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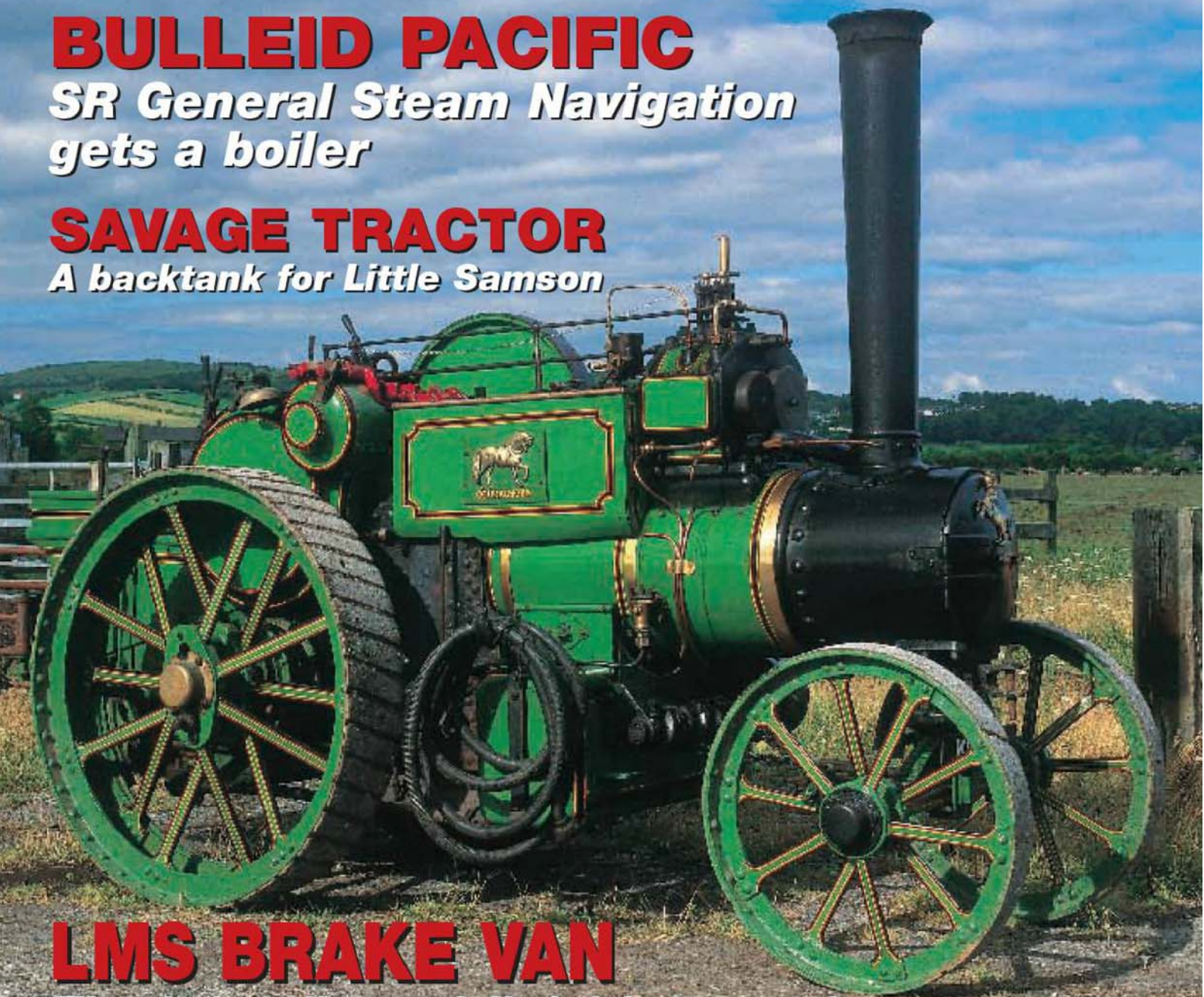

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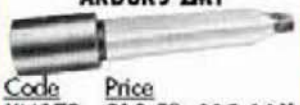

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Recalling warm, bright summer days, Courageous, *a 1918 Aveling & Porter engine owned by Andy Johnson in Carlisle, is seen here in a rural setting against a backdrop of a fine blue English sky. Thomas Aveling was one of the great pioneers of the traction engine. Born in 1824, he set up a small plant in Rochester in 1850 to develop a self-propelled engine. Aveling took on Porter as partner in 1862 and the company retained their combined names until 1934 when it amalgamated with the Peterborough company of Barford & Perkins.*
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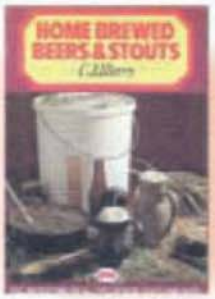

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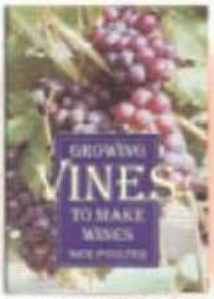

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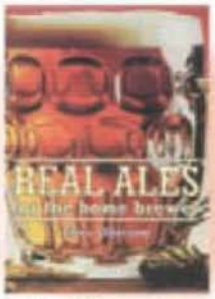

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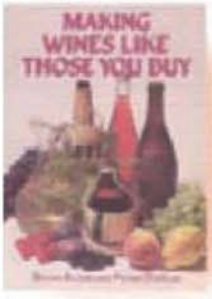

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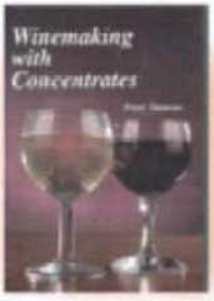

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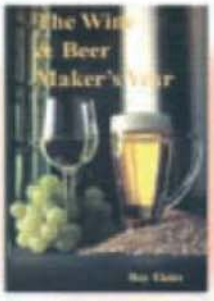

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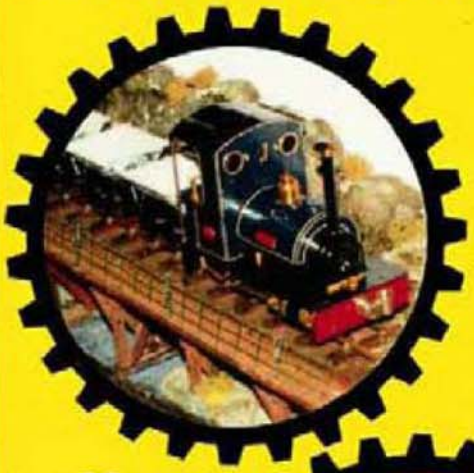

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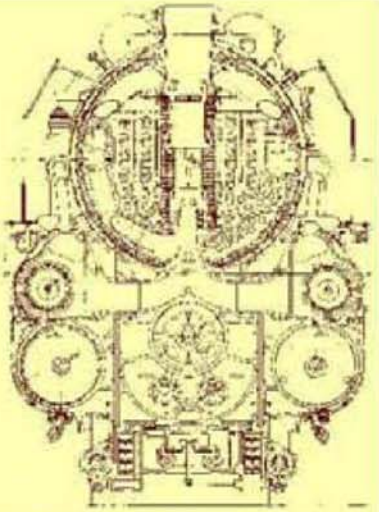

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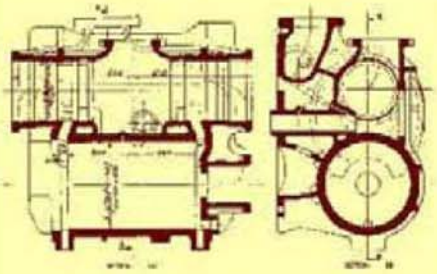

CHAPELON also wrote or edited a number of books, of which the two editions of *La Locomotive a Vapeur* are the most famous, but are now very rare, and have only previously been available in French. Our translation is of the 1952 edition, so it really covers the steam locomotive at its zenith.

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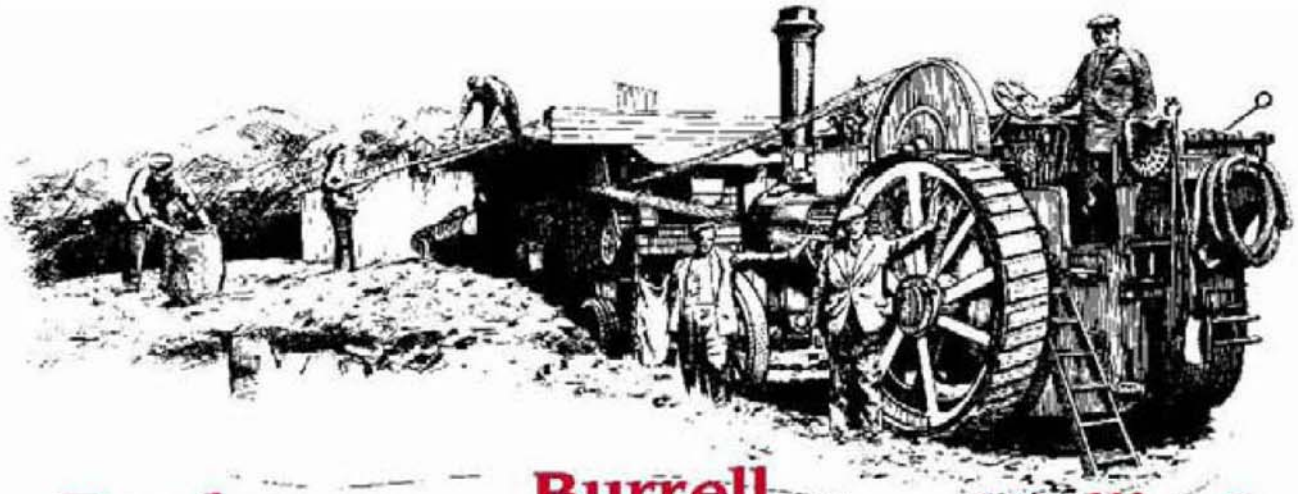

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A1	1/8 x 3/8 - 1/2 - 5/8 - 3/4 -1.	05.60
A2	3/16 x 3/8 - 1/2 - 5/8 - 3/4 - 7/8 - 1.	06.90
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C2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8.	09.20

B.M.S. SQUARES

D1	5/32 - 3/16 - 1/4 - 5/16 - 3/8.	04.10
D2	7/16 - 1/2 - 5/8 - 3/4.	09.20

BRASS ROUNDS

E1	1/8 - 3/16 - 1/4 - 5/16 - 3/8 - 1/2.	11.10
E2	1/16 - 3/32 - 5/32 - 7/32 - 9/32 - 7/16 - 9/16 - 5/8.	16.85

BRASS SQUARES

F1	1/8 - 3/16 - 1/4 - 5/16 - 3/8.	09.45
F2	1/4 - 5/16 - 3/8 - 7/16 - 1	19.25

BRASS HEXAGONS

G1	5/32 - 3/16 - 7/32 ñ 1/4 - 9/32 - 5/16	07.80
G2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8	21.95

BRASS ANGLE

H1	1/4 x 1/4 x 1/16 - 5/16 x 5/16 x 1/16 3/8 x 3/8 x 1/16 - 1/2 x 1/2 x 1/16	08.60
H2	5/16 x 5/16 x 1/16 - 3/8 x 3/8 x 1/16 1/2 x 1/2 x 1/8 - 3/4 x 3/4 x 1/8	14.70

DRAWN STEEL ANGLE

H3	16mm x 16mm x 3mm - 20mm x 20mm x 3mm 25mm x 25mm x 3mm	11.30

SEAMLESS COPPER TUBE

J1	1/16 x 28g - 3/32 x 28g - 1/8 x 24g - 5/32 x 24g	05.06
J2	3/16 x 22g - 1/4 x 20g - 5/16 x 20g	04.75

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K1	3/32 - 1/8 - 5/32 - 3/16 - 7/32 - 1/4.	08.00
K2	3/16 - 7/32 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2.	20.85

BA STAINLESS STEEL HEXAGON 303 F/C

L1	.152 - .193 - .220 - .248 - .275 - .324.	14.45

BA BRASS HEXAGON

M1	.152 - .193 - .220 - .248 - .282 - .324.	08.60

BA STEEL HEXAGON

M2	.152 - .193 - .220 - .248 - .282 - .324.	04.10

BRASS FLAT SECTION

N1	1/16 x 1/4 - 3/8 - 1/2 - 3/4 - 1	08.60
N3	1/8 x 1/4 - 3/8 - 1/2 - 3/4 - 1	14.75
N4	3/16 x 1/4 - 3/8 - 1/2 - 3/4 - 1	20.65
N5	1/4 x 3/8 - 1/2 - 3/4 - 1	23.50

ALUMINIUM ROUND F/C

P1	3/16 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2	09.35
P2	5/8 - 3/4 - 1	18.00

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Q1	1/8 - 5/32 - 3/16 - 1/4	09.00
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CBG8SC	150	125	-	£14.95	£17.57
CBG6RZ	270	150	-	£19.95	£23.44
CBG6RP	370w	150mm	£29.99	£24.95	£29.32
CBG6RSC	250	150	-	£25.95	£30.49
CBG6RWC*	200	150	-	£29.95	£35.19
CBG8RZ	250	150	-	£29.95	£35.19
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100E	27-100	-	£139.95	£118.44	£139.44
130TE Turbo*	30-130	-	£169.95	£143.85	£169.44
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- Hi Duty pump
- Auto stop/start control

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MODEL	CFM (HP)	MOTOR	WAS INC VAT	EX VAT	INC VAT
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14/50	10	2	-	£179.95	£211.44
15/50	14	3	-	£199.95	£234.94

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- Welded apron round back and sides
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- Recess for optional drawer unit

MODEL	SIZE (LxWxHmm)	EX VAT	INC VAT
CWB1000	1000x650x880	£119.95	£140.94
CWB1500	1500x650x880	£139.95	£164.44
CWB2000	2000x650x880	£159.95	£187.94

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CDP10B	13mm	5	-	£349.95	£411.19
CDP15B	13mm	5	-	£399.95	£469.94
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CAG120 DIY	115mm	550w	£17.95	£15.29	£17.99
CAG115 PRO	115mm	500w	£27.95	£23.79	£27.94
CAG115C PRO	115mm	720w	£29.95	£25.49	£29.99
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Emco Compact 5 CNC Bench Lathe, 1ph £1450.00
Hardinge HCV Centre Lathe, 2ph £1200.00
Harrison M90 Turret Lathe, Tooling, VGC £2750.00
Smart & Brown 1024 VCH, Tooltown Lathe, Well Tooled, 2ph £2000.00
Denford Explorer, ZYNC 3 Control (needs attention) ..... £ 750.00
Denford Viceroy 280 Synchro Variable Speed Lathe, Tooled, Choice of 3 ..... £2500.00
Myford Super 7 3 1/2" x 30" Long bed, Ind. Stand, Gearbox, PCF, Coolant, Tooled, 2ph £3500.00
Myford Talisman 3 1/2" x 30", Gearbox, Ind. Stand ..... £ 1650.00
Myford Super 7 3 1/2" x 19", Stand, Green, Gearbox, PCF, Tooled, 1ph £2850.00
Myford ML7 3 1/2" x 19", Chuck, Tool post, No Motor ..... £ 950.00
Myford CT Capstan Lathe, Collet Chuck and Collets, 3ph £1200.00
Myford ML4 Lathe, Stand, Tooling, 1ph ..... £ 425.00
Smart & Brown Model L2c Collets, Late Machine, 2ph ..... £ 750.00
Tos SUI2 Centre Lathe, 5' x 32" DUTY Tooling, 3ph £2250.00
Boxford AUD 5' x 22" Lathe, Tooling, 2ph or 1ph £1950.00
Boxford CUD 5' x 22" Lathe, Tooling, 2ph £1100.00
Boxford CUD 5' x 22" Lathe, Tooling, 3ph £1950.00
Boxford BUD 6 1/2" x 18" Lathe, Stand, 1ph, Tooled ..... £ 850.00
Boxford CUD 6 1/2" x 18" Lathe, Stand, 1ph, Tooled ..... £ 850.00
Boxford TUD Plain Lathe, 3ph ..... £ 300.00
Colchester Master 2500, 6 1/2" x 25", Gap Bed, Tooled, 3ph £2500.00
Colchester Student 19", 6" x 25", Tooled, 2ph £3000.00
Colchester Duniam 2000, 5 1/2" x 26", Gap, Tooled, 3ph £2000.00
Colchester Student 1200, Gap, Tooled, 3ph £1750.00
Colchester Duniam 5" x 20" Lathe, Tooled, 2ph £1950.00
Colchester Duniam 1900 5" x 20" Lathe, Tooled, 3ph £1950.00
Colchester Triumph 1914" 12" x 60" Gap Bed, Tooled, 3ph £1250.00
Harrison M250 Centre Lathe 5" x 20" Tooled, Light, Coolant, 3000RPM, 3ph £2250.00
Harrison 140 11" x 25" Gap Bed Lathe, 3ph, Tooled, VGC. Choice of 2 ..... £4950.00
Harrison USA 11" Gap Bed Lathe & Tooling, 3ph £1250.00
Schaublin 70 Capstan Lathe, Stand, Collets, 3ph £1750.00
Hallenger Plain Precision Lathe, Tooled, VGC £4500.00
Weiler Capstan Lathe & Tooling, 3ph £2250.00
Lorch 250E Lathe & Tooling, 3ph £1000.00
Ibarlux M125 Sliding Head Automatic Lathe, Lots of Accessories £2500.00
IME, Watchmaker Lathe, compound slide, lever tailstock ..... £ 750.00
Viceroy Plain Lathe, 5' x 20", 3ph, 3 Jaw, Tool post ..... £ 1000.00
Britan 1 1/4" Registone Lathe, Collets, 3ph ..... £ 500.00

DRILLING MACHINES

Herbert Pillar Drill, 2ph ..... £ 200.00
Pollard Beaford 3 Bench Drills, 1MT, 3ph ..... £ 350.00
Avit Bench Drill, Variable Speed, 1ph ..... £ 350.00
Hauser Bench Tapping Machine, 3ph ..... £ 225.00
Startrite Mercury Bench Drill, 3ph, Choice of 5 ..... £ 200.00
Fobco Star Pillar Drill, 2ph ..... £ 225.00
Fobco Star Bench Drill, 3ph, Poor Paintwork ..... £ 100.00
Fobco 7/8 Pillar Drill, 2MT, 3ph ..... £ 500.00
Union Bench Drill, 1MT, 3ph ..... £ 200.00
Union Pillar Drill, 1MT, 3ph ..... £ 250.00
Elliott Bench Drill, Tooled, 1ph ..... £ 150.00
Elliott Progress Pillar Drill, 1MT, 3ph ..... £ 175.00
Meddings MP2 Pillar Drill, 2MT, 2ph ..... £ 250.00
Meddings Drill Tru Pillar Drill, 2ph ..... £ 200.00
Meddings Bench Drill, 2ph, Choice of 4 ..... £ 150.00
WMW Geared Head Heavy Duty Pillar Drill, 3 MT, 3ph, Power Feed Down £2000.00
Elliott Progress 3A Geared Head Pillar Drill, Rack, Table, 2MT, 2ph ..... £ 850.00
H.G. Bench Tapping Machine, 3ph ..... £ 425.00
Avit High Precision Bench Drill, Stand, 3ph, VGC ..... £ 500.00
Swissed High Speed Bench Drill, 5,000 RPM Max, 3ph ..... £ 250.00
Gilbark Junior High Speed Bench Drill, 1/4" Cap, 3ph ..... £ 75.00
Herbert High Speed Bench Drill, 3ph ..... £ 250.00

MILLING MACHINES

Bocford 550/MC Vertical CNC Bench Mill, 1ph £1200.00
Mentor KF1 Turret Mill, 8Ø Spindle, 2ph (small) ..... £ 950.00
Hayes Dierssatter Bedroom Mill, Table Feed, Coolant, 2ph, VGC £1950.00
Milling Head for Bravo Compact 5 Lathe, 1ph ..... £ 250.00
BOA Jig Borer, Bench Mounting, 1ph see ..... £ 750.00
Perrin Jig Borer, Drill, DRO, 3ph, Stand ..... £ 600.00
Small Bench Mill, Rotary Table, Lever Op Slides ..... £ 950.00
Bilton 00 Omnimill, Vertical/Horizontal, 2ph £1000.00
Herbert Horizontal Mill, Very Large, 3ph ..... £ 750.00
Hauser M8 Jig Borer, 3 Axis DRO, 3ph, Tooling £2750.00
S.I.P. MP3KT Jig Borer, 3ph £1500.00
Bridgeport Vastspeed Turret Mill, Power Feed, 2ph, Tooling £2750.00
Bridgeport Series 1 2HP Turret Mill, Power Feed, DRO, Variable Speed, 2ph £2750.00
Condor Vastspeed 2HP Turret Mill, Power Feed, DRO, 2ph, Choice of 2 ..... £2750.00
KBV 2000 Vastspeed Turret Mill, DRO, Power Feed, 2ph £2750.00
Nerio Vastspeed Turret Mill, Power Feed, DRO, 2ph £2750.00
Bravo F1 CNC Milling Machine, Toolholders, 1ph, VGC £2000.00
Schaublin 12 Vertical/Horizontal Milling Machine, 3ph £1250.00
Harrison Universal Swivel Table Horizontal/Vertical Mill, 3ph £1500.00
Harrison Horizontal Milling Machine, 3ph, VGC. Choice of 2 ..... £ 475.00
Harrison Vertical/Horizontal Milling Machine, FF, 2ph £1450.00
Tom Senior M1 Vertical/Horizontal Milling Machine, 2ph, VGC £1450.00
Tom Senior Vertical Mill, Quill Type Head, 2ph, VGC ..... £ 675.00
Arisra F2 milling Machine, Vert/Hor, 2ph, VGC £2500.00
Arisra F2 Hyd/Vertical Milling Machine, 3ph, VGC £3250.00
Chilton 5301 Slide Vertical Mill, Choice, 3ph ..... From £1500 - £6500.00
Pollard Vintage Horizontal Mill, 1ph, Lever Op Slides, GC ..... £ 250.00
Emmett Bonnas Type TUCMH4 Production Horizontal Mill ..... £ 500.00
SIP MH/DRO, NEW, 3MT, 3ph, Stand ..... £ 900.00
Slotting Head for Elliott Omnimill, Universal, VGC ..... £ 375.00

POWER HACKSAWS/BANDSAWS ETC

Wallsave 4" Power Hacksaw, 2ph ..... £ 225.00
Jeenjee Horizontal Bandsaw, 2ph ..... £ 675.00
Kaydel 6" Power Hacksaw, 3ph, Choice of Several ..... £ 275.00
Startrite 14-5-5 Bandsaw, 3ph ..... £ 850.00
Startrite 181 S 10 Bandsaw, 3ph ..... £ 850.00
Ajax 8" Power Hacksaw, 3ph ..... £ 350.00
Startrite 24-S-10 Vertical Bandsaw, 3ph £1300.00
Startrite 24-3-5 Vertical Bandsaw, 2ph ..... £ 850.00
Master DB3200 Production Bandsaw, Feed Etc £2000.00

GRINDERS, LINISHERS, POLISHERS

Grovegraph Engraver Cutter Grinder, 1ph ..... £ 450.00
G. Alexanda Tool and Cutter Grinder, Collets, 3ph ..... £ 650.00
Jones and Shipman 540 Surface Grinder, Mag Chuck, 3ph ..... £ 1950.00
BJH Tire Tool Grinder, 3ph ..... £ 125.00
Union Belt Linisher, Stand, Extras, VGC ..... £ 325.00
BJH Ferret Tool Lapper/Grinder, Stand, 2ph ..... £ 275.00
Wolf Double Ended Bench Polisher, 3ph ..... £ 100.00
Wolf Double Ended Bench Polisher, 1ph ..... £ 175.00
BJH Belt Linisher on Stand, 4' x 3", 3ph, VGC ..... £ 450.00
Duplex Toolpost Grinder, 3ph ..... £ 375.00
Dorsal Bench Engraver Cutter Grinder, Clype 50/50-11200, 2ph, Items value ..... £ 750.00
Chilton 1-32/90R Drill Point Grinder, 1ph, Excellent £2750.00
Dorsetfield Hand Feed Surface Grinder, Late Machine, Mag Chuck, 3ph £1750.00
Superior Hand Feed Surface Grinder, Mag Chuck, 3ph ..... £ 750.00
Elliott 510 Surface Grinder, 3ph £1250.00
Boxford Union Tool and Cutter Grinder, Stand, 3ph, Tooled ..... £ 625.00
Viceroy Double Ended Buffer, 3ph ..... £ 275.00
Union Jubilee Double Ended Buffer, 3ph, VGC ..... £ 350.00
Jones & Shipman 540 Surface Grinder, D80, Chuck, 3ph £3500.00
Milacron 010 Hob Sharpener £1000.00

SHAPERS

Elliott 10M Shaper, 3ph ..... £ 250.00
Alba 1A Shaping Machine, 3ph, VGC ..... £ 275.00
Thos Taylor Hand Op Planer/Shaper, Very Pretty, Wooden Stand, Circa 1870 ..... £ 750.00
8" Stroke Hand Shaper, Bench Mounted, VGC ..... £ 350.00

BOXFORD SPARES AND TOOLING

Change Gears (Also fit Southbends)
16T-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-12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SMOKE RINGS
With the Editors

REMAP at MEX 2001

Previously in these notes, I have been able to offer a few snippets of information about the forthcoming Model Engineer Exhibition at Sandown Park Exhibition Centre, one of which recently concerned the presence of REMAP, providers of technical equipment for disabled people. Many of us very much regretted the decision to omit this deserving organisation from its traditional place at the Model Engineer Exhibition at Sandown Park last year. The fact that many model engineers are involved alongside other ingenious and skilful folk to devise and make special equipment to improve the quality of life of others provides at least two very good reasons for their presence at MEX 2001. The first is to demonstrate and discuss what some of the REMAP groups have done for their 'clients' thereby publicising their work. The second is to present REMAP to an audience from which new recruits might be drawn. On joining any of the local REMAP panels, these volunteers will appreciate the challenge of working with kindred spirits to help those less fortunate than the rest of us.

A charming photograph of Jo-Jo Cranfield appeared on the front page of a recent copy of REMAP news under the headline *John and Jo-Jo star in a film*. I am most grateful to John Wright, National Organiser for his permission to reproduce the photograph here. The accompanying feature explained that when Southend REMAP Panel engineer John Ralling and his perky client aged 7 got their picture in the paper, they had no idea that stardom would be just around the corner.

Born without a left forearm, Jo-Jo Cranfield couldn't ride her bike. Her parents had tried all possible sources, but suitable aids were not available, so REMAP was contacted. John created an aid which acts as a substitute arm connecting link. He said: *"We knew the job was a success after Jo-Jo went round the block with her dad. The next trip was all alone and she came back singing!"*

Publicity in the local *Evening Echo* miraculously resulted in visits from Anglia TV, and a film crew from Germany while doctors at Queen Mary Hospital, Roehampton promised to make Jo-Jo a new arm with a power articulated elbow and with articulated fingers to follow six months later.

Joan Copp, (REMAP's Public Relations Officer) noted: *"Southend Panel's connections with the press was certainly good news all round. REMAP attracted attention from another European country, people asked about REMAP, and two engineers became members. And the brick wall that Jo-Jo's parents met while trying to solve her problem has crumbled because Roehampton has taken an interest."*

REMAP will be delighted to hear from you if you believe you can help in any way, particularly if that help can be of a practical nature. Please contact National Organiser John Wright at Hazeldene, Ightham, Sevenoaks, Kent TN15 9AD; tel: 01732-883818; fax: 01732-886238; e-mail: **john.wright@remap.org.uk website: www.remap.org.uk** Or you may find it more convenient to contact National Organiser Scotland J. Golder at Maulside Lodge, Beith, Ayrshire KA15 1JJ; tel 01294-832566; fax: 01294-832374.

Perhaps I should add here that all donations are very gratefully received. Every £10 given to REMAP currently produces £200 worth of help, each REMAP panel member recruited voluntarily devoting his or her skills to helping people in need.

See you all at Sandown.

Calling T. Martin

The following request for assistance recently landed on my desk:

"Could anyone please advise where I can obtain castings for Tubal Cain's designs featured in his volumes Building Simple Model Steam Engines *Books 1 and 2.*

"Also, can anyone advise me of the address or website of the 2 1/2" gauge association/society?"

Unfortunately undated and signed only T. Martin, this correspondent omitted to include any means by which a reply may be made. If T. Martin sees this and recognises it, would he/she please make contact with the *M.E.* Editorial Office, PO Box 310, Hemel Hempstead, Hertfordshire HP3 8AX so that we can proceed!

Graduation Day 2001

The British Horological Institute held its Graduation Ceremony at Upton Hall, near Newark in Nottinghamshire, on Sunday 23 September 2001.

During the ceremony successful candidates in the Institute's examinations, and the winners of the Institute's special prizes, were presented with their certificates by BHI President, Sir George White Bt FSA, who is also Master of the Worshipful Company of Clockmakers. World-renowned watchmaker and BHI Vice-President Dr George Daniels, and BHI Chairman Mr Tony Lewis also congratulated the successful students.

In addition to its role in overseeing horological training in the UK, the British Horological Institute is a membership organisation. Anyone with an interest in clocks or watches can join the Institute as an associate, whilst professional grades are restricted to those with a technical horological qualification backed by practical experience. All members receive a copy of the Institute's monthly Horological Journal. Further information may be obtained by telephoning the Institute at Upton Hall on 01636-813795.

Engineers Emporium

Fay and Adrian Grimmett of L. A. Services Ltd. in Warwickshire, are pleased to announce that they now have an on-line catalogue of their varied and diverse range of stock. It includes some 64 different categories of items plus a section identified as 'miscellaneous' which covers a multitude of sins. New stock is being added as it arrives and existing stock is being included as and when time permits.

Visit **www.theengineersemporium.co.uk** to see for yourself. It's a veritable Aladdin's Cave with photographs and letters from happy customers, views of the workshop facilities and, for those seeking manuals for their workshop equipment, an extensive list in alphabetical order of manufacturer. The stock covers a large range of obscure and industrial titles—if you don't see what you want straight away, it's always worth asking the question; and they are always happy to purchase manuals or technical information in any condition or quantity.

L. A. Services Ltd are at **Bramcote Fields Farm, Bramcote, Warwickshire CV11 6QL; tel: 01455-220340; fax: 01455-221036; e-mail: engineersemporium@zetnet.co.uk**

Jo-Jo Cranfield can at last ride her bike thanks to Southend REMAP Panel engineer John Ralling.

Metalsonline.co.uk launches direct supply

Metalsonline, one of the UK's leading e-commerce specialists, has announced its entry into direct metals supply.

Last year, Metalsonline launched an online trade directory and e-quote service for the metals industry, allowing buyers to request competitive quotes from a range of stockholders. Reaction from customers has been positive; a recent survey of manufacturers rated Metalsonline as the second most important web site in the UK.

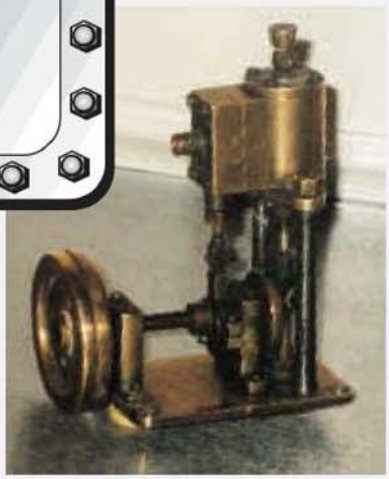
However, reaction from suppliers has been less enthusiastic. David Booth, Managing Director of Metalsonline said: *"The supply side of our industry is often very conservative. With notable exceptions, too many suppliers seem content to sit back and trade in the traditional way, hoping to retain customers and maintain large margins."*

David thinks such apathy is dangerous, and believes suppliers should do more to streamline their order process and reduce costs so they can offer a better service. He confirmed: *"We're prepared to put our money where our mouth is. As from today, we're open for business in the direct supply market. We're sure we can offer big savings and a better way of doing business."*

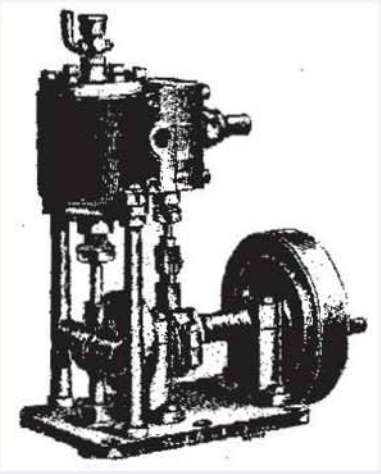
Metalsonline gives quotes online, and fulfils orders within 3 days. The service is initially aimed at small to medium-sized businesses, many of whom have not enjoyed the advantages which larger customers could demand in the marketplace. Metalsonline is confident that it offers the most competitive prices on the market for purchases of up to 50 kilos.

David said: *"Our new service means that companies who buy smaller volumes of metal can collectively benefit from low prices which they couldn't negotiate on their own. It's a classic example of how new technology and a fresh approach can drive down prices and improve service."*

POST BAG



Left:
Mr. Pritchard's slide crank engine was purchased from a second hand tool stall in Anglesey.



Right : Mr. Whitehand recalled seeing an article in Model Boats *magazine with this illustration of a Bassett-Lowke slide crank engine.*

Slide crank engines

SIRS, - I was very glad and surprised to find Mr. Pat O'Keeffe's letter (*M.E.* 4150, 13 July 2001) with accompanying photograph and drawings of his mystery model engine. It is identical, even to the wooden plinth (which I have removed) to the one I bought (photograph herewith) about 15 years ago from a second hand tool stall at the Anglesey Vintage Rally.

Since it is not identified with a mark or name of any sort, like Mr O'Keeffe I have wondered if it was a kit or a one-off by some model engineer. Now at least I know was a kit.

I've had my engine running from a test boiler; it runs smoothly at quite low pressures with a moderate amount of power for its size. The piston is about 1/4in. thick and is made up of leather-like material sandwiched between two brass disks machined to the diameter of the cylinder. It could be a simple marine engine as there are two 1/8in. holes in the flywheel which could take a drive to a propeller shaft of a boat.

It would do nicely for a model of the *African Queen.*

John Dewi Pritchard, Anglesey.

SIRS, - With reference to Mr. O'Keeffe's letter (*M.E.* 4150, 13 July 2001) and his enquiry about his mystery model engine, I append a photocopy of an article published in *Model Boats* magazine dated March 1984. This would appear to have very much the appearance of that illustrated.

In this article, Basil Harley refers to a 'handy little book' published in 1920 with the title *Machinery for Model Steamers*. It deals with boilers and engine sizes and how to keep the centre of gravity of a marine engine as low as possible. The discussion includes mention of a Scotch crank for engines used to drive propellers and refers to a marine engine made in the 1920s by Bassett-Lowke Ltd. in five sizes from 1/2in bore x 5/8in. stroke to 1in. bore x 1in. stroke. Their overall height ranged from 3 5/8in. for the smallest engine to 4 7/8in. for the largest 'and they certainly look solid, reliable and sturdy little engines.'

Note the marking W.J.B.L. & Co. along the baseplate edge.

I hope that this information will be of interest not only to Mr. O'Keeffe but also to other readers of our magazine.

Fred Whitehand, Norfolk.

Dates, lathes and sugar soap

SIRS, - Your efforts to maintain and improve *Model Engineer* are much appreciated but could I please add my voice to the protests that you have, no doubt, already received regarding the removal of the publication date from current issues? I find it incredible that any magazine publisher could have such little regard for its readers, after all we are the ones which keep it in print. Far better to be dated even if publication is a little late.

My second comment relates to the excellent web site run by one of your advertisers, Mr Tony Griffiths. It is a first class resource for all who are interested in machine tools. As it takes quite a time to download images on the web, I have recently purchased his two CD-Rom set containing all the information on the web site. I am only a satisfied customer but for someone considering the purchase of second hand British, European or American machine tools or simply has an interest in these things, I would recommend the purchase of a copy. There are many illustrations of the machines and some very useful and interesting comments. In fact with its assistance I was recently able to identify an old lathe purchased by a friend.

On a similar theme of machinery in general, I have found painters' liquid Sugar Soap is a very effective way of removing the brown film left on machine tools by the lubricating and cutting oils. Used straight from the container it does an excellent job, the parts are then wiped clean with a warm damp rag and oiled. Normal precautions need to be taken to keep the concentrated liquid off the skin.

Peter Brown,
New South Wales, Australia.

(Complaints about the omission of the publication date from M.E. *have been innumerable and completely understandable. We too find their absence extremely inconvenient and are pleased to remind readers that they are to be reinstated from* M.E. *4160 (see* Smoke Rings M.E. *4155, 21 September 2001). We are assured that our other concerns including paper quality, pagination, adhesive for cover mounts, and advertising are all under review by those with authority to do so—Ed.)*

Springs and things

SIRS, - I feel compelled to support Keith Wilson's reply to Martin Evans' letter in *M.E.* 4154, 7 September 2001. Why is the No. 10 hole too large? At the point of support by the hanger bolt the spring is only in shear. The width of the spring material at this point is 0.5in. - 0.193in. (No. 10 hole) = 0.307in. and the thickness is 2 x 0.064in. (16g) = 0.128in. giving a cross-sectional area of 0.039sq. inch. The core diameter of the 2BA bolt, which is in tension, is 0.147in. and has a cross-sectional area of 0.017sq. inch. As the shear strength will be approximately half the tensile strength it would appear Keith has his proportions about right. Furthermore, to replace the No. 10 hole with a slot 0.130in. wide would require the hanger bolt to be reduced to 5BA.

As the 2BA bolts are a free fit in the shock absorber, bracket and spring, are we expected to believe the bolt would slide in the slot? Hardly, the whole assembly would flex. Also, if slotted what would centralise the spring between the hangers? Visions of axles running out of parallel to assist the negotiation of curves! With a 9in. radius spring (hardly flat) the angle between the centre line of the bolt and a tangent to the spring is 68deg and should provide centralising effect.

There is one main objection to replacing a thick leaf spring with two of half the thickness just to make it easier to pierce the holes. The stiffness of the spring depends upon the cube of its thickness and if halved it becomes one eighth as stiff. Putting two together results in a spring of one quarter the stiffness.

Finally, engineering style twist drills made from solid tungsten carbide are available in a wide range of sizes. Examples range from 0.015in. diameter for drilling printed circuit boards to large sizes for drilling deep holes, with two spiral holes internally within the webs to feed coolant to the cutting edge. To say they have no place in the precision engineering shop is about as far from the cutting edge of technology as you can get.

D. W. Smith, Bedfordshire.

Newcomen's engine

SIRS, - May I congratulate Chris Leggo for building, and yourselves for publishing his excellent article on building a Newcomen engine. It is nice to see an example from the early days of steam that does not rely on published drawings with all the snags ironed out, but relies an application of the grey matter. That said, may I have the temerity to criticise a few points regarding Mr. Leggo's engine?

I built a Newcomen engine in the 1960s the construction of which was featured in *M.E.* 3315 (17 February 1967). It was roughly the same overall size as Mr. Leggo's and I had no difficulty in making it run. In fact it is a very easy engine to build and very impressive to observe running. I used L. T. C. Rolt's book on Newcomen for all the details and Barney's engraving of the Dudley Castle engine, obtained from the Science Museum. This last is the picture which normally appears in history books but has a full annotation of all the parts which is usually left out in print. Using this enables one to get a much better understanding of the working.

I feel that Mr. Leggo has introduced unnecessary complication into his valve gear which is inhibiting reliable operation If any prospective constructor follows the original valve gear with the addition of overscale weights to ensure quick operation, success is guaranteed. As Mr. Leggo points out the 'Y' lever must be capable of minute adjustment as must the plugs on the plug rod but not half as fiddly as setting up Stephenson gear with reverse. The steam admission valve is virtually identical to LBSC's 'Everlasting' blow down valve and I merely scaled up the details in his *Live Steam Book* with operating gear as per Newcomen. I would say from experience that it is essential to have both

The 1½in. scale spirit fired traction engine (left) and the 2in. gauge Bassett-Lowke locomotive (right) which Mr. Orr wishes to identify.

an eduction and a snifting valve to prevent windlogging and permit rapid draining of condensate. There should be no problem if the ends of the respective pipes terminate in non-return valves, not spring loaded but just immersed in the hot well.

Mr. Leggo noted problems with maintaining a head of steam. His engine is slightly smaller than mine as is his boiler but while basically similar I put in a number of large curved firetubes running from the base to the sides and had no trouble in maintaining 2psi. Indeed on one occasion the engine was required to run for periods of up to 45 minutes during rehearsals for a TV programme in which it featured.

In conclusion I liked the features on Mr. Leggo's engine which enable readings to be taken but if you want to build one of these delightful engines without problems stick to Thomas Newcomen's original and you will not be disappointed, not least for the minimal amount of machining required.

Michael Jones,
South Gloucestershire.

Water cooled smokeboxes

SIRS, - To make them more competitive with electric and diesel locomotives on fairly long trips, there is talk of increasing the speed of preserved steam railway locomotives used for steam specials. To get more from the coal used as fuel, my thoughts have been turning to the use of water cooled smokeboxes on steam locomotives to extract more heat from the products of combustion before they are exhausted to atmosphere. I imagine this would provide an increase in steaming capacity of some 10-15% which would enable these steam engines to climb grades such as that at Shap at increased speeds so as not to delay following service trains.

Boiler feed water would, of course, be used to cool the smokebox and in model form, a locomotive fitted with a water cooled smokebox would burn less coal and produce less smoke as a result.

What do other readers think?

On another matter, I was interested to read in *M.E.* 4133 (17 November 2000) about the international travels of Mr. W. F. Pearson of Auckland, New Zealand. We also had a W. F. Pearson out there who helped found the New Zealand Shipping Line. He lived in Oxford, near Christchurch and also in Croydon. Some of his family became doctors both in the UK and in New Zealand. My mother was given the second name Pearson after her grandmother, Mary Pearson before her marriage.

Some years ago, a doctor's widow, Mrs Sylvia Pearson of Christchurch NZ, sent me a copy of the book: *Oxford NZ, The First Hundred Years* in which Joseph Pearson and his family are mentioned as one of the founding fathers of Oxford, NZ. I would be pleased if any of the above named could get in touch with me.

William Ogilvie Pearson Willis,
Cumbria.

What are they?

SIRS, - I would be pleased if any reader(s) could identify the traction engine and locomotive shown in the accompanying photographs (above).

The traction engine is fairly self-explanatory but I have no other information than that it is possibly early 20th century, about 1½in. scale and spirit fired.

As far as I can determine, the 2in. gauge Bassett-Lowke locomotive is not catalogued.

Any assistance would be much appreciated.

Bill Orr, Wiltshire.

Compressed air and masonry drills

SIRS, - Regarding Mr. Spenlove-Spenlove's compressed air systems in *M.E.* 4153 (24 August 2001), not to detract from but to add to this fine gentleman's article, I would make a small safety point. Compressed air is obviously a dangerous commodity, particularly at factory mains pressures. My experience in plant maintenance and design taught me to install in the air line prior to the filter/regulator/lubricator (F.R.L.) a hand valve to isolate the system downstream, one which will exhaust all air in the equipment being supplied in that section. It is otherwise possible to retain sufficient pressure in a system to enable operation of equipment to occur with this residual pressure.

Imagine a simple clamping device effected by an air cylinder. An obstruction appears, swarf maybe, turn air off, residual pressure exists, hands in to clear the tools, inadvertent operation of start switch (or whatever) in doing so. Result? Air cylinder dutifully clamps on otherwise set of healthy fingers at an extremely rapid and uncontrolled rate. A 2in. air cylinder can move faster than you can shift your fingers! Seeing is believing! and fingers aren't easily replaced.

I removed all the usual diaphragm valves in our factory and ultimately replaced them with 'exhausting' type, usually of the Martinair or Legris designs.

A secondary precaution would be not to physically reposition any cylinder while the system is 'dead' otherwise reintroduction of pressure would cause sudden return of these items to their start position equally quickly. Suspended loads will also have descended under 'no pressure' and their rapid return to status quo could even cause mechanical damage. There are methods to reintroduce air to a system slowly but then things start getting complex. The alternative is to screw the pressure regulator back to zero after turning the air on so that everything moves in a controlled fashion.

Regarding use of masonry drills on hardened steel (Martin Evans' letter in *Post Bag, M.E.* 4154). I have used these items when re-sleeving some cast iron cylinder barrels. Loctite was used initially, then backed up with 'half dog' grub screws requiring a hole for dog location.

Rather than making new castings, 22 in all, we re-sleeved the old ones using jig drilling bushes which were glass hard; ask any jig and tool man. In total 176 holes were drilled and only two drills used. The first one finally gave up when the tip unbrazed itself. The method involved a slow speed and keeping the pressure on the drill; things do get a bit hot. Correct: precision is not to be expected, and hefty burr occurs at the drill exit which has to be ground off. Agricultural? Certainly! That is virtually what it was but time was of the essence and what was most important, it worked.

I have one tiny complaint. Would it be possible for contributors to refrain from using the phrase "usual disclaimer' in their articles and letters? I personally find this most annoying. Who cares whether or not they have a vested interest, provided that the information forthcoming is accurate and/or useful. It does get rather childish, after all we don't object to Messrs Reeves, Spink, C.E.S., Blackgates, *et al*, even our editor does some name-dropping occasionally.

Finally, please hang on to Keith Wilson as long as he can draw breath. I have no wish to build a Toad or a Castle, etc., but do find his articles entertaining and informative. He even finds space to admit to the odd mistake here and there.

I'm building a *Simplex* myself, plus a Jubilee clock; both have been around the workshop for years. The latter for the little woman's birthday, but I'm not saying which one (birthday that is!)

B. W. Mills, West Midlands.

Bulldog

SIRS, - I read with interest your editorial and the article by Captain Peter Lewis in *M.E.* 4153 (24 August 2001) describing the building of his *General Steam Navigation* locomotive to Keith Wilson's *Ariel* design. I am sure it will be of great help to other builders and of general interest to the rest of us.

I write to ask if anyone has done the same for Keith's *Bulldog* design. I have nearly finished the boiler, which seems to be error free, but have encountered a few minor problems with the tender frames and the front bogie. I hesitate to bring these to public attention, as being an amateur mechanical engineer I always fear I have misunderstood the drawings! I certainly intend no criticism of Keith's work; he has done and is still doing things that I could not, and I have always found his contributions very readable.

If there are builders 'out there' who wish to make contact with me regarding Keith's *Bulldog* design, I shall be pleased to co-ordinate any information which may be of general use and interest. I may be contacted by way of our Editor or by e-mail.

Chris Orchard, Northamptonshire.
e-mail: **quiltedsteam@cwcom.net**

BAILEY'S *BEE*
A VERTICAL CONCENTRIC HOT AIR ENGINE

Anthony Mount
describes the stand, firebox and air chamber for this handsome hot air engine.

●*Part II continued from page 272 (M.E. 4155, 21 September 2001*

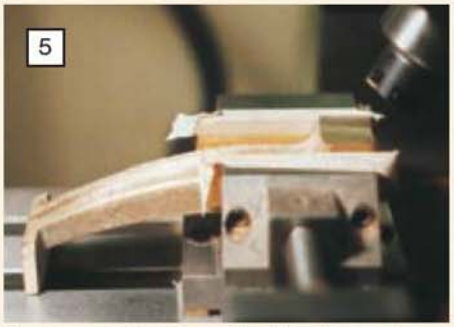
The stand of the full size engine would probably have been a single casting. While this would be possible for the model, the pattern and core boxes would be quite complex and lead to an expensive casting. Such a casting would also be difficult to handle on the lathe. So, I have broken it down to a ring and three separate legs held together with cap head screws fitted from inside the ring.

The legs and ring are gunmetal castings. For the sake of lightness, they could have been cast in aluminium alloy but many model engineers seem to have an aversion to this material.

Start by machining the ring, gripping it carefully by the outer diameter in the 4-jaw independent chuck and leaving clearance between it and the face of the chuck. Clean up the exposed surface and then machine the bore to finished size. Change to the 3-jaw chuck, reverse the part and hold by the bore. Just clean up the face and then machine the outside diameter to size leaving a small amount of material between the chuck jaws and the tool. Chamfer the corners. Reverse the part in the chuck, face off to length and chamfer the other corners.

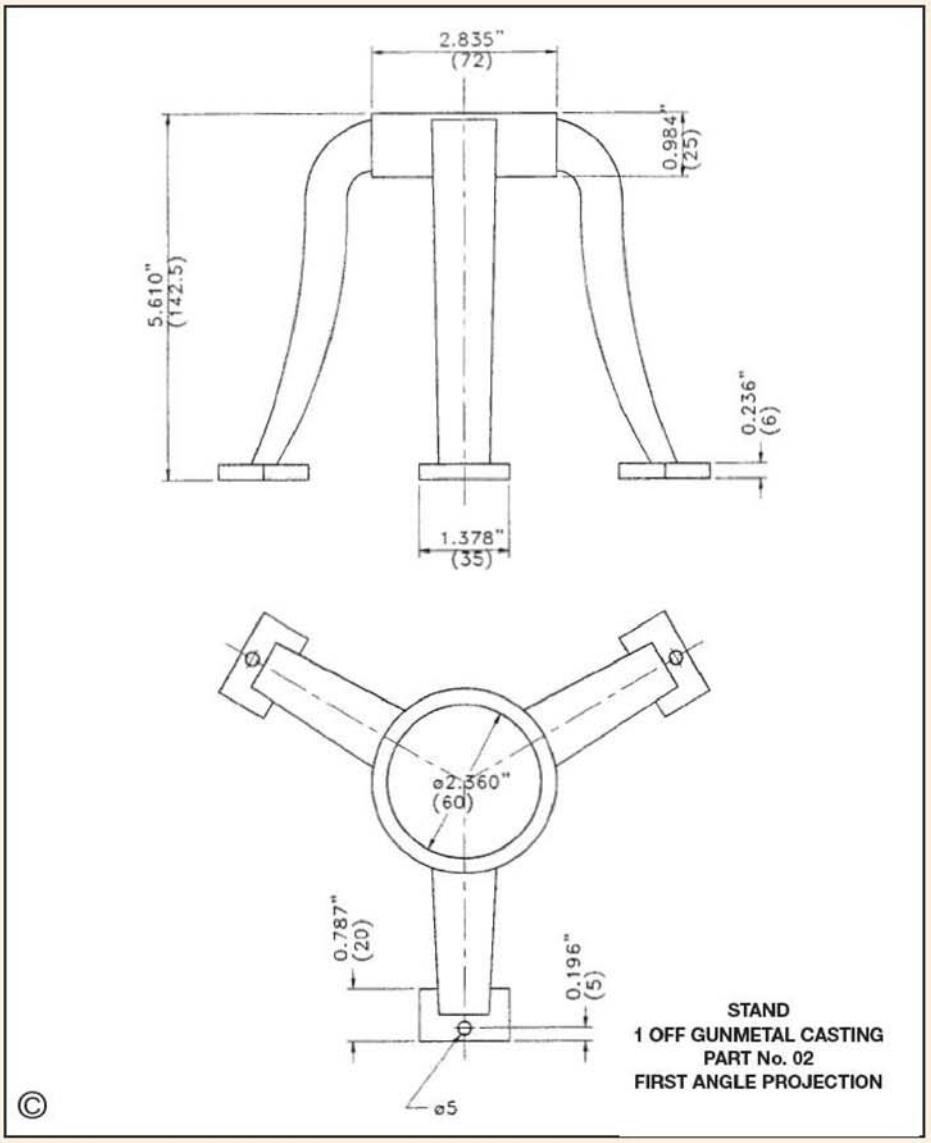
Using the special tool to reverse counterbore the stand ring for the screws to secure the legs.

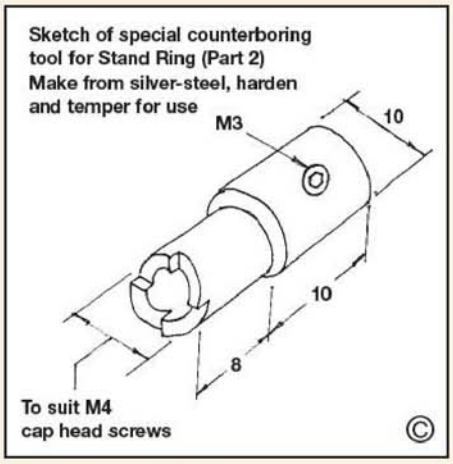
Machining the bottom of each foot using a sharp end mill. Note the tapered plywood packing.

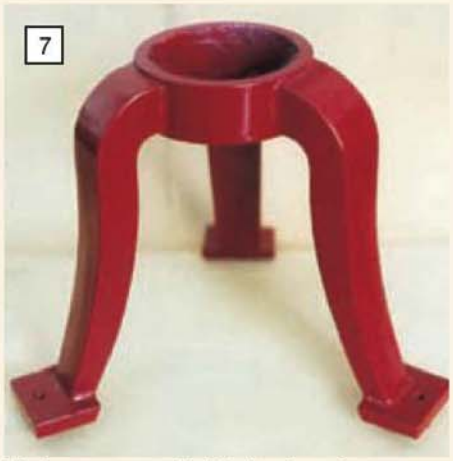


A concave surface is machined on the top of each leg to fit the stand ring diameter.

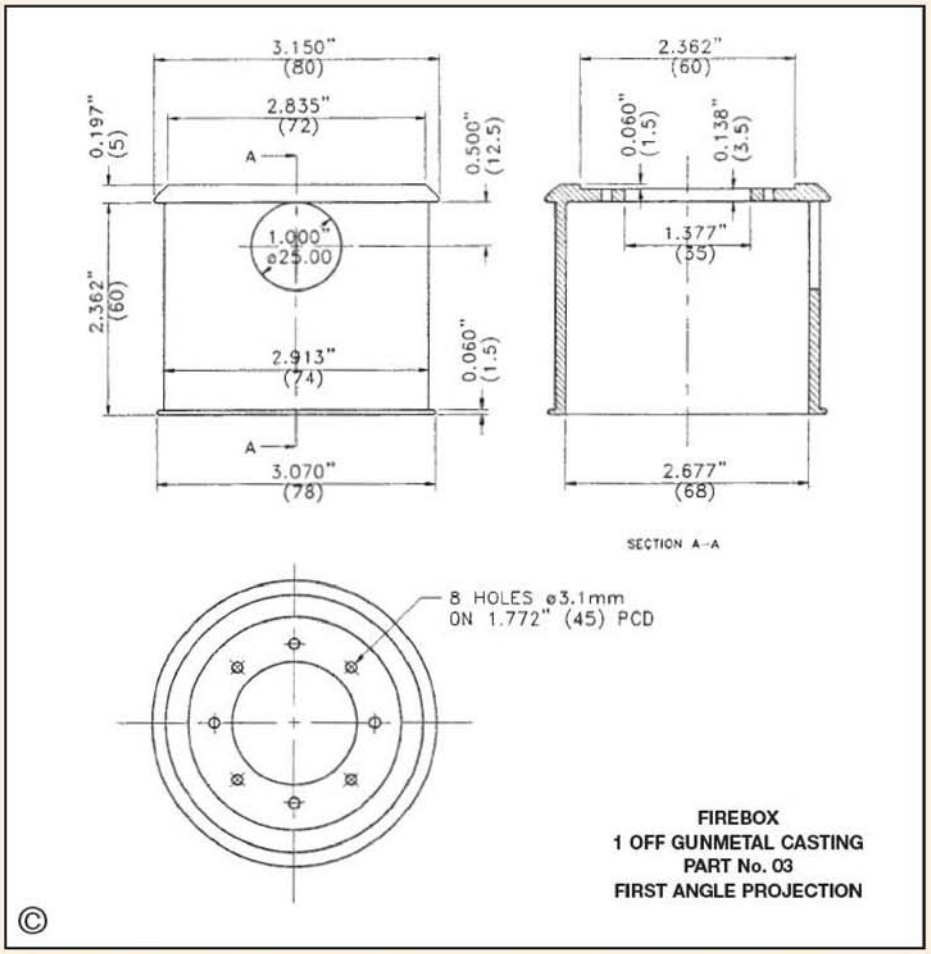
The legs are drilled and tapped to suit the screws used for assembly. Note the angle plate locator.







The legs are assembled to the ring using cap head screws and filled before painting.



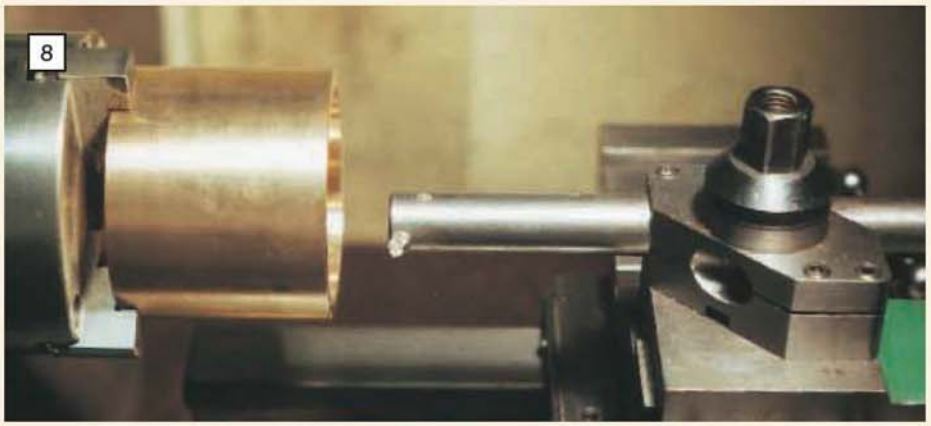
Without disturbing anything, transfer the chuck and ring together to the dividing head mounted on the cross slide. Pick up the centreline, index three positions and drill for the M4 cap head screws. Now for the interesting bit: the holes need to be counterbored on the inside of the ring for which we need to make up a little bit of tooling.

Start with a piece of 4mm dia. mild steel rod which will be held in the chuck and pass through the previously drilled hole. For the cutter, chuck a length of 10mm dia. silver-steel and reduce a length of 8mm to 7mm dia. for the head of the screw. Drill and ream to fit the mild steel rod and cross drill and tap for a grub screw. On the end, mill or file some teeth as shown in the sketch. Note that the direction of the teeth is opposite to normal, as we are cutting backwards. If the cutter is made in the usual way the lathe would have to be run in reverse for the tool to cut. Part off from the parent bar and harden and temper the cutter.

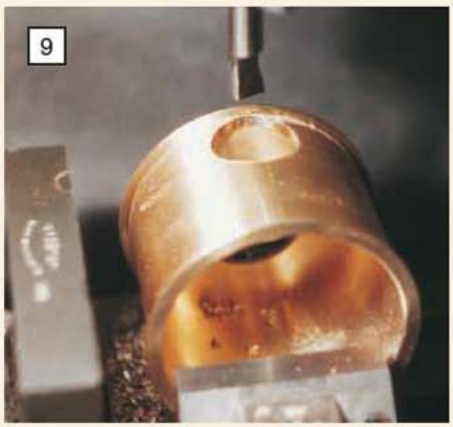
Chuck the rod, pass it through the hole in the ring, slide on the cutter and lock it to the bar with the grub screw. **Photograph 3** shows this set up. Now the cutter can be set in motion and the lathe saddle reversed against it until the counterbore is of sufficient depth that the head of the cap head screw is just below the level of the inside of the ring. Repeat for the other screw holes.

I would recommend the use of stainless steel cap head screws which can be obtained very cheaply from some building screw suppliers such as Screwfix; tel: 0500-414141 (usual disclaimer). For example, M4 x16 cap heads are currently listed at £2.45 for 50.

The legs do not need a lot of work. Start by making up a plywood template. Mark out the inside profile of one leg on one edge of a piece



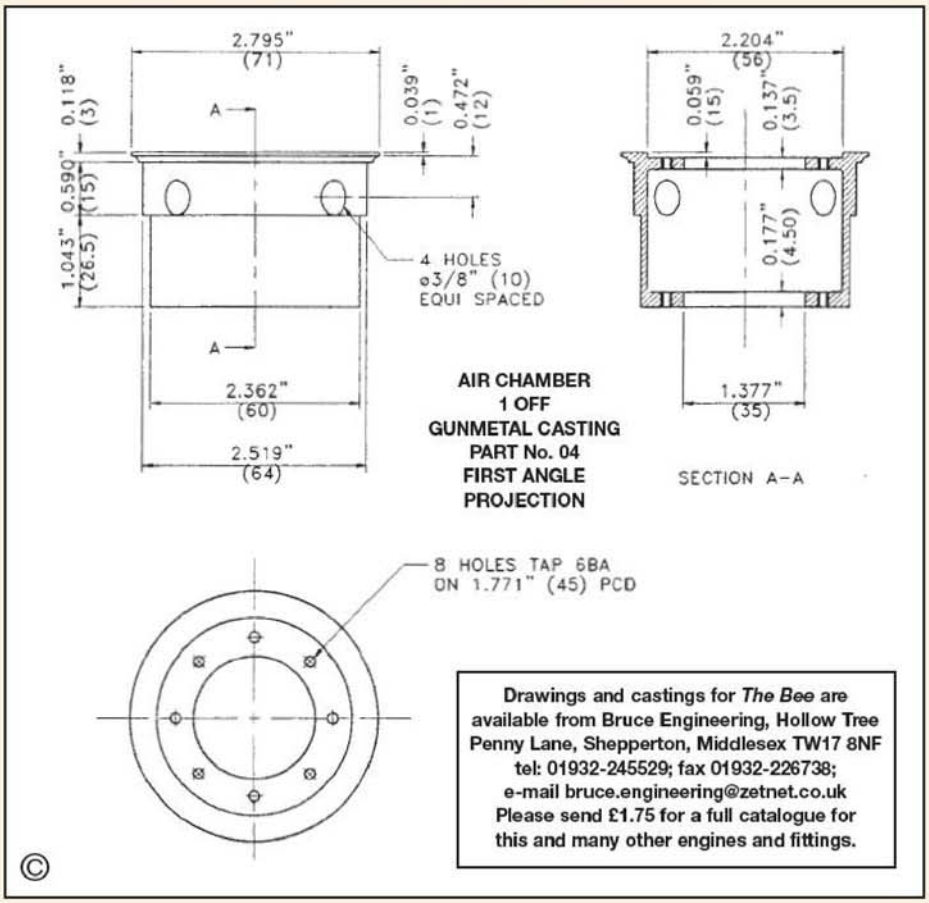
The external diameter of the gunmetal firebox casting is machined to size. The inside diameter is then finished to size using a substantial boring tool to ensure accurate dimensions and a good surface finish.



The exhaust pipe hole is most conveniently cut into the firebox by boring using an adjustable offset boring head.

The completed firebox with a short length of 25mm steel exhaust pipe tube in place ready for silver-soldering.

Cleaning up the bore of the gunmetal air chamber casting. The inside diameter is not critical. Note the tape on the outside diameter to protect the freshly machined finished surface.



Finshed air chamber.

Firebox (Part 3)

The firebox is also supplied as a gunmetal casting. Using the 4-jaw independent chuck, grip the part in the bore and turn the outside to maximum overall finished diameter. Face off the end, bore out the seating and form the recess.

Reverse the part in the chuck, and grip the outer diameter. Face off the end bringing the part to finished length. Set up a very stiff boring bar of say 20mm dia. or more and bore out the inside surfaces of the firebox. **Photograph 8** shows this operation. Reverse the part in the chuck again, this time gripping in the bore, and turn the waisted centre of the box and the bottom lip. For the next operation set over the top slide to 45deg. and turn the chamfer.

The firebox can now be set up on the dividing head and the 8 stud holes drilled. Change to the milling machine and clamp the casting by its ends in the machine vice. The exhaust pipe hole can now be bored out. Use a straight flute drill to minimise the chances of the drill snatching as it cuts through the thin walls of the casting. Finish with a boring tool (**photo 9**) to open out the hole for the exhaust pipe. The exhaust pipe can be a short length of 25mm (1in.) diameter tube which can be silver-soldered in place. I presume that in full size, an elbow and extension tube was used to carry away any exhaust. The completed firebox is shown in **photo 10.**

Air chamber (Part 4)

The air chamber is a cored, gunmetal casting which again can be machined all over. Using the 4-jaw independent chuck, grip the smaller, outside diameter and face off the end. Follow by turning the lip and the short straight O/D section. Bore through to 35mm diameter.

Now, the inside does not need to be machined as it is not seen but it is easy to do and does lighten the casting a bit. So, set up a boring bar with an overhanging square tool. I used a 3/16in. square high speed steel boring bit in a split clamped boring bar. It was just passed through the already bored opening and the inside excavated. Exact dimensions are not important. The set up is shown in **photo 11.**

Reverse in the chuck and grip the previously finished bore. Turn the smaller outside diameter to finished size and face off the end.

Set up the dividing head on the cross-slide again. Pick up the centre of the air chamber and index the four cross-holes of 10mm diameter. Turn the dividing head through 90 degrees and drill and tap for the stud holes. The completed casting is seen in **photo 12.**

●*To be continued.*

of plywood. Cut to the line with a coping saw or fret saw. The straight bottom edge can sit on the bottom of the machine vice, and the top edge cut to the shape of the leg supports the leg casting. The legs are tapered in their length so need tapered packing both sides of the leg to obtain a secure grip in the vice.

The legs can now be clamped in the machine vice on the milling machine, using the plywood template to set each one up to the same position as the others, for machining the bottom side of the feet (**photo 4**). The side of a long end mill can be used for this operation.

Turn the leg over and use another plywood template to set all the legs to the same position. Clamp the leg ready for machining the seating at the top of the leg that abuts the ring. As a cross check, use a square off the table against the bottom of the foot to see if it is square. Adjust until it is.

First, machine all the seats square using the end of an end mill, then machine the seats to the correct curved profile. The leg could be set upright and a fly-cutter, previously set to the radius of the ring, used to machine the seat. However it will be almost impossible to clamp the leg securely enough for this method. At the moment, the leg is firmly clamped and the seating squared off. By setting the milling machine head over at an angle of 30deg. and setting the cutter to a throw of approximately 18mm, the curved seating can be easily machined. **Photograph 5** shows this operation.

When the curved seat has been machined on the last leg, bolt a small angle plate to the machine table abutting the foot of the leg. This will form a stop against which the other legs can be positioned so that all the screw holes are equidistant from the bottom of the leg so that the table will stand square and not be lopsided.

Drill and tap the legs in the centre of the curved seats (**photo 6**) and then assemble the stand. Check that all the heads of the cap head screws are below the surface of the ring. I found it useful to screw the parts together with a smear of car body filler such as Isopon on the joint surfaces. This will act as an adhesive and where it squeezes out it can be formed into a fillet with a rounded spatula. When painted it will seem that the legs were all cast in one. **Photograph 7** shows the completed leg assembly.

PETE'S PAGE

ALIGNING LATHE CENTRES

Peter Spenlove-Spenlove discusses the alignment of lathe headstock and tailstock centres and describes techniques for checking and setting them for accurate working.

Most of us start our hobby by obtaining a lathe. It may be a modern precision machine which, when delivered will have all its parts carefully set up by the original manufacturers, but many of us will start with an old model made, perhaps, in the pre-WW2 years.

Whatever else, both types should be equipped with two 60deg. Morse tapered centres which are necessary when turning work between centres, hence the term 'centre lathe'. If the tips of each centre, one in the tailstock and the other in the headstock can meet, point to point *exactly*, one can turn parallel work. However, on some old lathes which were made down to a price for home workshops there could be a basic fault. The headstock spindle (mandrel) taper could be slightly eccentric. A modern well-made hardened Morse centre would not then rotate truly. This problem was well-known and acceptable in those days and it was usual for a *soft* centre to be provided for the headstock. It was similar to a regular centre in all other respects except that it had not been hardened. For precision work the turner was expected to fit the soft centre into the clean headstock spindle socket and take a careful skim from the 60deg. cone point with the top-slide set over.

Once this had been done, the tip was perfectly true, but if the centre was taken out and put back later, the error could be worse. It was normal practise therefore to stamp a mark on the centre and another mark on the collar behind the chuck locating area of the spindle or on the end of the spindle adjacent to the mark on the centre. These marks showed at a glance where to replace the centre each time in the future.

It is not unusual for this method to be adopted today. For accurate working between centres, grip a piece of bar in a less than perfect 3-jaw chuck, machine a 60deg. cone point on it and then leave it in place in the chuck until all subsquent between-centres work has been completed.

Another problem found on used lathes concerns the set-over tailstock. Those not yet fully conversant with lathes may not realise that part of the tailstock can be moved a small amount *across* the bed as well as slid along it. This is a special feature which enables long gently tapered work to be turned between centres. After the tapered work is finished, the tailstock should always be reset to its central position, which is not always easy on the cheaper centre lathe. It is possible to check that the two tips meet but it is not easy to do this accurately by eye. The usual technique is to make a series of test turnings of a bar mounted between centres. It is only necessary to machine a register at each end of the test bar at the same setting of the tool. After the cut has been taken, both ends of the bar are carefully checked with a micrometer, and when both readings are the same, the bar is parallel and the tailstock is central again.

The following method is an old machinist's dodge. It is not perfect, but usually adequate when turning short parts which are mounted on toolmakers' mandrels including such items as pulleys, gear blanks, collars, and the like. All you need is a piece of flat bright mild steel bar about 3/8in. thick. The width can be anything from 3/8in. (square bar) to 3/4in. or even more. Clamp it to the drilling machine table and drill a 3/16in. hole through close to one end. Use a centre drill to cut a clean chamfer of no more than 1/32in. to remove any burrs, using the drill press for an even cut. Hand scraping is not accurate enough. Thinner material can be used and a smaller hole drilled, of course, but be sure that when placed into each end of the hole, the tips of the 60deg. Morse centres do not touch. The tests which follow can be carried out more accurately with a dial test indicator but I have in mind the newcomer who has yet to buy his dial gauge.

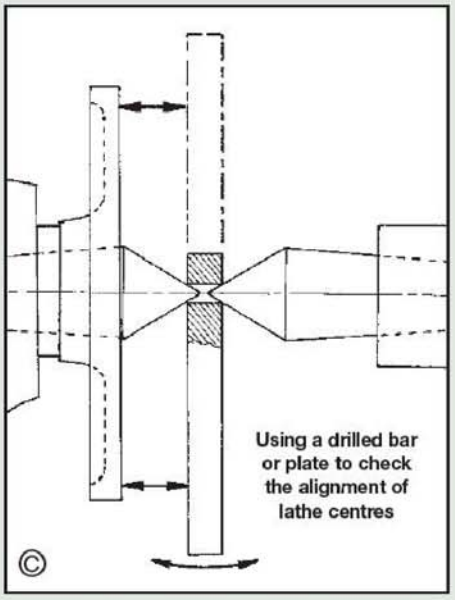
First fit the face plate and then both centres into cleaned sockets. *Never* try cleaning the headstock mandrel taper socket with the lathe running; *always* isolate the power supply first! Bring up the tailstock and gently nip the prepared plate/bar between the centres.

Test 1: Slowly rotate the mandrel by hand, but stop the bar from turning by the use of light finger pressure. If the bar can be seen to move towards and away from the face plate while you turn the mandrel, you have an out-of-true mandrel centre. If the centre is soft, skim it to get it to run true. If the centre is a new hardened one of known quality, any movement of the test bar is due to the mandrel socket itself. Old worn lathes with wear or dirt forcing a true centre out of line can be corrected by cleaning and using the soft centre which should be available from our usual suppliers; don't forget to mark it for correct replacement in the future.

Test 2: This test checks the alignment of the tailstock provided that test 1 is satisfactory. Using the same set-up, this time swing the bar around by hand for a full revolution. Note the gap between the outer end of the bar and the rim of the stationary face plate. If this gap alters, the tailstock centre is off-centre. If the gap varies at the back and front (3 o'clock and 9 o'clock on the faceplate) adjust the tailstock offset screws to centralise the tailstock.

This procedure may be considered a normal job, but if the gaps at 12 o'clock and 6 o'clock, i.e. when the bar is up and down, are unequal, there is trouble! If the tailstock centre is too high or too low, there could be dirt in the sleeve or under the tailstock, or it could be an indication of wear. It is even possible that you are checking a very old lathe on which a replacement tailstock has been fitted in place of a missing original.

Early lathes were not produced to the exact interchangeable standards to which we have become accustomed with modern methods of production. A certain amount of selection and fitting would have taken place during assembly. When the lathe assmbly was complete, each major part might be stamped with a machine number before dismantling, cleaning and painting. These numbers are usually the assembly number within a batch and only serve to aid the machine fitter to re-assemble the lathe, i.e., he would be able to pick the correct tailstock for the bed from the freshly painted batch. Other cast-on numbers were usually foundry pattern numbers.



These lathes were seldom given serial numbers, being known as, for instance 'Adept 1 5/8in.', 'Winfield 4 1/4in.', etc. The figure is the centre height above the bed. (USA makers use 'swing' which is double the UK figure, i.e., 'Winfield 8 1/2in.')

By the way, in Test 2, I have assumed that the face plate is true. Clean the threads and register face and the plain diameter of the mandrel nose and face plate. Fit it carefully and, when running, note any wobble. If there is, remove and clean it again, especially in the vees of the face plate threads. Re-fit and test again. If it still runs with a slight wobble, consider facing it true using a keen tool and the cross-slide feed with the saddle locked so that the tool can cut without the faceplate slots jarring the saddle back along the bed. Lock the top-slide by temporarily tightening the gib strip screws. If the cross-slide gibs are a little slack, adjust these too so that the cross-slide screw is slightly stiffer than for normal work. Use a freshly sharpened tool and a low spindle speed.

Turning a 6in. to 8in. cast iron face plate with slots is quite a demanding job for an old vintage lathe. If the face plate was part of the original kit sent out by the manufacturer, it is doubtful that the error will be much: 5-10 thou. probably at most. Feed the tool slowly and evenly across but don't let it rub. If the high speed steel tool fails part way across, try using a sharp carbide tipped tool ground as for turning brass. If you have a choice of grades, ask for a tough grade or tell the supplier the type of work, i.e., "light finishing with intermittent cutting on a cast iron face plate with slots."

GENERAL STEAM NAVIGATION

Peter Lewis

continues his narrative describing how he overcame the problems he encountered when building *Ariel*.

●*Part III continued from page 275 (M.E. 4155, 21 September 2001)*

We now come to the bissel truck, another nice chunk not unlike the front bogie. My fabrications pleased me once again, the more so when someone came round and asked me if the centre frame assembly was a casting, a question which I took as a compliment. However, somehow Keith managed to get the frames too wide apart and once again, I count myself lucky to have had advice from Australia. I have much for which to thank my friends 'down under'. I ended up with a width of $2^{9}/_{16}$in. over the frames. As Fred Grosvenor pointed out, the *inside* measurement of $2^{21}/_{32}$in. prevents the truck being fitted inside the chassis and I know of some who have followed the drawing and just had to cut the lot out. To do a proper job the whole lot has to be altered because there isn't enough swing between the main frames.

The axleboxes are fitted with roller bearings. Someone told me later that I should have stuck to plain bearings since any ash, etc., that gets into the bearings will cause me untold problems; I shall just have to be careful where I chuck the ash.

Keith's side control arrangement is fine. The only trouble I had here turned up later when I discovered that the side control was restricted by the ashpans, but I think I have just about got away with it. Ken Whittle has since informed me that the bissel truck axleboxes on the outside are not the right shape, but Ken is a *real* perfectionist. However, I have noted that for some reason the 'S.R.' initials are missing but they're in place on the tender axleboxes.

Boiler

Too big for me to handle, I have already explained that I chose to have the boiler made for me and, in any case, there are people far more capable of building one than me. Priory Boilers made a beautiful job of it at reasonable cost, to the extent that I recommended them to Pete Theobald in Ballarat.

Two things come to mind: first the whistle bush was not shown on the drawings and is therefore missing, an omission resolved by making up a dummy and fitting it to the cleading. I have made my whistle and reckon I've got the tone and pitch very near to full size. About 8in. long, it is made from $^{7}/_{8}$in. brass tube and has to be hidden somewhere; under the tender seems as good a place as any! The second omission is the front boiler support just before the smokebox.

With a reduced width to fit between the main frames, the fabricated bissel truck is fitted with needle roller bearings

Speaking of the smokebox, I didn't make it of brass since I may have overlooked it and by then I felt like going a bit easy on the outlay. Okay, later on, I did finally cough up for brass for the tender, but I made the smokebox from $^{3}/_{32}$in. steel sheet rolled up and welded along the seam. It turned out to be a lovely job, a perfect fit and circular to boot!

Cutting all the holes wasn't so much fun. The weird shaped hole in the bottom to fit over the middle cylinder was fine, but cutting an exact 3in. diameter hole for the chimney turned out to be a mistake because when I came to fit the 8BA hexagon headed bolts to secure the chimney, for the most part I found fresh air where the bolts where supposed to go. So out with the MIG welder—what a handy tool!—and on with a fitted piece to resolve the problem.

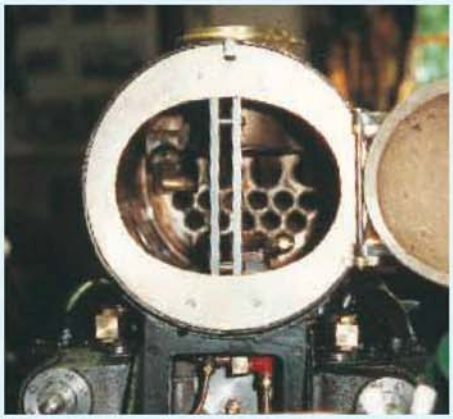
Someone asked me why the crossbar is set vertical. No doubt the reason is because it follows the prototype and I imagine that a vertical crossbar saves removing it each time to clean out the smokebox. At least you're unlikely to bang your head on it getting in and out! Making the dart, etc., and unlocking it is a right performance while the door and its bits was a fun job. I have beefed up the hinge bar and also the dart handles.

Still in the smokebox, getting the holes for the steam pipes in just the right place gave me a headache but like the best stories, it has all turned out well in the end. With the steam pipes in place and the cover plates fitted 'asbestos' rope and fire cement makes the assembly reasonably airtight.

How are you at bashing out a piece of brass or steel sheet for the dome cover? It seemed to me to be much easier to make a pattern for the dome cover and get Jays of Norwich to cast it for me in gunmetal. When it came to the regulator, I made all the bits more or less to the drawing but the trick is to chamfer off the rear end underneath, make the rod with only one bend in it instead of the two shown and then it's possible to get the whole lot through the hole in one piece. It works a treat but I have to admit that the experts assure me that it cannot be done. I found the business end somewhat useless and made up a sturdy arrangement that can be seen in my photograph.

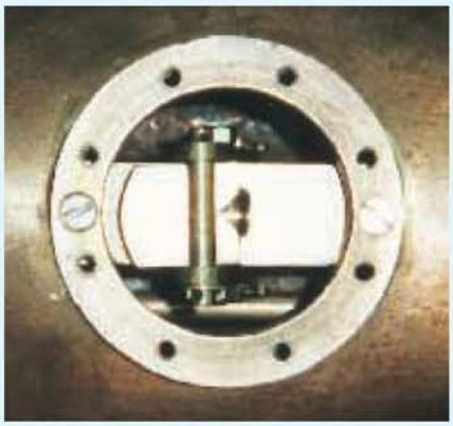
I made the clack valves as near as I could to the full size arrangement and avoided the usual threaded bush by using four 8BA tapped holes. The clacks are awkward little devils since the

The smokebox was rolled from steel sheet with a welded seam beneath. Problems were encountered when the chimney was fitted.



The vertical crossbar presents a few problems for the modeller but was doubtless more convenient in full size practice.

Fitted with a 'beefed up' hinge bar and dart handles, the smokebox door is characterised by its unmistakeable Bulleid profile.



The application of a little ingenuity means that the the regulator can be inserted and removed through the dome bush.

Having purchased a stainless steel superheater from Paul Gammon, the writer had second thoughts and made one himself in copper.

pipes are bent under the handrails. Then there are the backhead fittings. I bought my gauge glass fittings because Dave Noble makes such a beautiful job of his. Unlike the prototype with the handles all on one side, they are handed. The firehole door, which uses Meccano gears, the reverser screw gearbox and the steam brake are all examples of Keith's genius. I made a 'cool' handle for the steam brake as per full size.

When it came to the manifold, it struck me that starting with a piece of round stock bar was a right awkward way of going about things. I ended up with bushes pointing at all angles, so I had another go using a piece of 1/2in. square brass bar suitably drilled out. As the face is dead square all I had to do was to thread the holes 1/4in. x 40tpi. without having to go near a bit of silver-solder. Although there is a spare hole, I'm actually still one short since valves are needed for the ejector and for the steam drain cocks. I think it will come to teeing off the whistle nipple at the right-hand end.

I allowed myself to be persuaded to go for a stainless steel superheater. Paul Gammon also gave me the 'low down' and I ended up with one of his units with elements which go right to the back of the firebox. Now, I have heard stories about these glowing red which is something I just don't fancy; it's only a model and I don't want everything fried up! Years ago, when I was restoring a Doble steam car with both saturated and superheated steam temperature gauges on the dashboard, my father warned me not to run above 750deg. F. If you do, he said, you'll find the engine stiff next day. He was right. So having parted up with hard earned cash for a stainless steel superheater I wasn't convinced of its use so I discarded it and made a copper one as described by Keith. I fitted up the steam pipes and for the inside cylinder came across in a 'U' so I can get at the nuts inside the smokebox.

Securing the boiler to the loco wasn't as simple as I first thought. For a start I didn't want to screw through to the copper shell or through the foundation ring. I hate the idea of doing this to a brand new, tested boiler. I have managed to avoid this so far, and the backhead also remains unsullied, the firehole door being secured with a plate fixed to the cab floor. My first shot at fixing the boiler down was so complicated that I gave it up and started again. In the end I made an extension for the blowdown valve from a piece of hexagon steel bar and have used this for a plate to hold the expansion plates across the boiler on which it rests. Two 2BA bolts are fixed in the plates which go through the rear brake hanger and with nuts underneath. The front end of the boiler has one small bolt through the bottom which is fixed to a small plate

Steam is fed to the inside cylinder by way of a U-shaped copper pipe to facilitate assembly by giving better access to the union nuts.

brazed to the front boiler support which I have mentioned is missing from the drawings. Proof of the pudding is that I can rotate the loco all the way round without the boiler falling off!

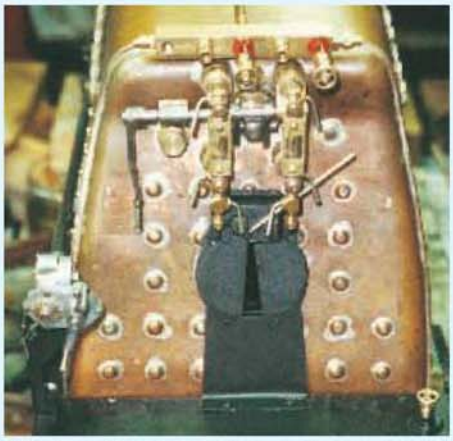
The safety valves had to be modfied as it came to light that the 1/4in. orifice was too small. I calculated the heating surface to be about 1500sq.in. and in his book, E. C. Steel published a table by Henry Greenly which recommends the various sizes of orifices. Three valves of 5/16in. bore were indicated. Also, the number of holes in the top to give this total area for release had to be changed. I drilled eighteen 5/64in. holes on a 5/8in. PCD with 1/32in. between each hole having made up a steel jig to drill all three valves. However, I have found no-one to say anything about the restriction in the orifice by the valve and I'm still looking into this matter. If a ball is used then this does not apply.

I made the injector valves more or less as drawing except that, to stop the valve coming out, I made the valve head bigger than the thread. The valve end is screwed into the end of the shaft using 8BA secured with a drop of Loctite 242. In the end I discarded them altogether and have used five commercial valves all of the same shape and type.

The cylinder exhaust pipes were made up of copper as suggested and brazed up with Sifcupron (for copper to copper alloys). There is one particular rod with 2% silver which runs like milk, and another without the silver which is great for gap filling. I use silver-solder for finally fixing to the brass flanges.

Before finishing with the boiler (for the time being anyway), I made up some protector glasses for the water gauges. I used 7/16in. brass box which is just clear on 3/8in. inside. With one side cut out the glass can be fitted easily. To fit them to the gauges, I discarded the hexagon nuts and made square ones which take an 8BA brass screw top and bottom to hold the protectors in place. They look exactly like the full size ones so I am quite chuffed about that. One more point: Keith has given us a hollow stay for the blower pipe which in full size runs down the outside of the boiler. I can't quite understand this configuration since it would cool off and be full of water for the first part; maybe no-one woried about it.

Norman Spink supplied the stainless steel grates. I have made them all up as per the instruc-



This view of the backhead shows the Dave Noble gauge glasses with protectors and the butterfly firedoor which is fitted with Meccano gears.

The safety valves were redesigned following study of Henry Greenly's data relating orifice area to boiler heating surface area.

tions with the centre section as a dropping grate. What with this and the ash pans it is a right Fred Karno's business! The centre section is held up by a piece of steel approximately 3/8in. thick and the width of the centre ashpan. It has a 3/16in. stainless steel bar right through locked into place with a grub screw and a lever outside the left hand ashpan. This is locked with a bolt so it cannot drop of its own accord. For all the bother, I don't think it was worth it since when it is dropped there isn't a great amount of space for the big bits of clinker to fall through the bottom door. These bottom doors are also held in place with a pin right across the loco (athwart ships for mariners!)

The ashpans are made up in three sections and I have not joined them over the top of the frames. I wanted to make the lot so I can get it all off without having to remove the boiler or cab floor, etc. I've done this and avoided having to screw into the foundation ring. I have made rear damper doors on the outside ashpans only. These work like a dream from a worm shaft through the cab floor on the right hand side where it is in full size. I cut the 8tpi worm in the lathe and I cut the worm wheel by hand with the use of a little home made jig. I am very proud of this since it is almost perfect. There is a layshaft across the loco that connects by levers the two doors on each side. The front damper doors are dummies. There is plenty of air from all sorts of other places.

While at the rear end, I shall deal with the cab floor. This is shown short without the required overlap at the back with all the angles fitted underneath. The generator control box recess is not quite the right shape so I have put that right. Peter Theobald asked me what the rhombus shaped hole was for approximately 2 1/2in. in front of the generator recess; this is for access to a mud drum at the bottom of the firebox. One of the many things I picked up by visiting the Bluebell Railway and seeing *Port Line* during overhaul.

● *To be continued.*

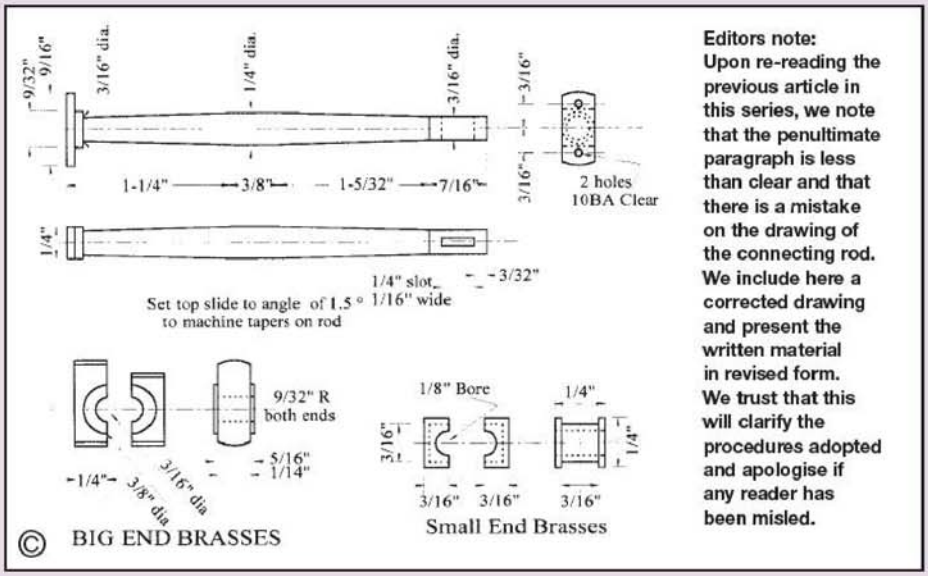
BRAY'S BENCH

RANSOMES & MAY
Horizontal Engine of 1850

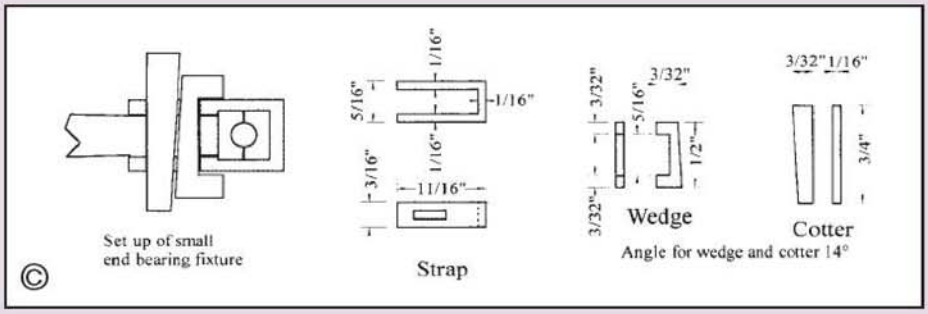
Stan Bray

continues the project with the big and little end brasses, crankshaft, eccentrics and eccentric straps.

●*Part XI continued from page 277 (M.E. 4155, 21 September 2001)*



Editors note:
Upon re-reading the previous article in this series, we note that the penultimate paragraph is less than clear and that there is a mistake on the drawing of the connecting rod. We include here a corrected drawing and present the written material in revised form. We trust that this will clarify the procedures adopted and apologise if any reader has been misled.



The big end bearing is of the split type but is unusual in that the end cap is longer than the half nearest the connecting rod. Make a start by soft soldering two pieces of 3/8in. square brass or bronze together. Pieces 1in. to 1 1/2in. long should suffice. Pick up the soldered joint and mark out for the big end hole approximately 3/8in. from one end. Chuck in the 4-jaw and adjust until the marked centre is running true, then drill and ream 3/16in. diameter (**photo 77**). Skim the face of the embryo brasses and turn the 3/8in. diameter boss.

Reverse the part in the 4-jaw chuck and press the finished face against a parallel. Set the hole to run true and withdraw the parallel. Skim the other face to bring the part to width and turn the other 3/8in. dia. boss. The material now needs finishing to the sections shown on the drawing. I chose to mill the bearing to a rectangular section (**photo 78**) and then mill a step in it (**photo 79**). This facilitated marking out and drilling the holes for the mounting studs. These are positioned 3/16in. either side of the centre line of the big end eye and are clearance for 10BA. I then filed the edge radii and separated the two halves of the bearing (**photo 80**).

The plate that attaches the big end bearing to the connecting rod was milled from mild steel bar (**photo 81**). It is silver-soldered to the connecting rod and best left 'on the bar' until this is done as it aids alignment with the slot in the other end of the connecting rod. **Photograph 82** shows the sub-assembly ready for silver-soldering. Note that the slot for the small end cotter must be at 90deg. to the hole in the big end bearing. In other words, the length of bar used to make the big end plate must be parallel to the small end slot during silver-soldering. A piece of 1/16in. strip in the small end slot during silver-soldering will facilitate alignment and help ensure this.

The two holes for the big end bolts are best spotted through from the big end brasses. After drilling the holes, cut the big end plate off the parent bar, bolt the big end brasses into position and file the radii on the bar to blend with those on the brasses. **Photograph 83** shows the completed sub-assembly.

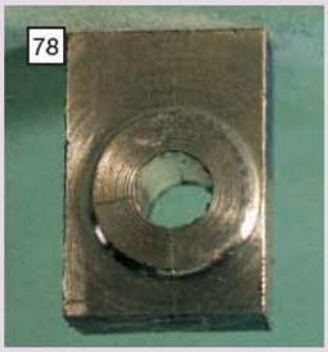
Small end strap, cotter and brasses

The strap can be made from strip or milled from a length of bar. If making it from strip, it is as well to leave the cutting of the slot until the bending operation is complete. As it is unlikely that a cutter of this diameter will be long enough to pass through both sides simultaneously, each side will need to be dealt with separately. If the strap is milled from the solid it is best to mill a slot on either side before taking out the middle section, thus making use of the extra rigidity that the use of a bar will give. The drawing shows the slot to have square ends but I left mine as milled (**photo 84**) and made the cotter and pad, which are filed from mild steel sheet, to suit.

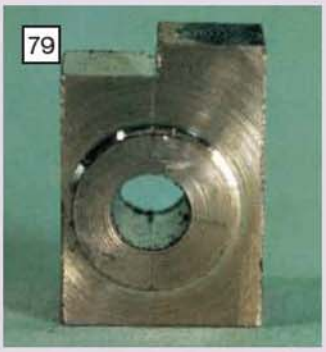
The little end brasses are made in the same time-honoured way used for the big end: that of soft soldering two pieces of brass strip together and drilling a hole for the bearing, using the join as the centreline. Yet again, it is important to use longer lengths of brass than required for the part so that the surplus can be used to hold the work while the various operations are carried out.

Once the bore is drilled and reamed, the chuck

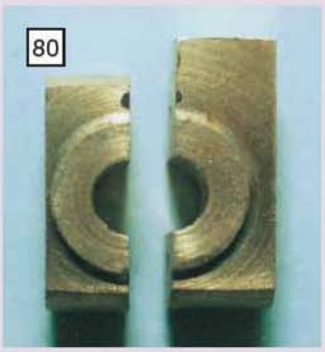
The big end bearings are made from two lengths of brass or bronze soft-soldered together.



After drilling and reaming, the big end boss is turned and the profile cleaned up by milling.

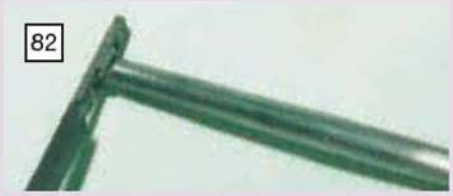


The big end cap is longer than its mating part which is reduced by milling.



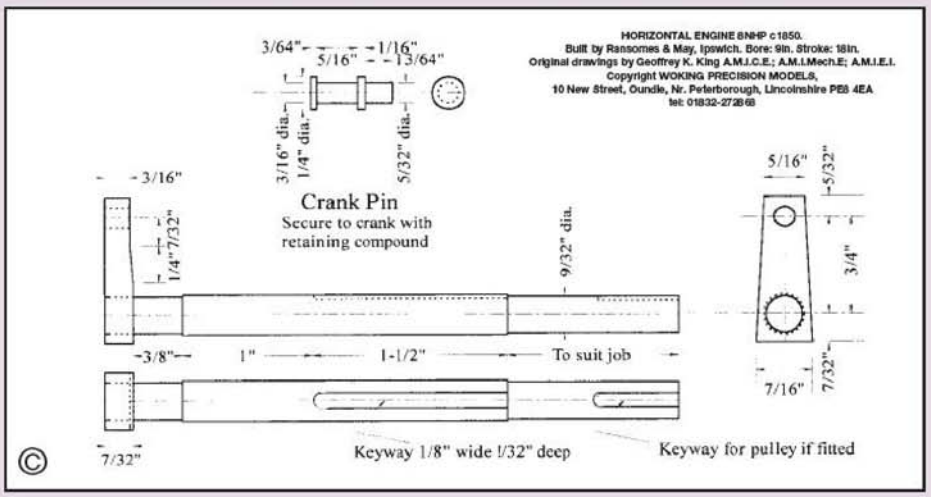
The two halves of the big end bearing are unsoldered and the joint faces cleaned up to finish.

Above: The plate attaching the big end brasses to the connecting rod is milled from mild steel bar and the spigoted joint silver-soldered (below).



Little end strap, cotter and wedge.

Connecting rod/big end assembly



and part can be transferred to the dividing head. It is then a simple matter to mill the small end brasses to their square section and mill in the groove for the strap. Return to the lathe for parting off to length.

Crankshaft

This is a fairly straightforward job and should pose no problems, even for a novice. The shaft itself is a simple turning exercise, best done between centres, and the crank is a piece of flat bar with two holes drilled in it. The latter does have a piece filed or milled away but it is not difficult to do. The crank pin too, is a simple turning exercise except that either a specially ground tool, or a parting off tool will be needed to machine the journal. There are two 1/8in. wide keyways in the shaft which should be machined before assembling the crank, the keyways are unusually shallow but this is not a problem.

Perhaps the only word of warning to be given about this part of the engine is that clearances are very tight, so do not make the big end brasses oversize, and the angled engine bearing should also be checked to ensure it is not overwidth. The measurements shown on the drawings assume that the three parts of the shaft will be assembled using a force fit. No doubt these days, most constructors will prefer to alter these sufficiently to allow the shaft to be assembled with an appropriate adhesive.

Eccentrics

There are two eccentrics, one for the valve gear and the other for the pump. They are similar, but have different throws so it pays to check carefully before plunging in to make them. Two bronze castings are supplied to purchasers of the kit (**photo 85**). They are adequate for the job and easy to work with as chucking pieces are cast in. The ones shown in the photographs are actually made of cast iron, again the result of receiving the castings in advance of the final decision regarding their manufacture.

Machining is very straightforward, with the 4-jaw chuck in action in order to get the required throw. The sequence I used is summarised in **photos 86** to **88** inclusive. A rim with a rounded edge along the centre of the top edge of each eccentric prevents the strap sliding off. A nick ground in an ordinary high-speed lathe tool will do nicely as a form tool for making this rim. The eccentric for the valve gear is cross-drilled and tapped for a grub screw. This is to allow for adjustment in order to get the valve gear operating correctly. The screw will, therefore, take a good deal of strain and it is essential that, once the correct position is found, the shaft be dimpled to accept the screw and prevent the eccentric from slipping. Once the position is found, tighten the screw as hard as it will go, then slacken off and take the eccentric off the shaft. The screw should have left a tiny indent in the shaft. Centre punch it and drill the shaft at that point to a depth just below the drill point, using the clearance size drill for the grub screw. When re-assembled the screw should fit into the recess and prevent any movement of the eccentric.

The pump eccentric can be fitted with a key, making it much more secure than when a grub screw is used.

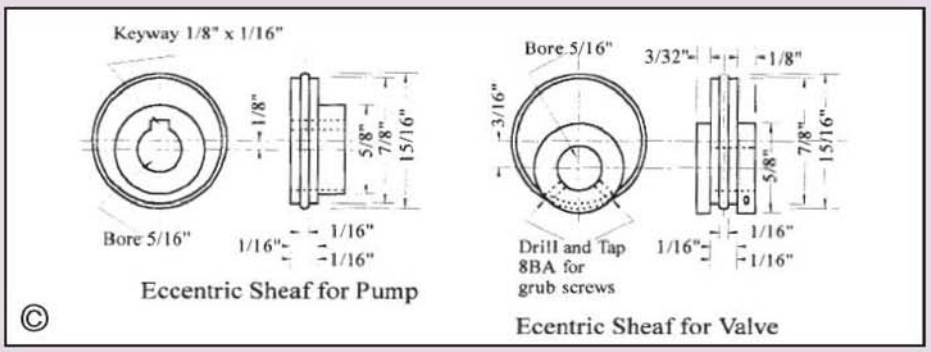
●*To be continued.*

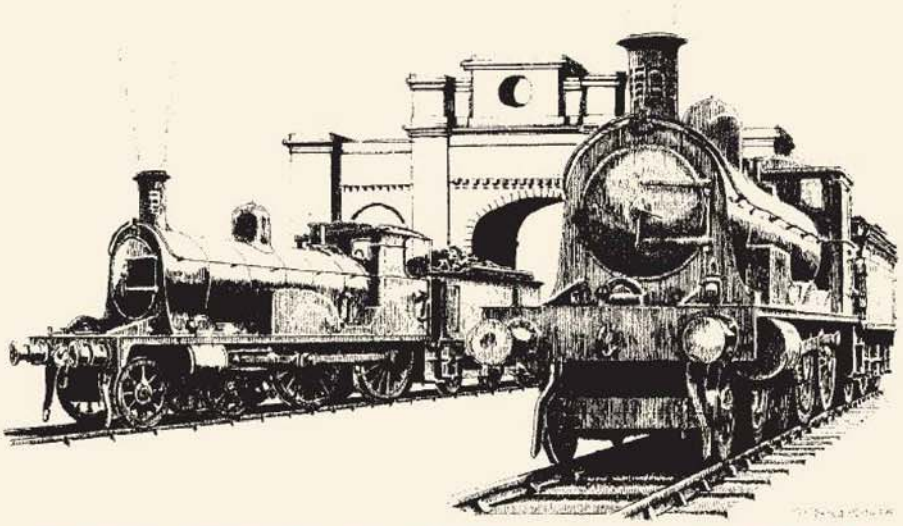
Gunmetal castings with chucking pieces are supplied for the eccentrics.

Turning the shoulder of the eccentric. Cast iron was supplied for these prototypes.

With the O/D machined, the eccentric is offset in the 4-jaw chuck for drilling the bore.

The finished eccentric sheaves for the slide valve and water pump.





THE HIGHLAND RAILWAY JONES 'BIG GOODS' & LOCH 4-4-0

LOCOMOTIVES IN 5in. GAUGE

Neville Evans

provides the valve gear drawing for 'Loch', deals with the weighshaft and discusses the side rods for both engines.

●*Part X continued from page 284 (M.E. 4155, 21 September 2001)*

My first thoughts on the subject of the weighshaft assembly were that the two link carriages and the reversing arm would be pinned to the shaft, thus enabling the weighshaft to be assembled through the two bushes. The other day, however, while running my Princess chassis on compressed air prior to mounting the boiler, I was somewhat dismayed to notice that one of the inside valve gear lifting links was slightly loose on the shaft. At this stage it was easy to re-ream and replace all the taper pins in the gear, but it would obviously have been impossible to do anything about it once the loco had been assembled. I therefore decided to silver-solder the 'Loch' and 'Big Goods' carriages onto the shaft. This means that the weighshaft must be put into the frame before the frame itself is assembled. The good news was received by Roger a fortnight ago and he didn't talk to me for a week. Now, however, he agrees that it makes a much better job. Remember to only silver-solder on the inside as per the drawing, so that the solder doesn't interfere with the frame bushes.

Note that the reversing arms of both locos are inclined forward, the actual number of degrees being shown on the drawing. The reason for this apparent aberration is that the carriage rotates further in backward gear than in forward. Allen valve gear does not take kindly to being made to accommodate long travels.

A pair of finished side rods for the 5in. gauge Loch.

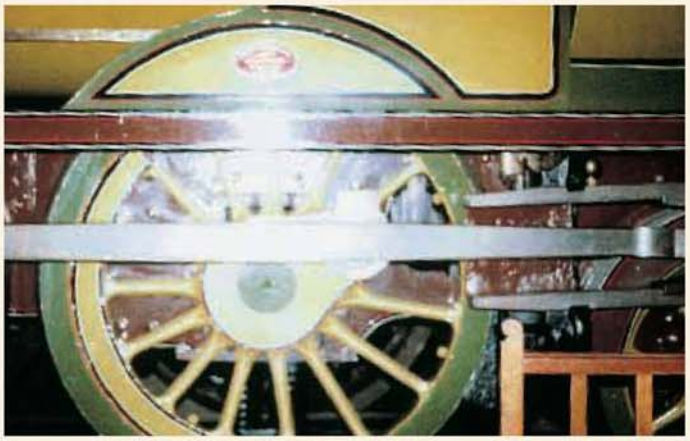
Coupling and connecting rods

Let us talk about the 'Loch' side rods first as they, of course, are far simpler than those of the 'Big Goods'. Two snags with these particular pieces are the fishbelly and their thinness. Don't be put off by the slenderness of the rods, 1/8in. is amply strong; the forces in cross section are minuscule compared to those of the full-size loco. My Hibernian ally Graham King, recently visited No. 103 in Glasgow Museum and reports that, in his opinion the connecting and side rods of that machine are made from round bar which has been forged down to an approximate rectangular section and then machined. This accounts for the rounded tops of the various outside motion rods of these locos as can be seen in the photos.

My friend, who is well on with the first loco,

A horizontal milling machine gives excellent visibility, and a facility to use substantial cutters. The rigid set-up makes it ideal for the manufacture of side rods. The ends are conveniently profiled using a rotary table.

With the Loch coupling rod located on a substantial fixture and securely clamped in place, a cutter of the appropriate diameter running at the correct speed will provide a suitably radiused runout to each boss end.



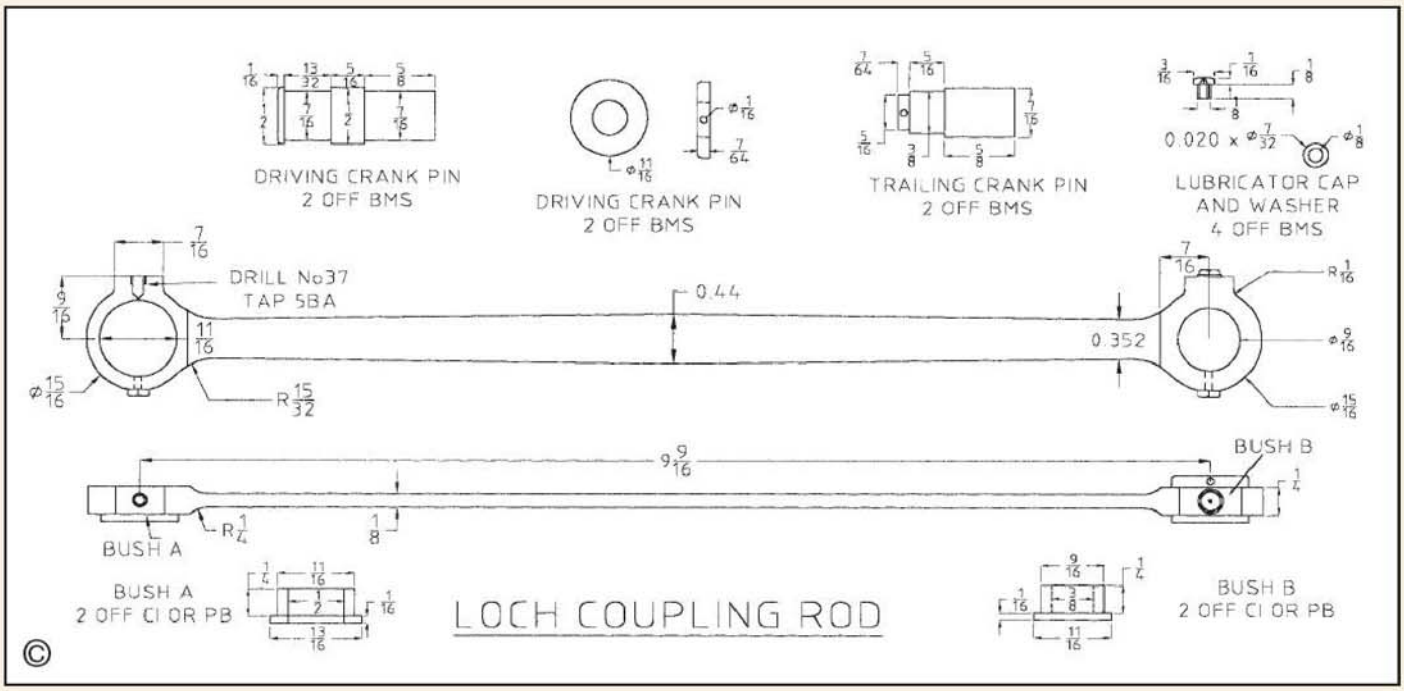
This general view of HR No. 103 at Glasgow Museum of Transport shows the front right hand connecting rod boss lurking beneath the coupling rod. Note the plate guard behind and the sander mechanism over the slidebars.

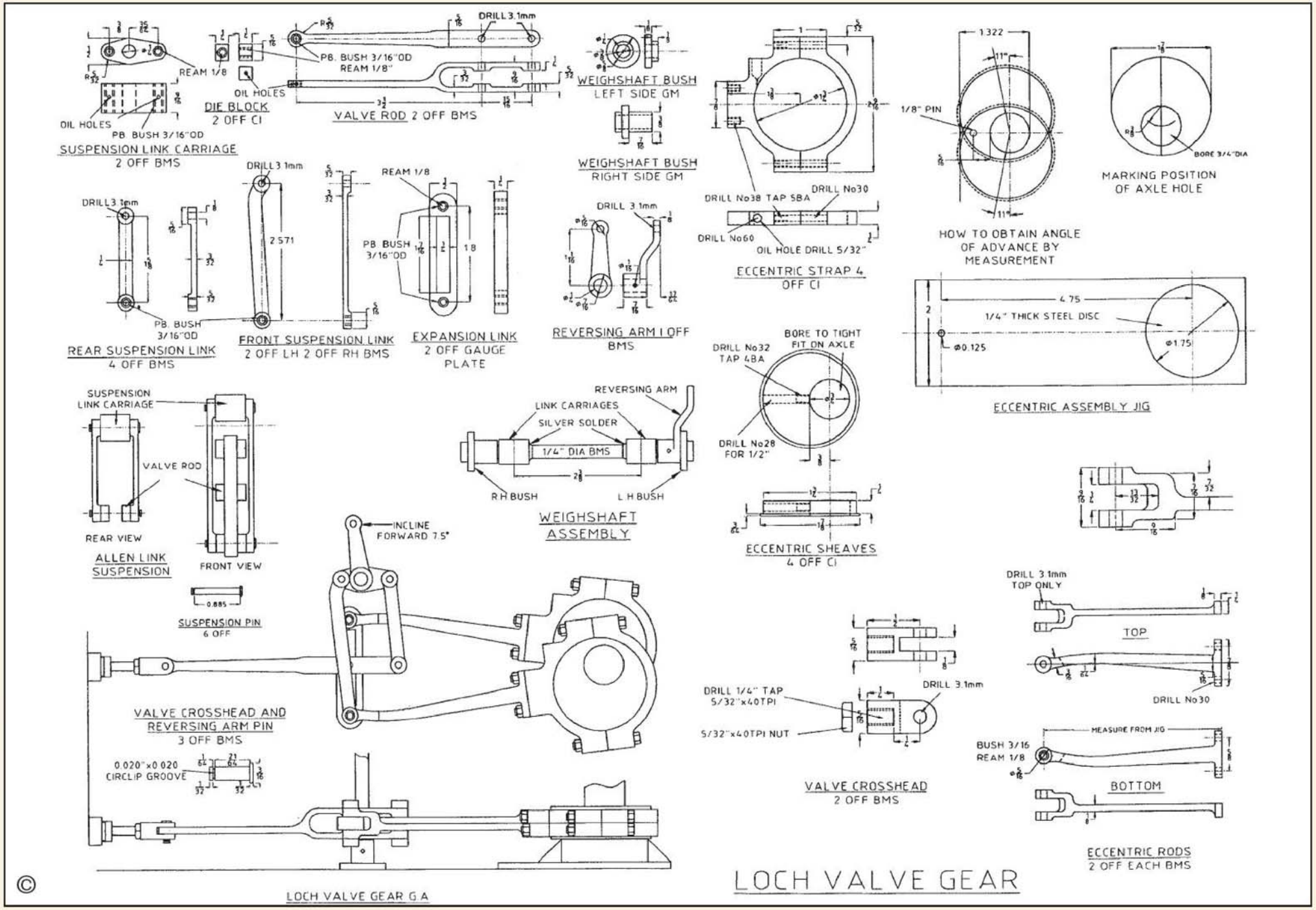
A closer view of the front right hand connecting rod boss reveals that no locking bolt is fitted under this boss on the locomotive on display at Glasgow Museum of Transport.

The rear side rod boss of HR No. 103, the Jones Big Goods at Glasgow Museum of Transport is fitted with a securing bolt. Builders are advised that a visit to inspect the locomotive is well worth the journey.

Several points are worthy of note from this view of the right hand big end, it features the later type rear side rod, a locking bolt under the side rod boss and square headed securing bolts for the cotter.

reports no problems, but it must be emphasised that the blanks must be thoroughly annealed before machining. A glance at the photos will show the set-up used—well within the scope of the average model maker. Roger machined the sides of the coupling rods, first as a flat blank and then with a packing piece between the rod and the milling machine table, the requisites being a sharp cutter and the proper speed. Note the use of a horizontal mill. With a vertical milling machine, the popular choice nowadays because of its greater versatility, we must first mount the work horizontally on a piece of thick plate to mill the side profile. The plate must then be set over a few degrees to machine the fishbelly. The angle is quite small, and probably is best arrived at by trial and error in the first instance. The roughed out rod is then held vertically, bolted to a stout angle plate, to reduce its thickness to 1/8 inch. I would use an instant glue to hold the packing strip in position, while the rod is being bolted up to it. As to speed of rotation I have a Senior type E vertical mill which was generally quite satisfactory, but suffered from the drawback that the lowest speed




REAM 1/8
OIL HOLES
DIE BLOCK
2 OFF CI
DRILL 3.1mm
PB. BUSH 3/16"OD
REAM 1/8"
VALVE ROD 2 OFF BMS
OIL HOLES
PB. BUSH 3/16"OD
SUSPENSION LINK CARRIAGE
2 OFF BMS
WEIGHSHAFT BUSH
LEFT SIDE GM
WEIGHSHAFT BUSH
RIGHT SIDE GM
1.322
1/8" PIN
HOW TO OBTAIN ANGLE
OF ADVANCE BY
MEASUREMENT
BORE 3/4"DIA
MARKING POSITION
OF AXLE HOLE
DRILL 3.1mm
DRILL No38 TAP SBA
DRILL No30
DRILL No60
OIL HOLE DRILL 5/32"
ECCENTRIC STRAP 4
OFF CI
DRILL 3.1mm
2.571
REAM 1/8
PB. BUSH
3/16"OD
1.8
PB. BUSH
3/16"OD
REAR SUSPENSION LINK
4 OFF BMS
FRONT SUSPENSION LINK
2 OFF LH 2 OFF RH BMS
EXPANSION LINK
2 OFF GAUGE
PLATE
DRILL 3.1mm
REVERSING ARM 1 OFF
BMS
4.75
1/4" THICK STEEL DISC
2
ø0.125
ø1.75
ECCENTRIC ASSEMBLY JIG
BORE TO TIGHT
FIT ON AXLE
DRILL No32
TAP 4BA
DRILL No28
FOR 1/2"
REVERSING ARM
LINK CARRIAGES
SILVER SOLDER
1/4" DIA BMS
R.H BUSH
L.H BUSH
WEIGHSHAFT
ASSEMBLY
SUSPENSION
LINK CARRIAGE
VALVE ROD
REAR VIEW
FRONT VIEW
ALLEN LINK
SUSPENSION
ECCENTRIC SHEAVES
4 OFF CI
INCLINE
FORWARD 7.5°
0.885
SUSPENSION PIN
6 OFF
VALVE CROSSHEAD AND
REVERSING ARM PIN
3 OFF BMS
0.020"x0.020
CIRCLIP GROOVE
DRILL 1/4" TAP
5/32"x40TPI
5/32"x40TPI NUT
DRILL 3.1mm
VALVE CROSSHEAD
2 OFF BMS
DRILL 3.1mm
TOP ONLY
TOP
DRILL No30
MEASURE FROM JIG
BUSH 3/16
REAM 1/8
BOTTOM
ECCENTRIC RODS
2 OFF EACH BMS
LOCH VALVE GEAR G A
LOCH VALVE GEAR

©

was far too high for anything over a 3/8 dia. end mill on steel. David Piddington designed and produced his excellent back gearing system for the Senior mill and I toyed with the idea of using his modification. Just after Christmas however, I bought the ML 370 speed controller from Newton Tesla (as advertised in the *M.E.*). This is a 3-phase converter system which gives me everything I want and I am delighted with the smoothness and power at very low revs.

One of the great shibboleths connected with side rods is the massive amount of slack necessary in the bushes thereof. In fact, with a 9 9/16in. side rod, the extra length required by a 1/4in. lift at one end is only 0.003 inch. If the axle boxes and horn blocks were perfectly accurate, the rear bush would have to be elongated by this amount, toward the rear of the loco. The extra length on a 1/2in. lift is only 0.013in., so what about adding 0.008in. to the new bush? That should take care of all eventualities. The driving crank pin bush can be given about 0.002in. running clearance. Note that I have specified gunmetal or cast iron for the bushes. Doug Hewson tells me that his cast iron bushes have lasted three times as long as phosphor bronze or gunmetal.

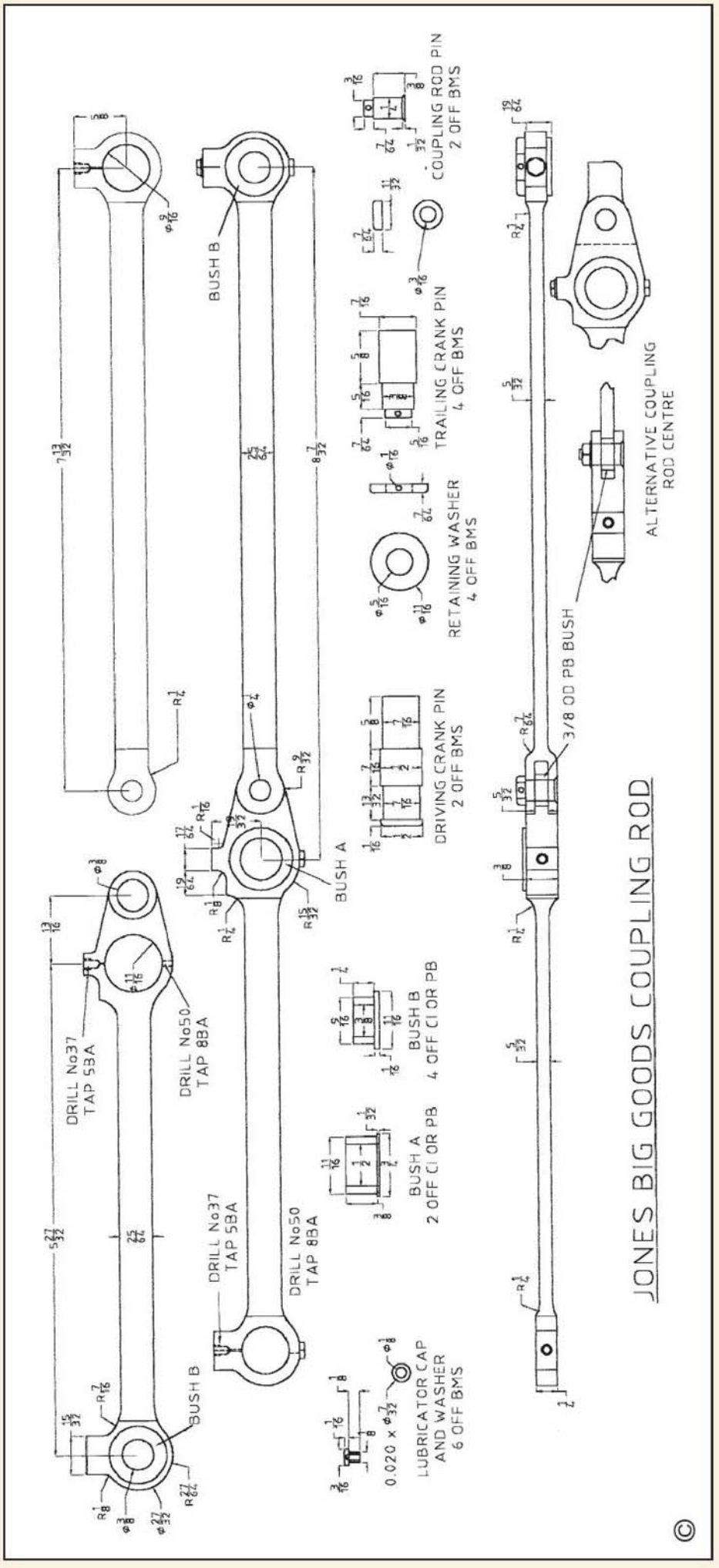
My own method of determining the centres of coupling rods is to mark them out from the job, after the horn blocks have been machined, but before the frames are assembled. I have noticed in these pages over the last 40 or 50 years, many jigs, fittings and gadgets for the drilling of side rods, some so complex that they take longer to make than do the rods themselves! I simply slide the axle boxes, complete with roller bearings, into the horns and clamp them in position. In the case of the 'Loch', a centre line is scribed down the coupling rod material, which should of course have been annealed, and an 11/16in. hole drilled on the centre line at one end. A short stub of 3/4in. round material is turned down for 1/4in. to fit the hole. A second short piece of material is turned to a sharp point, and inserted in the trailing axle box. The front stub is pushed into the leading axle box and an arc is scribed at exactly the correct centre. Centre punch, drill and open up to 9/16 inch.

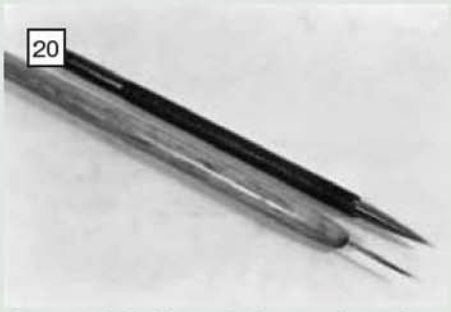
The 'Big Goods' side rods are more complex in that they are jointed behind the driving crankpins. Due to the shorter length of these rods compared with the 'Loch', we must allow a bit more slack in the fit of the bushes to the crankpins. I would think that 0.005in. both ends would be enough, assuming that the driving bush has a simple 0.002in. or so running fit. The rods are made from 3/8in. bar as opposed to 1/4in. bar for the 'Loch', and there is therefore going to be a lot more swarf! A point to make is that on the 4-6-0 engines as built, the front rod was forked. Later on they received rods with forked rear parts. The loco on show, and therefore the one in the photos, has the later type of set up. I've drawn both; take your pick.

Supplier

Drawings, castings, laser cut frames, etc. for the Highland Railway 'Loch' and 'Big Goods' locomotives are available from **Practical Scale, 46 Pentyla, Port Talbot, West Glamorgan SA12 8AA; tel/fax: 01639-883741.** Please include a stamped, self-addressed envelope with any enquiries.

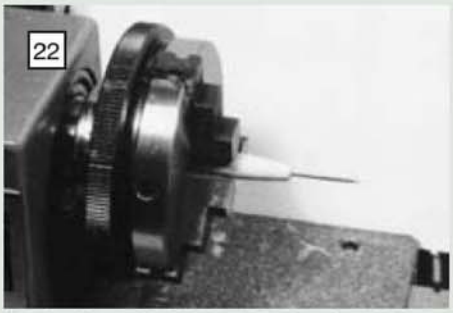
●*To be continued.*





A commercial scriber and a homemade one from wooden dowel rod and a sewing needle.

With the dowel rod in the 3-jaw chuck, a centre drill is used to start the hole for the needle.



The leading end of the wooden dowel rod is tapered with a file before being varnished.

WEIGHT DRIVEN EGG TIMER

John Wilding FBHI

makes a scriber and a tool setting gauge before continuing with the construction of his egg-timer.

●*Part III continued from page 280 (M.E. 4156, 2001)*

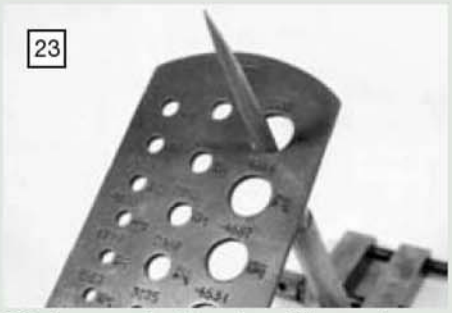
In the last part I dealt with the register pins and explained the correct way of fitting them. There are two further components which require attaching to the plates where register or steady pins are required. The next stage with the top plate is to carry out the simple decoration. This should be marked out on this plate and it will be seen that some of the curves are 1/2in. radius. I find the simplest way to draw these is to use a radius gauge such as is readily available from stationers or shops selling drawing instruments; made from plastic they are quite inexpensive. Alternatively, you can part off a disc from 1in. brass rod in the lathe. Some of the curves are not radial; these may be marked out with the use of French curves which again should be available from stationers. The use of these is denoted by the phrase 'form pleasing curves'.

Position a suitable section of one of the curves and mark the beginning and end of the selected portion with a felt tip pen, then turn it upside down to mirror the design on the opposite side. All marking out is done with a scriber; if you haven't one, then a makeshift scriber can be made from a short length of wood dowel rod and a sewing needle (**photo 20**). Cut off a 4in. length of the dowel and grip it gently in the 3-jaw chuck with some 1/2in. projecting. Face the end with a knife tool making sure the tool is at centre height so it doesn't leave a 'pip' at the centre of the work. With the 1/8in. body diameter centre drill start the hole (**photo 21**). Change this for a No. 59 twist drill (my sewing needle was 0.040in. in diameter) and drill the hole 1/2in. deep.

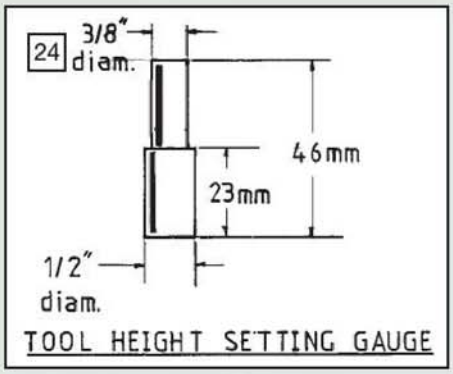
The needle should be gripped in the vice and snapped off to leave the pointed end 1in. long. I advise wrapping some rag over the needle before snapping it off to contain any splinters should the break not be a clean one. Round the broken end on the grinding wheel, hold the pointed end in the tailstock chuck and feed it into the dowel rod which should still be in the 3-jaw chuck (**photo 22**). No glue is required. The leading end of the dowel rod can be filed to a taper and then given a coat of clear varnish. It will feel a bit light compared with the commercial tool but will suffice.

With the decoration marked out, the shape can be cut with a piercing saw. I used a 410 blade with the work resting on the sawing board (**ref 1**) and the blade used vertically.

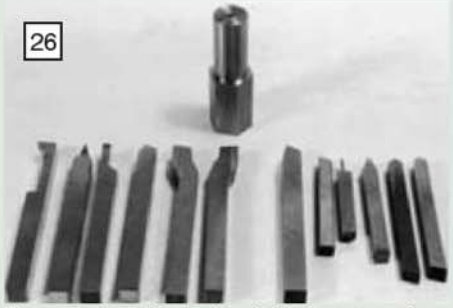
To carry out filing of this nature you will need crossing files 6in. length in Nos. 2 and 4 cuts. Crossing files offer different radii on each side of the file. Ordinary half-round files have a radius which is too acute for this type of work. You must accept that needle files need 'safe' edges on them (**ref 2**). For instance, the acute corners in this decoration will require the use of knife edged needle files. To obtain a fine point, the two knife edge files will require opposite safe edges to be formed, one on each in order to make the files left- and right-handed. In **photo 23** I show a crossing file being offered up to the drill gauge to check its radius. After the work has been filed to shape, it is 'drawfiled' a term used to denote using the file sideways. This reduces the cutting action and also assists in forming the edge of the work at right angles.



Offering a crossing file up to a drill gauge to check the radius of one of its cutting surfaces.



The height setting gauge in use.



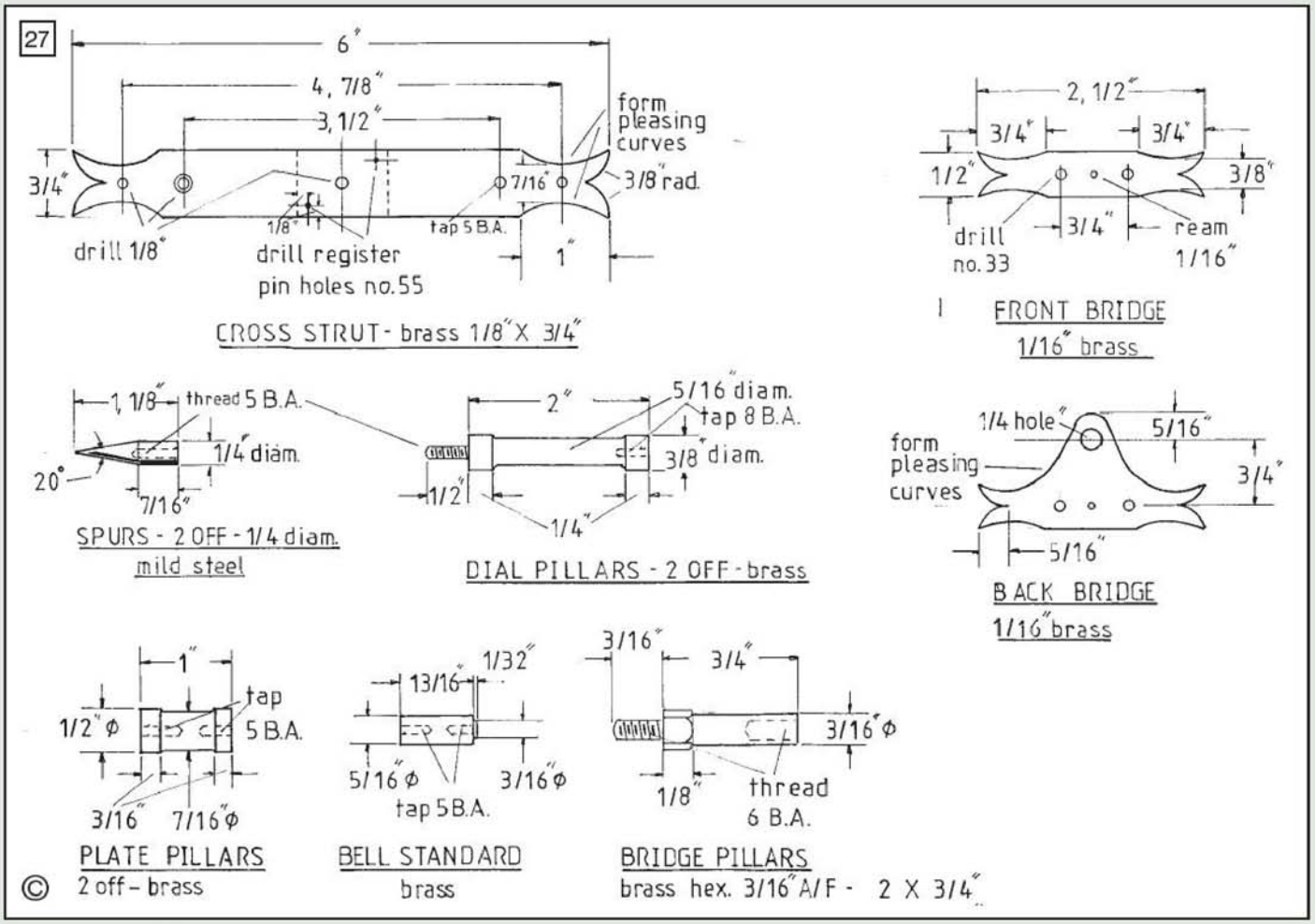
Two sets of turning tools suitable for use on the Unimat 4 lathe; the set for brass is on the right.

Plate pillar

Now that we are starting on the lathework, it is a convenient time to make the tool height setting gauge shown on the drawing (**fig 24**). It can be made from round or hexagonal stock and is a 'two position' gauge as it is designed to stand either on the cross-slide or the rear member of the lathe ways. The measurements shown are theoretical but the dimensions should be checked against a lathe centre. **Photograph 25** shows the gauge in use to check the height of the general purpose brass turning tool. It is most important that the base is slightly recessed to a hollow or concave profile so that the gauge stands firm on its outer diameter without rocking.

Two sets of lathe tools are shown in **photo 26**. Those on the left are for machining steel and are provided with top rake. These were supplied with the lathe. They are well designed so that in most cases if they are sharpened at their ends the height of the cutting edge will not be reduced. Those on the right have no top rake, i.e. the upper face is flat and are therefore suitable for turning brass. You can buy these tool bits in high speed steel. They are partially shaped, and 1/4in. or 3/16in. square would be suitable for the Unimat 4.

The brass stock for the pillars is sawn off slightly longer than the 1in. shown on the drawing (**fig 27**). The work is held in the 3-jaw chuck (**photo 28**) and after facing the end, the centre drill is used in the tailstock chuck to start the hole for the No. 36 drill which is a satisfactory size for



tapping 5BA. In this instance, because the work is to be supported by the tailstock centre at a later stage, I used the larger size of centre drill to ensure that a 60deg. bearing surface would be available to fit on the tailstock centre.

Lathe speeds

My experience has been that beginners tend to run the headstock spindle far too fast. We have no production schedules to meet! Most of all the turning for this project was carried out by me in the lowest, or one-from-lowest speeds, i.e. 130/200rpm. Whenever an unpleasant noise such as squeaking or vibration is heard, it may be taken as the lathe's way of telling you that something is wrong; perhaps too deep a cut or too high a speed, etc.

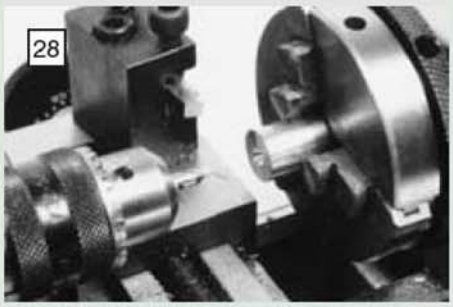
The work is now tapped 5BA and the taper tap is started in the lathe as depicted in **photo 29**. The drive belt is unshipped and the tailstock is loosened so that it can slide forward as the tap engages in the work. The chuck is pulled round by hand. You will only be able to penetrate the work for some 1/4 inch. The work is then removed from the chuck and held in the vice (with soft jaws); a tap wrench is fitted on the square at the rear end of the tap. The taper and plug taps are then used alternately until they bottom in the hole. As soon as there is any squeaking, back the tap out as this usually means that the flutes are blocked with brass filings.

Finally the work is reversed in the chuck to repeat the whole procedure at the other end. You should be able to see from the illustrations that the end faces of the pillars are recessed to ensure that they seat truly on the clock plates without rocking.

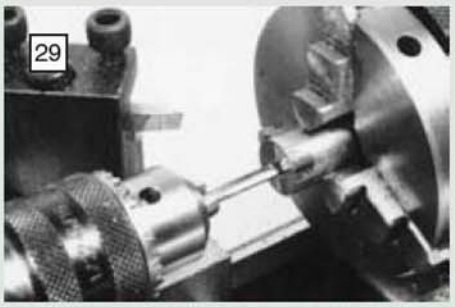
The waisting at the centre of each pillar is carried out as shown in **photo 30**. In order that the entire surface of the pillar is available not only for machining but also for polishing with emery sticks, the pillar is screwed onto a threaded mandrel which in turn is held in the 3-jaw chuck (**photo 31**). This is simply a length of 5/16in. brass rod with one end turned down and threaded 5BA. The tailstock centre shown here is of the revolving type. If a standard centre is used then it should be greased. Turning is carried out with the general purpose tool which can be fed both ways until the 7/16in. diameter is realised.

Screwhead holding tool

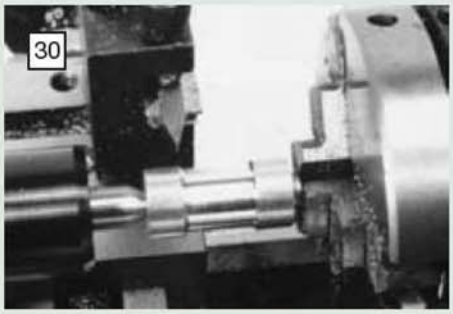
The pillars can now be fitted in the plates and secured with steel cheesehead 5BA screws. You cannot possibly stock all sizes and lengths of screws. It is usual to buy them in standard lengths according to the diameter. I buy 5BA screws 1/2in. ▶



First stage in machining the pillar: face one end, centre and drill tapping size for the thread.



Starting the thread with the taper tap in the lathe and the spindle drive belt unshipped.



Waisting a pillar using a general purpose tool for brass; note the absence of top rake on this tool.

The two pillars and the threaded mandrel used in their making. Note the recessed pillar end faces.

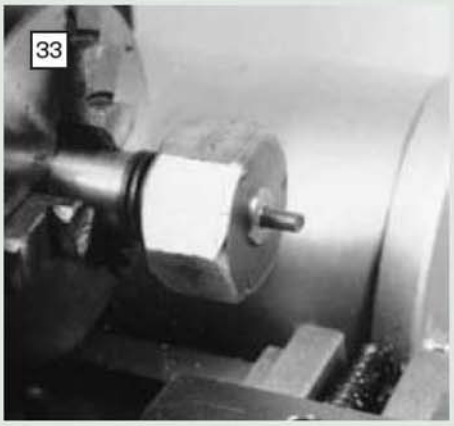
long. If I need shorter screws, then they can be cut off with a Junior hacksaw which of course leaves the end ragged. It is difficult to hold screws by their heads in order to tidy up the ends; round and countersink headed screws are particularly difficult to hold. You need a special holding tool for this work (**ref 3**). I show such a tool in **photo 32**.

As far as I know it is not available commercially, you must make your own. You can see that it is a holder with a number of collets having clearance size holes to accommodate the screwhead. In **photo 33** you can see the tool assembled with a 5BA screw in place ready for its end to be filed. If the screw is being used in a blind hole it is usual to file it to a slight taper as illustrated here in **photo 34**. If, however, the end of the screw thread is visible it is customary to round the end and burnish it as illustrated in **photo 35**. This burnishing was carried out with a combined clockmakers pivot file and burnisher. It took less than ten seconds to produce the mirror polish shown here. It is a golden rule in polishing that the result should appear almost immediately. If it doesn't then something is wrong; the burnisher has not been cross grained or 'made', this is a common fault, or perhaps not sufficient pressure is being used (**ref 4**).

I know that many readers find that the constant interruption of the project in order to make special tools to be irritating and I can sympathise, but when you are working in this specialised field most of these tools are not available commercially and have to be made.

Attempts to try and get by without having the proper tools invariably leads to accidents and poor results.

The special screwhead holding tool with its collets for different size threads.



The tool is gripped in the 3-jaw chuck and presents the cut screw end for finishing.

The tool makes easy work of chamfering the cut ends of screws like the 5BA screws shown here.

With the appropriate tools, burnishing the cut end of a screw is a matter of a few moments' work.

References

1: Making the sawing board is described in *Tools for the Clockmaker and Repairer*.

2: Putting safe edges on needle files is also described in *Tools for the Clockmaker*.

3: The construction of a screwhead holding tool can be found in *Using the Small Lathe*.

4: Cross graining or 'making' the burnisher and removing the built-in rake of a twist drill can be found in *The Construction of a 3/4 Second Pendulum Electric Clock*. All these books are available from **Rite-time Publishing, 18a Woolmer Way, Bordon, Hampshirre GU35 9QF.**

●*To be continued.*

ROAD STEAM

SAVAGE'S *LITTLE SAMSON* in 3in, 4in. (and other) Scales

Martin Wallis
shows us another archive picture and then describes the backtank and associated furniture.

●*Part XX continued from page 183 (M.E. 4153, 24 August 2001)*

Having studied the established archives, such as those in the Lynn Museum in Norfolk and the Road Locomotive Society portfolios, and kindly been given the privilege to view Dr. Middlemiss' private Savage Bros. collection, I was beginning to believe I had probably seen all of the surviving *Little Samson* pictures. Happily I was recently proved wrong. The illustration reproduced here (**photo 1**) was unearthed in a distant corner of Dr. Middlemiss' archive and is a beautiful period piece featuring a trailer of impressive proportions. Note the policeman and admiring school children between the engine and the trailer, and a second policeman just ahead of the road train. By scaling from the known length of the *Little Samson*, the trailer has to be over 30ft. long, excluding the drawbar. The trailer, as a model in 4in. scale, would end up some 10ft. long, which is plenty long enough to sleep in. I think readers would agree such a trailer would look splendid behind John Freeborne's model (**photo 2**). I suggest making a start just as soon as the engine is finished!

I imagine the trailer was destined for a fairground proprietor. A magnifying glass reveals a number of what look like iron straps and possible hinges but there is no discernible pattern suggesting drop sides or doors. The front of the wagon appears to have some sort of grille over it, so perhaps it might have been built for a travelling menagerie. The under-floor storage compartments have decorative panels featuring what looks like a complex floral design.

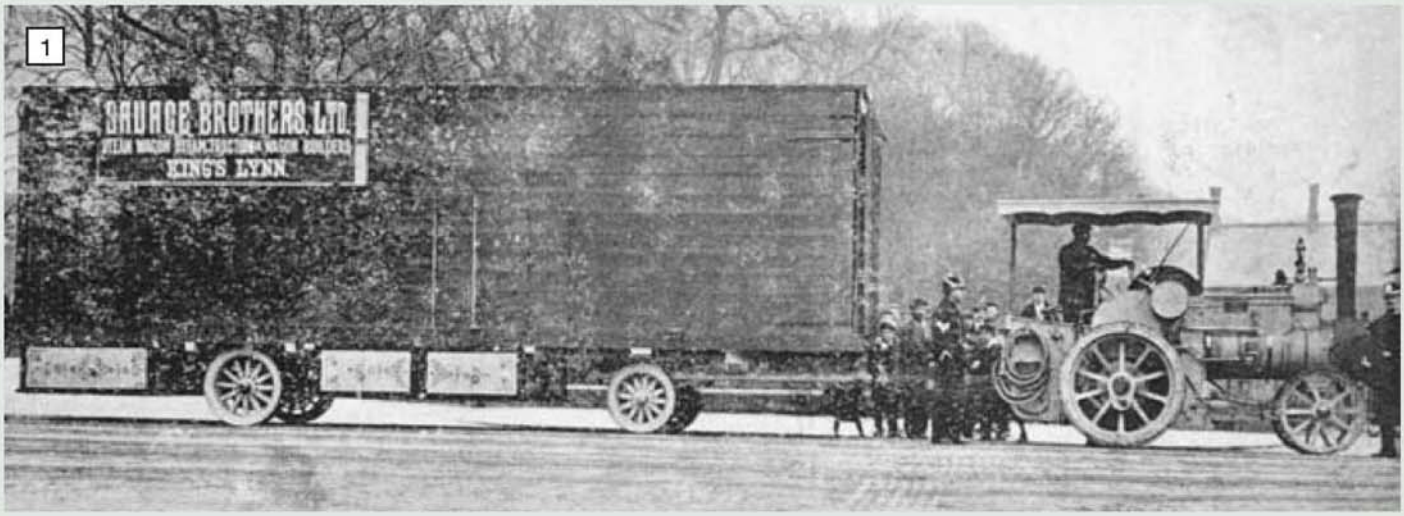
Basic workshop skills

Anyway, it's back to our model and time to make a start on the backtank. This is a sheet metalwork exercise which will make a pleasant change from all the careful machining on the gear train and shafts just completed. During the course of building a *Little Samson,* builders will have experienced a great many engineering disciplines. Fewer introductions to basic workshop skills and techniques can surely exist than the manufacture of a miniature steam engine.

This time I plan to look at the 1in. scale backtank being expertly made by Jonathan Milne-Fowler in Australia. However, for beginners I ought to to start with a brief description of the backtank fittings or furniture.

Backtank and furniture

The backtank is a metal box bolted to the back of the hornplates, which is filled with water. The water is used to replenish the boiler, the larger the



The text on the side of the trailer reads 'Savage Brothers. Ltd, Steam wagon, Steam tractor, & wagon builders, King's Lynn'. Unusually, the Little Samson *is fitted with a governor which may be clearly seen silhouetted against the house roof. The front wheels are set well back, the perch bracket being entirely under the boiler barrel just as on John Freeborne's model shown in photo 2. (Illustration courtesy Dr. John Middlemiss)*

water capacity the greater the distance the engine may travel between water stops. The term backtank is simply because the tank is at the back of the engine. Front tanks were fitted to some engines and were positioned under the boiler barrel (but not on a *Little Samson* as far as I am aware). Should any builder plan to fit a front tank, and there is no reason why not, the perch bracket would need to be moved forward under the smokebox so the front wheels do not foul the tank.

The sides and back of the backtank are extended upwards to form the coal bunker and manstand. A division plate separates the area set aside for the coal to that for the driver. The *Little Samson* backtank sides have no cut-out to facilitate driver access; the engine is sufficiently small for the driver to simply step over the backtank sides.

The various fittings on the backtank are collectively called the furniture. On the left-hand side (**photo 4**) are the tender steps and wire rope guide roller. The lower, and smaller, step is to aid the driver in getting aboard. The top step is noticeably bigger and angled for the comfort of the driver. When seated, the driver would have one foot inside the tender and the other outside on the step. The seat is mounted on a little bracket and arranged so it can be flipped back out of the way (**photo 2**) while the driver climbs aboard. The last item on the left-hand side is the wire rope drum guide roller. The wire rope is fitted on a large drum integral with the final drive and was paid out over the top footstep. Most other engine makers employed two rollers so that the wire rope may be fed between them, but on their *Little Samson*, Savages fitted only one. Whether this was for reasons of economy or to save weight, or both, is unknown.

On the right-hand side (**photos 3** and **9**) is the water pocket with its hinged lid. If water is being supplied by means of a bucket, it is into the water pocket that it is poured. If a hose is available, the end is put in the water pocket and hopefully the weight of the lid might hold it there.

Above the water pocket is the single bracket for the water lifter hose. The water lifter was a device which would lift water out of a stream or pond and deliver it into the backtank of the engine. The hose was a substantial affair of sufficient length to reach from the engine to the water source. This hose may be clearly seen wrapped round and hung from its bracket in photo 1. Below the water pocket is an oval inspection plate to allow access to the inside of the tank. Also on the right-hand side is the brake bracket and associated screws and handwheels which will be covered in detail later on.

At the back of the tank and just above water level is the draw bar, which is fitted with a single towing pin hole. A strengthening plate on the inside makes for a substantial and rigid design.

Straightforward build

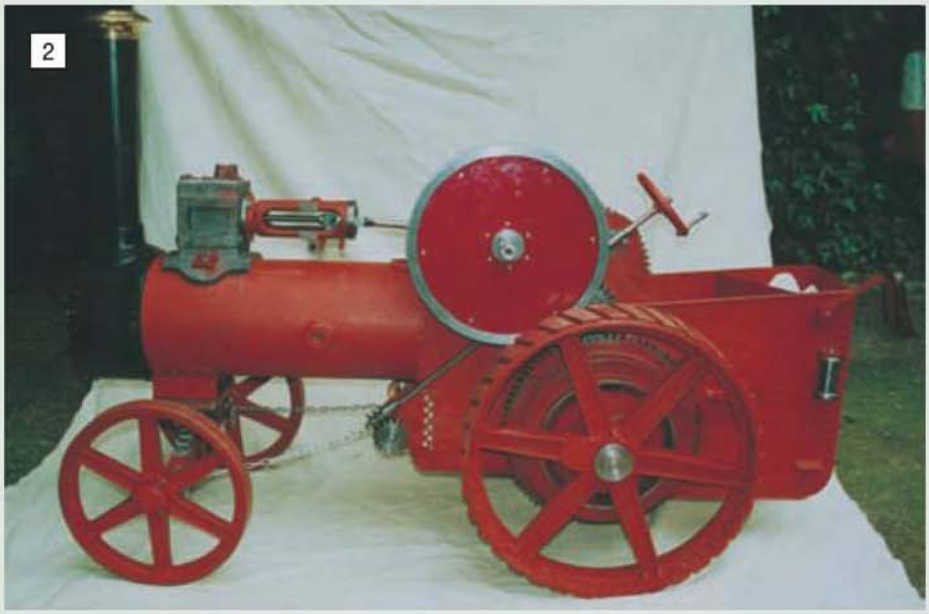
The *Little Samson* backtank is a much more straightforward build than most model traction engine backtanks as there are no flanged plates to be made. The joins are made by means of brass angle riveted and soft-soldered inside the tank. Apart from the material, (brass rather than steel) and the use of soft solder to make it water tight, this is exactly how Savages designed it.

Model backtanks are usually made from non-ferrous material, which will avoid the problem of rusting; brass is usually employed. Since *Little Samson* is relatively small for its scale—the full-size was only a 5 ton tractor—brass is likely to be adopted right up to 4in. scale. Brass is to be preferred to copper since it is a little stronger and harder, and is easier to drill and tap.

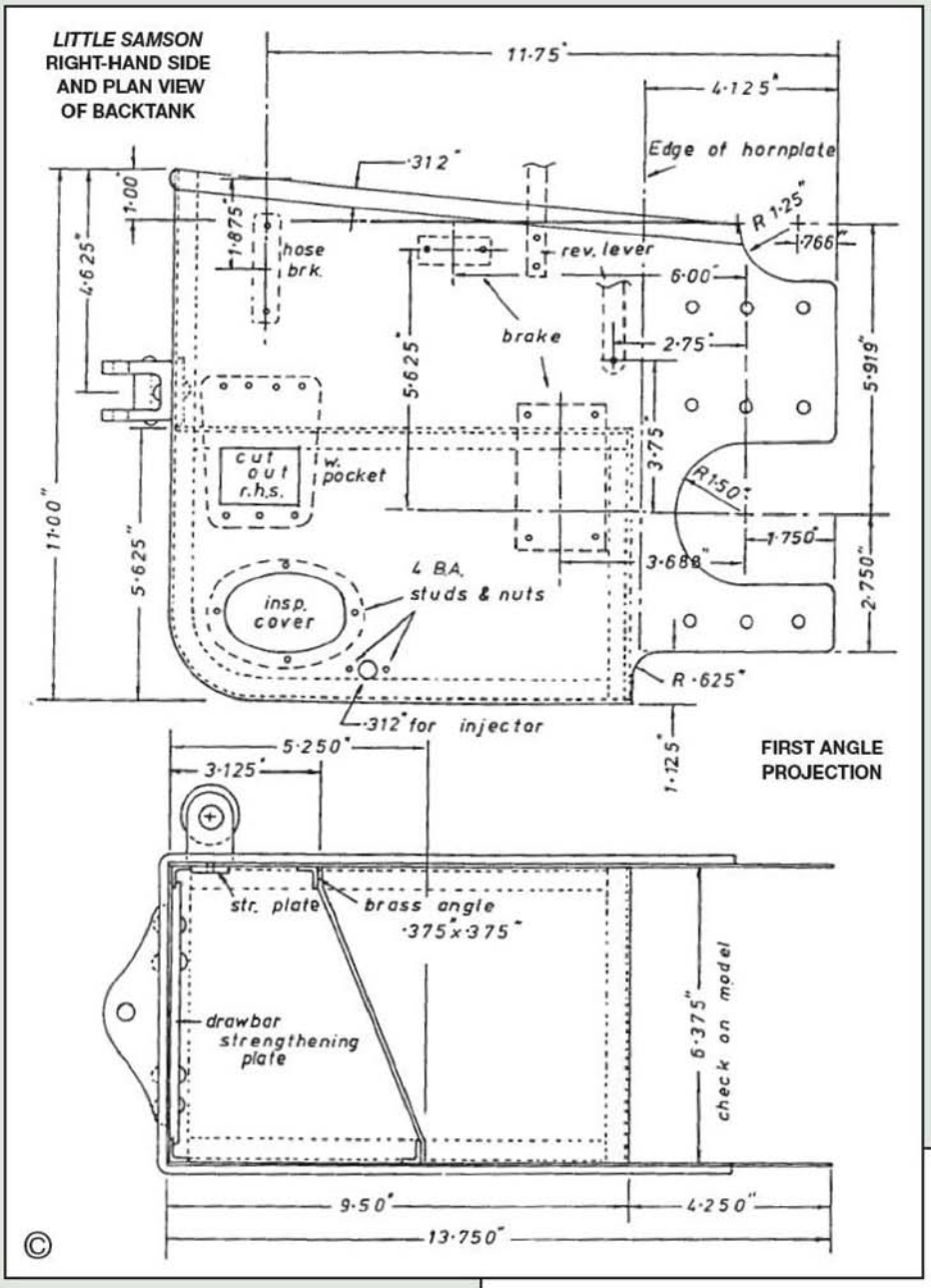
A steel backtank is perfectly acceptable. Most builders either fit a non-ferrous inner tank or apply anti-corrosion measures such as a coat of Hammerite or a bitumin paint. On a steel backtank the tender floor, or manstand, is generally made removable using rows of countersunk screws. This is to give acces so that the inside of the tank may be inspected easily or, if preferred, an inner tank fitted. Being totally non-structural, inner tanks may be made of much thinner material such as an old copper hot water cylinder. Soft-solder and a minimum number of rivets would be fine.

What matters

Readers may have spotted that by implication of the backtank being a 'change from the careful machining on the gear train and shafts' that dimensions and tolerances (i.e. how accurately you have to work) are none too demanding. I believe this to be fair comment with just one exception, namely the fit of the tank over the hornplates, dimensioned at 6.375in. in 3in. scale. This dimension has the proviso 'check on model' as there is no point aiming for that dimension if in practice the hornplates are a fraction different. ▶



John Freeborne's super 4in. scale Little Samson; *the steersman's seat has been flipped back. Slightly fewer 4in. scale* Little Samsons *are under construction than in 3in.; I believe John's is the furthest advanced. (Photo: P. Kybert)*



If your backtank ends up a little too wide over the hornplates a thin piece of packing will suffice, but if it is too narrow you may have a problem. Under such unfortunate circumstances it is not a good idea to force the tank into place. The soft-soldered joints will be placed under great stress which they are unlikely to withstand for very long.

Construction in 1in. scale

In constructing a backtank for his beautiful 1in. scale *Little Samson*, Jonathan Milne-Fowler, in Western Australia, adopted a slightly different approach to that of the larger engines. In 1in. scale the angle section necessary to fix the plates together would end up at just 1/8 x 1/8 inch. Allowing for the inevitable overscale thickness of the angle's section, this would leave very little room for the rivet heads.

Jonathan made the back, bottom and front of his backtank from one piece of 0.045in. sheet brass. A solid hardwood former was carefully shaped, complete with the small radii for the flanges, and the brass sheet was annealed and pulled around it. The flanges were then beaten over the former, the most demanding flange being the curved bottom corner. Jonathan would have needed to clamp the material firmly to the former to maintain all the intended dimensions.

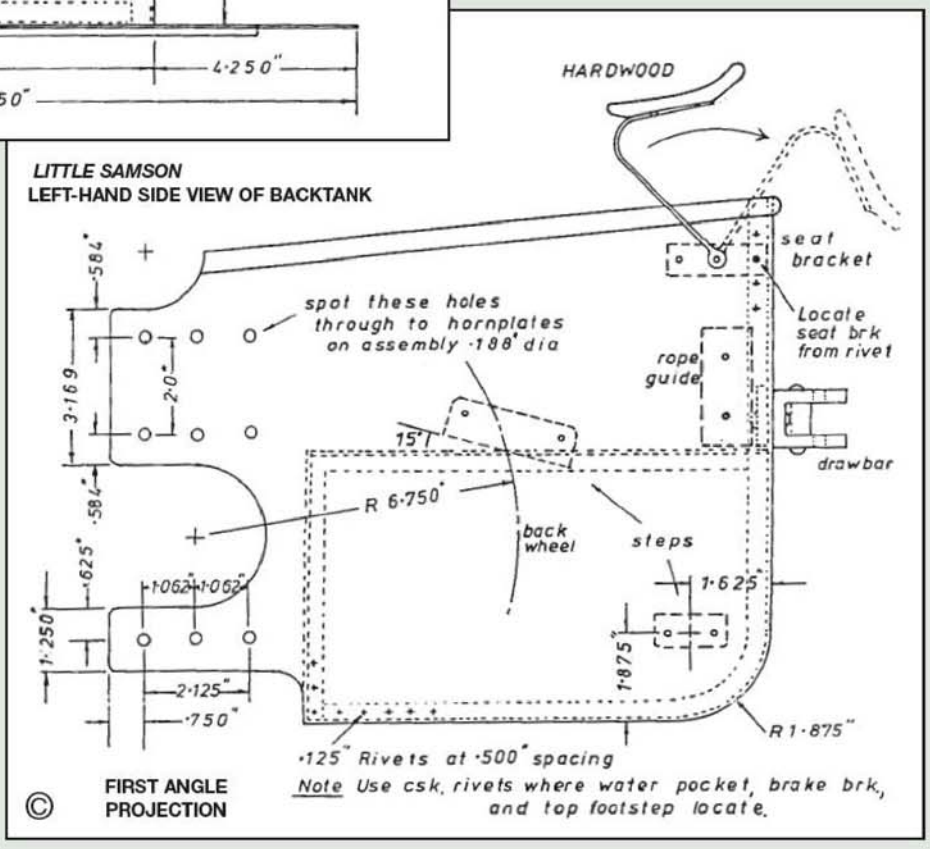
Unfortunately, one of the less favourable propensities of brass sheet is that when heated for annealing purposes it will adopt every shape known to man other than flatness. I am always filled with gloom whenever a member of my evening class arrives with a lovely shiny, flat piece of brass sheet and asks if he might anneal it. I know that however carefully the sheet is annealed it will end up grubby looking and, more importantly, anything but flat. The disappointment is all too obvious. Fortunately the smaller the piece of brass sheet the less pronounced the distortion ought to be, so in 1in. scale it should be manageable.

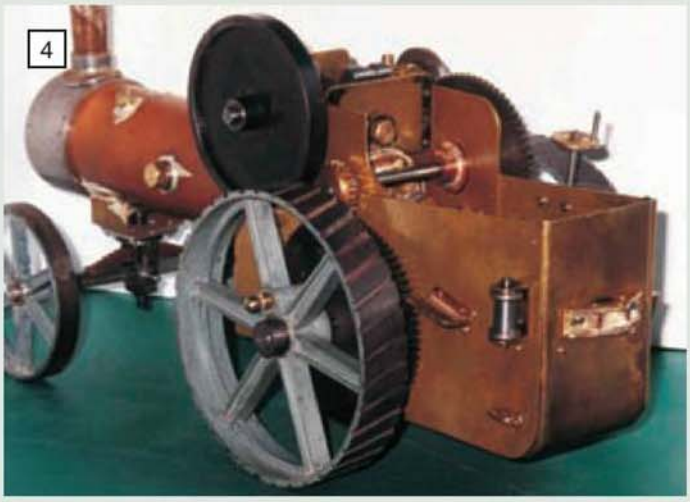
An angle frame was then made from 1/4 x 1/4 x 1/16in. brass (**photo 6**). The purpose of the frame is to receive the tender floor. Very sensibly, a steel reinforcing plate was temporarily added to maintain the correct orientation of the angle while hard-soldering.

Correct alignment

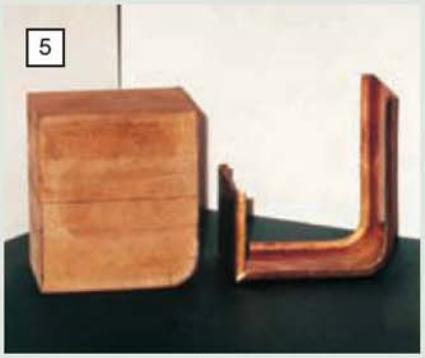
To ensure the correct alignment of the tank sides the two side plates were fixed to the hornplates. At this stage the upward slope of the backtank becomes particularly noticeable. The back/bottom/front and floor assembly (**photo 7**) could then be slid between the two plates and, when correctly positioned, a few judicious holes were spotted through to hold it all together. The tank was separated from the hornplates and soldered together.

Jonathan's backtank furniture is equally impressive. The top step was made from sheet brass flanged over an aluminium former with the bolting flange hard-soldered on. The bottom step was cut from brass angle with the strengthening web hard-soldered. A diamond, or chequer plate,

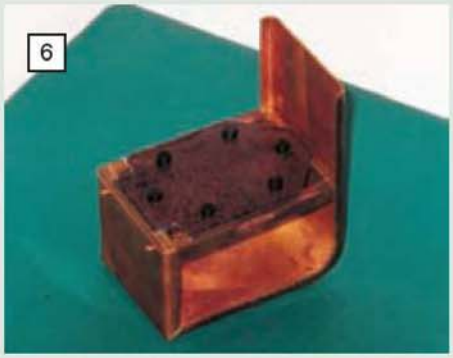




Two views of Jonathan Milne-Fowler's **Little Samson** *backtank in 1in. scale. The back corners have yet to be levelled off and the brass beading applied. (Photos: J. Milne-Fowler)*



A prepared hardwood former was used to shape the brass for the tank back, bottom and front. (Photo: J. Milne-Fowler)



A steel plate was used to hold the brass angle together ready for hard-soldering. Four rivets located the angle frame to the brass platework during brazing. (Photo: J. Milne-Fowler)

The brass angle frame hard soldered in place. (Photo: J. Milne-Fowler)

pattern was produced with a V-shaped tool in a shaping machine. The water pocket was similarly formed over an aluminium former, and the hinge part of the lid was achieved by very carefully soldering on three short lengths of 3/32in. O/D copper tube to the respective parts. While not strictly in the remit of this article, in 1in. scale Jonathan's brake screw scaled down to 48tpi on a diameter of just 0.083 inch. Very sensibly Jonathan settled for 6BA which was very close in respect of the pitch but a little over-scale on diameter. The seat and tool box have yet to be made. The water lifter hose bracket on the earlier cast wheel *Little Samsons* seemed to have been fitted over the drawbar, so the hose hung over the back of the engine, which is what Jonathan will probably do.

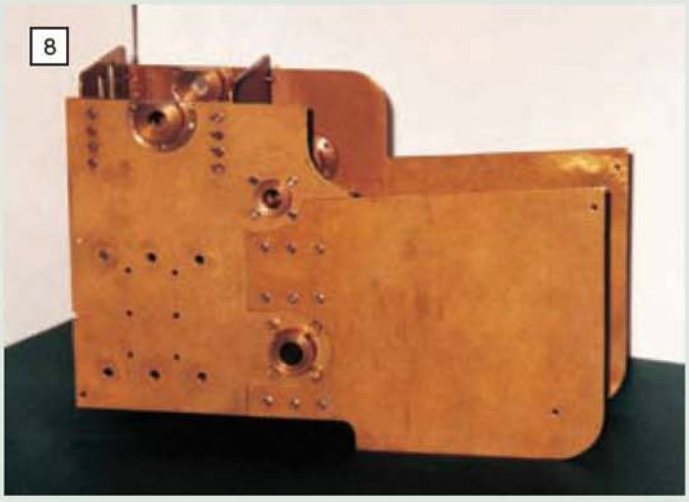
I am very grateful to Jonathan for sending me the illustrations featured together with some notes to aid me with the explanations.

I hope our Editor will find enough space this month for the accompanying 3in. scale backtank drawings. This will give us plenty of room for backtank construction photographs in the larger scales in the next part of this series.

Supplier

A *Little Samson* catalogue listing drawings, copies of works drawings, materials and castings in 3in. and 4in. scale, is available for £2.50 post paid (UK) from ***Little Samson*** Models, 38 Wheatsheaf Way, Linton, Cambridge CB1 6XD. Visit **http://homepages.tesco.net/~little.samson**

●*To be continued.*



The horplates are used as a jig to orientate the two sides of the backtank. The assembly from photo 7 is then gently slid into place and a few holes are spotted through to hold it together for subsequent hard-soldering. Sharp-eyed readers will have noticed from photos 3 and 4 that this soldering operation has yet to take place. (Photo: J. Milne-Fowler)

The backtank of David Hall's 3in. scale engine. The brass beading has yet to be fitted but the backtank is otherwise complete. (Photo: B. Camps)

KEITH'S COLUMN

SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7¼in. gauge

Keith Wilson

compares Walschaerts and Stephenson's valve gears before describing his method for making expansion links and other valve gear components.

●*Part XX continued from page 291 (M.E. 4155, 21 September 2001)*

Valve gears, many and varied are they, but the main pair are Walschaerts and Stephenson's, which as we know was really Howe's. Generally, W's was best for fast running, S's for slower running but hard slogging. Whether there was much to choose between them I don't know, but certainly W's with its constant lead (and therefore constant exhaust points) could be notched up to 12% in reasonable cases, whereas due to the fact that S's advances as it is notched up, input into the cylinders is advanced. This advance acts the opposite way for exhaust and generally only about 20% is practical before the loco will 'kick back' and tend to choke on its own exhaust. Neither of these is necessarily exclusive, for many W's have hauled pretty phenomenal loads at times. (Kings on 25 carriages at 79mph, Gresley Pacifics taking similar loads, etc.) and S's running at 100mph, (more common than might be thought) and also taking hefty loads, but not generally quite so rapidly.

As far as can be 'scaled' from such Swindon drawings that I have, the angle of advance for Swindon version of Stephenson's is about 26deg. for the big engines; those with inside motion with locomotive links (as distinct from 'launch' links) had 16 degrees. It is interesting to note that whereas for the Kings the angle of eccentrics was 99deg. and was clearly shewn as a figure on the drawings, the angle for the others was not; I have had to scale it. However, a number of engines made with the 26deg. advance seem to work okay. So unless someone knows better, 26deg. shall it be.

Now dear old Curly's advice to set eccentrics by nudging them round on the axle to give good results is I fear incomparable with accurate pre-setting and keying of eccentrics together with jig-boring methods for super-accurate machining of expansion links and eccentric rods, etc., finally setting valves under steam, notched up, after running-in.

This last is very important, for I know of a very fine locomotive that I drove some years ago by invitation. It went beautifully in full gear, but dare to move 'the pole' and it sounded more like a badly-syncopated jazz-band. Ugh! I don't know what went wrong, but something certainly did—or had.

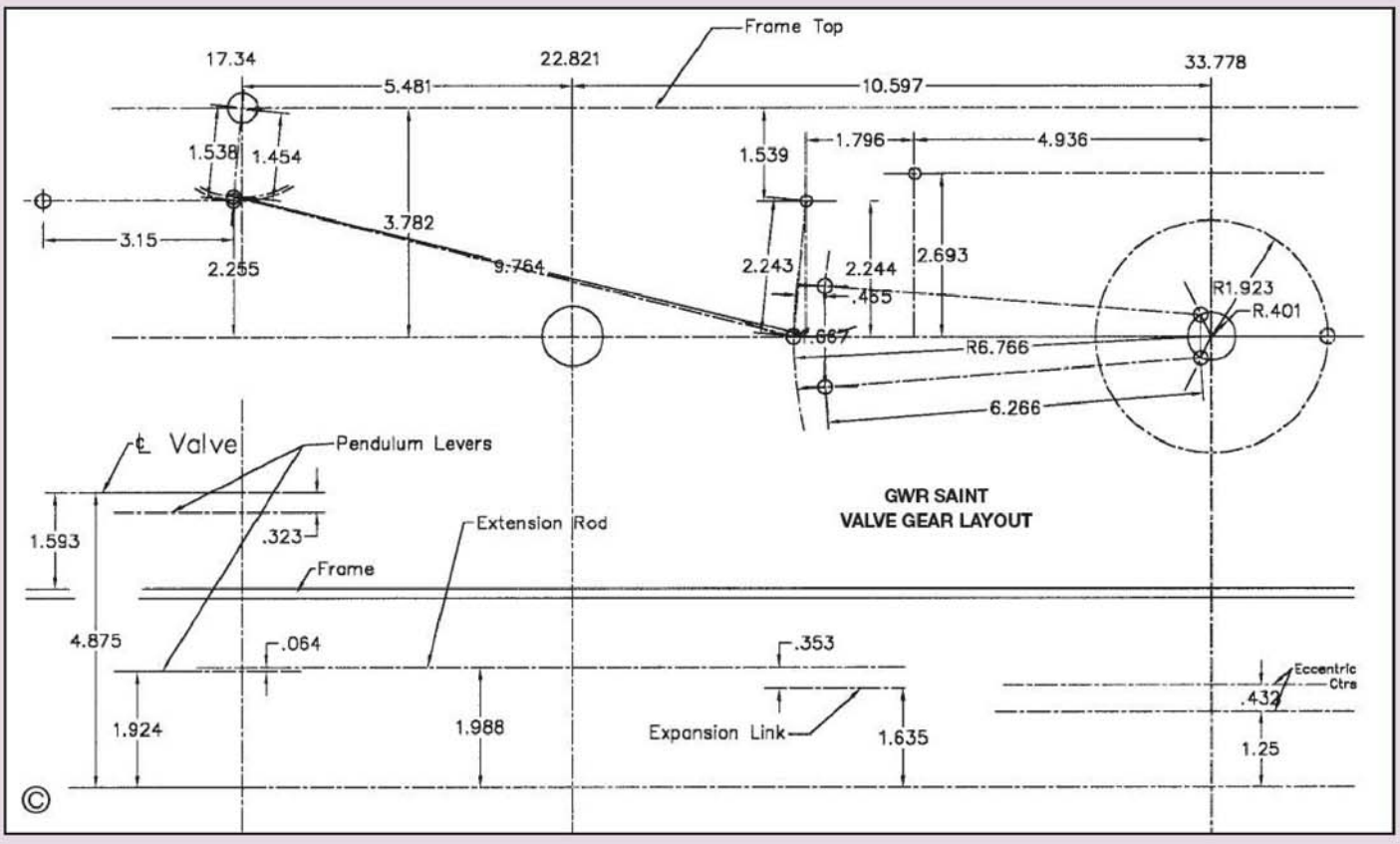
It doesn't seem too obvious why a perfect or near-perfect setting in full gear should go to pot immediately it is notched up, but it does happen. Hence the final setting well notched-up when run in. It will pay. Some years ago during a rainy day when passengers were thin on the ground (or limited in the queues) I played around with the valve setting in this way, suddenly finding that 'she' would pull and go in mid-gear, theoretically just about impossible, but it did, running forwards. Not so good in reverse, but perhaps not surprisingly.

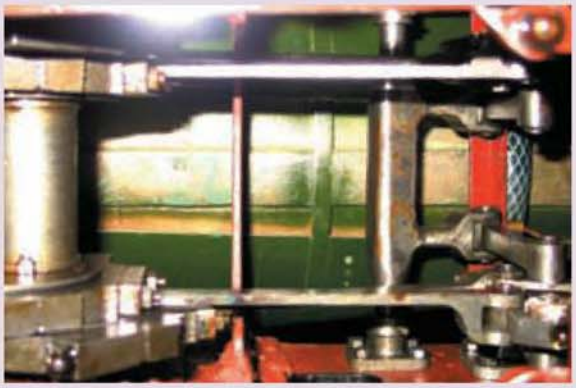
In some highly successful main-line locomotives, backwards running was deliberately sacrificed in order to get better results forwards. Logical. For, except for tank locomotives, forward running is the order of the day, often as much as 98% being done nose-first, especially at speed and with loads. It took nearly 100 years for this to be realised, which shews the advantage of occasionally looking at a matter from the other side.

Expansion links

These are generally feared. Indeed, they are tricky beasts to deal with, but properly looked at, there is no real difficulty. Life is made immensely easier here with the use of jig-boring methods. No matter how accurate your marking out may be, there can be few who can mark out to within 0.001in. but with jig-boring 'tis simple.

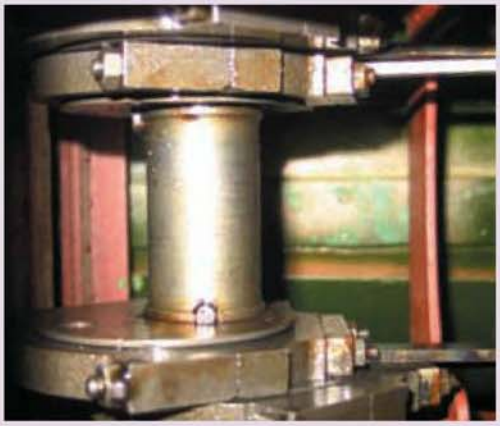
I give a highly-dimensioned drawing of what might be called the setting-out points for the link, if you use the dials on your cross-slide and vertical slide (in a lathe) or saddle and long table on t'mill then you will end up with a fairly high-precision pair of links. *Do not* rely on centre-punching, but use a





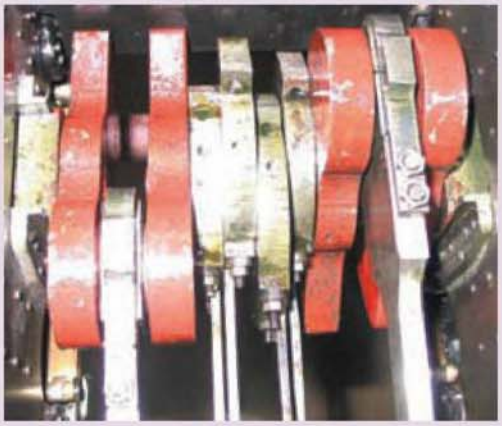
Left: Typical GWR Stephenson's valve gear; main axle, eccentrics, rods, weighshaft, lifting links, expansion links.

Right: Lifting link, expansion link, valve extension rod, and some parts of lubrication system required for tank engines.



Left: A closer view of main axle and eccentrics, note key fixing eccentrics to axle.

Right: The same set-up for inside cylinders, using locomotive links, and in a cramped space. For really sharp-eyed readers, note that the right-hand pair of eccentrics are the wring way round. It is only convention, but normally the outside eccentrics are for forward gear, the inside pair are for reverse. I boobed on this loco (a 7¼in. Bulldog) but she still ticks over on less than 5psi. It doesn't in fact matter much, and working is unaffected. I am making two, and boobed identically on the other one as well!

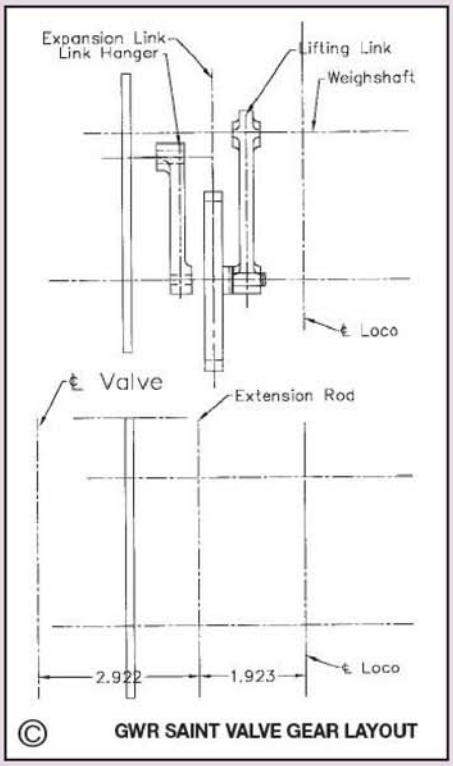


small centre-drill for marking each point. Remember to be very careful about backlash in the slides. If you have digital read-out then no problems.

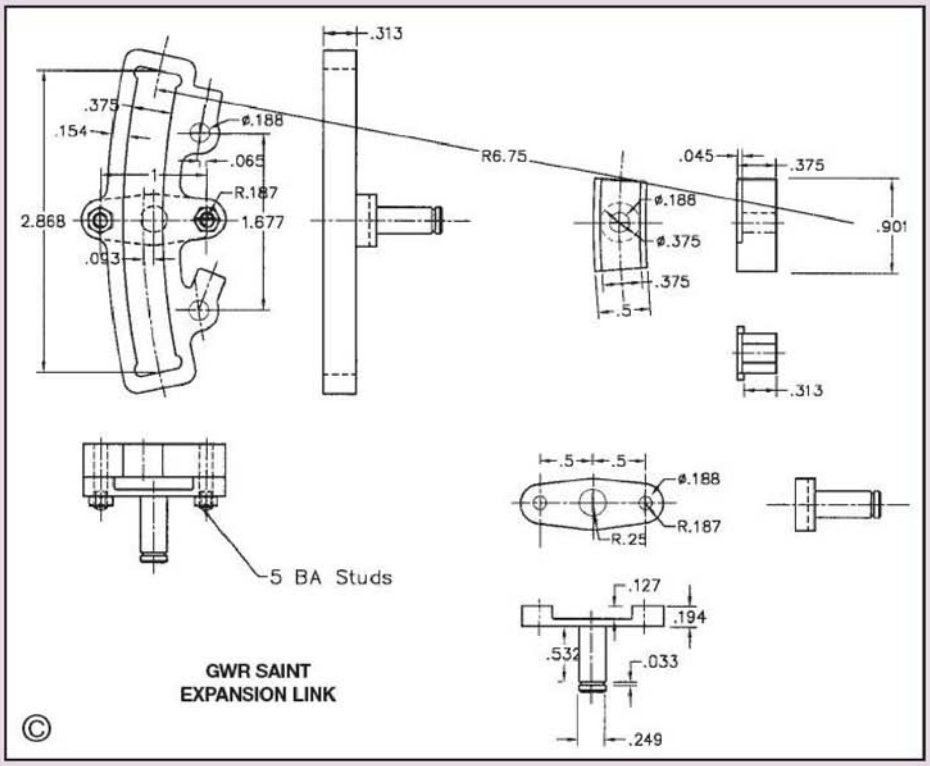
Note that the blank is much larger than the finished link. This is important, as I found out some ten years ago when knocking out some box-type Walschaerts links. I thought that a similar arrangement to apparent full-size practice would work; I forgot that the machining stresses were not proportionate. On the full-size King links there are two holes on the curved centre-line of link that appeared to be machining holes as well as assembly aids, so I mounted the embryo links by these holes using silver-steel studs in reamed holes. N.B.G. for play rapidly developed despite the tight fitting. So I ditched four sets of links (there's courage for you!) and started again. This time, blanks with mounting holes at 5in. centres, ½in. diameter to boot, (we'll see who gets tired first!)

To get the blanks right, I marked one out using the milling machine as a jig-borer as mentioned above. This was then drilled out to reaming size, clamped to a second bar and spotted through. This of course produced two blanks about as identical as possible. These blanks were then used for one further blank each, so: four identical blanks. Since I required eight pairs of links this process was repeated: eight 'masters'. Repeated once more then at the very least: eight matched pairs, especially when reamed in pairs.

When doing this, ream one of the ½in. holes first and push a stub of ½in. silver steel though it; then ream the other one and ditto. Lastly ream out the two driving holes. If this does not produce two remarkably similar blanks then *"zummat pecooliar be goin' on!"* If making pairs for any reason then don't forget to mark them as pairs; you might well think 'no need, I will just keep them in pairs side-by-side.' Forget it, Sod's Law says you'll mix them up somehow. In theory it should not matter, but 'belt and braces *and* carry a piece of string' is not a bad plan.



© GWR SAINT VALVE GEAR LAYOUT



© GWR SAINT EXPANSION LINK

If you have a big enough rotary table, then mount a plate on it large enough to comfortably hold a blank To get the two tapped holes for 1/2in. studs located accurately, first set of the table so that its rotating centre is exactly under the centre-drill; not too difficult. Then crank away on the main table until the correct position is reached; rotate table to get to end-position of 1/2in. hole, drill and tap it. Screw in a stud (silver-steel recommended) and then set for the other stud-hole.

It could be useful to use one of the blanks to aid its location. Set a bit of 1/2in. in the chuck, check that it runs truly, and juggle around with the rotary table only until it fits into the hole in the blank. Replace the bit of 1/2in. with the centre-drill, then *"off we jollywell ..."* I suggest that very little further writing is here needed, beyond mentioning that a sharp slot-drill 'one size smaller' is best for cutting the slot, and preferably a brand-new one for the last few thou, using a piece of silver-steel as a gauge. Little and often is best for cutting the slot.

When the inner is completed, then chew the outside to shape, precision not over-important. Leave a 'neck' *un-milled* until the end, hacksawing this off and finishing to shape by filing or use of a belt sander.

Well-known Welshman: Dai Block

I have always used phosphor-bronze for these, machining them to a fine fit in the link using much the same set-up; however a crafty wangle that I got from Bob Shaw of Blackpool is to use a piece of polytetrafluorethylene (PTFE, or Teflon, if you prefer) and just drilling the central hole. Leave the outside a bit over-size, not necessarily curved to match the link, and force it into its link on assembly. He has used this on his extremely fine 7 1/4in. *Britannia* and it works very well. The very low co-efficient of friction of this material ensures good working; wear is just about zero, and precision is not so important.

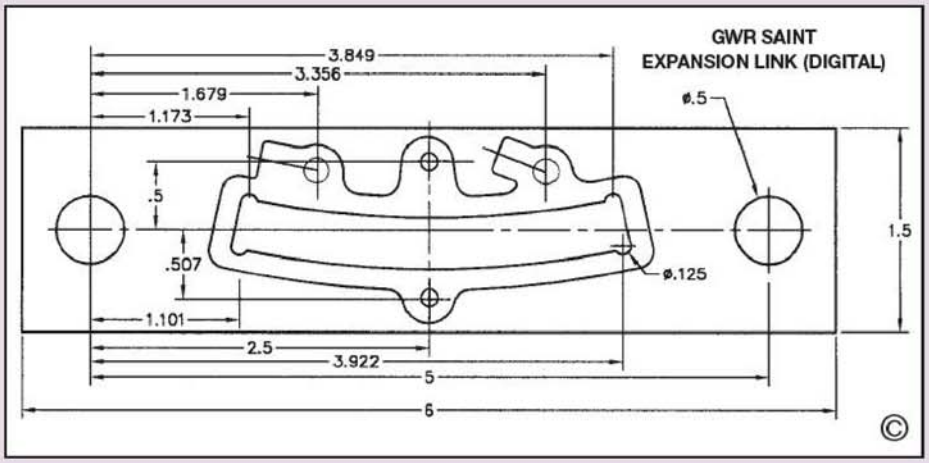
To get eccentric rods exactly matched (very important), assemble on a jig if necessary using shims as per full-size to get them right.

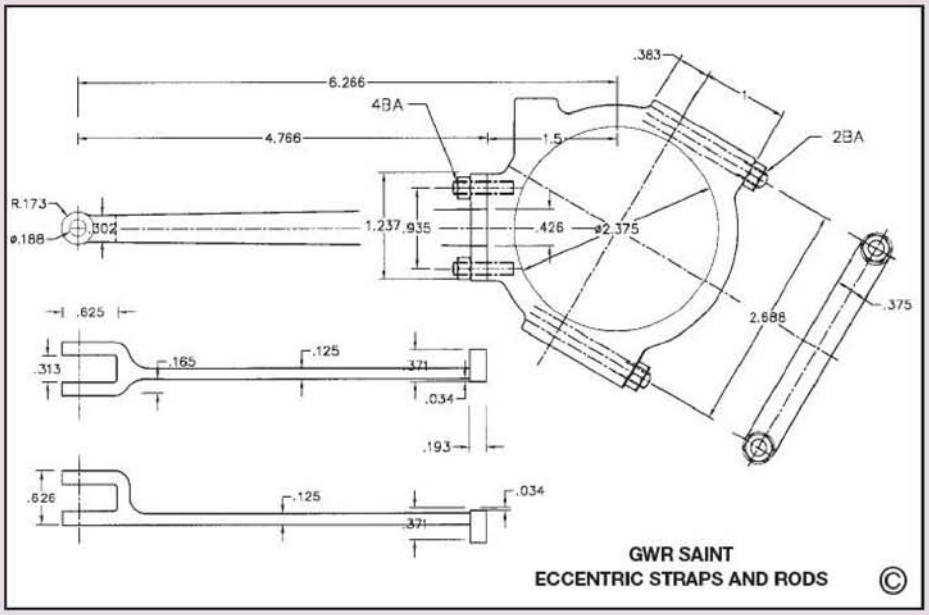
The other items needed for the valve gear present no great problems, extreme accuracy not being needed quite so much, but the lifting links and suspension links should be closely matched, likewise the fork pieces on the weighshaft.

Weighshaft and bearings

It looks at first as if the weighshaft cannot be assembled through the frames with those big bearings in the way; however it is those very bearings that make things easier. They can be chewed out of round brass, milling or sawing it to their semi-rectangular profile as the last operation. There is no name that I know of for this shape; if they were square with rounded corners then 'squircle' would be about right, however 'rectircle' does not look right. Note that there is no need to allow for the full diagonal of the rectangle, for the rounded corners reduce this figure by quite a lot.

As far as I know, the weighshaft was machined from a big forging, it looks like this on the drawings. Perhaps surprisingly, this can be done even on the humble 3 1/2in. lathe, but it saves lots of time to get a flame-cut blank. Take it gently and between centres. Incidentally, 'between centres' includes one end in chuck—t'other supported by tailstock centre, preferably of the 'revolting' variety. But beware that the extra end-thrust could push the job into the chuck, so take precautions. Milling the forks is no problem.

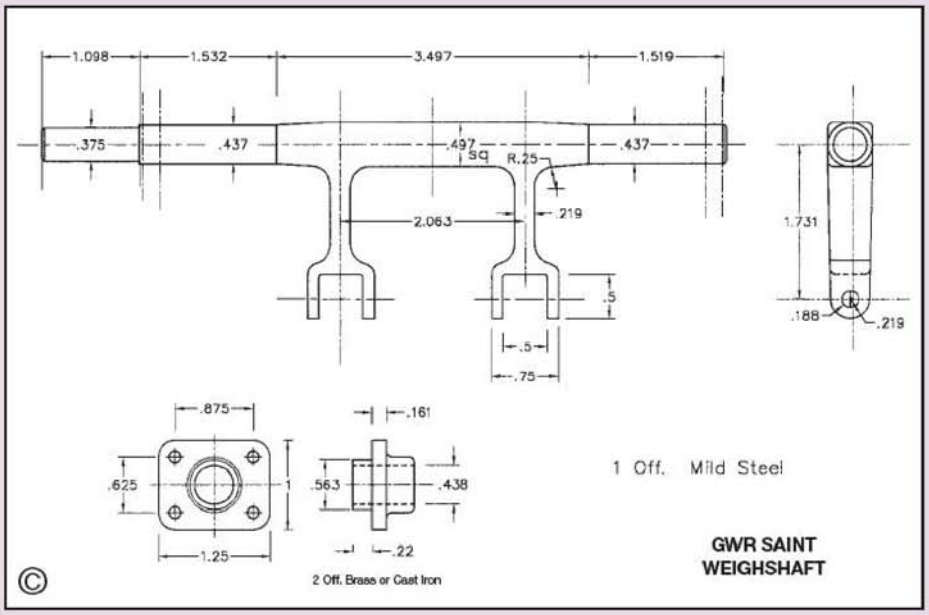




In the inside cylinder version, the weighshaft lever is usefully made a permanent fixture, because it is between the frames, however with 29 and 47 it has to be removable. Even when pinned, it can rock on its shaft and work loose, so make it a good fit. A grub-screw fixing as well as a hefty taper pin is recommended. This lever will appear later, as it is on another sheet.

I must point out that this is not exactly the valve gear as applied to Saints (thanks to Pete Rich *'Taff'* for this information); but I am not trying to get a perfect 'replica' but one that looks very like the original loco, and will run like the proverbial bat out of hell with a tidy load to boot.

●*To be continued.*



A 20 TON LMS BRAKE VAN in 5in. gauge

Geoff Dowden

brings his notes to a close with the construction of the roof, a few final embellishments, and a word or two about livery.

●*Part V continued from page 176 (M.E. 4153, 24 August 2001)*

Each of the partition doors was made using the previously scored MDF 4 1/8in. high and slightly less than 1 1/4in. wide, glued between two 6 3/8in. lengths of 1/4in. square, a top and bottom rail of the same material, and a centre rail sitting on top of the MDF. The pieces were glued together, placed on a flat surface, squared up and held with metal blocks until the glue set hard. A pair of miniature 1/2in. brass hinges were then rebated into the door and corresponding frame and secured with the 1/2in. brass brads supplied with the hinges. Uncertain which way the doors opened, I hung mine on the right-hand side to open inwards. If this is wrong, my response will be that the joiner who fitted the doors on my prototype van had the official works drawing back to front!

The inside framing for the window was first glued in position as before, using butt corner joints and then painted inside and out to match the partitions. I took this opportunity to apply a couple of coats of paint to a couple of 3ft. lengths of the 1/16in. square stripwood ready for later use.

Glazing

The five windows for the openings in one of the partitions were then cut to an easy fit from the 0.010in. glazing material and secured in position with lengths of the previously painted 1/16in. square stripwood, this time with mitred corner joints. The fitting of a pair of door knobs, inside and out, obtained for me by my wife during one of her visits to a Miniaturama fair, were perfect to finish off the partition. The popular scale for these items is 1in. to 1ft. which suits 5in. gauge.

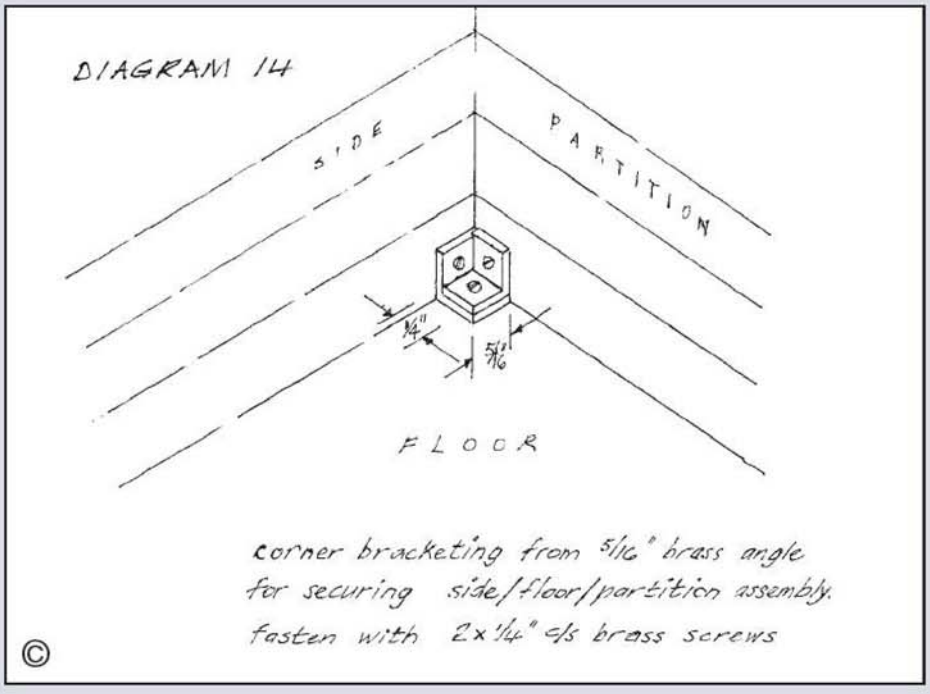
Interior

Now well and truly hooked, internal detailing had become important to me before permanently uniting the whole assembly, as I then thought. It seemed prudent to build the basic interior furniture while it was easy to position and secure these few items inside the van. These were to include the two guards' seats in front of the ducketts, two benches along one side, either side of the guard's seat, a coal box, a stove and a desk under one pair of the partition windows.

The guards' seats consist of two shaped sides, a front and a seat of 1/8in. thick material all glued together. I found a spare piece of drawer bottom material with a white plastic covering on one side which was marked out and cut into the various components required. It produced the guards' seats backrests, the two benches and the coal box in the corner of the van against the partition at the stove end. I used it to make the desk but for realistic effect made the desk top from 1/16in. wood veneer which I had to hand. A length of 1/16in. square strip to suit the width of the desk was profiled to an approximate semi-circle and glued in position at the bottom edge of the desk lid to represent the anti-fall bar. Seat cushions were made from pieces of thin foam rubber packaging similar to the underlay for 00-gauge track, covered with grubby cotton material and glued together with UHU but I drew the line at attempting to upholster the sides of the guard's seat!

I made the stove next, the body being taper turned from a short length of 3/4in. brass bar and incorporating the two wider bands around the circumference and a bored out recess for the billy can on the top. A 7/32 dia. x 1/4in. long spigot was turned on the bottom and threaded so that the stove could be secured to the cinder tray. This tray was turned from a length of brass bar to 1 9/16in. dia. and bored 7/32in. deep to leave a 0.030in. thick rim before parting off to leave a total depth of 9/32 inch. An off-centre hole was drilled in the base of the tray where the stove is located, the spigot inserted and secured underneath with a nut. Three No. 50 holes were then drilled 3/16in. from the outer rim and tapped 8BA to attach three short legs to lift the cinder tray off the floor. These legs are 1/4in. lengths of 1/4in. dia. brass with 3/32in. of 8BA thread on one end and tapped 8BA 3/16in. deep at the opposite end to provide fixing points through the floor to enable the stove to be removed if ever the need arises. The legs were screwed into position, the cinder tray mounted in the chuck and the leg studs protruding through the tray trimmed to length.

The stove body details rekindled previous experience in working with styrene sheet, a boon to modellers if ever there was one, as during my 00-phase this material superceded the tradition of modelling in card. I wished I had remembered the benefits of working with this particular material when I built the duckets and determined to use it in future if the occasion demands. ▶



Stove detailing

I drilled a 5/16in. hole in the stove body 1/8in. deep just below billy can level to locate the chimney. I then used 0.030in. styrene sheet for the sides, top (curved on the inside edge to suit the stove radius) and door with simulated hinges and lifting handle for the upward lifting ash cleaning door, which were glued up and located towards the bottom of the stove 180deg. from the chimney hole.

A few words about the adhesive used for styrene sheet may be appropriate. One of the benefits of this material is the adhesive used to weld it together. Of a watery consistency, the cement melts the styrene, bonding one part to another, no matter how large or small, almost instantaneously. Any excess adhesive evaporates to leave a perfectly clean joint without any need for cleaning up or traces of stringiness associated with some other proprietary plastic glues.

The parts for the model upper drop down coal feed door with its hinge and handle were then prepared and glued onto the stove body. Purists will probably scoff at this technique and no doubt take great delight in producing all these very small bits and pieces from brass sheet, soldering the lot together as easily as shelling peas. Had I thought I could do it without the whole lot constantly falling apart, or me going prematurely insane, I might well have done the same!

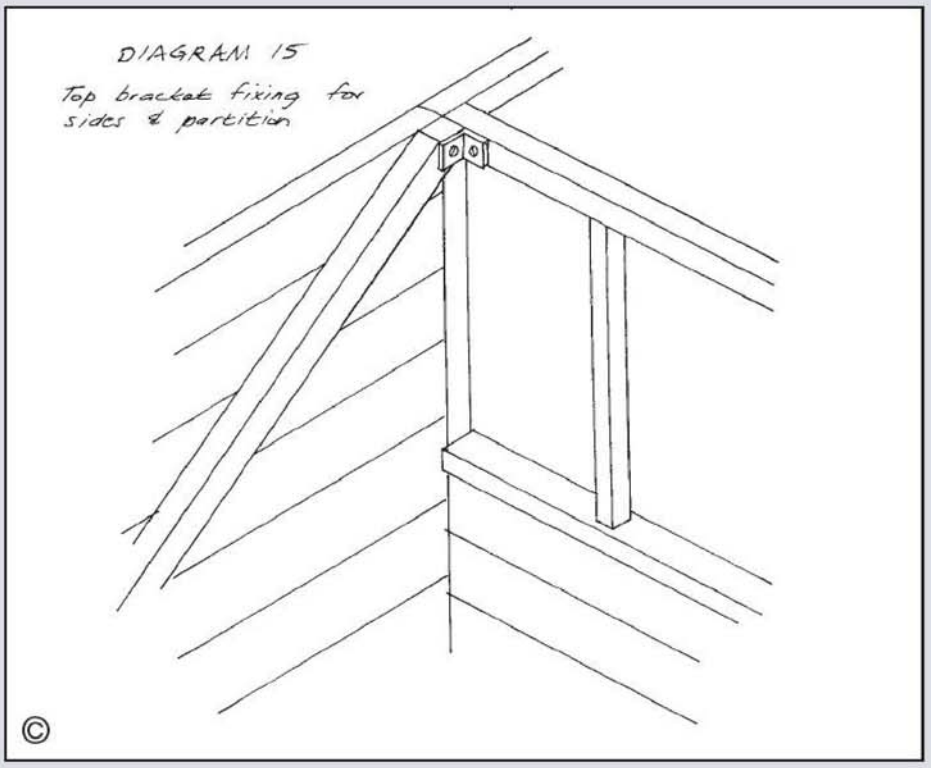
An 8in. or so length of 5/16in. copper pipe was then selected for the stove chimney which forms a 90deg. bend to the vertical as it leaves the back of the stove. Not too good at bending pipe, I took it to work one day and in conversation with one of our maintenance engineers, I casually enquired if he had any small bending springs or, if not, how I might best produce the necessary bend close to one end so as to avoid too much wasted material. When I explained what it was all about, I learned that elbows, sleeves and other fittings were commercially available for this pipe. He advised me of a plumbers' merchant where I obtained what I required over the counter. I epoxied a short stub of 5/16in. pipe into the back of the stove, pushed on the beautiful elbow and added the vertical chimney to finish with a perfectly rigid assembly.

My wife has promised to buy me a billy can on her next visit to a Miniaturama fair where she assures me she has seen them on offer; I live in hope. As my van is of the non-fitted variety there is no need to fit any of the associated gauges, valves or other equipment. Whether I get round to providing lamps, spare coupling hook, flags, shunter's pole, etc. remains to be seen.

Before final body assembly, the four segments to fit on top of the ends and the partition walls, with the 10 1/4in. radius to support the roof section had to be made. Four pieces of MDF were cut out, clamped together, squared off, filed to radius and then glued in place. As an afterthought, I made two extra thinking that they may come in useful later as additional support to the roof and to help maintain the correct curvature.

Final body assembly

Despite all my forward planning, several changes to my original intentions had been made and now it was time for another. From the outset, I had expected to glue all the bits and pieces together, including the bottom of the sides and ends to the MDF floor in order to produce a really good solid 'box' which could be removed from the underframe by simply lifting off the roof, slackening the four end stops and unscrewing the 6BA screws retaining the floor. As final assembly approached, I wondered if it would be possible to achieve the same result but retain the sectional sequence capability.



To achieve this objective I determined that any fixings should be unobtrusive by locating them inside the van itself. After much thought and experiment I settled on providing three 5/16in. brass angles screwed to the bottom of the cabin sides against the floor, one located in the centre under the guard's ducket seat and one in each corner, side on against the partition (**diagram 14**). On one side of the van these would be covered by the guard's seat and the side benches and on the other by the guard's seat and the coal box; and only the one under the desk would be visible. Similar brackets, 1/4in. wide, fixed to the bottom corners of the partitions share the same floor fixing screws and hold the partition against the left or right-hand verandah opening upright. Delighted with the results of the trial, I repeated the exercise for the other side, the 1/4in. No. 2 countersunk brass screws being quite adequate to provide a secure anchorage.

An external bracket which straps the end of the partition to the inner verandah opening upright close to floor level presented a small problem. If secured with 1/8in. brads, these brackets would prevent the side-panel parting company with the partition. The bracket at the top corner of the end section would also hold the verandah side top cross member to the end section.

I ignored this problem for a time and continued with the task of developing the 'Meccano' technique. If rigidity was to be improved in a glueless state, it seemed logical to fix the top of the partitions to the sides, so brackets were attached to each end of the partition cross member and the top end of the diagonal bracing which will only be visible when the roof is removed (**diagram 15**). When repeated at each corner, the assembly seemed reasonably rigid. Four more brackets were then fitted to the inside of each verandah corner, directly behind the strapping which proved to be quite unobtrusive. The addition of a countersunk screw from the inside into the half joint itself proved unnecessary as the assembly was quite rigid enough.

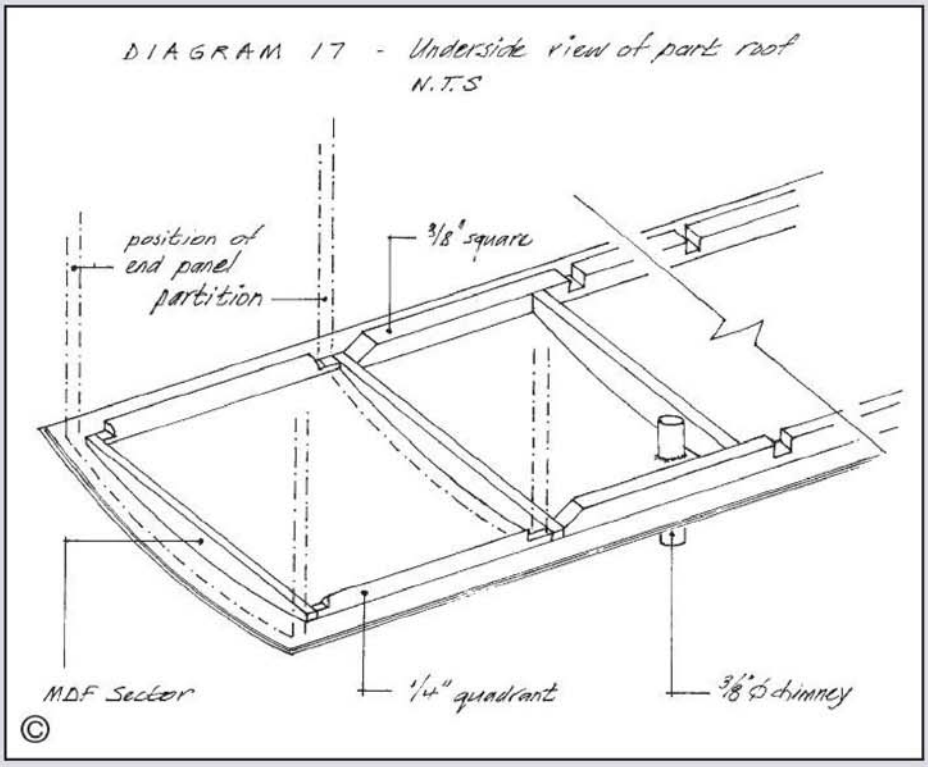
A length of 1/4in. square stripwood filled the void and formed the step between the verandah opening framing. Four lengths were squared off at each end to fit in the opening between the bottom of the uprights, supported on the metal sub-floor aligning snugly against the edge of the MDF floor to which it was secured with PVA glue. This will present no difficulty should the van body have to be dismantled in future as the step will remain as part of the van floor.

Eight pieces of strapping were still required to complete the body, four at the top outside corners and four at the bottom of the inner verandah uprights. These are simple right angles drilled and folded as previously, the latter with a shorter return along the van side, stopping at the inner edge of the verandah upright. To allow the side panel to be removed if required, these brackets were secured to the side of the van with a touch of UHU and 1/8in. pins driven in when the glue had set. However, before doing so, pins were fitted into the other length of the angle by soft soldering the pins into a slight countersink in the back of the angle and trimming the backs of the pins off flat. Once in place, the illusion is effective and when the seven brackets are unscrewed, the side panel is released as intended.

The duckets were given a couple of coats of the grey primer as the auto aerosol grey I had used earlier was a touch lighter than the paint on the remainder of the assembly.

Roof

I pondered various options for construction of the roof for some time before settling on a method. With no welding skills and no wish to impose on my society colleagues I had to make my roof framework a glue and wood affair instead of the perhaps more usual curved spars welded to a horizontal member on each side.



I prepared six MDF segments curved to match the radius of the van ends to fit inside the panelling, four lengths of stripwood cut to fit between the van ends and the partitions, and two longer ones of 3/8in. square stripwood cut and shaped to fit between the diagonal braces on the side panels with notches to clear the tops of the vertical side members either side of the ducket openings. Had I planned the roof construction before building the side panels, I would have made the vertical side members 5/16in. shorter to leave the roof stiffener intact.

Two pieces of good quality 1/16in. card were cut to size, the first to protrude 1/8in. beyond the sides when laid over the curved end and to overlap the ends by 1/4 inch. The two lengths of quadrant and the 5/16in. square stripwood were then glued to the card along one edge, allowing for the overhang and the thickness of the MDF side panel. They were left overnight to set hard.

The card was then placed in position, rolled over the ends and the location of the other stripwood marked off from under the verandah opening. After gluing in position, checking that all was well and that a good fit had been established, the MDF sectors were glued into position one at a time between the lengths of stripwood, starting from one of the ends, the MDF being fixed right behind the verandah end panel. The operation was then repeated for the opposite end, then the two located behind the partitions, and finally the pair equi-spaced between the partitions themselves.

It was not easy to hold the roof card to the full length of the MDF sector during the gluing operation, so I decided to glue only half of each sector at a time. When the first half of all the sectors had dried, adhesive was applied to the remainder. This method worked very well. A further check confirmed a good fit and I felt sufficiently confident to carry on, my plan now being to glue a second piece of card on top of the first, this piece being 1/32in. shorter at each end and overhanging the sides by 3/16 inch. This accomplished, a piece of fine cotton sheet was found and cut to overlap the roof by 1/4in. all round.

White PVA glue was diluted 50% with clean water, brushed onto the roof and the cotton sheet carefully applied, stretching out any creases before folding the edge under and gluing to the underside. The corners were trimmed to eliminate the ugly bulk resulting from multiple thicknesses. When the glue had dried, I was extremely pleased with the canvas effect and set about fitting the rainstrips which stretch almost the full length of the roof.

Two pieces of 1/16in. square stripwood were carefully rounded off along the top edge and glued in place to the required arc with PVA. It turned out to be unneccesary to pin or clamp the strips in position, the rainstrip remaining in place without. Had it been necessary, it could have been pinned in two or three places. Care was taken to avoid using more glue than absolutely necessary since excess glue would have spoiled the 'canvas' effect on the roof. Any surplus glue was immediately removed with copious supplies of water applied with a small artist's brush to avoid filling the cotton 'grain' which would have been quite noticeable along the stripline.

When quite dry, the position of the chimney was marked out and drilled 3/8in. dia. A 1 3/4in. length of 3/8in. dia. copper pipe was carefully drilled 19/64in. to reduce the wall thickness and then opened out to 21/64in. for a depth of 1 1/2in. so that the stove pipe, which extends a little above the roofline, slides easily into the short length of chimney when the roof section is lowered into position. The exact location of the stove could now be determined and its position on the floor marked by poking a scriber or pencil through the partition door. However, before dealing with this, I decided that my next prioritywas to paint the roof.

A coat of white emulsion paint was applied to the underside of the roof and stiffening sections and two coats of thinned dark grey vinyl silk to the top and undersides of the overhangs. The paint was applied sparingly to avoid filling the 'grain' of the cotton. When the paint was quite dry I replaced the short chimney stump and trimmed the canvas at the chimney hole with a sharp scalpel to neaten the edge around the circumference of the chimney. A small band was then prepared by wrapping a couple of inches of of 0.020in. styrene strip around the chimney and applying a touch of Plastic Weld at the overlap position. When set, the band was slid off the chimney, the excess overlap removed and the ring refitted to the chimney, closely abutting the cut edge of the canvas.

After securing my idea of what a waterproofing clamp might look like with a drop of Plastic Weld all around the chimney, the canvas was touched up with the dark grey paint and the inside and outside of the chimney and the waterproofing ring were given two coats of Humbrol satin black, although matt black may be a more appropriate representation of real soot staining!

To avoid possible damage to the van I decided to remove the superstructure from the chassis before attempting to drill the stove fixing holes in the van floor. The holes were drilled No. 43 for 8BA screws to be fitted from underneath to secure the stove to the floor. The van was then re-assembled, the bottom of the roof chimney section lowered onto the stovepipe and the roof section lowered into place. Having confirmed that all was well, the roof was lifted off and the short section of chimney fixed permanently with a fillet of Araldite on the underside of the roof.

Although the roof fits firmly inside the van sides and ends, I felt that additional security would be an advantage but wondered how to achieve this without it being too obvious. I decided that two swivelling clamps at each end of the van, screwed into the bottom of the roof end panel and locating under the lower edge of the verandah upper cross member would do the trick. Among my collection of cup hooks I found four suitable hooks with a right angle bend at the end of a coventional wood screw type thread. When straightened out, re-bent to the appropriate length and filed flat on the inside face, these provide a convenient and effective quick release mechanism for securing or releasing the roof section. When in use the swivels only need to be rotated 45-60deg. to lock the roof in position and are not obvious when the van is viewed normally.

Conclusion

Following a trial run on the society track which fulfilled all my expectations, I felt that embellishment with LMS works plates would be quite appropriate. While aware that superb examples of these details can be purchased through the usual trade suppliers, I chose to make my own.

I made up the plates using styrene sheet together with Slater's No. 1 letters and freehand drawing. At the time of writing, the resulting plates have been placed in safe storage awaiting securing to the solebars with UHU after final painting and lettering. The van will be liveried in keeping with its early 1930s origin, in light grey with large white LMS letters along the side and the running number in a white edged, black panel above the guard's lookout ducket. Below, the solebars will be black.

Taking all in all, I am very pleased indeed with the appearance of the completed model which I feel measures up to the character of the prototype and totally conceals its somewhat unconventional construction method and techniques. I hope that if any readers should choose to follow the ideas outlined in these notes they will be equally delighted with the end result.

CLUB CHAT
With Stan Bray

Alan Grueber test runs his petrol electric loco; Alan Stokes' petrol hydraulic **Harlech Castle** *is on the right with an 0-4-0 Bagnall and container storage in the background. The new engine shed can be seen in the distance.*

UK News

Members of **Bournemouth SME** have been in continuous negotiation to find a new site for a track since expansion by Bournemouth City Football Club forced them to vacate their original location. A suitable area in Littledown Park has now been selected, plans have been drawn up, and a number of site meetings held with local authority officials who have agreed to support the club's application for permission to build there. They have been fortunate to obtain the services of qualified architect Gary Worsfield who just happens to be an 0-Gauge live steam enthusiast and therefore perfectly understands the requirements of the club. We look forward to hearing that they have been successful and will soon be in a position to start work on building a new track. Some distance from Bournemouth, the present venue for monthly meetings does not suit all members, so meetings are to be moved to the Terrace Room at the Littledown Centre in the hope that it will be more suitable.

Those present at Illshaw Heath for this year's **Birmingham SME** National Locomotive Rally reckoned it to have been one of the best ever, surpassed only by the first such rally held after the event was reinstated when even more visitors and locomotives were present. This year's event was remarkable for the number of large 5in. gauge express passenger type locomotives present; there was also a fair representation of other smaller engines and models in 7¼in. gauge, the latter using the ground level track. The garden gauge layout was busy too, with some very smart models in operation, frequently hauling equally impressive trains. A few weeks prior to the rally, the club held its Muscular Dystrophy Day when sufferers from the disease were invited to visit and enjoy themselves; and they did just that. Club members provided a good selection of locomotives for them to ride behind. The club's safety officer found it necessary to recruit members to police certain areas around the site to control children who seemed to have little idea of safety. However, all was well thanks to the vigilance of the members and everyone seems to have had a whale of a time.

Last summer saw a spate of thefts from containers owned by **Burnley & Pendle MRS** and believed to be secure, by which they lost property to a total value of about £1000. Not only did it hit the club finances, but it also slowed down work on the track. Luckily the Parks Department came to their rescue with the loan of wheelbarrows and gardening tools. Efforts have since been made to improve the security of the containers. However, all is not entirely doom and gloom as the club has had a donation from the Lancashire Attractions Development Fund, amounting to about a quarter of the cost of phase two of their plans. The society wishes to attract more members; anyone interested and living in the area is invited to contact club Secretary, Don Kitson, tel: 01282-603031, e-mail **don@g3trk.freeserve.co.uk**

The annual *Sweet Pea* Rally was staged this year by **West Riding SLS** when, as usual, plenty of models were to be seen in action, including the original. Nowadays, there are innumerable variations on the original design, most having been customised by the builder so, although observers are looking at one design, many different engines appear to be on display. A couple of weeks later the club staged the Jack Scarth Efficiency Run, which was won by John Lockwood with *Nigel Gresley*. The Geoff Haythornthwaite Steaming Trophy was held in conjunction with the trials and in this case the winner was Peter Clayton driving *Tug*. A neighbouring company has put security gates in place which will restrict access to the club track, not so much to members who will be able to get in at any time they wish, but to unauthorised persons, so hopefully the society may be lucky enough to be free of vandalism and theft in the future.

Repairs to the A10 road have caused its complete closure for several months and have brought widespread disruption to traffic in the Kings Lynn area. Early publicity indicated that there would be no access to their normal meeting place, so **Kings Lynn DSME** made alternative arrangements which many members found inconvenient. The discovery that the use of country lanes made it possible to cross the A10 to get to their normal meeting place at West Wynch came as a pleasant surprise and meetings have been reinstated at the usual venue. Since resigning from the post of Secretary, Ivan Coussell still gets mail relating to club matters, causing problems to both Ivan and the society. Readers are therefore urged to note that the new club Secretary is Mike Coote of 26 Adelaide Avenue, Kings Lynn, Norfolk PE20 3AH; tel: 01553-673728; e-mail **mc@dedays.fsnet.co.uk**

Engine developments continue to be made by the **Gas Turbine Builders Association**, but unfortunately space does not permit us to detail them here. Membership continues to increase steadily worldwide; at one time home built gas turbines were not acceptable in the United States but hard work by three members has caused Authority to change its mind. The association has a very active web site at **www.gtba.cnuce.cnr.it** where it is possible not only to obtain information about the society but also to see many of the innovations and building methods used to make the turbines. The association will have its usual spectacular stand at the forthcoming Model Engineer Exhibition at Sandown Park, 29 December 2001 -1 January 2002.

A questionnaire sent to all members of **Taunton ME** concerns the facilities and use of a new site for the club headquarters, the possibility of one at Creech St. Michael is presently being explored. Although at the time of writing, this year's annual exhibition has not taken place, plans for the 2002 event are already in hand. Such efficient planning is probably the secret of success for their exhibitions; they intend to have a theme of 'models in motion' and to present as many as possible in operation, one way or another.

Rotherham DMES staged a display at a model engineering exhibition at Barrow Hill Roundhouse, sponsored last year by Winson Model Technology. This year the Roundhouse decided to proceed without this support and the club display drew many favourable comments. Members manning the club stand had an excellent opportunity for a close-up view of the many preserved full-sized locomotives present. Following heavy rain, the uneven site resembled a quagmire and laying the portable track seemed to present problems. Not to be deterred, the Roundhouse folk brought out a mechanical digger, levelled the ground in no time at all and the track was soon laid. They seem to be rather expert in the use of mechanical diggers at Rotherham as they also used one to cut trenches in which to lay cables, pipes, etc., as well as to level the ground at their regular site ready for seeding.

It is impossible to describe in mere words the latest superb copy of the *Bulletin* from the **Society of Ornamental Turners** which is packed with fascinating articles, mostly constructional and, as usual not only well written but also well illustrated. The society meets quarterly at Baden Powell House and as well as general discussion about society matters there are short talks and demonstrations. Members' work is both very interesting and quite remarkable and, while we all accept that ornamental turning lathes are very special machines designed for such work, an increasing amount is accomplished using regular screw cutting lathes with specially constructed homemade fittings. Examples of such work are shown at meetings with ensuing discussions about techniques. It almost seems that the principal aim in life of SoT members is to try and help others with less ability than themselves. Certainly anyone reading the *Bulletin* might consider forsaking the building of steam engines to take up ornamental turning instead. We advise a visit to the society web site at **www.the-sot.com**

An evening meeting at **Sutton MEC** devoted to the Mamod steam engine and its various derivatives was remarkable for the interest it generated and the number of members who arrived with one example or another. A total of 14 models were to be seen running during the evening, the oldest by far being made in 1936 while most were 40 or so years old. Augmenting this col-

James Moody at the regulator of the Bagnall hurries through the crossing. All photographs of Steamscene, Canterbury, N.Z. June 2001 by Angus Davis.

A view of the Steam Exhibition Hall with Scott Amies' Bagnall and Alan Hamilton's 4in. scale Burrell traction engine silhouetted in the foreground.

lection was a Hornby *Rocket* and a pop-pop boat, both of which were seen in action. All present seem to have found the meeting entertaining and agreed it was well worth the effort. As with most other clubs, interest in the garden gauge layout appears to be gathering momentum, and a train of 14 wagons has now been constructed for general use. The club shed has had its roof raised and now boasts good lighting and plenty of power sockets. Following a quote of £1000 for a commercial safe cabinet to contain hazardous materials including paint, thinners, and the like, member Derek Jones has made one for use by the club.

Very protracted negotiation for a new lease between **Chichester DSME** and the local District Council seems to be making progress at last, and the club is hoping for good news in the near future. Even so, it will result in a massive 130% rent increase which has made it necessary to increase subscriptions. In the meantime work on the club locomotive, a *Speedy,* is making good progress and although not yet assembled, it is beginning to look something like a locomotive. A slight delay due to some minor leaks in the boiler should now be over.

After more than a year of marking time, the **Northern Mill Engine Society** has now heard that an old building adjacent to the one they occupy is almost certain to be converted to a museum in which to house the the local authority's historical and industrial collections. This will enable the two organisations to work together and should assist if an application is made by the society for a grant from the Heritage Lottery Fund. A previous application was rejected as it did not fulfil the required conditions. The society's magnificent collection of steam and internal combustion engines is accompanied by a considerable resource of archive material relating to steam engineering and the textile industry, in the form of books, catalogues, photographs, and the like. These have been catalogued on a computer database system with financial assistance from the North West Museum Service which is very well aware that a great deal of material of this nature is disappearing fast and will be happy to see it included in their own collection rather than destroyed for ever. Anyone with access to such material which they would like to go to a good home should contact the Secretary, Mr. J. Phillp, 84 Watkin Road, Clayton-le-Woods PR6 7PX; tel: 01257-265003. The society is pleased to welcome new members who should also get in touch with Mr. Phillp.

After several years of enjoying fine weather for their Open Day, **Wortley Top Forge ME** were unlucky this year with overcast skies and plenty of rain. Despite the weather, an early start was made when 7 or 8 members erected the club's marquee in just an hour; the fact that last year two boy scouts managed the job in 20 minutes is neither here nor there! It was some time before the first of the visiting locomotives arrived, the owner having decided to brave the wet weather. The delay had caused some concern as the public had already arrived and was waiting for rides. Previous experience had taught members of the host society not to bring a locomotive because the large number of visitors had prevented them from having a run. However, more participants soon arrived with road vehicles as well as locomotives and, despite getting very wet, everyone seems to have enjoyed themselves. The forge arranged guided tours to coincide with the event and a collection of model stationary engines had been assembled inside to add to the interest.

World News

New Zealand

Many metal stockists in their area are only prepared to sell whole sheets and will not now cut sheet metal to size and so, if there is sufficient demand, **Auckland SME** is considering the purchase of sheets for resale in smaller pieces to members. Metal supplies are often a problem for model engineers as many stockists will no longer cut to length, except in the case of very large bars. UK based model engineers are very fortunate to have access to so many model engineering suppliers that sell lengths especially with the modeller in mind; such suppliers do not exist in many overseas countries. For some time, the club has been plagued with leaks in their water supply which, being metered, have proved a costly drain on their resources. These are gradually being traced and repaired, mainly by a group of retired members known as the Tuesday Club. It seems probable, however, that there is a significant leak under the concrete of the station which will not be easy to sort out.

Christchurch Live Steamers officially started life in May 2000 with what they describe as a casually constructed, lightly laid, 7¼in. gauge track and an old container donated to them for use as an engine shed. It is an independent group which operates under the aegis of the **Canterbury Steam Preservation Society** which has a 30 acre site on reclaimed land known as McLean's Island. Since its inauguration, the members have laid some 560 metres of heavier track, installed water and electricity supplies, built two sheds and have made a turntable. The museum has a 3ft. 6in. gauge Bush railway with a unique 5-way stub point; there is a selection of rolling stock and locomotive power. Among other things, the Steam Exhibition Hall houses a fine example of a Robey mill engine which has been completely restored and ran continuously for all three days of an Open Weekend. Various special events are held, special arrangements can be made for group visits and anyone requiring further information should contact Colin Barry, e-mail: **colin.barry@clear.net.nz**

Canada

With the running season reaching its conclusion with a Halloween night run, as regards passengers carried **British Columbia SME** has had its busiest season ever. During the season the club locomotive, a model of a Hudson cried *"Enough!"* and opted out of the proceedings. It was stripped right down to the frames and completely overhauled in a month by three members who must have burned a great deal of midnight oil in doing so. The question of safe operation has been dealt with at length in the club newsletter (*The Whistle)* in which it is stressed that all drivers should carry a two-way radio so they can maintain contact with the main area. In the event of a problem with the locomotive, a red flag should be placed on the track at a suitable stopping distance behind the train. The club keeps a supply of flags and track clips for the purpose. As for the stopping distance, this is suggested as twice the distance that van be viewed ahead, with due allowances made for heavier trains. There is much more, most of which is pertinent to the society track which is far larger than any to be found in the UK. ▶

In Memoriam

It is with the deepest regret that we record the passing of the following members of model engineering societies. The sympathy of the staff at *Model Engineer* is extended to the family and friends they leave behind.

Ernie Hargreaves	*Kings Lynn DSME*
Franz Kottek	*Society of Ornamental Turners*
Maurice Leeding	*Sutton MEC*
Jim Mercer	*Warrington DMES*
John Petrie	*Northern Mill Engine Society*
William Spencer	*Society of Ornamental Turners*

Members of **Bluewater MES** were able to visit to the **Exbury Gardens Steam Railway** earlier this year; word is that it made a very enjoyable day out. A new 12½in. gauge line, it runs through the gardens for a some 1¼ miles. Motive power presently consists of one steam locomotive and three carriages. With the addition of another steam locomotive and three more carriages, this will be doubled next year. A diesel powered locomotive is planned as back-up. The Bluewater club meets regularly at the Northern Collegiate Machine Shop, Indian Road, Sarnia and would be pleased to welcome prospective new members.

CLUB DIARY

A minimum of 6 weeks notice is required for diary entries. Clubs and Societies are asked to include a telephone number for the assistance of would-be visitors.

NOVEMBER

30 **Frimley & Ascot LC.** *Annual Dinner.* Contact Bob Dowman: 01252-835042.
30 **Hereford SME.** *Bits & Pieces.* Contact John Arrowsmith: 01432-265151.
30 **Historical MRS (Essex Area).** *Graham Stacey: London Steam Before 1930.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
30 **Malden DSME.** *Rummage Sale.* Contact J. Mottram: 01483-473786.

DECEMBER

1 **Cardiff MES.** *Childrens' Christmas Party.* Contact Trevor Jenkins: 029-20755568.
1 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-760762.
1 **Portsmouth MES.** *Alan Noble: Loctite Products for the Model Engineer.* Contact Bob Aldred: 023-92-523366.
1 **SM&EE.** *Competition & Work In Progress.* Contact David Boote: 01202-745862.
1 **York City & DSME.** *Martin Blackburn: An NCB Locomotive (12":1ft).* Contact Ken Bateman: 01904-421445.
1/2 **Leighton Buzzard NG Rly.** *Santa Specials.* Enquiries: 01525-373888.
2 **Birmingham SME.** *Pat Crisp: Flower Arranging.* Contact John Walker: 01789-266065.
2 **Cardiff MES.** *Santa Special Day.* Contact Trevor Jenkins: 029-20755568.
2 **Ottawa Valley Live Steamers.** *Meeting.* Contact John Bryant: 761-1109.
2 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
3 **Historical MRS (London Area).** *Members' Evening – Bring Something of Interest.* Contact John Millbank 0208-948-0556.
3 **Leicester SME.** *David Webb: Life and Locomotives of Sir William Stanier FRS.* Contact Raymond Wallis: 0116-285-8824.
3 **Manx Steam & MEC.** *Meeting.* Contact Mike Casey: 01624-861613.
4 **Auckland SME.** *Trev McConchie: Making Reproduction Toolmaker's Toolboxes.* Contact Steve Berkley: 416-6619.
4 **Oxford (City of) SME.** *Bits & Pieces.* Contact Graham Toplis: 01235-771180.
4 **Romney Marsh MES.** *Roy Clench: A Slide Miscellany.* Contact John Wimble: 01797-362295.
4 **Stamford MES.** *Doug Hewson: Lost Wax Casting.* Contact David Ash: 01780-751211.
5 **Birmingham SME.** *President's Evening.* Contact John Walker: 01789-266065.
5 **Chingford DMEC.** *Bits & Pieces.* Contact Martin Masterson: 0208-989-3051.
5 **Tyneside SMEE.** *Video Night.* Contact Malcolm Halliday: 0191-262-4141.
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TO HELP YOU GET THE BEST FROM THE MODEL ENGINEER EXHIBITION

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

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

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

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

Club exhibits

Where a club is exhibiting, each model should be entered on a separate entry form and clearly identified as a club exhibit by entering Loan/Club in the class section box. This ensures that we have a full record of all models on display during the show and facilitates matters of administration and insurance.

Additional forms

If you do not wish to deface your copy of the magazine we are happy to receive photocopies of the entry form, one for each model. We will be pleased to send out extra forms if required, so if you know of a modeller who is not a reader of one of our magazines but who you think may wish to participate, please advise them to contact our Exhibitions Office (01322-660070), or simply photocopy the entry form for them.

The success of the show depends largely on the number of models on display. Your work could well be the stimulus which inspires someone else to start in the hobby. There can be no doubt that this event is our showcase on the world of modelling in all its aspects. Every modelling discipline needs more and more participants, and it is by displaying not only the crème-de-la-crème, but also examples of work of a more achievable standard, that people are encouraged to join into the wonderful world of modelling, in whatever aspect.

We look forward to seeing a sample of your work at the show!

Engineering Section

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

Railway Section

B1 Working steam locomotives 1" scale and over.
B2 Working steam locomotives under 1" scale.
B3 Locomotives of any scale, experimental, freelance or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
B4 Scratchbuilt model locomotives of any scale, not covered by classes B1, B2, B3, including working models of non-steam, electrically or clockwork powered steam prototypes.
B5 Scratchbuilt model locomotives gauge 1 (10mm scale) and under.
B6 Kitbuilt model locomotives gauge 1 (10mm scale) and under.
B7 Scratchbuilt rolling stock, gauge 1 (10mm scale) and under.
B8 Kitbuilt rolling stock, gauge 1 (10mm scale) and under.
B9 Passenger or goods rolling stock, above 1" scale.
B10 Passenger or goods rolling stock, under 1" scale.
B11 Railway buildings and lineside accessories to any recognised model railway scale.
B12 Tramway vehicles.

Note:

Kitbuilt: any model containing a preponderance of commercially produced parts.
Scratchbuilt: wholly made by the entrant except wheels, gears, motor, engraved plates and small turning, etc. not exceeding 5% of the whole.
Rolling Stock: Where a rake is entered, competitors are asked to nominate one vehicle for judging purposes.

Marine Section

C1 Working scale models of powered vessels (from any period). Scale 1:1 to 1:48.
C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384. Excl. miniatures as classified in C8.
C3 Non-working scale models of powered vessels (from any period). Scale 1:1 to 1:48
C4 Non-working scale models of powered vessels (from any period). Scale 1:49 to 1:384 excl. miniatures as classified in C8.
C5 Sailing ships and oared vessels of any period – working.
C6 Sailing ships and oared vessels of any period – non-working.
C7 Non-scale powered functional models including hydroplanes.
C8 Miniatures. Length of hull not to exceed, 15in for 1/32 in. to 1ft scale or larger, 12in for 1/25 in. scale, 10in. for 1/16 scale; 9in. for 1/8 scale. No limit for smaller scales.
C9 For any model boat built from a commercial kit. Before acceptance in this competition the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.
C10 Functional Model Yachts

Supporting documentary evidence of accuracy may be submitted by entrants in large and clearly identified envelopes.

Model Horse Drawn Vehicle Section

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

Junior Section

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

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

Model Vehicle Section

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

Duke of Edinburgh Challenge Trophy

Rules and Particulars

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

The trophy remains at all times the property of Nexus Special Interests.

The name of the winner and the date of the year in which the award is made will be engraved on the trophy, which may remain, at the discretion of Nexus Special Interests Ltd, in his/her possession until required for renovation and display at the following Model Engineer Exhibition.

Any piece of model engineering work will be eligible for this Championship Award after it has been awarded, at The Model Engineer Exhibition, a Gold or Silver medal by Nexus Special Interests Ltd.

No model may be entered more than once.

Entry shall be free. Competitors must state on the entry form:

That exhibits are their own bona-fide work.

Any parts or kits which were purchased or were not the outcome of their own work.

That the model has not been structurally altered since winning the qualifying award.

7. Nexus Special Interests Ltd. may at their sole discretion vary the conditions of entry without notice.

Loan Section

The Loan Section is for anyone wishing to display models on a non-competitive basis. Unfinished models will be eligible providing a good standard of engineering workmanship is displayed. FREE entry by normal competition application.

Self Delivery

If you intend to bring your model to the show personally please take note of and comply with the delivery times and instructions contained in the Competitors' Information pack.

UNDER NO CIRCUMSTANCES CONSIGN YOUR EXHIBIT DIRECT TO SANDOWN PARK EXHIBITION CENTRE. The staff there have no facilities to deal with them, and no insurance cover for such items.

The Early Bird

If you intend to visit the show on your own, with friends or as a member of a party, substantial savings on tickets may be had and queuing avoided by ordering your tickets in advance. A special Hotline is in place: Tel: +44 (0)1858 438897, Fax: +44 (0)1858 461739. The Hotline is open Monday-Friday 8am-9.30pm; Saturday and Sunday 8am-4pm. Call and place your order after 2nd October.

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THE MODEL ENGINEER Exhibition & Competition

LOAN/COMPETITION ENTRY FORM

A separate form is required for each entry.
Please send to:
Nexus Special Interests, Events Dept.
Nexus House, Azalea Drive,
Swanley, Kent BR8 8HU
Tel: 01322 660070 Fax: 01322 616319

ENTRY NO.

Office Use Only

CLASS | ENTRY NO.

PERSONAL DETAILS (Please print clearly)

Surname _____ Forename(s) _____

Address _____

_____ Post Code: _____

Home Tel No: _____ Daytime Tel No: _____ Age: _____

Model Club or Association membership _____

Value of Model (Nexus takes no responsibility if the value is not entered) £ _____

N.S.I. plan used? (Y/N) _____ How many years have you been a modeller? _____

Name and address of your local newspaper _____

_____ Publicity? (Y/N) ☐

My model will reach the exhibition via:
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Do you subscribe to a Nexus magazine? (Y/N) ☐

MODEL DETAILS

Title of model: _____

Description _____

_____

Machinery used: _____

Type of construction: _____

Parts not made by you and commercial items: _____

_____

Name and address of your local newspaper _____

Scale: Length: Width: Height: Weight:

N.B. Please make copies including photographs of all information relating to your model as Nexus will not accept liability for any loss.

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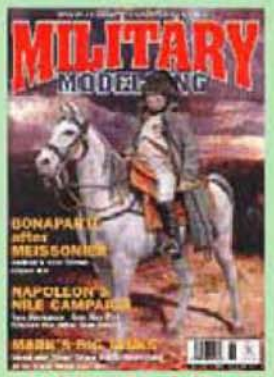

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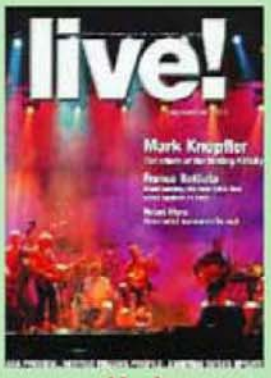

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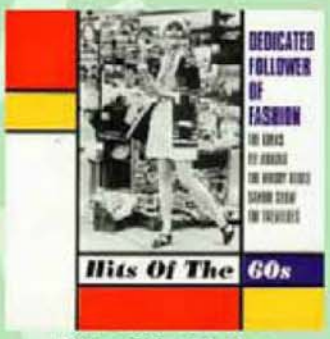

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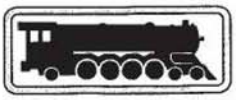

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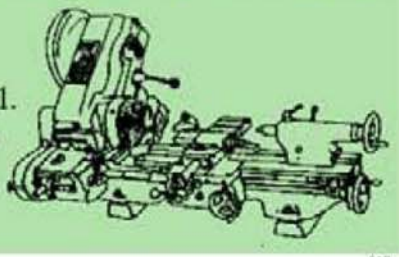

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- Tool Box & Tool Kit
- Tray & Splash guard

£850

Price Include VAT & Delivery UK

Model B-Super

- Swing over bed: 420mm
- Distance between centers: 500mm
- Mill drill spindle taper: 19mm
- Tailstock barrel travel: 80mm
- 7 speeds 60-1300
- Swing over cross slide: 160mm
- Spindle taper: MT3
- Draw bar: M12
- Cross slide travel: 180mm
- Motor: ¾hp
- Net weight: 155kg

STANDARD EQUIPMENT

- 4" 3-Jaw chuck
- 2 dead centres
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£725

Price Include VAT & Delivery UK

Comet Lathe

- Swing over bed: 250mm
- Swing over cross slide: 133mm
- Distance between centers: 550mm
- Spindle bore: 19mm
- Taper in spindle bore: MT3
- Motor: ¾hp
- 6 Speed: 125-2000
- Net weight: 130kg

Mill Attachment

- Spindle taper: M13mm
- Head travel: 215mm
- Speed variable
- Range: 0-3000b
- Motor: ½hp
- Net weight: 45kg

£1115

Price Include VAT & Delivery UK

Centurion

- Swing over bed: 420mm
- Distance between centers: 520mm
- Mill drill spindle taper:
- Tailstock barrel travel: 80mm
- 7 speeds 160-1360
- Swing over saddle: 160mm
- Spindle taper: MT3
- Draw bar: M12
- Cross slide travel: 200mm
- Motor: 2 x ¾hp
- Net weight: 230kg

STANDARD EQUIPMENT

- 4" 3-Jaw chuck
- 2 dead centers
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£1395

Price Include VAT & Delivery UK

Craftsman Precision Belt Drive

- Swing over bed: 300mm • Swing over gap: 450mm • Swing over saddle: 170mm
- Distance between centres: 570mm • Spindle bore: 36mm • Spindle nose taper: MT5
- Cross slide travel: 150mm • Compound travel: 89mm • Tailstock barrel taper: MT3
- Tailstock barrel travel: 92mm • Range of speeds: 50-1250rpm • Motor: 1 1/2 hp
- Netweight 398kg

STANDARD EQUIPMENT:

- 6" 3-jaw chuck with reversible top jaws
- 8" 4-jaw chuck with reversible top jaws
- Steady rest • Follow rest
- Stand • 12" face plate
- Splash guard • Threading dial
- 4-way tubular tool post
- 3MT dead center
- T-Slotted cross slide

£1725

Price Include VAT & Delivery UK

Cub 620/630/640

- Swing over bed: 300mm • Swing over gap: 430mm • Swing over saddle: 174mm
- Distance between centres: 500/750/1000mm • Bed width: 190mm • Spindle bore: 38mm
- Spindle bore: D4-5 • Spindle nose taper: MT5 • Cross slide travel: 160mm • Compound travel: 75mm
- Tailstock barrel taper: MT3 • Tailstock barrel travel: 70 • Range of speeds: 9 60-2000rpm
- Number of inch threads: 33 • Range of inch threads: 4-72 TPI • Motor: 1 1/2hp 240v or 2hp415v
- Approx shipping weight: 380kg

STANDARD EQUIPMENT:

- Headstock and gearbox gears in headstock
- Built-in stand • Foot brake • Worklight
- Induction hardened bedways • Face plate
- Jog button and emergency stop
- 4-way tubular tool post
- 6" 3-jaw chuck with 2 pairs top jaws
- 8" 4-jaw chuck
- Steady rest / follow rest • 2 dead centers
- Coolant system w/back splash • Threading dial
- Direct reading dial cross slide
- Removable chip tray

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