Man accused of being addicted to brake fluid claims to be able to stop when he likes'



Speyerbach, an industrial locomotive of 1904 at the 'Cuckoo Train' (photo courtesy of Reiner Frank).

Contact:
geofftheasby@gmail.com

FREE PRIVATE ADVERTS



Did You Know? You can now place your classified ads by email. Just send the text of your ad, maximum 35 words, to neil.wyatt@mytimemedia.com, together with your full name and address, a landline telephone number, whether it's a for sale or wanted and stating that you accept the terms and conditions for placing classified ads – see below. Please note, we do not publish full addresses to protect your security.

Classifieds and Coronavirus

For the duration of the coronavirus outbreak, it is unlikely that people will be able to collect items. Please also avoid unnecessary trips to the post office etc.

Anyone selling or buying must do so on the clear understanding that despatch/delivery is likely to be delayed until it is safe to do so. If you buy or sell something for collection make sure both parties are happy to wait until after the lockdown to finalise the deal.

Please respect the needs of delivery drivers to protect their own safety and, if receiving a parcel take sensible precautions when handling anything packaged by someone else.

Machines and Tools Offered

■ Adolf Erikson shaping machine. 240 volt, tooling, dial gauge, 2 vices on stand. £350. **T. 01560 80083. Launceston.**

■ Workshop clearance, 5 toolmakers parallel clamps 3-6 ins. £15. 4 vee blocks various, £20. 5 inch face plate screw

fitting £15. 1 Magnetic base switch type £10.

T. 020 8363 5936. Enfield, London.

Parts and Materials

■ Full set of castings, frame steel and full set of drawings for a 31/2 inch Don Young 43x 2-6-0 loco. Unused project.

Buyer collects £250 or sensible offers please. **T. 01293 519087. Sussex.**

Wanted

■ A 3" (1:4) running Fowler DCC are Foster DCC traction engine, my 4" is now too big for me.

T. 0049 711574987. Germany

YOUR FREE ADVERTISEMENT (Max 36 words plus phone & town - please write clearly)

☐ WANTED ☐ FOR SALE

Phone:	Date:		Town:		
NO MOBILE PHONES, LAND LINES ONLY		Please use nearest well known town			

Adverts will be published in Model Engineer and Model Engineers' Workshop.

The information below will not appear in the advert.

Name

Address

.....

.....

..... Postcode.....

Mobile D.O.B.....

Email address.....

Do you subscribe to Model Engineer ☐ Model Engineers' Workshop ☐

Please post to:

ME/MEW FREE ADS, c/o Neil Wyatt, MyTimeMedia Ltd, Enterprise House, Enterprise Way, Edenbridge, Kent TN8 6HF

Or email to: neil.wyatt@mytimemedia.com

Photocopies of this form are acceptable.

Adverts will be placed as soon as space is available.

Terms and Conditions:

PLEASE NOTE: this page is for private advertisers only. Do not submit this form if you are a trade advertiser. If you wish to place a trade advert please contact David Holden on 07718 64 86 89 or email david.holden@mytimemedia.com

By supplying your email/ address/ telephone/ mobile number you agree to receive communications via email/ telephone/ post from MyTimeMedia Ltd. and other relevant 3rd parties. Please tick here if you DO NOT wish to receive communications from

MyTimeMedia Ltd: Email ☐ Phone ☐ Post ☐

or other relevant 3rd parties: Email ☐ Phone ☐ Post ☐



Quality, Performance, Reliability

Locos from

£1,095

Driving trucks, control systems and a whole lot more

www.phoenixlocos.com
01704 546 957



POLLY MODEL ENGINEERING LIMITED



NEW! Gauge glass

cutter **only £8.00** each.

Visit our Facebook page

to see our

demonstration video



Box Spanners

Sizes: 2BA -12BA

2mm - 8mm

In-house

British Manufacture

Available individually or in sets

Only £3 each

Trade enquiries welcome



PIPE BENDERS

Will bend pipe from 1/8" - 1/4"

Special price £10.00



Expanding range of In-house manufactured components



See these and our full range of fittings etc, in our 144 page Catalogue

Find us on

Catalogue available £2.50 UK posted £8 international and enquire for further details or visit our website where you will find Polly Locos Kits, drawings and castings for scale models and comprehensive ME Supplies.



Polly Model Engineering Limited
Atlas Mills, Birchwood Avenue,
Long Eaton, Nottingham, NG10 3ND

www.pollymodelengineering.co.uk
Tel: 0115 9736700
email: sales@pollymodelengineering.co.uk

NEWTON TESLA

SMOOTH, QUIET, HIGH PERFORMANCE VARIABLE SPEED CONTROL FOR LATHES AND MILLING MACHINES

Supplier to industry since 1987 of high power speed control systems from 100W to 2,200,000W,

MITSUBISHI INVERTERS from £122 inc VAT

VARIABLE SPEED CONTROL PACKAGES



HIGH PERFORMANCE INVERTERS

For serious machining duty.
240V 1-phase input, 220V 3-phase output, for you to run a dual voltage (Delta wired) three phase motor off your 1-phase supply.
Six sizes from 0.1kW (0.12hp) to 2.2kW(3hp).
Built-in user keypad, display and Speed Dial.
Unique Integrated Emergency Stop Function.
Advanced Torque Vector control for optimum performance. High Reliability.

Fully CE Marked and RoSH Compliant.

Compatible with our Remote Control station Pendants.

Supplied pre-programmed at no extra cost.

REMOTE CONTROL STATIONS from £66 inc VAT

Remote control station Pendants suitable for use with all our Mitsubishi Electric and IMO iDrive Inverters. Industrial grade push buttons and controls.

Featuring START, STOP, FORWARD, REVERSE, RUN/JOG, & Variable Speed potentiometer.

3-wire control - Behaves like a No-Volt-Release. Beware of low quality copies of our original tried and tested controls.

Fitted with 2-metre length of control cable ready for connection to drive, and supplied with wiring diagram.



The 'original' & best lathe speed control system.

Pre-wired systems, and Inverter, Motor, Remote packages available to suit wide a range of metal and wood turning lathes, including; **MYFORD ML7**, Super 7, **BOXFORD**, & **RAGLAN** lathes, Wood turning lathes including; ML8 and MYSTRO and **UNION GRADUATE**.
Pre-wired ready to go! Power Range: 1/2hp, 1hp, 2hp and 3hp.
Super smooth control across entire speed range, giving chatter free machining and excellent finish unattainable with 1PH motors!
Powered from domestic 240V Single Phase mains supply.
Made in the UK, ISO9001:2008 Quality Assured.



Our Pre-wired Lathe Speed Controllers are now covered by a 10-Year Warranty

Newton Tesla (Electric Drives) Ltd,

Warrington Business Park, Long Lane, Warrington,
Cheshire WA2 8TX, Tel: 01925 444773 Fax: 01925 241477

E-mail: info@newton-tesla.com

Visit **www.lathespeedcontrol.com** for more information.



THE MOST VERSATILE TOOL FOR TURNING & FACING

It's easy to see why our best selling turning tool is the SCLCR. It can turn and face a bar without altering the toolpost, and the 80° nose angle gives much more strength than a 60° (triangular) insert. The NJ17 insert cuts steel, stainless, cast iron, phosphor bronze, aluminium, copper, brass etc. Please state shank size required - 8, 10 or 12mm square. Spare inserts £6.94 each for 8-10mm tools, £8.11 for 12mm.

SPECIAL OFFER PRICE £20.00

USE THE OTHER 2 CORNERS FOR ECONOMY!

Our SCRCR rough turning tool uses the same inserts as the SCLCR tools above. The good news is that it uses the other two corners! These very strong 100° corners are rigid enough for rough or intermittent turning. The insert is mounted at 75° to the lathe axis. 10mm sq section (for CCMT06 insert) and 12mm section (for CCMT09 insert).

SPECIAL OFFER PRICE £31.90

PROFILING WHEELS or SHAPING AXLES & PILLARS?

If you need to create complex shapes, our SRDCN button tool is invaluable. The 10mm square shank holds a 5mm dia cutting insert, and gives great versatility, superb strength and excellent tool life. The late Mr D Hudson of Bromsgrove SME used these tools for many years to profile the special form of tyre treads for his self-steering wheel sets with great consistency. Spare inserts just £5.87 each.

SPECIAL OFFER PRICE £34.00

TURN SMALL DIAMETERS with LIVE CENTRE IN PLACE!

The SDJCR tool uses a 55° insert, allowing access to small diameter components when using a tailstock centre. It can also profile back-angles. The NJ17 insert cuts steel, stainless, cast iron, phosphor bronze, brass, copper, aluminium etc. Shank size 8mm or 10mm square section. Spare inserts just £6.94 each.

SPECIAL OFFER PRICE £20.00

A TOP QUALITY BORING BAR FOR YOUR LATHE

Bar Dia.	Min Bore	Here's your chance to own a top quality boring bar which uses our standard CCMT06 insert. Steel shank bars can generally bore to a length of approx 5 times their diameter. Please state bar dia required - 8, 10 or 12mm.
8 mm	10 mm	Spare inserts just £6.94 each.
10 mm	12 mm	
12 mm	16 mm	

**SPECIAL OFFER PRICE £20.00 ea
or buy all 3 sizes for just £55.00!**

INTRODUCING THE GROUNDBREAKING NEW KIT-QD PARTING TOOL!

The new and innovative KIT-QD parting tool has a more secure insert location, stronger body and improved insert design compared to the original KIT-Q-CUT. It has an increased maximum reach of 23mm, giving over 1.3/4" parting capacity in solid bar. As previously, the tool fits the vast majority of ME lathes, including ML7 & ML10 machines, regardless of toolpost type. It comes complete with the key to locate and eject the tough, wear resistant insert. Cuts virtually all materials. Spare inserts just £11.07 each.

SPECIAL OFFER PRICE £69.50

EXTERNAL THREADCUTTING TOOL

These tools use the industry standard 16mm 'laydown' 3-edge inserts. With tough, tungsten carbide inserts, coated with TiAlN for wear resistance and smooth cutting, threads can be cut at very slow speeds if required. Tools are right hand as shown. 55° or 60° insert not included - order separately at £5.65. See our website for more info.

SPECIAL OFFER PRICE £36.50

INTERNAL THREADCUTTING TOOL

These tools use the industry standard 11mm 'laydown' 3-edge inserts. With tough, TiAlN coated tungsten carbide inserts, quality threads can be cut with ease. Tools are right hand as in picture. 10, 12 and 16mm diameters available. 55° or 60° insert not included - order separately at £5.65. See our website for more info.

SPECIAL OFFER PRICE £20.00

DORMER DRILL SETS AT 60% OFF LIST PRICE!

All our Dormer drill sets are on offer at 60% off list price. The Dormer A002 self-centring TIN coated drills are also available to order individually in Metric and Imperial sizes. Please see our web site for details and to place your order.

TURNING, BORING & PARTING TOOLS COMPLETE WITH ONE INSERT.

Please add £3.00 for p&p, irrespective of order size or value



**DONCASTER
EXHIBITION
8-10 MAY '20**

Greenwood Tools Limited

2a Middlefield Road, Bromsgrove, Worcs. B60 2PW
Phone: 01527 877576 - Email: GreenwTool@aol.com

Buy securely online: www.greenwood-tools.co.uk



**Good
Projects!
Good
Reading!**



**ORDER A BOOK AND BE READING IT A
MINUTE LATER ON YOUR COMPUTER,
LAPTOP, TABLET OR YOUR MOBILE PHONE!**

NEW DIGITAL EDITIONS now available include:

"Ellie" The Steam Tram • Allison • £ 9.00

'A Simple 16mm scale live steam locomotive you can build', "Ellie", whose construction is described in this book, is a very simple live steam model locomotive to build, and is a superb first project for any newcomer to model engineering - or as a quick-build model for the more experienced, possibly as a gift for a young steam minded relative. Full drawings, instructions and set-up photos. 64 page A4 format paperback also available £14.20 inc P&P

LASER-CUT parts available for this design - see our website



Stirling Engine Projects Vol. 1 • Rizzo • £12.00

Covers "Bell-Crank" engines - the oldest of all operating mechanisms in Stirling engines, and amongst the simplest. Four chapters cover this mechanism, plus methods of heating and cooling engines, as well as troubleshooting. Six 'Projects' follow describing, in detail, how to build increasingly sophisticated Stirling engines, all with Bell-Crank mechanisms. Three are horizontal engines, three are vertical engines, which will provide interesting exercises for all builders, from the beginner to the more experienced. 128 pages, drawings & numerous colour photos. A4 format paperback also available £17.90 inc P&P



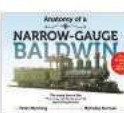
The Tesla Disc Turbine • Cairns • £ 4.20

In Tesla's turbine the bladed segment rotors were replaced by discs, working on the concept of flowing media being converted to rotary motion by friction on the discs. W. Cairns describes in detail the concept and the history of the original engines. He suggests uses for such turbines, all illustrating the extraordinary versatility of the engine. Finally he provides the design and building instructions for a small Tesla turbine which any model engineer can build. Not only does a Tesla Turbine provide a high power to size ratio, it can also be used as a compressor or pump. 34 pages. Numerous drawings and sketches, including 6 pages of drawings. A4 format paperback also available £8.00 inc P&P



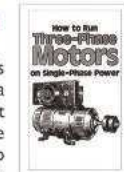
Anatomy of a Narrow Gauge Baldwin Manning • £11.40

Baldwin WVN 37399 is a 60 cm gauge 2-4-0 tender locomotive built in 1911 for the Cantareira Tramway in Brazil. During its long life it has hauled passengers, sugar, limestone and cement on various lines, and now awaits restoration. Modified at various times during its life, it is a superb project for modellers. In the 92 landscape A4 pages of this book Peter Manning provides 150 CAD drawings of the engine and its tenders, largely to 1:24 scale, with basic dimensions included. There is also an excellent history of the loco with 20 photographs, both B&W and colour. No. 37399 would make a wonderful model for 16mm NG, but it would also lend itself to larger scales, notably 7/4" gauge, where it could be used to modify 'Lucky 7', to which it is very similar in its basics.



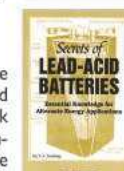
How to Run Three-Phase Motors on Single Phase Power • Lindsay • £ 1.44

Written by Tom Lindsay of Lindsay Publications back in 1977, this is an excellent introduction to the hairy subject of how to run a three phase motor on single phase power. Describes clearly, but without great reams of figures how this can be done by the capacitor, the autoformer or the dynamic converter methods. Also includes basic three-phase and induction motor theory. Complete with drawings, diagrams and capacitor values. 15 pages.



Secrets of Lead Acid Batteries • £ 3.60

The 1999 edition of Tom Lindsay's book, telling how batteries are rated, built, the different types of charging, how they discharge, and why they fail, how to quick charge, equalise cells, rejuvenate a sick battery, test them etc.. Much more than basic information, but without heavy mathematics and chemistry, and a cheap way to save yourself trouble when the car won't start! 48 pages.



**Digital Editions may be ordered and downloaded 24 hours a day,
every day of the year - NO delivery charges!**

**These are not ebooks, so cannot be read on a Kindle or similar
but can be moved from device to device, for example
from a home computer to a tablet if required.**

Digital Editions can ONLY be ordered on our website

Barrow Farm Rode Frome Somerset BA11 6PS 01373 830151

See our full range and buy online at:

www.camdenmin.co.uk

Model Engineer Classified

CNC Cutting service Wood, Metal, Plastic & CNC Conversions

- Need a part for your loco or model CNC machined?
- Need fine engraving done onto metal?
- We have lathes, mills, plasma cutters, laser engravers.
- CNC Machine conversions (both lathes and mills).
- Custom PCB design.

NO job too small give us a ring today for a chat!

Routout cnc +
Tiggy Aviation

Tel: 01664 454795
www.routoutcnc.com

Complete home Workshops Purchased

Essex/Nottinghamshire locations
Distance no object!

Tel: **Mike Bidwell**

01245 222743

m: **07801 343850**

bidwells1@btconnect.com

THINKING OF SELLING YOUR LATHE, MILL OR COMPLETE WORKSHOP?

and want it handled in a quick professional no fuss manner?

Contact Dave Anchell,
Quillstar (Nottingham)

Tel: 0115 9206123

Mob: 07779432060

Email: david@quillstar.co.uk

Artistic fine metalworker needed

Artistic fine metalworker needed to work on antique works of art, working in a long established business with a team of six restorers. The applicant could be an engineer, a jeweller, or a similar person with a wide range of skills including experience on machines. Soft soldering, silver soldering, brazing and the ability to repair and make most items is important. A background of model making, trains, boats etc would be an advantage.

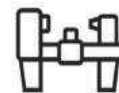
The workshop is in Gt Harwood Lancashire. Please email taantiques@gmail.com

webuyanyworkshop.com

Re-homing model engineers' workshops across the UK



It's never easy selling a workshop that has been carefully established over a lifetime. I can help make it easy for you to find a new home for much loved workshop equipment & tools.



Please email photos to

andrew@webuyanyworkshop.com

Or to discuss how I might be able to help, please call me on **07918 145419**

I am particularly interested in workshops with Myford 7 or 10 lathes

MODEL ENGINEER

BECOME PART OF THE ONLINE COMMUNITY FOR MODEL ENGINEER MAGAZINE

- Get access to exclusive competitions and giveaways
- Exclusive articles and advice from professionals
- Join our forum and make your views count
- Sign up to receive our monthly newsletter
- Subscribe and get additional content including Online Archives dating back to 2001*
- Register for free today and join our friendly community!

WWW.MODEL-ENGINEER.CO.UK

* only available with digital or print + digital subscriptions

FOLLOW US
f b

HOUSE FOR SALE



with large Model Engineers' Workshop



Large 4 bedroom detached family house South Nottinghamshire village.
42' X 9' workshop/garage, 3 phase power, 1/4 Acre plot, open countryside view. Excellent road/rail connections, 4 Local Model Engineering Societies. Great central railway.

VACANT MID 2020, NO CHAIN £460K
TEL 07710 493681

Model Engineer Classified

M-MACHINE
Unit 6 Forge Way, Cleveland Trading Estate
Darlington, Co. Durham. DL1 2PJ
Metals for Model Makers
Contact us for Copper, Brass, Aluminium,
Steel, Phosphor Bronze, etc.
PHONE & FAX 01325 381300
e-mail: sales@m-machine.co.uk
www.m-machine-metals.co.uk

TAPS & DIES
Excellent Quality manufactured-supplied

British-box HQS taps dies cuts stainless
ME5(33pcs) ME4 (30pcs) BA3(35pcs) has
all Model Eng 32+40tpi BA, BSB, MTP etc
THE TAP & DIE CO
445 West Green Rd, London N15 3PL
Tel: 020 8888 1865 Fax: 020 8888 4613
www.tapdie.com & www.tap-die.com

**To advertise
please email
[david.holden@](mailto:david.holden@mytimemedia.com)
mytimemedia.com**

WESTERN STEAM
Model Engineers
Founder Member Assn of Copper Boiler Manufacturers (ME)
COPPER BOILERS
For Locomotive, Traction, Marine &
Stationary engines, to PER cat 2. All
copper construction, silver soldered
throughout using quality materials to the
standards required by the APCBM(ME),
PER, & relevant Model Engineering
Associations. CE marked and certificates
of proof test and conformity supplied.

Write or phone to Helen Verrall:
Unit 4A, Love Lane, Burnham-on-Sea
Somerset, TA8 1EY
Tel. 01273 788 007
Visit our website: www.westernsteam.co.uk

Cowells Small Machine Tool Ltd.
Cowells Small Machine Tools Ltd.
Trenning Road, Little Berriley, Colchester CO7 8SH Essex England
Tel/Fax +44 (0)206 351 792 e-mail sales@cowells.com
www.cowells.com
Manufactures of high precision screwcutting lathes,
8mm horological collet lathes and
milling machines, plus comprehensive accessory range.
Talk directly to the manufacturer


Meccano Spares

New Reproduction and
Pre-owned Original
Meccano Parts.
www.meccanosparses.com
sales@meccanosparses.com
Tel: 01299 660 097

PHOENIX  PRECISION
The Original and Still the best
Phoenix Precision Paints Ltd.
Orwell Court, Wickford, Essex, SS11 8YJ.
www.phoenix-paints.co.uk sales@phoenix-paints.co.uk
CARR'S
Modelling Products
www.carrs-solder.co.uk

GB BOILER SERVICES
COPPER BOILERS FOR LOCOMOTIVES AND TRACTION ENGINES etc.
MADE TO ORDER
Constructed to latest European Standards
7 1/4" guage and P.E.D. category 2 Specialist
 
Enquiries, Prices and Delivery to:
Telephone: **Coventry 02476 733461**
Mobile: **07817 269164** • Email: gb.boilers@sky.com

metalcraftTM
Hand powered metalforming tools
Handy for so many jobs

Also suppliers of
a wide range of
steel, fixings,
clock components
& much more.
Call today for your free catalogue and if you
quote our promo code "MMENGW19", we will
send you our demonstration DVD free of charge.
J & C R Wood Ltd, Dept MMENGW20, 66 Clough Road, HULL HU5 1SR
Tel: 01482 345067 Email: info@jandcrwood.co.uk
OR Visit our on-line store at
www.metal-craft.co.uk

MODEL MAKING METALS
1/32in. to 12in. dia. bright steel, stainless
steel, bronze, spring steel, brass, aluminium,
silver steel, steel tubes, bolts, nuts & screws,
tap dies + drills, white metal casting alloys.
Fine materials, chain, plastic.
Lathe milling machines and equipment,
new and secondhand.
Mail order nationwide and worldwide callers
Mon.-Fri. 9 - 5pm. *All cards welcome.*
Send now for a FREE catalogue or phone
Milton Keynes Metals, Dept. ME,
Ridge Hill Farm, Little Horwood Road, Nash,
Milton Keynes MK17 0EH.
Tel: (01296) 713631 Fax: (01296) 713032
www.mkmetals.co.uk
email: sales@mkmetals.co.uk

To advertise on these pages contact David Holden at david.holden@mytimemedia.com

CLOCK CONSTRUCTION & REPAIR

Books by:

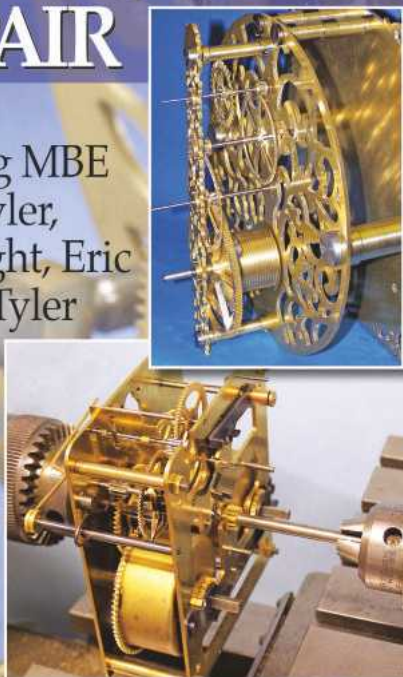
John Wilding MBE
FBHI, E. J. Tyler,
John G. Wright, Eric
Woof, John Tyler
and others.

SPRINGS
BEARINGS
FRAMES
DIALS etc.

**FREE
Catalogue**

Telephone: +44 (0) 1420 487747

www.ritetimepublishing.com



MODEL ENGINEER

BECOME PART OF
THE ONLINE
COMMUNITY FOR
MODEL ENGINEER MAGAZINE



- Get access to exclusive competitions and giveaways
- Exclusive articles and advice from professionals
- Join our forum and make your views count
- Sign up to receive our monthly newsletter
- Subscribe and get additional content including Online Archives dating back to 2001*
- Register for free today and join our friendly community!

WWW.MODEL-ENGINEER.CO.UK

* only available with digital or print + digital subscriptions

FOLLOW US



Tracy Tools Ltd.
Unit 1, Parkfield Units,
Barton Hill Way,
Torquay TQ2 8JG

 **Tracy Tools Ltd**

Visit our brand new website

We ship anywhere in the world

www.tracytools.com

PRODUCTS

- Taps and Dies
- Centre Drills
- Clearance Bargains
- Diestocks
- Drill sets (HSS) boxed
- Drills
- Drill set (loose) HS
- Endmills
- Lathe Tooling
- Reamers
- Slot Drills
- Specials
- Tailstock Die Holder
- Tap Wrenches
- Thread Chasers

Acme
Taps



Taper Shank Drill
HSS



Reamer



Taps
&
Dies



Tracy Tools Ltd

Tap & Die Specialist, Engineer Tool Supplies

Tel: 01803 328 603
Fax: 01803 328 157
Email: info@tracytools.com
www.tracytools.com



POLLY MODEL ENGINEERING LIMITED



Spring Offer 2020

Build and drive your own 5" gauge coal fired 'POLLY Loco'!

British Made with a Proven Track Record

Molly Ann – other models available



Supplied fully machined, assembly requires hand tools only – no riveting, soldering or other complex processes. Kit includes boiler CE certified and accepted under Australian AMBSC regulations. Model can be supplied as full kit (unpainted) or a succession of kit modules.

FREE Tool & maintenance kit

Worth over £200 with all orders placed for Polly Locos

Free tool & maintenance kit will be sent with Kit 1 and can be purchased on its own at the discounted cost of £180 (list price over £200) – offer available with the purchase of any Polly Loco upon receipt of the full deposit. Offer will end 11.05.2020 at Midnight. Tools, lubricants and spares useful in the assembly, operation and maintenance, for years of trouble free running.



Catalogue available £2.50 posted and enquire for further details or visit our website where you will find other Polly Locos, Kits, drawings and castings for scale models and comprehensive ME Supplies.



Polly Model Engineering Limited
Atlas Mills, Birchwood Avenue,
Long Eaton, Nottingham, NG10 3ND

www.pollymodelengineering.co.uk

Tel: 0115 9736700

email: sales@pollymodelengineering.co.uk

DB10VS SUPER LATHE NOW IN STOCK



CHESTER
Hobby Store

Swing Over Bed	250mm
Swing Over Cross Slide	150mm
Distance Between Centres	500mm
Width of Bed	100mm
Spindle Bore	26mm
Spindle Taper	MT4
Speed Range	50 - 2500rpm
Longitudinal Feed Range	0.07 - 0.2mm/r
Metric Threads	0.2 - 3.5mm
Cross Slide Travel	115mm
Top Slide Travel	70mm
Tailstock Quill Travel	70mm
Tailstock Taper	MT2
Motor	0.75kW (1hp)
Weight	145kg
Dimensions	1150 x 560 x 570mm

Features: Digital Spindle Readout • Powered Crossfeed • Variable Spindle Speed



£1,600.00 inc. vat



Includes:

- 125mm 3 & 4 Jaw Chucks
- Fixed and Travelling Steadies
- Machine Tray
- Machine Stand
- Rear Splash Guard
- Lathe Tool Set

Covid 19 Update

Due to Covid 19 our showroom is currently closed to the public. We are, however, still open to orders by telephone and internet and we can be contacted by the methods below.
Many thanks for your continuing support and stay safe.

For more information contact our **Sales Team**, call us on **01244 531631**, email us at **sales@chesterhobbystore.com** or visit **www.chesterhobbystore.com**

Prices may be subject to change without notice