No6

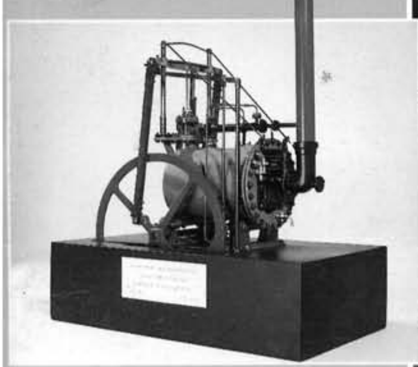
£2.60

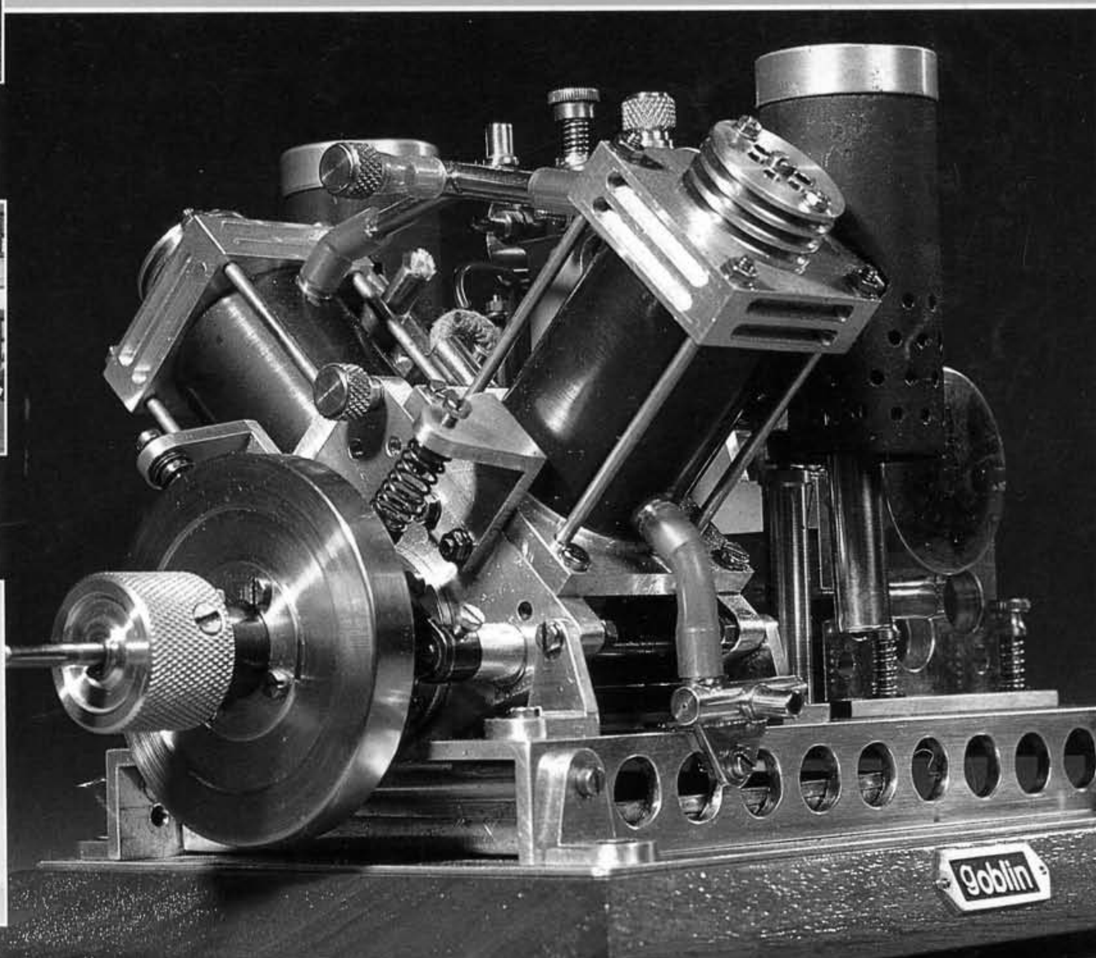
World of MODEL ENGINEERING

PROJECTS TO MAKE - WATER TUBE BOILER
• CHUCK BACK STOP • LATHE SADDLE STOP
• STATIONARY ENGINES

WORKSHOP & LATHE CHOICE

PHOTOGRAPHING MODELS





COMPREHENSIVE SUPPLIERS LISTING

TRACTION ENGINES • BOATS
• LOCOMOTIVES • TRAMS
• MINI STEAM ENGINE
• HMS WARRIOR

06

9 770968 705019

NEXUS

PROBABLY THE MOST VERSATILE LCD WELDING CARTRIDGE EVER

CHAMELEON

SUPPLIED READY TO SLOT INTO YOUR CHOICE OF HELMET SHELL

LESS THAN 1/000TH SECOND SWITCH TIME ARC TO DARK

BATTERY LOW WARNING LIGHT

SENSITIVITY ADJUSTMENT FOR USE IN STRONG SUNLIGHT

SHADES 9EW-12EW AT THE TOUCH OF A SWITCH

- CE APPROVED TO EN169 & EN379
- Batteries easily replaceable & obtainable anywhere - uses 2 x AAA - Average life 500 hours
- On & Off switches plus auto off facility after 20 mins non use
- Reliability second to none Fully Guaranteed
- Delay facility, dark to light - variable from less than 0.1 second
- Lightweight - cartridge with batteries fitted only 120gms

£149 INCLUDING VAT & DELIVERY

OXFORD MIG 181 TURBO

Our latest 180 amp British made Copper wound machine will weld from the thinnest material up to 3/8" plate, runs from a 13 amp point and comes complete with torch, mask & gas regulator. Eight voltage settings and fan cooled for only:

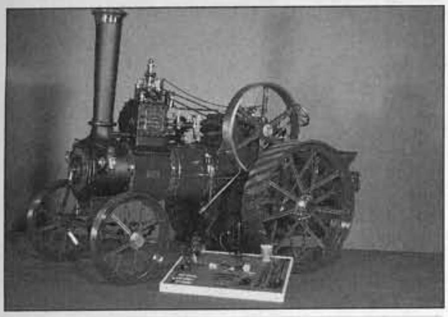
£499 INCLUDING VAT & DELIVERY

C.G. & W Young Ltd. Colne Road, Twickenham, Middx TW2 6QQ

Tel: 0181 894 7767 or 0181 894 5168

PRICES INCLUDE VAT & P+P   CREDIT CARDS WELCOME

CONTENTS



Welcome to the latest edition of World of Model Engineering. This is the 6th edition of this title which is published approx. every two years. Stan Bray wrote the first issue way back in the mid 1980's as a "one-off" publication but he received so many requests for a follow-up that it was decided to produce another issue after a couple of years. And, guess what! He was inundated with requests for yet another issue! And so began what has now become a tradition which looks set to continue.

Unfortunately Stan has now decided that he would like a rest from the pressures of writing an entire magazine on his own and is all set to enjoy his favourite hobby of model engineering at his leisure. I am sure that all his friends and fans will understand and hope that he may now enjoy his life of "retirement" for a long time to come.

When I was asked to take over from Stan for this edition I knew that I would be unable to follow in his footsteps and write the entire issue myself, especially in the short time scale that was available! So I persuaded some very good friends to contribute some of the articles which appear in these pages. I would like to thank them all for their invaluable help and "burning the midnight oil" on my behalf.

During my time as Assistant Editor to Laurie Lawrence and Ted Jolliffe on Model Engineer, I realised that there was always a demand for help and advice from the beginners in this hobby of ours and I hope World of Model Engineering No.6 will help them in some way and encourage more newcomers into the hobby.

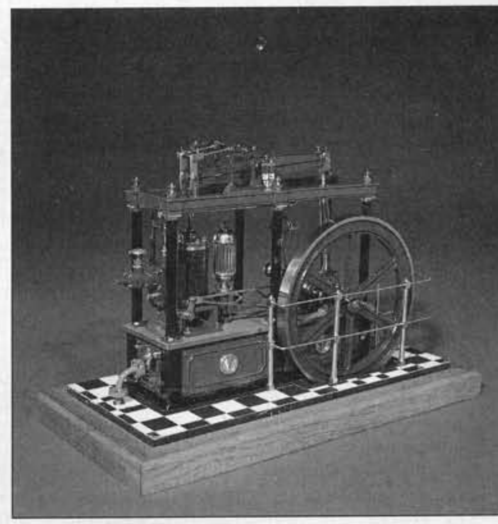
Obviously there is not enough space in one issue to cover all the different fields of model engineering properly, so I have tried to give a "feel" for some of the more popular subjects and have introduced a few new ideas which may appeal to new model engineers in these times of "short cash flow". Smaller scale models do not require such a large outlay for materials and can be made on smaller lathes and so on.

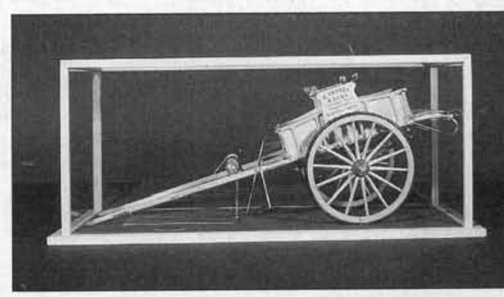
I have incuded a couple of projects to make for the lathe which may give the beginner something to "get his teeth into" and will make useful additions to the workshop. The small water tube boiler is an easy entry into boilermaking and will run various small engines such as the Crosskill's engine which is also included. With a little "light reading" from the Armchair Model Engineer and the description of building H.M.S. Warrior and a short history of Stuart Turner, I hope you will find issue enjoyable.

I wish you all good modelling and, who knows, we may yet see your models at the Model Engineer Exhibition in the future.

Mike Wade

**Published by Nexus Special Interests Ltd
Nexus House Boundary Way, Hemel
Hempstead, Herts HP2 7ST.
Tel: 01442 66551 Fax: 01442 66998**





G & M TOOLS

CURRENT USED STOCK LIST

LATHES

Boxford CUD 5" x 22", 3ph, Fully Tooled	£1200.00
Boxford TUD 5" x 22", Plain Lathe, 3ph	£400.00
Boxford BUD 4½" x 18", 3ph, Tooled	£800.00
Boxford CUD 4½" x 18",1ph, Variable Speed Drive, tooled	£875.00
Harrison M300 6½" x 2" Centre Lathe, Tooled, 1ph	£2650.00
Harrison 8" x 36" Lathe, Gap Bed, Taper Turning, 3ph	£1500.00
Colchester Triumph 2000 7½" x 50" Gap Bed Lathe, tooled	£3750.00
Colchester Bantam 5" x 20", well tooled, 800rpm, 3ph	£1200.00
Pultra Lathe, Cabinet Stand, Cross and Compound Slides, Cut Off Slide, Capstan Att. Lever Op Tailstock, 100 Collets, Suds Unit, Step Collets, Capstan Tooling, Bar Feed, 3 phase	£2000.00
Myford ML10 Bench Top Lathe, tooled, 1ph	£800.00
Cromwell 3½" x 18" Lathe (Vintage)	£300.00
Raglan Varispeed Lathe, Tooling, 1ph	£450.00

DRILLING MACHINES

Eliott Progress 3E Geared Head Drilling Machine, 3MT, 3ph	£800.00
Kerry Geared Head Drilling Machine, 3MT, 3ph	£450.00
Arboga Pillar Drilling Machine, 3 phase	£325.00
Cincinatti Chomienne 1MT Drilling Head, Bolts to Table, 3ph	£110.00
Startrite Mercury Mark 2 Bench Drilling Machine	£175.00
Promex ½" Cap. 5 speed Bench Drilling Machine, 1ph, new	£70.00
Delta Bench Drill ½" Cap. 1ph, new	£165.00
Oldak Tapping Machine (1ph)	£120.00

MILLING MACHINES

Beaver Variable Speed Turret Mill, with DRO, 40INT, 3ph	£2200.00
Elliott 1100 Vertical Milling Machine, 40INT	£1250.00
Myford KF-VM-C Turret Mill, R8 Spindle, 1ph	£975.00
Harrison Horizontal Mill, Power Feed, 3ph	£650.00
Raglan Vertical Mill, 3ph	£500.00
Tom Senior M1 Horizontal/Vertical Milling Machine, 3ph	£1200.00
Tom Senior M1 Horizontal/Vertical Milling Machine, 1ph	£1000.00
Tom Senior M1 Horizontal Mill, 3ph	£500.00
Gravograph Engraver with Type	£450.00
Hauser Bench Milling Machine (no motor), vintage restoration project	£225.00

POWER HACKSAWS

Meddings 300A Circular Cut Off Saw, 3ph, on Stand	£450.00
Omes Mec 250 Circular Cut Off Saw, Stand, Blade, 1ph, NEW	£800.00
Rapidor 6" Power Hacksaw, 3 phase	£250.00
Benchmaster Senior Power Hacksaw, 3 phase	£225.00

GRINDERS, LINISHERS, POLISHERS

Viceroy Horizontal 16" Sharpedge Grinder, 3 phase	£250.00
Viceroy Horizontal 10" Sharpedge Grinder, 3 phase	£200.00
March (Clarkson) Tool & Cutter Grinder, tooled, vgc	£1250.00
Clarkson Tool & Cutter Grinder, tooled, 3ph	£650.00
Astra AR5E Tool & Cutter Grinder, very well tooled	£1500.00
Vison Tool & Cutter Grinder, tooled, 3ph	£750.00
Wolf 6" Bench Grinder, 3ph	£50.00
Wolf 8" Pedestal Grinder, 3ph	£100.00
Delta 6" Bench Grinder, new, 1ph	£50.00
Trimtool Bench Lapping Grinder	£75.00
Delta 10" Bench Grinder, new, 1ph	£150.00
Viceroy Double Ended Polisher, 3 ph	£100.00
Eagle Surface Grinder, c/w 10" x 5" Mag. Chuck	£600.00
Frikla Surface Grinder, c/w 10" x 5" Mag. Chuck	£400.00
Dormer Model 108 Drill Grinder	£550.00
Delapena Bench Honing Machine (No Mandrels) Hence	£100.00

SHAPERS

Boxford 8" Shaper, 3ph, Cabinet Stand, immaculate	£500.00
Elliott 10M Shaper, 3ph	£300.00
Viceroy 10" Shaper, 3ph	£250.00

BOXFORD SPARES AND TOOLING

Change Gears (also fit Southbends)
16T-£10, 18T-£11, 20T-£11, 21T-£11, 22T-£11, 23T-£11, 24T-£11, 26T-£11, 27T-£11, 28T-£11, 30T-£12, 31T-£12, 32T-£12, 35T-£12, 36T-£12, 37T-£12, 38T-£14, 40T-£14, 41T-£14, 43T-£14, 44T-£14, 45T-£14, 46T-£14, 48T-£14, 50T-£15, 52T-£15, 53T-£15, 54T-£15, 56T-£15, 59T-£15, 60T-£15, 64T-£15, 71T-£18, 75T-£18, 79T-£18, 80T-£20, 88T-£22, 100T-£25, 127T-£25.

100/127T Compound Gear	£55.00
127/135T Compound Gear	£65.00
54/18T Compound Gear	£30.00
72/18T Compound Gear	£35.00
32T Tumbler Reverse Gear	£12.00
Duplex Toolpost Grinder, 1ph, For 5" Lathes, Int/Ext, NEW	£440.00
5" Catchplate	£15.00
6" Backplate	£20.00
4" Backplate	£18.00
8¼" Faceplate	£35.00
Collet Drawbar, Adaptor & Nose Cap (New)	£85.00
Boxford Norton Screwcutting Gearbox (Imperial) & Leadscrew	£250.00
Boxford Apron & Saddle Assembly with Power Crossfeed	£200.00
Boxford Saddle Limit Switch Kit	£40.00
New Brook Crompton 1 ph 240 volt Electric Motor	£115.00
Danfoss Contactor & Overload Switch for above	£28.00
Boxford Apron & Saddle (not crossfeed) & Topslide Assy	£75.00
Headstock, Saddle & Apron parts available	P.O.A.
4½" or 5" Tailstock	£125.00
T-slotted Cross Slide, fits Models A, B, C, AUD, BUD, CUD & Southbends (New)	£90.00
Boxford Change Gear Cover	£40.00
Boxford Change Gear Quadrant	£15.00
Boxford Little Giant Toolpost Grinder, immaculate, 240 volt	£300.00

MYFORD SPARES AND TOOLING

Myford Change Gears, 30T-£4.00, 35T-£4.50, 45T-£5.00, 50T-£6.00, 55T-£7.00, 65T-£8.00, 70T-£8.00, 75T-£8.00, 100T-£12.00, 127T-£15.00.

Myford S7 Change Gear Guard (Pt. Nos. A1959 & 1960 etc)	£25.00
Myford S7 Leadscrew Bracket Assy. (Pt. No.74/1134)	£10.00
Myford S7 Headstock Assembly	£200.00
Duplex Toolpost Grinder for Myford Lathes, Int/Ext, New	£245.00
Myford 4½" Catchplate	£15.00
Myford 7" x 5" Surface Plate, Boxed	£45.00
Myford No.30022 Chuck Guard	£25.00
Myford 1133C 16mm Arbor	£25.00
Myford Lever Op., Collet Chuck (as new, no collets)	£200.00
Myford 1419 Thread Dial Indicator	£12.50
Myford Set of 3 Lathe Carriers 33 050 051 & 052	£15.00
Myford Collet Nose & Closing Tube	£20.00
Myford Between Centres Boring Bar & Cutters (as new)	£24.00
Myford 6 Station Capstan Attachment, green,	£450.00
Myford Cut Off Slide, Handwheel Type	£100.00
Myford Raising Blocks	£25.00

RAGLAN SPARES AND TOOLING

Raglan Faceplate	£35.00
Raglan Catchplate	£20.00
Raglan Topslide and Toolpost	£75.00
Raglan Cross-lide Screw & Handle	£35.00
Raglan Topslide Screw & Handle	£25.00
Raglan Tailstock Barrel, Screw & Nut	£25.00
Raglan Taper Turning Attachment for 5" Lathe	£150.00
Raglan 6" Backplate	£22.00
Raglan Saddle and Apron Assembly	£100.00
Raglan Bed and Headstock Assembly, bare	£100.00

Raglan Gears, 30T-£10, 32T-£10, 36T-£10, 42T-£12, 44T-£12, 45T-£12, 48T-£12, 52T-£14, 60T-14.

HARRISON SPARES AND TOOLING

L5 and L6 gears 20T, 25T	£10.00
28T, 32T, 34T, 35T, 36T, 38T	£15.00
40T, 42T, 43T, 44T, 45T, 56T, 48T	£20.00
50T, 55T, 56T, 59T	£25.00
60T, 63T, 64T, 65T, 66T, 69T	£30.00
70T, 72T, 75T, 76T, 77T	£35.00
80T, 81T, 84T, 86T, 90T, 94T	£40.00
100T, 100T Nylon, 108T, 115T, 120T, 120T Nylon	£45.00
126T, 127T, 130T	£50.00
9" Faceplate	£35.00
6" Catchplate	£20.00
5" and 6" 2¼" x 6 TPI Backplates	£15.00
7½", 2¼" x 6TPI Backplates	£20.00
L5/L15 Micrometer Carriage Stop	£50.00
L15 4 Position Indexing Carriage Stop	£75.00
L5 Micrometer Cross Slide Stop	£35.00
L5/L6 Travelling Steady, complete	£30.00
Saddle Apron Cross Slide and Tailstock Handwheels, each	£15.00
Gear Charts, Name Plates and Badges, from	£3.00
Harrison L15 Travelling Steady	£55.00
L5 1⅜" Bore Headstock Sleeves	£18.00
L5 10" 4 Jaw Ind. Chuck (2¼" x 6TPI)	£100.00
L5 Gap Piece	£50.00
L5 Saddle Assembly	£125.00
6" L5 Backplate 1½" x 6TPI	£20.00
Harrison 11" Capstan Attachment	£300.00
Harrison M400 Capstan Attachment, unused	£500.00
Harrison M400 Saddle Drilling Attachment, unused	£150.00

COLCHESTER SPARES AND TOOLING

Colchester Bantam Capstan Attachment	£300.00
Colchester Master Roundhead Capstan Attachment	£300.00
Burnerd Multisize Collet Chuck with 12 Collets (Bantam Fit)	£300.00
Colchester Chipmaster Apron Assy (no handwheel)	£50.00
Colchester Chipmaster Tailstock	£125.00
Colchester Chipmaster Screwcutting Gearbox	£75.00
Colchester Chipmaster Topslide	£100.00
Colchester Chipmaster Rear Splash Guard	£30.00
Colchester Chipmaster Quadrant Various Gears etc, (Lot)	£40.00
Colchester Chipmaster Single Toolpost	£20.00
Triumph 14" Faceplate (L1)	£50.00
Student Roundhead 12" Faceplate	£50.00
Student Roundhead Tailstock	£100.00
Student Roundhead Apron & Saddle Assembly	£75.00
Student Roundhead American Toolpost	£20.00
Student Roundhead 1000 r.p.m. Headstock	£100.00
Student Roundhead Change Gears (Various Sizes)	each £15.00
Student Roundhead Gap Piece	£50.00
Student Travelling Steady (for Roundhead machine)	£30.00
Student 5" Crawford Trugrip Collet Chuck and 7 Collets	£150.00
Mascot Roundhead 16" 4 Jaw Chuck, v.g.c.	£200.00

MACHINE ACCESSORIES

Huron 600mm Rotary Table	£850.00
OMT 300mm Optical Rotary Table with Light Source	£325.00
Schaublin 280mm Rotary Table, Power Drive Arm	£325.00
Hofmann 250mm Rotary Dividing Table	£300.00
Kamakura 12" Rotary Table	£275.00
Excel 10" Rotary Table	£250.00
Elliott 12" Rotary Table	£275.00
Elliott 6" Rotary Table	£150.00
Bessboro SWR2 325mm Swivel & Tilt Rotary Table	£350.00
Jones & Shipman 8" Swivel Machine Vice (as new)	£350.00
Apex 4" Swivel & Tilt Machine Vice (as new)	£150.00
Abwood 6" Swivel & Tilt Vice	£300.00
Spencer Franklin 150mm Power Lock Self Centering Machine Vice, vgc	£200.00
5" Self Centering Bar Vice	£100.00
Apex 4" Universal Vice (as new)	£150.00
10" x 8" x 5" Swivel T Slotted Angle Plate	£85.00
Hofmann Indexing Head 100mm C/H with Tailstock	£175.00
Carl Zeiss 130mm Optical Dividing Head and Tailstock with Light Source on 42" x 18" Plate, vgc, choice of 2	£450.00
Record 4" Drill Vice (new)	£15.00
Clarkson 3 Morse Taper Dedlock 150 Chuck	£45.00
Clarkson Large/Small Adaptor c/w 4 Imperial Collets	£75.00
Clarkson 30 INT Quikswitch Dedlock Chuck	£45.00
Clarkson 30 INT Autolock Chuck (small) with 4 Collets	£85.00
Bristol Erickson Acramill 30INT Collet Chuck - small	£65.00
Clarkson 40 INT Autolock Chuck (large) with 2 Collets	£100.00
Clarkson 40 INT Autolock Chuck (small) with 4 Collets	£80.00
Clarkson 40 INT Dedlock Chuck	£45.00
Clarkson 40 INT Deckel Dedlock Chuck	£35.00
Qualcut 40 INT Collet Chuck c/w 2 x ¾" Collets	£60.00
Clarkson 40 INT FC3 Holder	£25.00
Alfil 45 INT Collet Chuck (unused) 4 small Metric Collets	£75.00
Clarkson 50 INT Autolock Chuck (large) 2 Imp Collets	£75.00
Clarkson 50 INT Autolock Chuck (small) 4 Imp Collets	£75.00
Clarkson 50 INT Dedlock Chuck	£55.00
Clarkson 50 INT FC3 Holder	£45.00
Titanic 50 INT Milling Chuck and 4 small Collets, Imp	£75.00
Bristol Erickson Acramill 50 INT Collet Chuck - large	£125.00
Clarkson 4 MT Autolock Chuck (large) 2 Imp Collets	£80.00
Clarkson 4 MT Autolock Chuck (small) 4 Imp Collets	£80.00
Clarkson 5 MT Autolock Chuck (small) 4 Met. Collets	£80.00
Qualcut 5MT Collet Chuck, 4 collets	£60.00
Modeloy 3 MT light duty Milling Chuck, 3 Imp Collets	£65.00
Modeloy 2 MT light duty Milling Chuck, 3 Imp Collets	£55.00
10 B&S Taper Autolock Chuck with 4 Imp Collets	£80.00
40 INT Stub Milling Arbors ¾", 1", 1¼"	each £20.00
40 INT-1, 2, 3, 4 MT Adaptors	each £25.00
40 INT Milling Arbor ¾"	£40.00
50 INT-40 INT Adaptor	£30.00
50 INT-2, 3, 4 MT Adaptor	each £30.00
50 INT Horizontal Milling Arbor	£50.00
50 INT Ground Test Taper	£20.00
R8-3MT and R8-2MT Adaptors	£22.00
4 MT Precision Offset Boring Head	£65.00
Wolhaupter UPA5 Boring and Facing Head, 5MT Shank	£600.00
Wohlhaupter UPA5 Boring & Facing Head, 50INT Shank	£600.00
Elliott 4MT Boring Head	£100.00
Wohlhaupter UPA3 Boring & Facing Head, 4MT Shank	£375.00
Wohlhaupter UPA4 Boring & Facing Head, 4MT	£500.00
Wolhhaupter UPA 4S5 Boring & Facing Head, 40 Int, Cased	£600.00
Huron Precision Boring and Offset Boring Head, 40INT, Cased	£225.00
4 MT Boring and Facing Head, Made in Germany, UBS GR 2	£250.00
Armag 4MT Boring & Facing Head for irregular bores	£300.00
Crown 4MT Offset Boring Head, Boxed	£65.00
Lockwood 2MT Micro Boring Head (new)	£75.00
Lockwood 40 INT Micro Boring Head (new)	£100.00
Coventry Type CH 1¼" Diehead	£65.00
Coventry Type CH ⁹⁄₁₆" Diehead	£50.00
Coventry ½" Diehead	£50.00
Coventry Type CHS 1" Diehead	£50.00
¾" Landmatic Diehead	£50.00
⅝" Landmatic Diehead	£40.00
Jones & Shipman Tap Relieving & Sharpening Att., v.g.c.	£400.00
J&S UX8004 Radius Wheel Forming Attachment	£150.00
Jacobs ¼", ⅜", ½" Drill Chucks on ¾" Parallel Shanks	£12.00
Jacobs 2 and 3MT Drill Chucks	each £18.00
Ackworthie Goliath Model 201-4 4 Spindle Drill att. 1MT	£100.00
Pratt 12" 4 Jaw Chuck, backplate mounting	£100.00
Pratt 8" and 10" 4 Jaw Chucks, backplate mounting	each £85.00
Pratt 14" 4 Jaw Chuck, D8 Camlock	£200.00
Pratt 12" 4 Jaw Chuck, D8 Camlock	£200.00
Pratt 12" 4 Jaw Chuck, L2 fitting	£150.00
Pratt 12" 4 Jaw Chuck, all steel, heavy duty, unused	£175.00
Pratt 10" 4 Jaw Chuck, D5 Camlock	£150.00
SCA 250mm 3 Jaw Chuck, D8 Camlock	£125.00
1MT, 2MT, or 3MT Tailstock Die Holder (new)	£30.00
3 MT Horizontal Milling Arbor (new)	£75.00
3-2 MT Open ended Ejecting Adaptor (new)	£15.00
3 MT Stub Arbor (new)	£30.00
1MT, 2MT or 3MT Revolving Centre (new)	£20.00
4MT Lathe Centre (unused)	£8.00
5MT Lathe Centre (unused)	£10.00
6MT Fixed Centre (New)	£25.00
26½" Faceplate D 1.8 Camlock	£100.00
Viceroy 5" Catchplate	£15.00
Viceroy Change Gears, Various sizes available	£P.O.A.
Dividing Head Tailstocks, 5" & 7" available	each £30.00
Two Wheel Clamp Type Knurling Tool (Marlco Type) NEW	£45.00
Dickson S2 Toolpost and 5 Holders	£200.00
Dickson S3 Toolholder	£35.00
Herbert Indexer fitted 7" 3 Jaw Chuck	£100.00
Deckel 40INT Horizontal Arbor	£75.00
Crown Windley Bench Centres on T-slotted Plate	£250.00
Spare Centres, Wheeldresser & Manuals for Edgewick Tool & Cutter Grinder	£35.00
Qty. Quick Switch Tooling inc. M.T. Adaptor, 2 Bristol Erickson Chucks & Boring Bars, 16 items	£125.00

WORKSHOP EQUIPMENT

Hilger and Watts Microptic Theodolite with Tripod, cased, Immac	£400.00
Wild Heerbrugg Theodolite with Case and Tripod, Swiss	£450.00
Avery Degrave Chemical Balance, weighs up to 1oz, cased, vgc	£100.00
Oertling Laboratory Balance, 1-3kgs, 2-7lb, Glass Cased, Immac	£150.00
Hilger & Watts MC Clinometer, boxed	£85.00
12" x 12" Crown Windley Granite Surface Plate	£65.00
18" x 24" Black Granite Surface Plate, vgc	£120.00
36" x 24" Surface Table	£150.00
18" x 18" Surface Plate	£50.00
12" x 18" Surface Plate	£45.00
12" x 12" Lapping Plate	£35.00
12" x 8" Lapping Plate	£30.00
2' x 2' Surface Table	£75.00
M&W 18" Engineers Square	£60.00
M&W 8" Engineers Square	£15.00
Brown & Sharpe No. 559 Toolmakers Square	£25.00
Pair Windley Bros 15" x 18" x 24" Hand Scraped Box Cubes	£300.00
6" x 5" x 4¼" T-slotted Box Cube	£50.00
7½" x 6" x 5" T-slotted Box Cube	£50.00
9" x 7" x 6" T-slotted Box Cube	£60.00
12" x 10" x 9" T-slotted Box Cube	£75.00
16" x 10" x 9" T-slotted Box Cube	£85.00
Eclipse No 312 5" x 5" x 7" Swivel Angle Plate	£65.00
12" x 12" x 24" Cast Iron Angle Plate, Hand Scraped	£150.00
7½" x 15" Tee Slotted Swivel Table	£125.00
18" x 14" Tee Slotted Swivel Table	£200.00
6" x 6" x 6" Webbed Angle Plate	£35.00
10" x 8" x 6" Webbed Angle Plate	£35.00
12" x 12" x 12" Angle Plate	£40.00
12" x 9" x 9" Angle Plate	£40.00
M&W Metric Radius Gauge (New)	£7.00
Presto BSW Rethreading Files (New)	£5.00
Number Drill Gauges 1-60	£5.00
General 255M Screw Pitch Gauge .35-6mm Pitch	£7.00
Craftsman 9-4030 Screw Pitch Gauge 4-84TPI	£10.00
Grinding Wheel Dressers	£7.50
M&W Metric Wire Gauge, New	£6.00
Eclipse Junior Hacksaw Blades (Box of 100)	£8.00
250mm Sine Bar	£35.00
Habit 4" Magnetic Sine Bar, boxed	£120.00
New Linear Magnetic Dial Gauge Stands, fitted used Baty or Mercer Clocks	£35.00
New Linear Magnetic Dial Gauge Stand	£26.00
15" x 13", 12" x 12", 19" x 18" Double Casting Boxes	each £20.00
7" x 11" x 10" Centres Grey and Rushton Sine Table, hand scraped, vgc	£130.00
Sigma 6" x 9" Bench Test Centres, vgc, Choice of 6	£60.00
Essex Tool and Gauge Co 15" Centres Sine Bar with Test Centres	£150.00
7" x 4" Magnetic Sine Table	£125.00
22" x 8" Sine Table	£150.00
PVE 100mm Sine Bar	£25.00
Grey and Rushton/Matrix 5" Sine Bar, cased	£25.00
Pitter 10" Sine Bar, Cased	£30.00
Windley Bros Tunnel Type Demagnetiser, 415 Volt	£150.00
Eclipse No 913 Pair of Magnetic Floaters	£25.00
Fimax 18" x 6" Magnetic Chuck	£165.00
Eclipse A510 Magnetic Chuck Adaptor Plate	£35.00
Baty Magnetic Dial Gauge Stand, Boxed	£50.00
Pair Toolmex Vee Blocks 90mm x 70mm x 125mm & Clamps, unused	£100.00
5 and 6 Morse Taper Test Mandrels	each £25.00
9 Jarno Taper Test Mandrel	£25.00
May 3 Morse Taper Gauge	£30.00
PVE 8" x 2" & 2" x 2" Precision Rollers	Pair £25.00
Transwave 5HP Capacity Phase Converter (new)	£320.00
Transwave 3HP Capacity Phase Converter (new)	£254.00
Transwave 1.5HP Phase Converter for smaller motors (new)	£188.00
Elcometer Coating Thickness Gauge, Non Magnetic Paint etc	£15.00
18' x 15' Tarpaulin Sheets	£45.00
21' x 18' Tarpaulin Sheets	£55.00
Felco 500kg Chain Hoist with Carriage	£50.00
Pair Eclipse No 925 Magnetic V Block Holders, vgc	£175.00
Watts 18" Engineers Block Level, Cased	£150.00
M&W No 305 Engineers 6" Spirit Level, Boxed, Unused	£24.00
Coventry Combination Angle Gauge Set	£200.00
Instrumatic Portable Hardness Tester, boxed, vgc	£250.00
Poldi Portable Hardness Tester, boxed	£35.00
Avery Counting Scales, 100/1, 10/1	£75.00
Chesterman 40" Gunters Scales, cased, flexible, light	£15.00
Chesterman 40" Gunters Scales, cased, heavy	£24.00
Brenray Watch Cleaner	£150.00
Leg Vice on Tripod Stand	£75.00
2½ Cwt Blacksmith's Anvil	£120.00
Blacksmith's Cone Mandrel	£100.00
6' x 3' Double Blacksmith's Forge, Fitted Bower, 1ph	£350.00
Kasenit Gas Forge/Brazing Hearth	£200.00
Edwards 48" Straight Folder	£500.00
Keetona 48" x ⅛" Cap. Geared Straight Folder	£750.00
Norton 3DB Flypress with Hunton Bending Attachment	£300.00
Denbigh No.2 Flypress	£85.00
Denbigh No.3 Flypress	£100.00
Stanelco Toggle Press	£100.00
Triangle 15 KVA Spot Welder, 3ph	£150.00
Starrett 9¾" x ¾" x 8T Raker Bandsaw Blade, 18 off, LOT	£35.00
ArcTec 200 Amp 3 Phase Mig Welding Set	£500.00

MEASURING EQUIPMENT

M&W 0-1", 1"-2", 2"-3" Micrometers	each £20.00
M&W 3"-4", 4"-5", 5"-6" Micrometers	each £25.00
M&W 6"-7", 7"-8", 8"-9" Micrometers	each £30.00
M&W 9"-10" Micrometers	£35.00
M&W 10"-11" Micrometers	£40.00
M&W 11"-12" Micrometers	£45.00
M&W 12"-13" Micrometers	£50.00
M&W 13"-14" Micrometers	£55.00
M&W 14"-15" Micrometers	£55.00
M&W 15"-16" Micrometers	£60.00
M&W 16" -17" Micrometers	£60.00
M&W 17"-18" Micrometers	£65.00
M&W 18"-19" Micrometers	£65.00
M&W 19"-20" Micrometers	£70.00
M&W 20" - 21" Micrometers	£75.00
M&W 21" - 22" Micrometers	£80.00
M&W 22"- 23" Micrometers	£85.00
M&W 23"- 24" Micrometers	£90.00
M&W 0-2" Adjustable Micrometer	£30.00
M&W 16" - 20" Adjustable Micrometer	£150.00
M&W 4"- 8" Adjustable Micrometer	£80.00
M&W 8" - 12" Adjustable Micrometer	£100.00
Shardlow 16" - 20" Adjustable Micrometer	£150.00
M&W 18" - 24" Adjustable Micrometer	£165.00
Shardlow 20" - 24" Adjustable Micrometer	£165.00
Shardlow 24" - 30" Adjustable Micrometer	£175.00
M&W 0-½" Micrometer Heads, boxed, unused	each £10.00
M&W 0-1" Micrometer Heads (large dia. thimble)	each £25.00
M&W 0-25mm Micrometer Heads (large dia. thimble)	each £25.00
M&W 175mm-200mm Micrometer	£25.00
Starrett 50-75mm Micrometer	£25.00
Starrett 250mm-275mm Micrometer	£45.00
M&W 275mm-300mm Micrometer	£50.00
Starrett 375mm-400mm Micrometer	£60.00
M&W 200mm-300mm Adjustable Micrometer	£100.00
Starrett 300mm-400mm Adjustable Micrometer	£150.00
M&W 0-1" Micrometer 4" deep throat	£25.00
M&W 3"-4" Micrometer 6" deep throat	£40.00
M&W 1"-2" Micrometer 6" deep throat	£40.00
M&W ¾" - 1¾" Sheet or Plate Mic. (wide anvils)	£25.00
M&W 2"-6" Adjustable Micrometer	£65.00
M&W 0-4" Adjustable Micrometer	£40.00
Starrett 6"-9" Adjustable Micrometer	£75.00
Mitutoyo 8"-12" Adjustable Micrometer	£100.00
Mitutoyo 3"-4" Direct Reading Micrometer	£23.00
Mitutoyo 5"-6" Direct Reading Micrometer	£25.00
M&W 0-300mm Depth Micrometer	£85.00
Shardlow 0-1" Depth Micrometer	£20.00
Starrett No.4468 0-2½" Depth Micrometer	£25.00
Starrett No.446A 0-2" Depth Micrometer	£20.00
Brown & Sharp No.607 0-3" Depth Micrometer	£30.00
Starrett 0-9" Depth Micrometer	£50.00
Carl Mahr 70-95mm Gear Tooth Tangent Micrometer	£25.00
Moore and Wright 2"-3" x 6" Throat Micrometer, boxed, vgc	£35.00
M&W Instrument Maker's Micrometer, boxed, vgc, Revolving Adjustable Anvil with Holes	£100.00
Verdict 6" Height Micrometer with Riser Block	£65.00
Verdict 12" Height Micrometer	£65.00
Tesa 4"-5" Micrometer, Boxed	£25.00
Tesa Tube Micrometer, 0-1"	£30.00
Sigma 0-2" Bench Micrometer	£60.00
Sigma 0-4" Bench Micrometer	£100.00
Baty Dial Gauge, Imperial	£15.00
Mercer Dial Gauge, Metric	£15.00
Boxed Set of 16 Hoffman Precision Rollers ³⁄₁₆"-1¼"	£40.00
Set of 5 Pitter Gauge Block Holders with Base and Measuring Arms, cased	£125.00
M&W 9" Scribing Block	£20.00
M&W 18" Scribing Block	£25.00
Matrix Hob, Worm or Gear Profile Recorder, Boxed, Immaculate	£300.00
Taylor Hobson Alignment Telescope and Collimator in fitted box Light Source, 6 Graticules, Level	£325.00
Negretti and Zambras Thermograph Temperature Recorder, 30/130°F	£75.00
Matrix 12 Sided 30 Degree Polygon, Cased, Immaculate	£250.00
P.V.E. 6 sided Polygon, cased	£150.00
Surrey Tool and Precision Co Travelling Microscope, Light, Box	£150.00
Short and Mason 0-100°F Thermograph, Copper Case	£85.00
Casella Whirling Hygrometer with Spare Wicks, cased	£12.00
90mm x 90mm Glass Graticule for Projector, Marked Grid, Boxed	£28.00
Watson Barnet Konimeter, Cased, 3 Slides, Tests Air Purity	£75.00
Coventry E41 Workshop Slips	£50.00
Micronaid E81 Inspection Grade Slip Set	£250.00
Engineering Services 33 pce, Metric Slip Gauge Set	£125.00
Matrix Pitter Metric Reference Wire Set (12) 2.91-3.05	£30.00
Matrix E81 Imperial Slip Gauge Set, Inspection Grade	£150.00
Mitutoyo Grade 1 E81 Slip Gauge Set	£350.00
Tesa Grade 1 M41 Slip Gauge Set	£200.00
Cary Le Locle 79 Piece Tungsten Calibration Grade Slip Set	£325.00
Coventry Gauge E81 Tungsten Carbide Slip Set, Inspection Grade	£300.00
Coventry Gauge M88 Tungsten Carbide Slip Gauge Set	£350.00
Coventry 83 Piece Imperial Slip Gauge Set, Workshop Grade, vgc	£225.00
Set of Plug Gauges with Mandrel, ⅛"-1 ¼", Boxed	£40.00
British Indicators (Baty) 6"-12" Dial Bore Gauge Set, Boxed	£150.00
Intast Bore Gauge Set, range 10mm-20mm, 11 Setting Probes, boxed	£175.00
Mercer Dial Bore Gauge Set, Range 2"-6:", Boxed, vgc	£125.00
Baty Long Reach Dial Bore Gauge Set, Range ⅞"-2", Boxed	£125.00
Baty Dial Bore Gauge Set, Range 2"-6", Boxed	£125.00
Mercer Dial Bore Gauge Set, Range 6"-12", Boxed	£145.00
Mercer Dial Bore Gauge Set, Range ½"-⅞", 6" Depth, Boxed	£80.00
Mercer Dial Bore Gauge Set, Range ⅞"-2",6" Depth, Boxed	£100.00
Mercer Long Reach Dial Bore Gauge Set, Range 2"-6", 23" Reach	£135.00
Mitutoyo Groove Micrometer, 75mm-100mm, boxed	£30.00
Pair Chesterman 12" x 3" x 1½" Parallels	£65.00
Pair Chesterman 10" x 2" x 1" Parallels	£50.00
Pair Windley 12" x 3" 1½" Parallels	£65.00
Pair Roebuck 12" x 1½" x ¼" Parallels	£50.00
M&W Combination Square	£75.00
Matrix 18" x 3¾" Cylindrical Square, Cased	£75.00
Coventry Gauges 8" Circular Toolmakers Flat, Cased	£85.00
Tesa 2" Precision Glass Optical Flat, Cased	£25.00
OMT 3" Precision Glass Optical Flat, Cased	£30.00
OMT 2" Precision Glass Optical Flat, Cased	£25.00
Chesterman 26" Vernier Caliper	£65.00
Brown & Sharp 5" Vernier Depth Gauge	£15.00
Starrett 12" Vernier Depth Gauge	£25.00
Benson 11" Vernier Depth Gauge	£25.00
Grey & Rushton 10" Vernier Depth Gauge	£20.00
Hudersfield Gauges 24" Vernier Height Gauge	£85.00
Chesterman 42" Vernier Height Gauge	£150.00
Chesterman 26" Vernier Height Gauge	£100.00
Chesterman 20" Vernier Height Gauge	£85.00
Chesterman 12" Vernier Height Gauge	£75.00
PAV 18" Vernier Height Gauge	£100.00
Ritefeel 12" Vernier Height Gauge	£75.00
Mitutoyo 12" Vernier Height Gauge	£100.00
9" Vee Blocks (pair)	£60.00
12" Vee Blocks (pair)	£75.00
12' Steel Straight Edge, cased	£150.00
Moore & Wright No.612 6' Grade A Straight Edge	£125.00
Moore & Wright No.310B 6' Bevelled Straight Edge	£100.00
Moore and Wright No.310 8' Bevelled Straight Edge	£50.00
Moore and Wright 6" Straight Edge, boxed	£20.00
Moore and Wright No 315 Straight Edge Set (3) with Test Bar	£60.00

CUTTERS, DRILLS, ETC

Horizontal S&F Cutters 1" arbor 4", 5", 6"	£5.00, £6.00, £8.00 each
20 Assorted Thread Chasers	£20.00
50 Assorted Reamers up to 1"	£45.00
10 Assorted Reamers 1"-2"	£35.00
Shell End and Slab Mills, Various Sizes	from £5.00

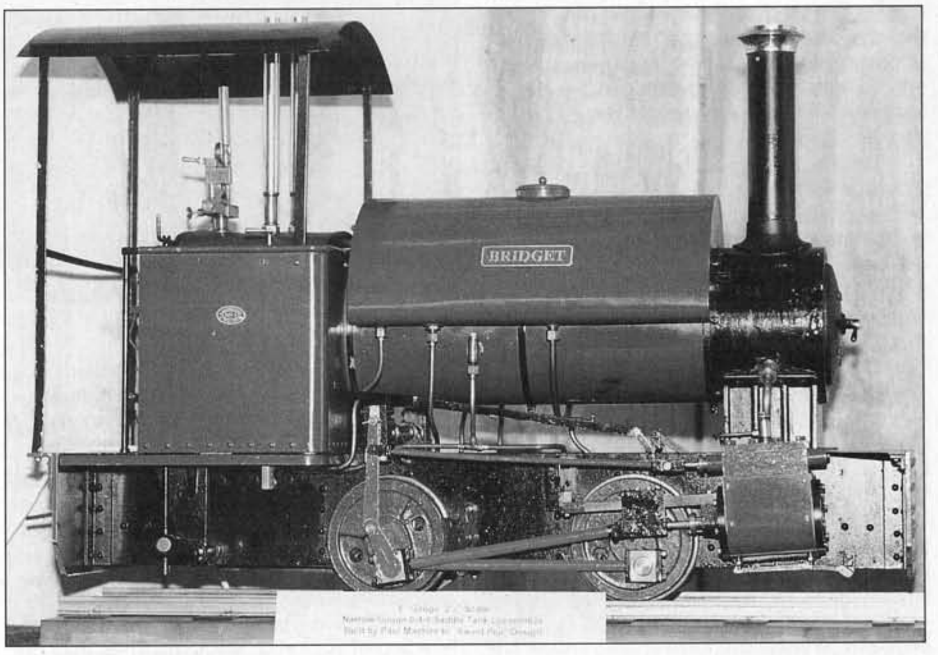
TELEPHONE ENQUIRIES WELCOME ON ANY ITEM OF STOCK.
WE HOLD HUNDREDS OF ITEMS THAT ARE NOT LISTED.
ALL ITEMS SUBJECT TO AVAILABILITY
ALL PRICES ABOVE ARE SUBJECT TO CARRIAGE AND VAT AT 17.5%
WE DELIVER TO ALL PARTS OF THE U.K.
OVER 7000 SQUARE FEET OF TOOLS MACHINES AND WORKSHOP EQUIPMENT

VISA **G AND M TOOLS • THE MILL • MILL LANE • ASHINGTON • WEST SUSSEX RH20 3BX • TEL (01903) 892510 FAX (01903) 892221** Access

WHAT IS MODEL ENGINEERING?

The world of model engineering covers a vast range of subjects and this must surely make it one of the most appealing of all the practical hobbies ...

Using the tender hand pump to top up the boiler water level on a live steam, spirit fired Gauge '1' LMS Patriot 4-6-0 **Lady Godiva.**



5" gauge (2½" scale) narrow gauge locomotive to the "Sweet Pea" design.

For the uninitiated the words Model Engineering may not bring an immediate response as to what sort of hobby it may cover. So, for the newcomer to the hobby (and maybe for some of those already taking part!), I will endeavour to explain what the model engineering hobby is all about.

The Collins dictionary definition of the word 'model' is given as "a representation, usually on a smaller scale, of a device, structure, etc." I think this sums up the word 'model' quite well in the context of the hobby modeller. Generally speaking, the hobbyist will produce a likeness of a particular subject in a different scale. Usually the scale chosen makes the model to a smaller size than the prototype item in question and the reason for this is because the prototype is normally too big to be carried around or to be put on a table for display or demonstration purposes.

In industry it is normal practice to design a subject on the drawing board or a computer and then to have a small scale model made to prove that the original design will look right and actually work before going into full size production. It is much cheaper to build a model and sort out any problems at that stage than it would be to build the full size item and correct any errors that may come to light.

People who build models for pleasure do so for a variety of reasons. Some may take delight in making an accurate replica for their own enjoyment, while others may just enjoy using the machinery and tools involved in the process. If the model is made as a working replica many modellers gain a lot of pleasure and satisfaction from using it and seeing it perform just like its full size original.

So much for the 'model' part of our hobby title. What about the 'engineering' part? The Collins dictionary definition of the word 'engineering' is quite lengthy but I think this shows just how diverse engineering can be as a subject: "engineering - the profession of applying scientific principles to the design, construction, and maintenance of engines, cars, machines, etc. (mechanical engineering), buildings, bridges, roads, etc. (civil engineering), electrical machines and communications systems (electrical engineering), chemical plant and machinery (chemical engineering), or aircraft (aeronautical engineering)."

I think most people tend to think of engineering in terms of the mechanical applications, those that involve the use of metals rather than wood or concrete etc., and indeed quite a large proportion of model engineers seem to work in the various 'metal' fields of locomotives, engines, tools and the like. But the use of other materials such as wood (in horse-drawn vehicles for instance) and brick or concrete (in buildings or bridges) also come under the heading of engineering. Many other materials such as plastics, glass, water and hydraulics can also be used in engineering. The combinations are endless.

MODEL ENGINEERING AS A HOBBY

There is a vast range of subjects which the model engineer can choose from. The following is intended as a brief introduction to some of the more popular branches of the hobby, separate features in this issue will provide a more in-depth look at the subjects and provide more information.

Railway Locomotives

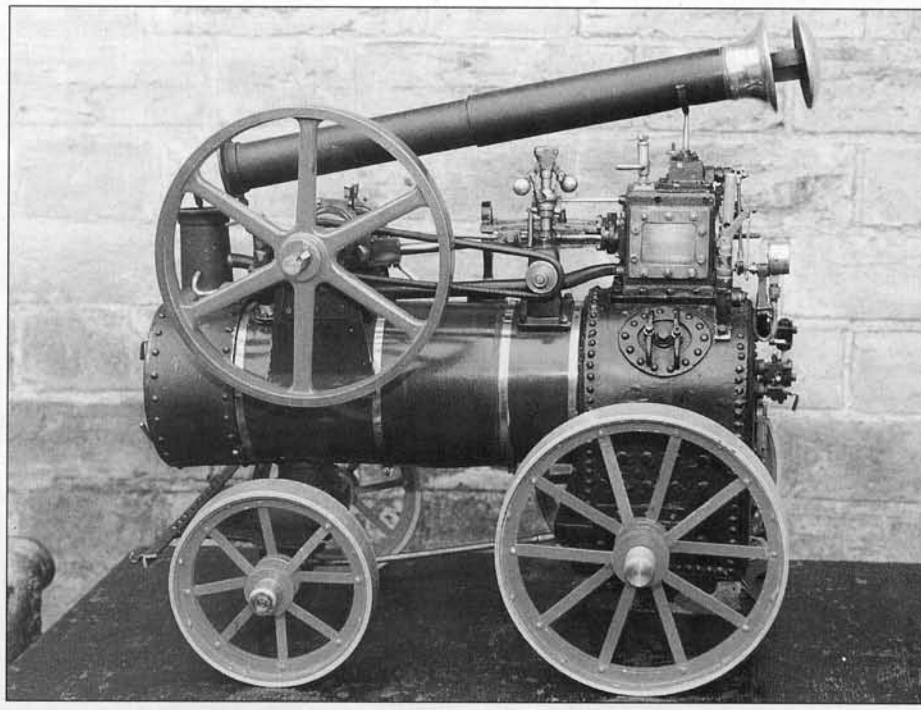
Without doubt one of the most popular branches of the hobby is that of model railway locomotive building. Whether they be steam, electric or internal combustion types the railway locomotive has a lot to offer in modelling terms. Designing, building and running models of railway locomotives can become a most absorbing pastime. There is tremendous scope for research into the history of the prototype as well as searching for details of a particular engine in order to make the model as accurate as possible. Experimentation and development of new ideas using modern materials can be very rewarding.

Railway locomotive models can be built in a large range of scales to suit the workshop facilities and funds available. There are many clubs and societies around the world where help and advice from many years of experience is readily available. The smaller scales offer the facility to run prototypical trains with proper carriages and goods rolling stock, whilst the larger scales enable the driver to sit behind his locomotive and haul trains of full size people.

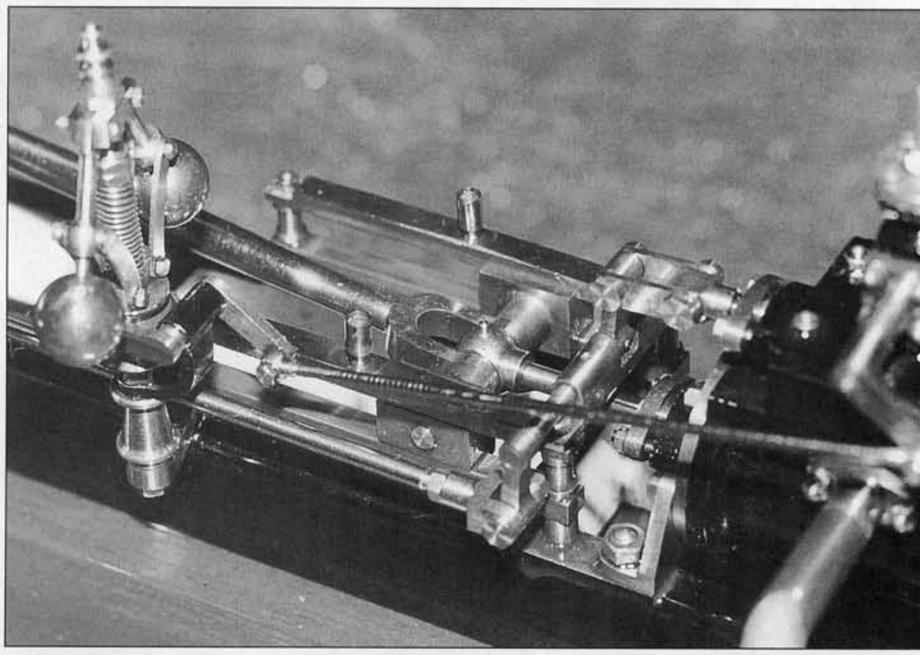
Traction Engines

This is another very popular branch of the hobby and it contains several types of engine. Some engines were built to provide power for farm implements, sometimes to haul loads across fields and also to drive machinery such as threshing boxes. Portable engines were designed to provide an essentially static source of power for machinery. They could be moved from place to place on their own wheels but needed the assistance of a tractor etc. to tow them about. Ploughing engines had large drums of steel cable mounted beneath their boilers and were designed to haul ploughs or drainage implements across a field.

Road locomotives, as the name suggests, were designed to haul loads or trailers on the public roads. Strictly speaking the term 'traction engine' refers to this type of engine. They were capable of pulling enormous loads when required and many different types of vehicle where built including tractors and lorries. A specialised form of road vehicle was the Showman's engine which was used to haul fairground rides from site to site and also to supply electrical power from its generator to drive the rides.



A 1½" scale Marshall portable engine owned by Heather & Tony Taylor.



Details of the motion work on a Stuart "Victoria" horizontal engine built by Norman Phelps.

As with railway locomotives, traction engines may be built in a range of different scales to suit the modeller's requirements, from table top showpieces up to half size models capable of doing 'real' jobs of work. Many model engineering societies have groups of people interested in traction engine modelling.

Stationary Engines

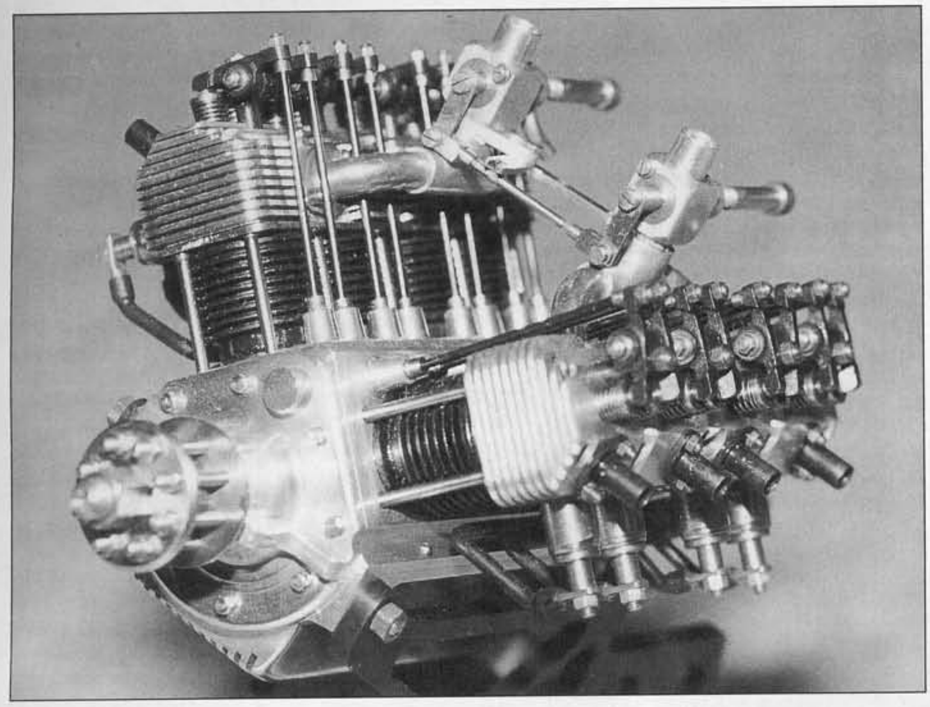
Many different types of engine fall under the heading of stationary engines. They may be driven by steam, hot air, gas, petrol, diesel etc. Some were designed to power static machinery like water pumps or generators, some were built to drive workshop machinery, whilst others were used to power aircraft, boats, cars etc. Those engines which ran on fuels like petrol and diesel are normally referred to as I.C. (or internal combustion) engines. Many fine examples of stationary engines have been built and there are a few steam and I.C. engines which are actually used to provide the power in some model engineers' workshops.

Again, there is quite a large range of scales to choose from, including table top models and going up to quarter or half size engines which may supply power for other items.

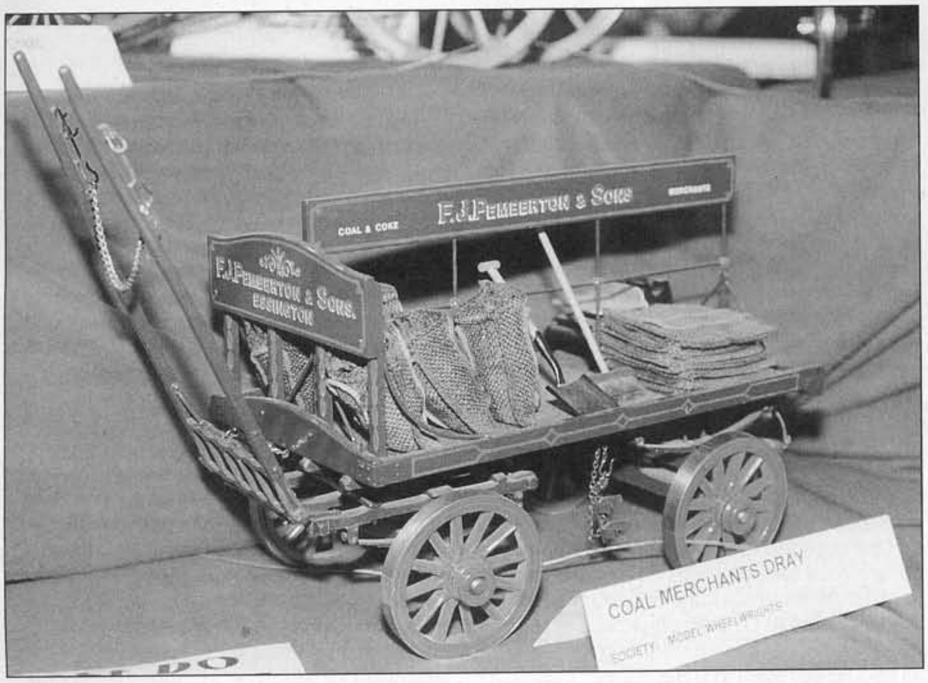
Horsedrawn Vehicles and Fairground Models

This is one area of model engineering which uses wood as the primary material for construction. Many types of horsedrawn vehicle were built and they covered wagons for hauling goods, various types of coaches for carrying passengers, and military vehicles for carrying guns and equipment.

Models of traditional fairground rides and equipment are also quite appealing and usually take the form of working models. The large size of the prototypes often



10.6cc V8 4-stroke I.C. engine (overall length of this model approx. 5").



Horsedrawn vehicles - a coal merchant's dray.

means using a scale which will produce a manageable model which can be accommodated on the table top. Ferris wheels, gallopers, cakewalks, and so on make beautifully intricate models which can often take many hours of research and construction time.

There are many model kits available for constructing horsedrawn vehicles and some fairground items, as well as several plans for building from scratch. There is a reasonable number of specialist traders who can supply most items required for this branch of the hobby.

Model Trams and Tramways

This is a branch of the model engineering hobby which encompasses several disciplines including metalwork, woodwork, glazing and electrical work. There are many different prototypes to model, ranging from the traditional trams of bygone days up to the more recent trams which are now being built to supplement the public transport systems of the nineties.

Tram models generally tend to be built to scales of 4mm, 7mm and $^3/_4$" to the foot. The larger models certainly require model engineering skills for the power bogies and chassis components as well as woodworking skills for the bodyworks.

Model Boats

Some boat models may be classed as model engineering items. The most obvious ones are the steam powered craft with their steam boilers and engines. It can also be very rewarding to make one's own internal combustion engine to drive a model boat. There is even the possibility of constructing a steel model of a steel ship if the modeller has some sheet metal working skills.

Once again there is some support from the model trade who can supply drawings, castings and materials for the boat modeller.

Clockmaking

Another absorbing branch of model engineering is the making of clocks and timepieces. Normally made to full size in terms of scale, clocks have been made for centuries using engineering materials and techniques. It is only in comparatively recent times that electronics have taken over as the driving force in many timepieces. The craft of clockmaking involves the use of many techniques which may at first sight appear to be against the accepted rules of the engineer. Spindle bearings running in a tapered hole are a case in point but there are several good reasons for working in this way. Many of the clockmaker's methods can have a place in the model engineer's repertoire and may sometimes provide the key to overcoming some difficult problems. There are many different types of clock, including the well known grandfather clock (which is more correctly referred to as a longcase clock), mantle clocks, carriage clocks, skeleton clocks, regulator clocks and so on. Clockmaking can be a fascinating hobby which can even prove to be quite useful if one becomes involved in restoration work.

Workshop Tools and Equipment

The making of workshop equipment and tools can provide a lifetime hobby in itself or it may just help to improve the modeller's own workshop. An enormous number of articles and books have been published on this subject. There are many plans and castings etc. available from the Trade to enable the modeller to build almost anything he may require, from a lathe or milling machine right down to hand tools and measuring equipment.

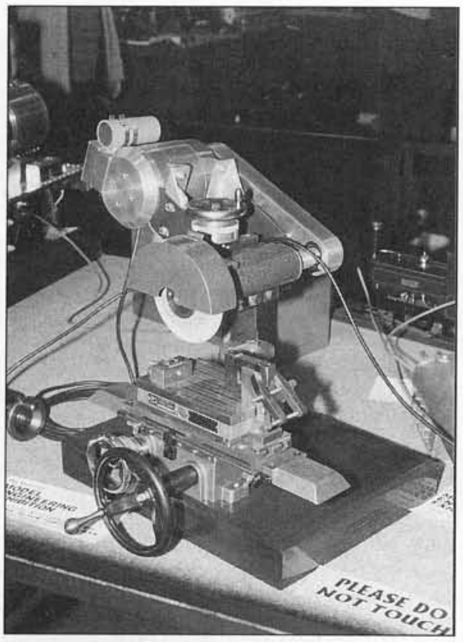
Some people may build a perfect scale replica of a particular lathe etc., while others may wish to build a lathe with which to make other models. The question of scale is usually determined by whether it is to be a scale replica or if it is to be a working tool, in which case it will be made to full size proportions.

Making one's own tools and workshop equipment can prove to be very beneficial in financial terms but it should be remembered that the time spent making the tools shortens the time available for making the models!

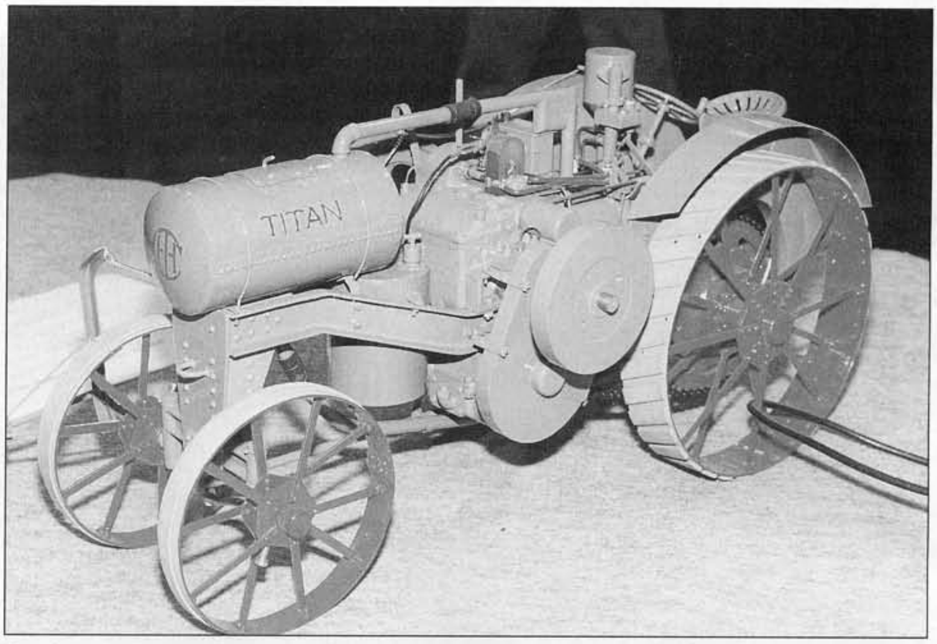
WHAT YOU WILL NEED

Tools and Equipment

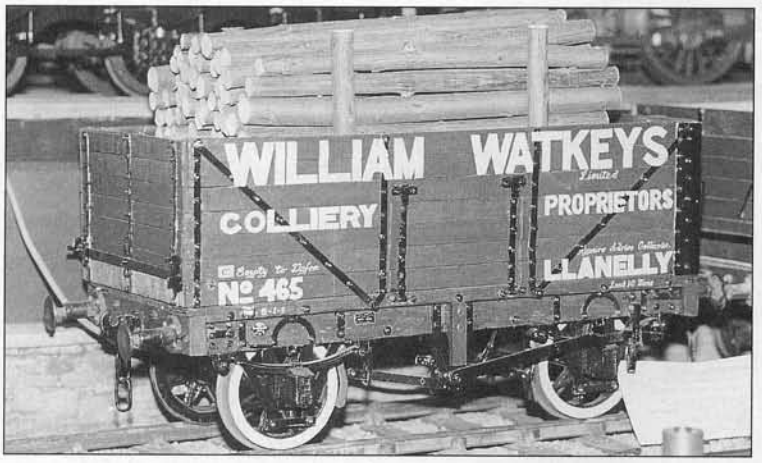
The workshop equipment and tools required for making models of engineering prototypes obviously depends on the scale and type of the model being built but essentially it comes down to the same basics. As far as machines are concerned, the most essential item would be a lathe, the size of which will be dictated by the scale of the model. For instance, model locomotives of 7mm and 10mm scale can be produced with small lathes such as the Unimat or the Cowells. $2^1/_2$" to 5" gauge locos need a lathe with a bigger swing and the Myford, Hobbymat and Warco machines of around $3^1/_2$" centre height will fit the bill much better. For the larger locos of $7^1/_4$" gauge and above, lathes of 5" or 7" centre height will be needed to cope with the larger



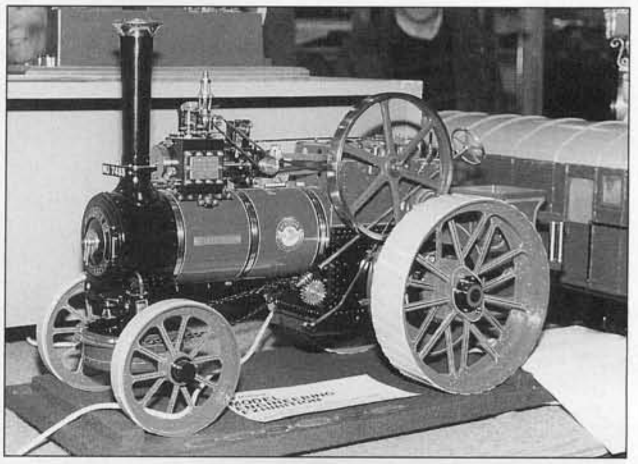
A "Stent" tool & cutter grinder which has been modified into a surface grinder.



Something a little bit different - a 2" scale Titan farm tractor built by Tony Webster.



This splendid 5" gauge private owner wagon by William Hall shows that there is more than locomotives to be modelled in the railway scene.



One of the most popular traction engine models is the 1½" scale Allchin to Bill Hughes' design. A detailed construction article was published in Model Engineer and it is also available in book form.

cylinders and wheels as found in those scales.

Whilst it is a recognised fact that the model engineer will 'stretch' his lathe to the limit (and sometimes beyond!), it is wise to think carefully about the size of work to be undertaken before purchasing an item of machinery.

Two other items which are almost a necessity are a drilling machine and a grinder for sharpening lathe tools etc. A very nice luxury would be to have a milling machine of some sort. Whilst it is perfectly feasible to use a vertical slide on the lathe for milling purposes, a dedicated milling machine definitely makes life much easier. Probably the most useful milling machine would be one of the vertical type, a lot of operations can be performed with a range of end-mills and a flycutter.

The normal range of hand tools, such as a vice, files, hacksaw, measuring equipment etc. will be needed, together with some form of heating such a gas torch for silver soldering etc.

Workshop accommodation

The size and scale of the model to be built will dictate the size of the workshop. Many of the smaller models can be built, quite literally, on the kitchen table (always assuming that one can get permission from the household authority!). Even the small lathes can be mounted on a board which can be clamped to the table but that may not improve relations with the head chef! If the kitchen table scenario is used the modeller should be very conscious of the need for cleanliness - something we really all should do, even in a dedicated workshop.

Many modellers have a workshop in the house - in a spare bedroom or utility room. This can be an ideal situation because few rooms indoors will have the same problems of heating and condensation that outdoor workshops can suffer from. There is also the added advantage of not being too far away from the rest of the family or, more importantly, the kettle and tea-making facilities.

For the majority of model engineers, however, an outdoor location in the garage or a shed will be the only possibility. Here there are benefits in terms of less noise disturbance to the household, less of a need for cleaning up after each session and the ability to be able to leave set-ups in the lathe or milling machine ready to be used next time.

IN SUMMARY

It may be seen from the above that model engineering as a hobby offers a vast range of subjects for the modeller to choose from. Indeed, several of the aspects may be interrelated in some way and may be combined to expand the scope of the modeller's interest and abilities. It is certainly not necessary to be an expert toolmaker or whatever in order to enjoy the hobby. On the contrary, it can make the hobby much more rewarding if the modeller can learn how to achieve something which is not in his own field of skill or expertise.

Help is readily available from a variety of sources. The model engineering fraternity is a very friendly group of individuals and club members and the greater majority of them are only too willing to pass on help or advice to those who ask for it. The model engineering magazines and books are invaluable sources of reference and information.

There is very good support from the model engineering trade who will supply materials, drawings and good advice when needed.

Probably the most important piece of advice for the beginner to model engineering is not to be frightened of having a go. So, how about giving it a try and seeing just what you may be capable of doing. You never know, you might just surprise yourself! ■

MODEL TRACTION ENGINES FOR THE NEWCOMER

By Malcolm Frost

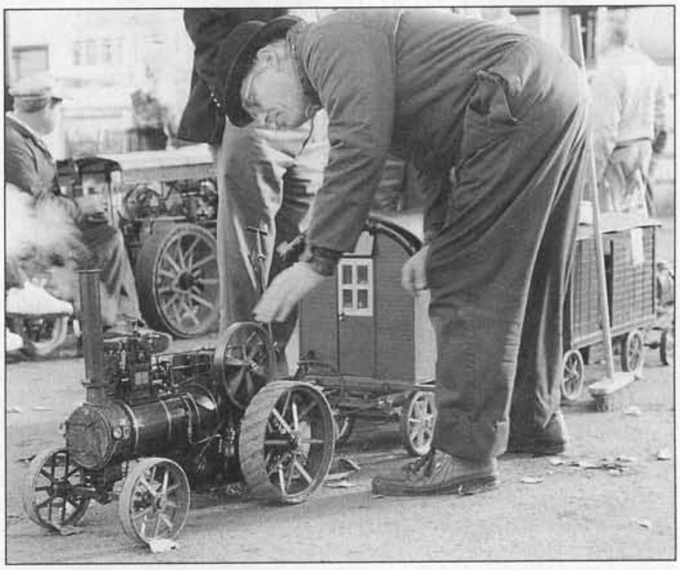
The building of model traction engines has gained in popularity very rapidly over recent years, due partly to the increased availability of good quality drawings and castings, and also to the emergence of specialised events catering solely for model traction engines. This has, in turn, led to the formation of clubs like the Model Steam Road Vehicle Society, which now enjoys the organisation of local area groups where enthusiasts join together to talk about and generally foster their love of model traction engines.

The main advantage of building a traction engine is that it doesn't require a track to run on, in fact it can give great pleasure without moving an inch! Just raise steam, put it out of gear, open the regulator gently, and admire the smoothly rotating flywheel, the flashing rods, the tumbling eccentrics; sit back and be fascinated by the gentle exhaust beat in the chimney, to say nothing of the wonderful smell of hot oil, coal smoke and steam.

It is a fact of life that the term 'traction engine' is used to describe most types of steam road vehicle but, in fact, there are many variations on the theme which I will now do my best to describe.

Variations on the theme

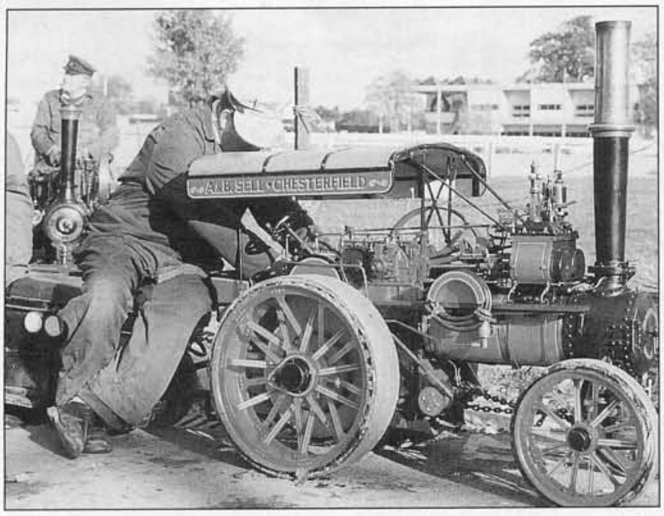
We will begin with the smallest which is the Steam Tractor. This was a small machine built to a 5 ton limit under the motor car act of 1905. Most of the traction engine manufacturers entered this market, one of the best known being Charles Burrell and Sons Ltd who produced their Gold Medal Tractor, named after their entry won the premier award in the 1907 RAC trials. Steam Tractors were capable of being driven by one man and were quite fast on the road. Because of this they were favoured by hauliers who specialised in the lighter loads. They were invariably compound engines, with both axles sprung and they were usually fitted with rubber tyres.



You can even build accessories for your model traction engines, such as the living van, tool van and water cart shown here with Tony Webster's 2" scale Durham & N. Yorks. traction engine.

Next in size comes the general purpose Traction Engine which was a larger machine of five to eight "nominal horse power". As the name indicates, these engines were used for any job that might arise, but principally for threshing and other agricultural tasks, not for continuous road work. The majority of traction engines were single cylindered but most builders also made compounds which, of course, were more economical in terms of fuel and water. These engines were generally more heavily built than the tractors and, as they were often working off the road, they were usually un-sprung and retained their original steel straked wheels which offered more grip in slippery conditions.

Without doubt, the most magnificent class of engine were the Road Locomotives. Built primarily for heavy road haulage, they were generally of heavier construction, with stronger shafts and gearing and larger wheels which were invariably fitted with solid rubber tyres. Compounding was usual, and belly tanks were nearly always fitted to allow extra mileage on the road. Three speeds were common, as was the fitting of springs to both axles. Many of these engines were built for the travelling showmen and they were fitted with a dynamo over the smoke box, a long canopy supported on twisted brass rods (olivers), lots of extra brass work and a brighter paint finish. The largest of all the engines are the Ploughing Engines.



Albert Sell chose to build something a little bit different with his 3" scale Fowler R3 fen engine. The original was used on the Smiths Crisps potato farms in the Norfolk fens.

These beautiful machines were the brainchild of John Fowler of Leeds and were built to massive proportions to plough and cultivate large areas of farmland fairly quickly. They are immediately recognisable by the large horizontal drum mounted underneath the boiler. This drum held a wire rope which was connected to one end of the plough. The other end of the plough was connected to a similar wire rope from a sister engine on the other side of the field. The plough was then pulled backwards and forwards between the two engines. This set up also proved ideal for dredging lakes, rivers etc. The engines were invariably compounds, although it is quite something to hear a pair of singles shouting to each other across a steeply inclined field.

Also under the umbrella term "Traction Engine" come the steam roller and the steam wagon. The Road Roller is basically a traction engine having the straked wheels replaced by smooth rolls. To enable it to roll its total width, the front rolls were made wide enough to go right across the front of the engine and were mounted on a separate forecarriage which was really an extension of the smokebox. They were built to be driven by one man and were generally produced without a differential, so negotiating corners was sometimes a little fraught.

Steam Wagons were the last ditch development of steam power on the roads as the manufacturers fought in vain to compete with the internal combustion engined lorries. There were two basic designs of steam wagon, the overtype and the undertype. The first has its motion over

Steam wagons like this 3" scale Atkinson make interesting models and are always useful for collecting the coal and water at fetes and rallies!

the top of the boiler like a traction engine, Fodens of Sandbach were the leading manufacturer of these. The second has a totally enclosed engine unit (like a car engine) fitted underneath the chassis, hence the term undertype. Sentinel of Shrewsbury were the most successful manufacturers of these. In their final design, these waggons (Sentinel used two g's in the word waggon) were remarkable vehicles having an excellent turn of speed coupled with an impressive load carrying capacity. Who knows what might have happened had the development of steam power been allowed to continue to this day!!

Last but not least comes the Portable Engine. I suppose, technically speaking, this engine should have come first as it was the fore-runner of all the others. The term "portable" is a bit of a mis-nomer as in general terms it was anything but! Incapable of moving itself, it required at least two shire horses to move it about, but nevertheless was a very useful machine for most types of farm and timber work. From the modelling point of view, it is much easier to build as it has no tender or gearing to make and no steering either, the front axle being simply pivoted under the smokebox and steered by the horses that were pulling it. Because of its inability to move itself, it has not proved popular with model engineers, even though it would be fairly quick to build, and there are very few designs on the market.

Choice of scale

Having discussed the various types, you will now be in a position to make up your mind as to which type you would like to model so the next question will be, in which scale should I make it? Of course, there are many factors which help to decide the scale you have to use, and one of the first must be the capacity of your machine shop, which often simply means "what diameter will my lathe swing?" A second important consideration is the size and weight of the finished model, very important when it comes to transport and storage. For example, a 3" scale engine will be about four feet long, two feet wide, and weigh about two hundredweight, something worth thinking about. Performance also comes into the equation, as you need to know whether you want to pull loads of children or simply place it in a glass case to be looked at.

The largest components to be coped with on a tractor, traction engine, or road locomotive, are the hind wheels. For example, they will be about 10" diameter on a 1½" scale traction engine or a 2" scale tractor, about 12" dia. on a 2" scale traction engine, and about 18" dia. on a 3" scale traction engine. In 4" scale they will be 24" dia. and also weigh the thick end of half a hundredweight! However, most suppliers these days supply them cast on size in aluminium or fabricated in steel, neither type requiring to be machined. This means that the flywheel or the final drive gear will be the largest items which need to be turned and these can easily be put out to be machined if you are determined to build the largest engine possible.

Now, what about performance? Of course, the performance of any engine depends to a large extent on the quality of the workmanship put into it, so it is difficult to say for certain but, assuming ordinarily good craftsmanship, a 1½" scale traction engine will haul its driver quite happily and on a good surface another passenger as well. Likewise, a 2" scale tractor. However, for serious passenger hauling, giving rides at fetes or traction engine rallies etc., the minimum scale is 3". One of these engines will generally haul its driver and half a dozen children without too much effort. Of course, 4" scale is better again!

Drawings and castings

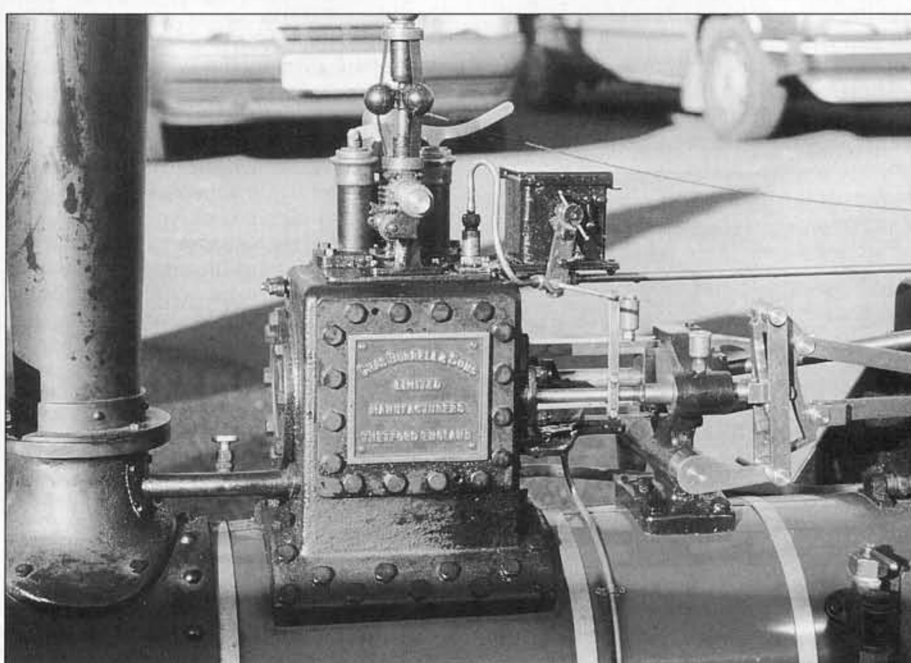
So, with all of these facts in front of you it shouldn't be too difficult to make the right decision as to which type and scale. You will then have to look at the various suppliers of drawings and castings to see what is on offer and, as a guide, I have listed the major ones at the end of this article. If you are very brave you could always go it alone and scale down a full size engine to make something different, but this is a very hard way of doing it. I have a friend who has done this several times and he is building a nice collection of unusual engines, all of them in 2" scale.

When you have decided on a model and have obtained a set of drawings, the first thing to do is to study them carefully to see how the various components fit together. Some models have had their construction described in the pages of Model Engineer or Engineering in Miniature magazines and it would be worth obtaining the relevant issues which would undoubtedly give you a lot of help. Your next decision to be faced will be where do I start?

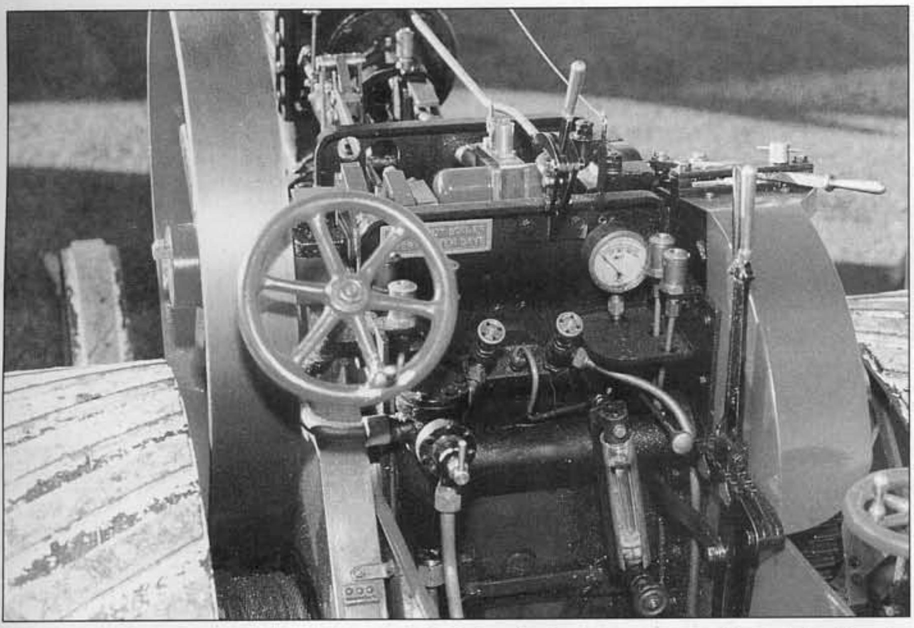
Looking at construction

Unlike a locomotive, a traction engine does not have a chassis as such but the boiler, being the centre of the engine, doubles as the chassis. So you can't put very much together until the boiler has been built. Therefore it is a very good place to start but, unfortunately, not a very interesting one. My own preference is to start with the front end which comes together fairly quickly and gives you something to look at and spur you on. It also breaks you into wheel building fairly gently with the front wheels thus preparing you for the more difficult rear ones later on.

Having completed the front end, the boiler should really come next, then everything else that you make can be fitted to it and you will be able to see your engine taking shape in a logical sequence. When making the boiler, take very good care to see that the sides of the outer wrapper are parallel with each other and perfectly in line with the barrel. Care taken here will be repaid in full later on when you come to fit the hornplates. On full size traction engines, the hornplates formed the outer sides of the boiler, but you will find that most scales up to and including 3" will call up copper as the



A close view of the cylinder and motion work on the 3" scale Burrell 7nhp traction engine built by Malcolm Saytch.



A driver's eye view from the tender of the Burrell 7nhp traction engine constructed by Malcolm Saytch. This hard working engine can often be seen hauling a trailer full of children at local events.

boiler material. This would not be suitable for the hornplates and so these are made of steel for its extra strength. They are usually fitted to the boiler by rivets or screws passing through hollow stays in the firebox sides. As these horn plates carry all of the shafts and gears of the engine it will be apparent that they must line up perfectly with the boiler barrel on which the cylinder is fixed. Hence my comment above concerning the sides of the outer wrapper being parallel with each other.

With the front end, boiler and hornplates fitted, you have a choice of direction in where to go next. You can either stay with the horn plates, fitting the bearings, shafts and gears, or you can make and fit the tender thus allowing you to see the full size of your engine.

Assuming that you are staying with the bearings, a couple of words of warning will not be amiss here. When marking out the shaft centres on the hornplates be careful not to make them too tight, otherwise when you get your gears they may not fit and it is much easier to build in a little clearance in the beginning than it is to reset already machined gears to take a few more thou' off them. The same goes for the diameters of the bearings. Don't make them too tight otherwise, when you raise steam for the first time, everything may seize up when it gets hot. I know - I've done it! Having mentioned gears, don't be put off by the need for gears if you haven't got the necessary equipment to make them. Unless you want the challenge of actually doing it yourself, it is easier and not that expensive to go to a specialist gear cutting firm to have the teeth cut for you. At M.J. Engineering we can cut the gears for almost any model traction engine, either machining them complete or cutting the teeth when you supply the turned blanks. This applies to bevels as well as spurs and steering gears.

Now, with the centre of your engine complete, I think that it is best to complete the cylinder block and motion, and then you will be able to see it work! The cylinder block usually requires some fairly intricate work but the best advice here is to take it very carefully without any rush, checking and re-checking before you make a mistake which you cannot correct. It is vital that the bore and saddle are truly parallel with each other in both planes and that the bolting face for the cylinder cover nearest the crankshaft is perfectly square with the bore. Take care with the valve ports and make sure that the slide valve matches dimensionaly.

With a traction engine the motion is always on show, so it is worth making a good job of it. Gone are the days when you could get away with fabricated eccentric rods, standards are getting very high these days and it is far better to machine everything from solid.

When it comes to bolting the cylinder block to the boiler, I always like to assemble it complete with piston, rod, crosshead and slide bars, all bolted together. Lay this assembly on the top of the boiler and fit the connecting rod to the crankshaft and to the crosshead. You can then turn the flywheel while adjusting the position of the assembly so that everything runs freely. The block can then be clamped securely and the boiler drilled for the fixing bolts.

We mentioned the tender a little while ago, so it wouldn't hurt to deal with that now. Up to 3" scale this will probably be made of brass as, in addition to looking good, it has to contain coal and water which are both corrosive substances. The manufacture involves quite a lot of sheet metal work and you will have to make some formers around which to beat the brass. The area of the water tank will be close rivetted and sealed permanently with soft solder. The width of the tender is critical as it has to slide nicely over the hornplates and, as you do not know the actual width of this until it is made, the tender is best left until quite late on in the construction of the model.

Making it look good

Painting and lining is one of the most important features of any model as it is the one that everybody notices first. A bad paint job and an otherwise good model will not merit a second look; on the other hand a good paint job will make an indifferent model look brilliant. Preparation is everything, both in the surfaces to be painted and in the paint itself. Spray the paint if at all possible, using many thin coats rather than a few thick ones. This will allow the colour to build up without losing the crisp detail of rivet heads etc. If you don't own dedicated spray equipment, then it is quite possible to spray your model using the aerosol touch up cans from your local car accessory shop. Use heat resisting paint for the smokebox, chimney, and fire box sides.

Steaming up

Your first steam up should be made quietly on your own or with an experienced friend, definitely not with a crowd around you. Take things very slowly with not too big a fire so that you have plenty of time to make adjustments, seal leaks etc. With about 30 p.s.i. on the clock you will be able to put the reversing lever forward, open the drain cocks, and just crack open the regulator and watch your pride and joy ticking over for the first time properly under steam. As your confidence grows you will open the regulator a little more and see the rods become a blur, but don't do this too much as traction engines were never high-revving engines. If you have already made a driving truck, you can now couple it up and take yourself for a ride around the garden. At this point all your effort will have been worthwhile.

It is possible to register your engine for use on the road, your local licensing authority will guide you here but I would say that 4" scale is the absolute minimum practical size for this, given todays density of traffic. Remember that you are very small and will be moving very slowly relative to the vehicles around you. Having said that, it is quite a thrill to drive an engine on the road if it is nice and quiet.

I hope that this article will have whetted your appetite to have a go at building a model traction engine. They are very rewarding to build and, as I have said earlier, far less restricting than railway locomotives. ■

Trade suppliers

The major suppliers of drawings and castings for model traction engines are:

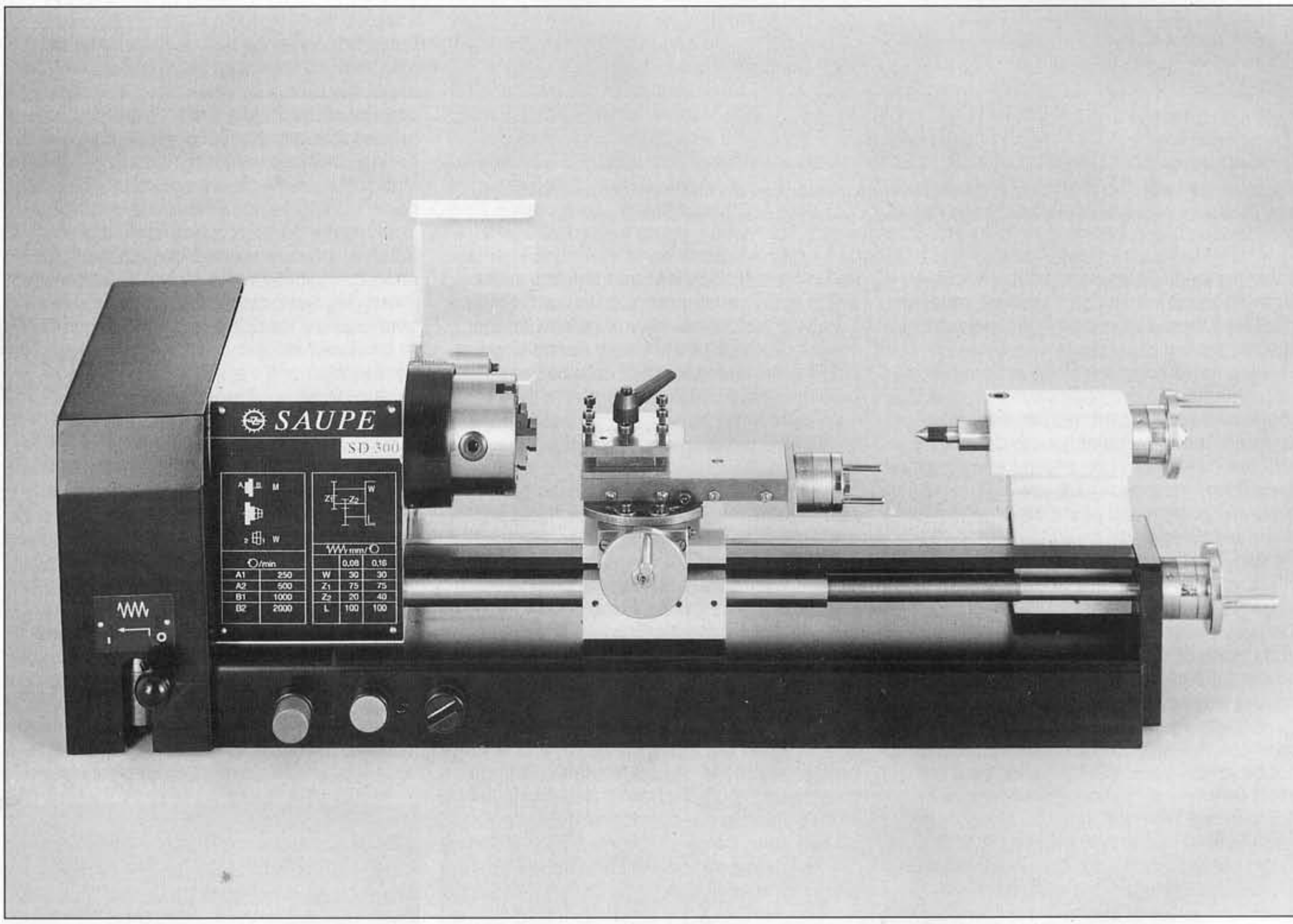
M J Engineering, Manor Hatch, 63B Southampton Road, Ringwood BH24 1HE. They supply drawings and castings for traction engines up to 3" scale and a gear cutting and machining service for all scales.

Live Steam Models, Unit 7, Old Hall Mills, Little Eaton, Derby DE21 5DN. They supply drawings and castings for traction engines from 3" to 6" scale, including accessories, machining and wheel building etc.

Jones and Bradburn Ltd., Braye Road, Vale, Guernsey, Channel Islands GY3 5XA. They supply drawings and castings for traction engines from 2" scale to 4.1/2" scale, and offer a machining service.

A.J.Reeves (B'ham) Ltd. Holly Lane, Marston Green, Birmingham B37 7AW. They supply drawings and castings for traction engines up to 3" scale and offer a gear cutting service.

THE WORKSHOP



The Saupe SD300 lathe from C.Z. Scientific.

So you want to make a start - what will you need in terms of space and tools? ...

You have decided to have a go at model engineering but don't know what facilities you will need. This article should give you an idea of how to organise things and get you started. Contrary to popular belief, you do not need a fully equipped machine tool workshop to make engineering models. All you need is a space to work in and some basic tools, some of which you have probably got already.

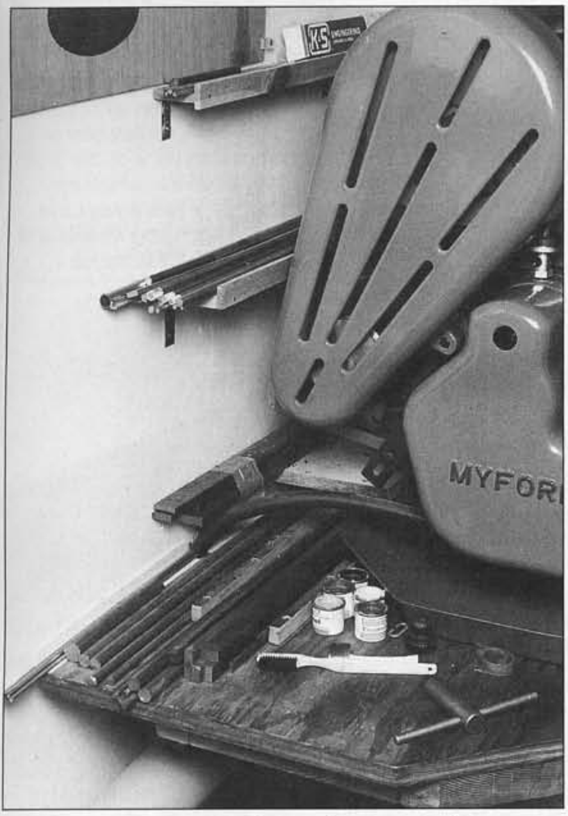
A space to work in

The amount of space required will be depend on the type and size of modelling you wish to undertake. Small stationary engines, for example, will only need a small area to work in, whereas a 7¼" gauge locomotive will obviously need a much larger work area!

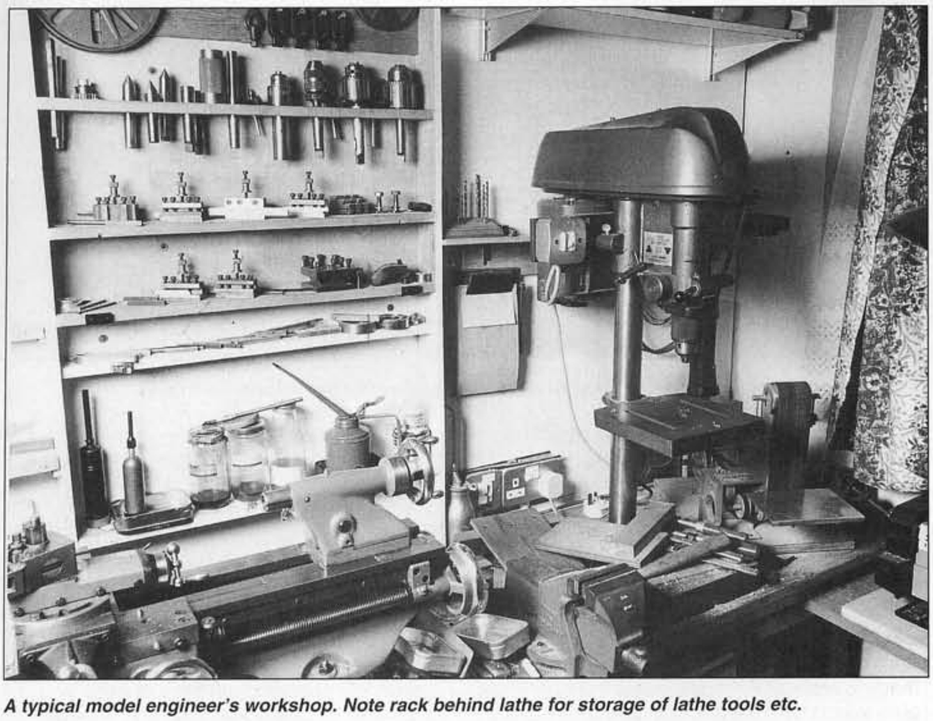
Whilst it is quite possible to work - literally - on the kitchen table, this arrangement is seldom practical as swarf and food shouldn't really be mixed! So, a dedicated work area is a much better solution. If you have a spare room in the house (perhaps a 'utility' room) this would make an ideal place for the workshop; it will probably be heated in some way and you will not be too far away from the rest of the family. The noise of running machines and sawing and filing could be a problem but with a little consideration for the others in the house this is not insurmountable.

For many of us, however, an "outside" workshop in a shed or garage may well be the only alternative. If this is the case it is well worth spending a bit of time and money on making it comfortable by insulating the walls and roof. This will help to prevent the model engineer's worst enemy, condensation, from forming rust all over your tools and models. Some form of heating will be required and I would recommend that you avoid things like paraffin and gas heaters because they cause water vapour to be given off and this causes condensation. The tubular "greenhouse" heaters are quite economical to run and should be capable of keeping the workshop above 56 deg. F (13 deg.C) which is the point at which condensation starts to form.

You will obviously need an electricity supply for lighting and powering the lathe etc. Make sure it is properly installed (preferably by a qualified electrician) and has a circuit breaker between the power



Neat storage for 2' lengths of bar stock on narrow shelves behind the lathe. Paint tins for colour coding materials.



A typical model engineer's workshop. Note rack behind lathe for storage of lathe tools etc.

supply from the house and the workshop installation. A separately fused spur for the lathe motor supply is a wise arrangement, this will prevent the whole workshop being affected if there is a problem and it is also useful to be able to isolate the lathe by removing the fuse if there are children around. You will also need a couple of double switched socket outlets in the area of the work bench.

The work bench

A flimsy, lightweight bench which sways as you try to saw through a piece of metal will cause endless frustration and lead to inaccuracy. The work bench should be made as heavy as possible and should, preferably, be attached firmly to a wall for extra support. Bench height is a matter for personal preference, but a good guide is to make the top surface about level with your hips, This will put the top of the vice jaws at elbow level which should be comfortable for filing etc. Width of the bench top should be a minimum of 18" but 24" will be found better if you have room. A top covering of plywood or "MDF" board will give a nice smooth, but tough, surface on which to work and a length of aluminium or steel angle along the front edge of the bench serves as protection for the edge and also stops things rolling off the bench!

The vice is normally placed to one side of the main work area so that it is not in the way when marking out or assembling the model. For most purposes I would recommend a 2½" or 3" vice (measured across the width of the jaws) and this should be bolted firmly to the bench top, ideally positioned over one of the legs of the bench. Don't forget that you will need clear space behind the vice to accomodate the length of the hacksaw when cutting! I have also found that a second, smaller, vice of around 2" jaw width is very useful for dealing with some of the smaller items such as the more delicate parts of valve gear etc. Both my vices have had the serrations ground off the jaws so as not to mark the workpiece.

Hand tools

Essential items to start with are a 6" and 12" steel rule, a 3" or 4" try-square, a scriber, a pair of engineer's dividers and a centre punch and small hammer. A small scribing block and a 2" angle plate would be handy, but not essential. You may also find that a magnifying glass or jeweller's loupe will help towards accuracy when marking out! (I now have to clip a magnifying lens onto my reading glasses to see if I get it right - must be age catching up with me!).

Some of the hand tools you may well have in your toolbox already. A hacksaw will be needed and I suggest you use two blades - one for brass and one for steel - of around 28 or 32 tpi. A small selection of files incuding an 8" second cut flat, an 8" second cut half round, a 6" smooth flat and a set of "Swiss" files will get you started. Keep these for "model engineering use" only so that they don't become blunt or clogged on the rougher household jobs.

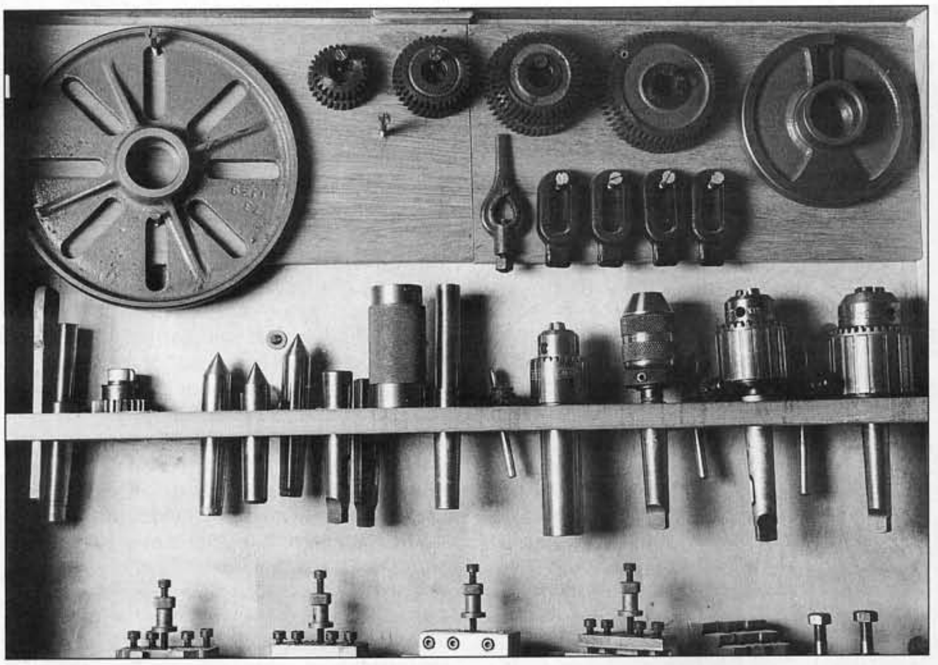
You will also need some drills, taps and dies. It would be wise to invest in some new ones and, again, keep them for "model engineering". A set of high speed steel drills from 1mm to 6mm diameter in 0.1mm steps will cover most requirements and you can add to these as required. I suggest getting metric drills as these are now the "preffered" sizes and all the current charts and tables for tapping etc. specify the metric sizes. Taps and dies will depend on the type of modelling you are doing but, generally, the most often required ones will be for BA and "model engineer" threads. Carbon steel taps and dies are much cheaper than high speed steel ones and they are perfectly adequate for the needs of the model engineer.

Machinery

Although a lot of models can be made with hand tools alone, some form of machine tool will be well worth while. On the question of costs, it all comes down to what you can afford but don't overlook the secondhand market where plenty of bargains can be found.

Probably the best investment is to buy a lathe because the lathe is capable of doing a lot more than just turning - it can be used for milling, slotting, drilling, planing, cutting gears, and a whole lot more. You will find more information about choosing a lathe in Bruce Davey's article which follows. I would recommend, however, that you give some thought as to its installation in your workshop. It should be properly mounted on a really sturdy bench and should be very carefully levelled and tested before use. Don't forget to allow space beyond the headstock for long bar material to pass through the spindle, and also to get a piece of bar in to knock out centres etc. from the spindle nose. (I mention this because I didn't think about it when I set up my first workshop many years ago - I ended up with a hole in the shed wall to accomodate long material!!).

Lathe tools will also be required and here you have a choice. You can purchase sets of individual high speed steel cutting tools and they will cover most of your needs. They will, however, need resharpening on a grinder as you use them. It can sometimes be a problem for the beginner to grind tools accurately until he has obtained quite a lot of experience. To make things a lot easier I would highly recommend the use of insert-type tools. These consist of a toolholder which is clamped in the lathe toolpost and inserts which are attached at the end of the toolholder by means of clamp screw. I have used the Sumitomo right hand turning and facing tool (ref. SCLCR), which has a solid titanium carbide insert, for many years now



Faceplate and changewheels held on screws. Centres and chucks held in holes in wooden shelf.

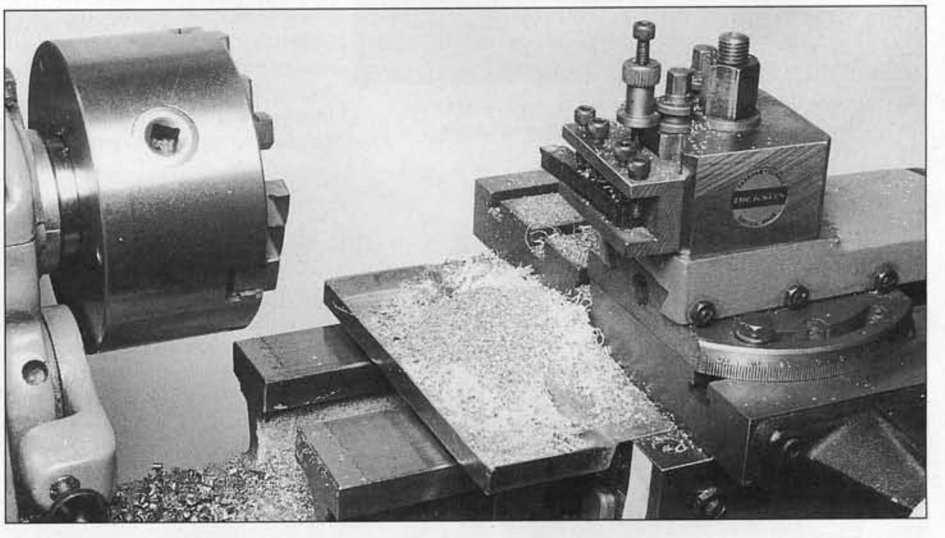
and I find that I rarely need to use any other type of tool for most work. When the tip becomes too worn, all that is needed is to remove the tip and replace it with a new one - and the manufacturing tolerances are so good that the new tip will still be at centre height without any need for adjustment; - No grinding - No problems. The same titanium carbide tip will cut most materials the model engineer will come across and higher spindle speeds may be used without any detriment to the tool. There is also no need to use coolants on most materials. Sumitomo make a range of these tools in shank sizes from 6mm up to 16mm square, the 6mm & 8mm being the most suitable for model engineers.

A drilling machine is also a very useful item to have. One of the smaller bench mounted ones from our advertisers would be ideal, preferably with a $^{3}/_{8}$" (10mm) capacity chuck. You can always get a pin chuck later on for holding very tiny drills. A speed range from around 500 rpm to 3000 rpm will be suitable for most needs. Speaking from painful experience, I would definitely recommend the purchase of a good quality machine vice to hold the work while it is being drilled. It is all to easy, especially for the beginner, for the drill to snatch as it breaks through the metal and this can rip the work out of the operator's hand, with quite nasty results.

At some stage you will need to sharpen your drills and lathe tools (unless you use insert-type lathe tools), so a grinder will be needed. Be careful here as there a few cheap ones on the market which have end play in the spindles. A grinding wheel can explode in an extremely violent manner and this can be very dangerous. Stick to the grinders from our advertisers and you shouldn't go far wrong. A 6" double ended grinder with one coarse and one fine wheel will be most suitable. Look for decent sized tool rests which are adjustable for position. And ALWAYS wear eye protection when using the grinder.

Storage facilities

It is easy to overlook storage facilities until you try to find somewhere to put your tools



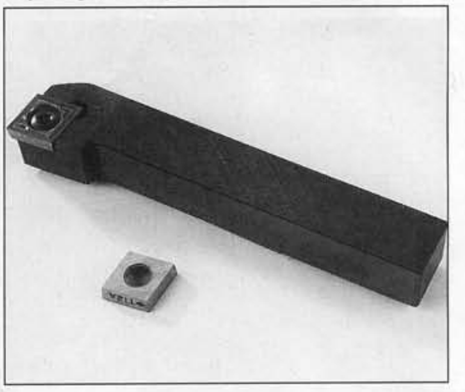
A simple swarf tray made from sheet steel helps to keep the lathe bed clear of swarf.

or materials etc. This is where you can use your ingenuity and save money, or go out and buy shelves, racks and drawer units as required. Have a look around other peoples' workshops and you will soon pick up some ideas. It is useful to have some of the more frequently used tools in racks above the bench or behind the lathe etc. Small items like nuts and bolts are best kept in small drawer units which should be labelled for quick identification. Hand tools may be hung on a board with Terry clips or suitably positioned screws (I use screws as the thread will help to stop the tool from slipping off).

Another useful tip is to paint the ends of bar materials with a colour code to differentiate between two materials which may look alike but have totally different properties - mild steel and stainless steel are a case in point. Don't forget, also, that you will need somewhere to put the model whilst you are building it. A glass case on the mantlepiece will do when the model is finished!

Safety

A word (or two!) about safety:- You cannot place too much emphasis on safety precautions, they could save your eyesight and protect you from injury. Unless you are very confident in your abilities, it is wise to get a qualified electrician to do all of your electrical installation work. It may seem expensive at the time but think of the "cost" if you get an electrical shock, which may even cost you your life. Always wear eye protection when using grinding wheels and anything that might be likely to cause



The Sumitomo SCLCR right hand turning and facing tool with titanium carbide insert.

particles of metal to fly through the air. Be extremely careful when using machinery, make sure there are no loose items of clothing which may get caught up in the chuck etc. It is wise to wear some form of overall or workshop coat to protect against hot pieces of swarf and so on.

A decent size fire extinguisher or fire blanket should be kept in the workshop, especially if you use a gas torch etc, for soldering or brazing, and make sure you know how to use it! Always have a large bucket of cold water ready to hand when working with acids, by the time you have walked up the garden to the kitchen sink to flush spilt acid of your skin it will be too late. Speaking of acid, remember to ALWAYS ADD ACID TO WATER when diluting it, never add water to the acid as this may cause an explosion.

Fortunately, serious accidents in the model engineer's workshop are a very rare occurrence and taking heed of the above precautions should make sure they do not happen to you.

My final piece of advice is to never be afraid to ask any other model engineer for help or advice on workshop matters. They will be only too willing to help you. ■

CHOOSING A LATHE

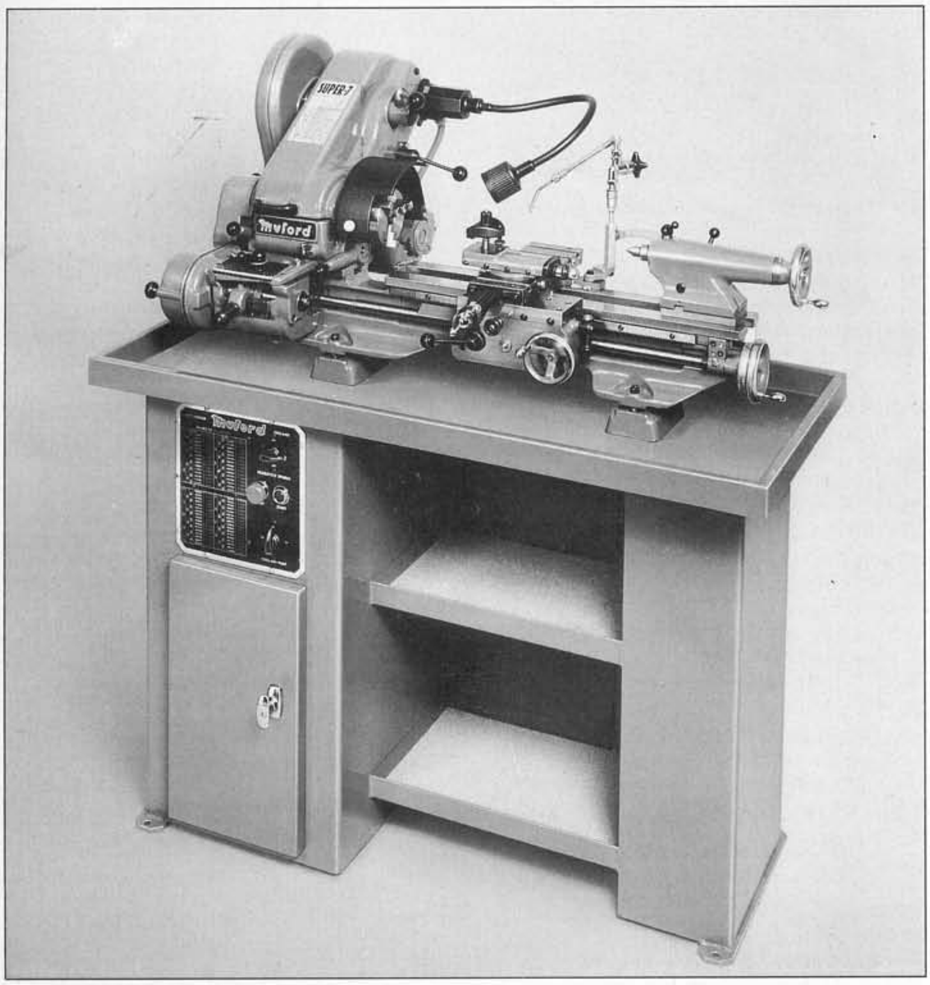
by Bruce Davey

One of the most important decisions that a model engineer must make is to choose the right lathe. Bruce gives some Hints and Tips to help you on your way ...

So you want or need to make something, how and where do you start. First you need a place, not just a damp garden shed or the end of a draughty garage, be comfortable and go for the spare room or insulate and heat the workshop. Obviously you know what type of models fire your interest, for many (such as boats and aeroplanes) simple hand tools will suffice and the same applies for most kit based models, even some steam locomotives. However, many of us really want to do it ourselves and build a locomotive or make parts such as working undercarriages for aeroplanes and for this we need to invest in the King of tools, the Lathe. It really is an investment for, if you treat it well, you will always get your money back - even years later.

The lathe is definitely the most versatile of tools, with it one can remove and form metal in many different ways to produce the desired shape and size of the finished article. The lathe will turn, mill, drill, slot and plane metal. It can also be used to spin sheet metal into hollow shapes, wind springs, cut gears and a host of other things. It is not difficult to use and with the minimum of instruction, either by an instructor or from a book, one can have a go.

Having decided where your workshop will be, you will know how much space you can allow for the lathe, don't forget to allow space at the left hand end for long work which may protrude beyond the headstock. Now we have our first technical term perhaps we should introduce the lathe properly.



Introducing the lathe

The lathe comprises the bed, a long rectangular section on which is mounted the headstock at the left hand end and the tailstock at the right hand end. Between them, sliding on the bed, a travelling carriage is placed which carries a toolholder. At the back or underneath is an electric motor which drives the headstock mandrel by means of gears or vee belts. Mandrel is a smart term for the shaft, usually hollow to enable long work to be passed through it, which carries the chucks etc.

Lathes are measured by two basic dimensions, the height of the centre-line above the bed and the distance between centres. The first term is self explanatory but the second can be confusing and is effectively the maximum length of shaft that can be turned when held between pointed steel centres mounted in the headstock and tailstock respectively. In adverts for lathes the letters BGSC often appear, this means back geared screw-cutting, this is covered later. The biggest diameter you can turn is generally twice the centre height. Knowing the sort of work you wish to do and the area available to work in you can now review the market place for a suitable machine.

However there is one little detail that needs to be covered first - how much can you afford to spend as, in all things, you only get what you pay for. This often heard statement these days, regrettably, needs qualifying to:- "you get what you pay for providing the goods are what you are told they are!!" Unless you are one of those people who win lotteries etc. your investment will probably be between £250 and £2500. At the lower end, one will get a serviceable $3\frac{1}{2}$" to 5" centre lathe anything from twenty to sixty years old - my own 5" lathe was supplied as lend lease in the last war and still produces excellent work. Around £850 to £1200 will get you a more modern lathe of similar size, and up to £1700 to £2500 a shiny new one. An important point here in favour for second-hand lathes is that they often come equipped with tooling such as drills, tool bits, chucks etc. which, if purchased new, may well cost half the price of the lathe or more.

Sizes and suitability

Very small lathes of 2" x 8" (50 X 200mm), such as the Cowells, Peatol and Emco Unimat, are most suited to model boat and aircraft work and possibly clockmaking. This is not to say that these small lathes are not suitable for steam engines, they are and many engines such the Stuart 10 series have been made on them. The next size up is around the $2\frac{1}{2}$" to $3\frac{1}{2}$" (65 to 90mm) centre height with centre distance of 15" to 24" (375 to 600mm)-into this bracket come the famous British lathes from Myford Ltd., the ML10 and the slightly larger and more versatile ML7 series. From Austria we have the excellent Emco Compact 5, and then the Hobbymat from Germany and many similar lathes from the far east, China and Taiwan, and from other Eastern Bloc countries including Poland, Rumania, Bulgaria and Czechoslovakia.

Now we come to larger lathes, typically 5" or 6" (125 to 150mm) centre height and 18" to 30" (450 to 750mm) between centres. In this group we have the Emco Compact 8, the Boxford (now regrettably out of production but still with a good spares service), the American Atlas (also called Acorn, Sphere and Halifax; all based on the original American design which is out of production but with UK based spares still available), Colchester Chipmaster and Student, Harrison, Holbrook and a host of other old British names most of which are no longer in business. At the more expensive end we have the new lathes from Myford and overseas dealers such as Warco, Emco, Axminster, Graham, Excel and Chester.

How to choose

The advice is that a bigger lathe can always turn a small part but a small lathe cannot turn a big part. Sensibly speaking it still comes down to space and cash, if you have got it go out and buy a new lathe with all the accessories. For general model work, be it building model aero engines or locomotives, one of the finest lathes with a good range of accessories is the British Myford Super Seven. The imported lathes from people like Warco are very good value for money and accurate.

Alternatively, if your pocket is not limitless, here are some suggestions. As said before, the Cowells, Peatol and Unimat are all suitable for small model work; they can be fitted with proper chucks and faceplates and are available new and second-hand with a price range from £80 to £500.

In the next bracket up you cannot beat the older Myford ML7 series lathes (£375 to £575 in used condition). Most model engineering designs are based upon the capabilities of them and a host of special accessories are also available for them. They may be mounted on the bench or on a special metal cupboard which stores all the tooling. Also in this bracket is the Myford Series 10 lathe and the Hobbymat which, until East Germany came in from the cold, was bargain priced; however, it is still a good buy if you want a desktop lathe although I would recommend you add the low speed conversion kit available from Essel Engineering.

Now we come to medium size lathes. Some, like the Atlas or Boxford, are still bench or floor mounted. The Atlas and its clones are good and simple lathes and cost between £250 and £450 depending on age and condition. Interestingly, the Atlas lathe handbook is still in print and is one of the best books around on the subject.

If you are into bigger things like $7\frac{1}{4}$" gauge locos, small industrial lathes will be more suitable. Lathes like the Colchester Chipmaster are usually made in one piece with a substantial cast iron base and are definitely not suitable for the garden shed floor. They have often had heavy industrial use but there are some good ones around between £1500 and £2500, the same applies to Harrison, Holbrook and similar lathes. Currently, with the Government's lack of interest in teaching skills useful to the country, many ex-training establishment machines are coming on the market in virtually unused condition.

Equipment and features

Most lathes have a wide speed range through either a gearbox or stepped pulley belt drive. They usually have 6 or 8 basic speeds and then a low ratio (called back gear) giving a theoretical range of 12 or 16 speeds. The wider the overall range the better off you are, my own lathe goes from 20 r.p.m. to 1700 r.p.m. but 50 to 2000 is just as suitable, the top speeds not often being used unless you are turning very small parts.

A new basic lathe will come with a single tool holder,catchplate, hard and soft centres, a set of change wheels and, if you are very lucky, a three-jaw chuck. Additionally a four-jaw chuck and tailstock drill chuck may be supplied if you are fortunate. Second-hand lathes usually have all the foregoing and many other small tools as well, particularly if you purchase privately.

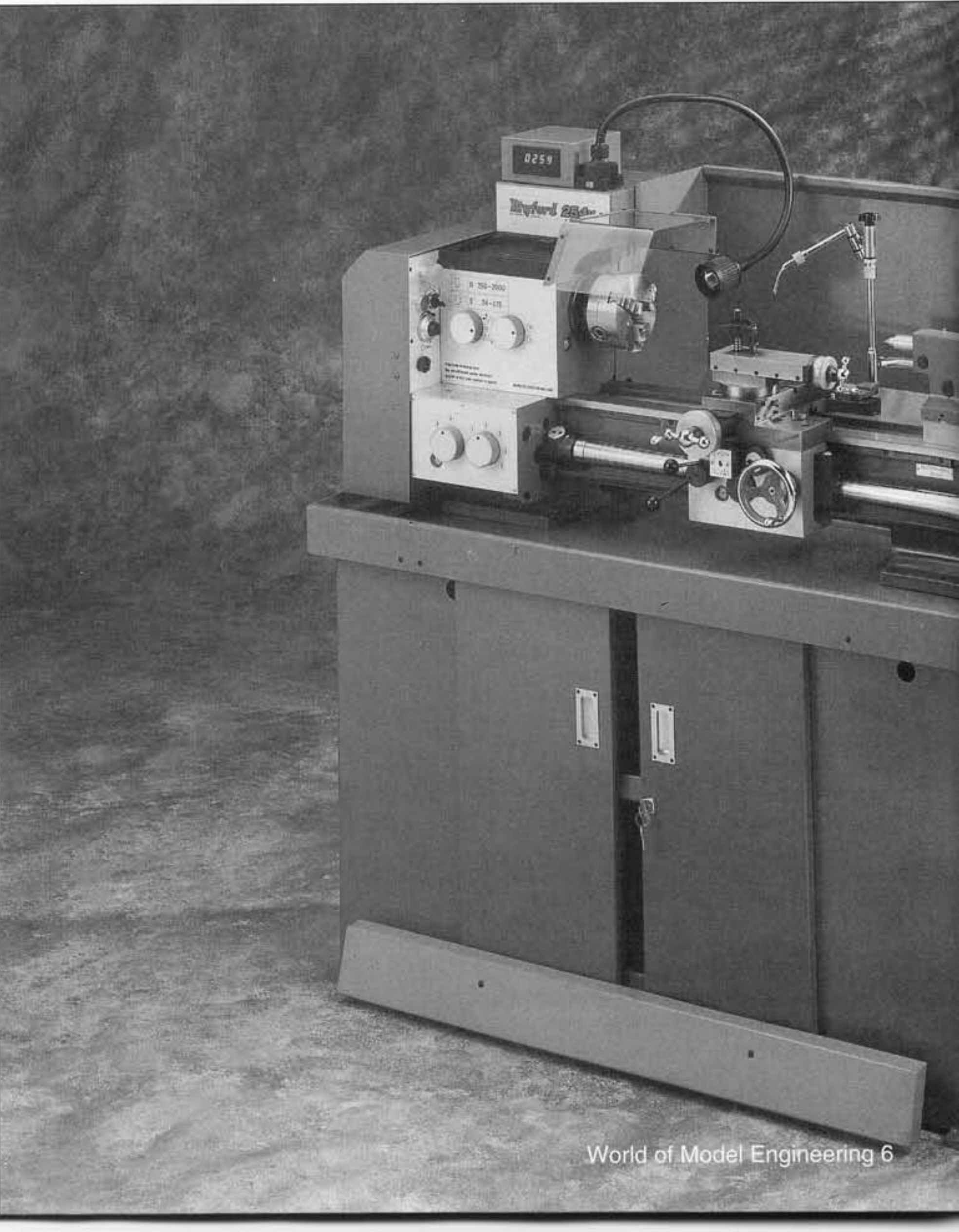
Lathe features to look for

1) Work holding:
Ideally the lathe should have a three-jaw self-centring chuck with internal and external sets of jaws, an independent four-jaw chuck, a faceplate, a catch (driving) plate and one hard and one soft centre. Although driving dogs to match the driving plate are not essential, they are nice to have. All these fit to the headstock mandrel either by a large coarse thread or with cam lock pegs. Additionally, the mandrel is made with a Morse tapered hole in the middle so that centres can be fitted.

2) Screwcutting change wheel set:
Often nine or more in number, these are fitted to the left of the headstock in various combinations to enable the tool bit to be driven under power to form threads or to machine the work parallel at different feed rates. Right or left hand threads can be machined.

3) Alternatively, a quick change screw-cutting gearbox:
Usually supplied as an extra on smaller lathes, the gearbox speeds up work enormously as you do not have to fiddle with loose gears to change feed drive ratios.

4) Horizontal power feed:
Provided by the change wheels or quick



change gearbox as above, it enables the toolbit to be traversed in either direction along the lathe bed as the work rotates, usually giving a better finish than can be achieved by hand.

5) Power cross feed:

Again an automatic way in which the work is machined; this time, as the name implies, to face off the work across the axis of the lathe. Often an extra on smaller lathes it is not so important as horizontal power feed.

6) Four way tool post:

Not as useful as it may seem at first, this device clamps four tools in place at once and can be rotated 90 degrees at a time to bring each tool into use as required. Most people find that the tools not in use either collide with the tailstock or tender parts of the anatomy! However, they have their uses.

7) Alternatively, a quick change toolpost:

Much better than the above, each tool bit is held in a small tool holder which fits to a toolpost with a quick lock mechanism. Easily adjusted for height, they make life much easier. Look out for lathes fitted with them, or ask if the lathe comes with Dickson tooling.

8) Back gear:

Fitted to most lathes, even the small Cowells (but an essential extra on the Hobbymat), it is an extra low gear used for turning large diameter objects and screwcutting. It is also ideal for fine finishing items such as crankshafts.

9) Vertical Slide:

A very useful extra which is bolted to the cross slide, work is mounted on it and can then be traversed in three planes. If a milling cutter is fitted in the lathe chuck then the work can be milled to shape.

10) Tailstock:

The tailstock is part of every centre lathe and can be fitted with tools that have a Morse taper, such as a hard or live centre used to support the end of long work, or a drill chuck for drilling items held in the headstock chuck etc. Tapered drills and reamers fit directly, or via adapter sleeves, into the tailstock barrel.

How to check a lathe

It is almost essential to be able to operate the lathe when viewing it for possible purchase. Unless you can do this it is impossible to check if it will turn parallel and square to the centre-line. Make an appointment with the seller and tell them you would like to turn test pieces that you will provide. If they are happy with this carry on, if not forget them and try elsewhere. Take, if possible, two items appropriate to the size of the lathe; for example, for a five or six inch lathe one item should be a piece of mild steel bar 6" long and 1" to $1\frac{1}{4}$" diameter, the other should be 4" or 5" diameter by about $\frac{3}{4}$" thick.

First examine the lathe for misuse, repaired handles, damage to the slideways, excessive play (backlash) in the operating handles: 10 to 20 thou may be O.K. but half a turn is no good. Check the speed range by actually running it in each speed, you will probably find that the full range has not been used in many years, and don't forget to try the back gear.

Now to the test pieces: the first is held in the 3-jaw chuck with about 4" clear of the jaws, if it appears to run true the chuck is O.K. but, if not, all is not lost; with a suitable turning tool in the toolpost and speed of about 1000 r.p.m. take a cut along the bar using power feed if available. Using a micrometer, measure both ends of the turned bar and if both readings are the same there is nothing to worry about. If they are not the same, a taper of $\frac{1}{2}$ thou per inch is not unusual and, if the price is right, is quite acceptable. One thou per inch of taper is the limit of acceptability even for a relatively old lathe. Now grip the large disc in the external jaws of the 3-jaw chuck and, at about 80 to 100 rpm, take a cut across the face of the disc, once again using power feed if available. When faced all the way across, take a straight edge and place it across the disc just above the centre-line (in case there is a pip in the middle). If it rocks, its bad news, if there is an obvious gap in the middle of the straight edge check it with feeler gauges - over 5" a gap of 1 to $1\frac{1}{2}$ thou is acceptable.

There are other checks that can be done but, if you are a beginner, you would be unlikely to have the necessary equipment. A good idea is to join a local model engineering club and find a member to go along with you to check over your prospective purchase.

A word on standards

The European world is metric and, to a degree, we are going the same way. However, generally speaking the world of model engineering (and America) is still in Imperial measurements with the few metric designs in the minority. If your particular hobby is metric then by all means buy a lathe with metric divisions but generally you will be better off with Imperial. It is, of course, possible to produce anything in either dimensions provided one has good measuring gear and a calculator and it does not really matter if the lathe is Imperial or metric.

Where to buy a lathe

1) privately
2) from an authorised dealer
3) from a used machinery dealer

The best place to start is to look in magazines such as Model Engineer and Engineering In Miniature and also in the classified sections of old vehicle interest magazines like Old Glory, Classic Motorcycle, Classic Car etc. and in Exchange & Mart and Industrial Exchange & Mart. Machinery often turns up at auctions (see Industrial Exchange & Mart for ads.) so keep an eye on your local paper for notices as this is often where the real bargains are found. If you do attend an auction, however, a note of caution is advised - know what you want and how much you are prepared to bid (include the auctioneer's percentage as well) and never bid more as it is all too easy to get carried away. You may find items selling for more than their apparent value and then you may be tempted to bid higher for the next one in the sale, don't! It is not unheard of for dealers to pay over the odds for lathes in order to keep out private bidders, and auctioneers also wind up the price (and for the good of their client, so they should) by taking bids off the wall. So be warned, know your price limit and then stop bidding. ■

Some useful addresses

New machines

Axminster Power Tool Centre, Chard Street, Axminster, Devon EX13 5DZ Tel:01297 33656.

Graham Engineering, Alpine House, Roebuck Lane, West Bromwich, Birmingham B70 6QP Tel: 0121 525 3133.

Chester U.K. Ltd, Unit 8, Waverton Business Park, Chester CH3 7PD Tel:01244 336100.

Emco Maier Ltd, 10 Woodshots Meadow, Croxley Business Park, Watford WD1 8YZ Tel: 01923 250051.

Myford Ltd, Chilwell Road, Beeston, Nottingham NG9 1ER Tel: 01155 9254222.

R.A.Atkins, Hunts Hill House, Hunts Hill, Normandy, Guildford, Surrey GU3 2AH Tel: 01483 811146.

Warco, Warco House, Midleton Industrial Estate, Guildford, Surrey GU2 5XW Tel: 01483 33361.

Essel Engineering, 23 Cavell Road, Billericay, Essex CM11 2HR Tel:01277 659774

Used machinery dealers

Home & Workshop Machinery, 144 Maidstone Road, Footscray, Sidcup, Kent DA14 5HS Tel: 0181 300 9070

G&M Tools, The Mill, Mill Lane, Ashington, West Sussex RH20 3BX Tel:01903 892510

R.A.Atkins (see entry above).

Rejon Machine Tools, Unit N7, Inchbrook Trading Estate, Bath Road, Stroud GL5 5EY Tel: 01453 835663