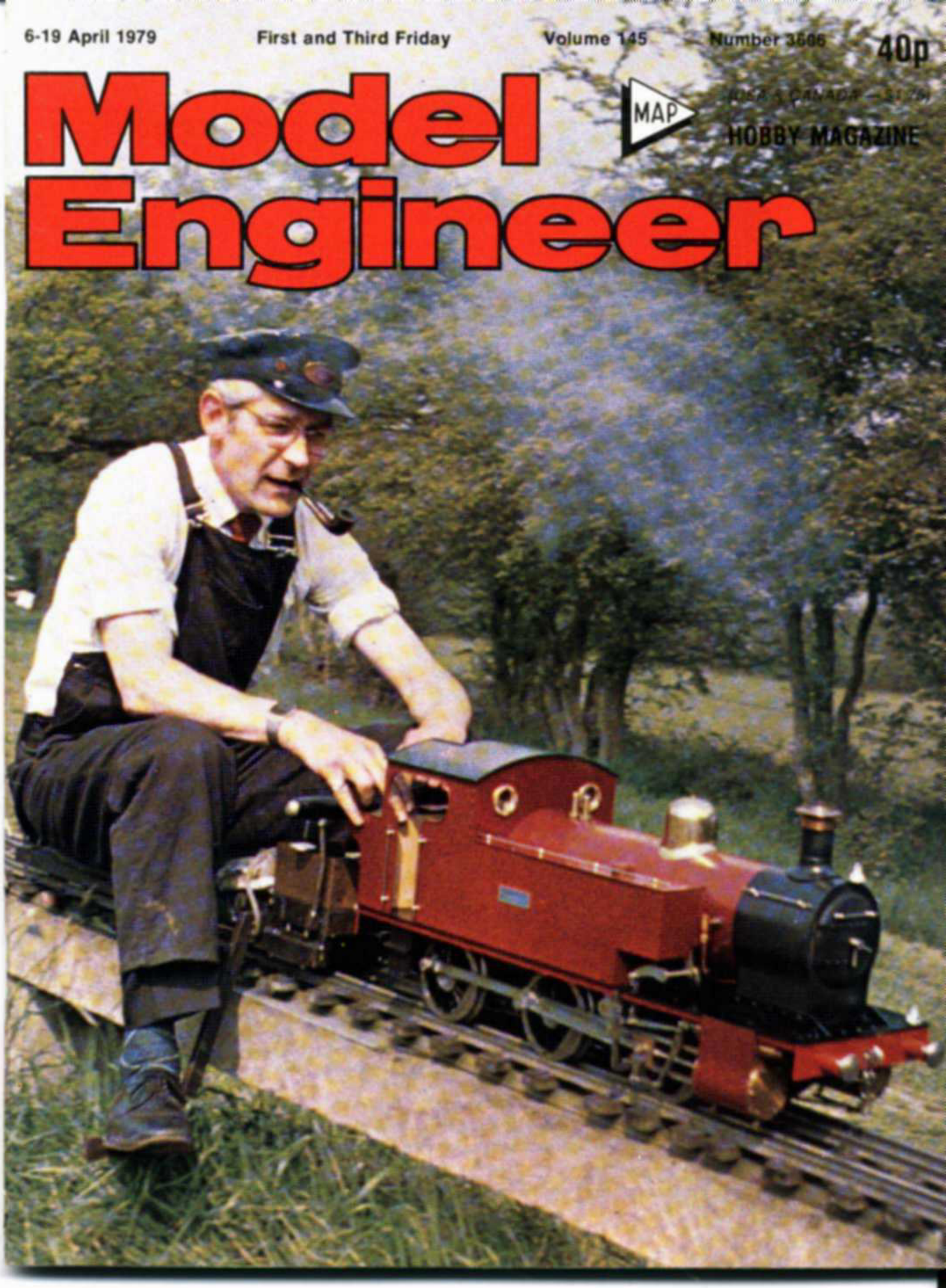
6-19 April 1979 First and Third Friday Volume 145 Number 3606 40p

Model Engineer

MAP HOBBY MAGAZINE



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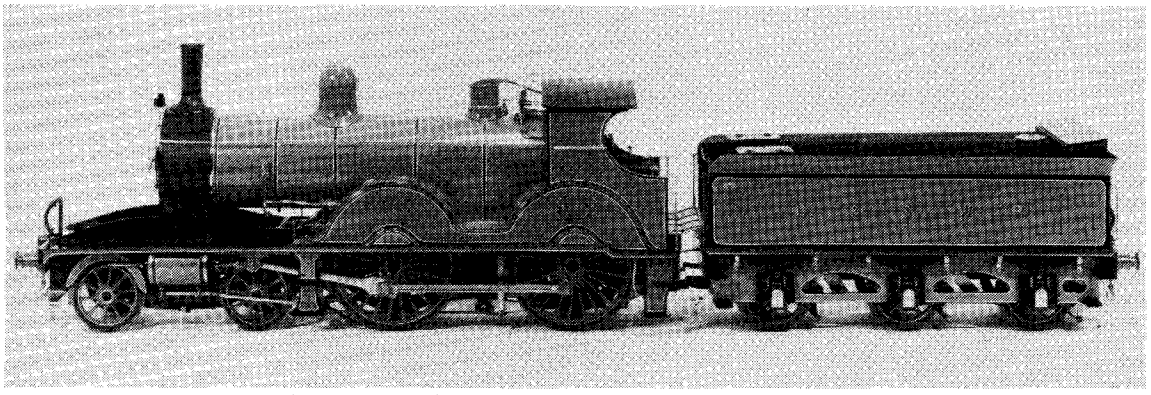
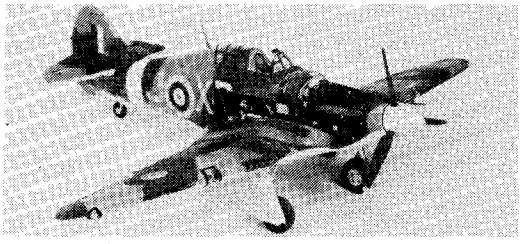
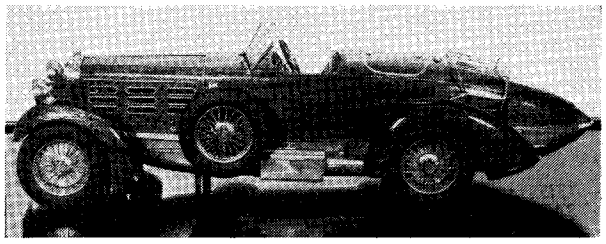


5 in. gauge model of the L.S.W.R. Adams 4-4-0 locomotive and tender No. 575, built by D. W. Horsfall, Halifax, 15 in. by 58½ in. (38 cm. by 148.5 cm.)



A 1/16 scale model of the Hawker Hurricane Mark IIA Series I, built by Studio Aguila, New Zealand, wingspan 29½ in. (75 cm.).



Exhibition standard 1/10 scale model of the 1924 8-litre Hispano Suiza 'Tulip Wood', built by Rex Hays, 6 in. by 22 in. (15 cm. by 56 cm.).

Illustrated catalogue (£2.80) available from our London Office or from The Engineerium.

On view Saturday, April 28 and Sunday, April 29 from 10 a.m. to 5 p.m. and on the day of the sale from 10 a.m. to 12 noon.

Further information available from The Engineerium.

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Volume 145 Number 3606
6 April 1979

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COVER PHOTO

Colin Kay drives his 0-6-0T Achilles *on the Birmingham SMEE track.*
Photo by David Piddington.

NEXT ISSUE

Modifying a slotting attachment.

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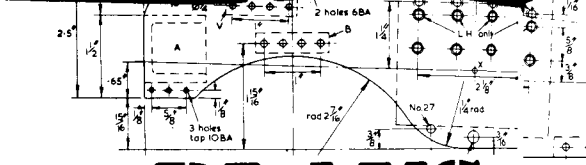

Model Engineer PLANS S

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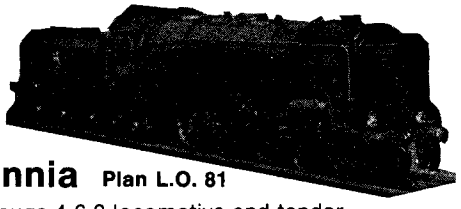
LOCOS



Britannia Plan L.O. 81

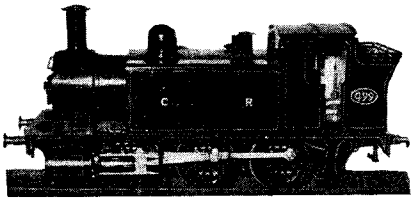
3½ in. gauge 4-6-2 locomotive and tender

Sheet 1 — General arrangement, **80p. 2** — Mainframe details, stays, buffer beams, hornblocks, coupled wheels, axles, axleboxes, coupling rods, pump and lubricator eccentrics and crankpins, bogie frames, wheels, axleboxes, equalising beams, springs, bogie slide assembly and details, **£1.10. 3** — Pony track frame, pony axleboxes, wheels and axles, roller brackets, king-pins, screw couplings, buffers, erection of pony truck and pump, position of cylinders, details of cylinders, piston valves, etc., mechanical lubricator and details, **£1.10. 4** — Guide bars, crossheads, connecting rods, guide bar brackets, valve crossheads, elevation and plan of valve gear, combination levers and union links, L.H. and R.H. motion brackets, expansion links and die blocks, radius rods, position of motion brackets, **£1.10. 5** — Reversing screw and nut, L.H. lifting and reversing arms, R.H. lifting arm, return cranks, lifting links, eccentric rods, steam brake arrangement and details, boiler and firebox, **£1.10. 6** — Firebox (further details) and smokebox, footplate fittings, **£1.10. 7** — Injector, grate and ashpan, pipe connections, whistle valve, blower valve, alternative slide valve regulator, steam gauge, **£1.10. 8** — Firehole door and details, safety valves, blowdown valve and clack-box, cab and superstructure details, **£1.10. 9** — Cab brackets, footplate, injector water valve, reversing gear shaft and universal joints and reversing gear, **£1.10. 10** — Pipe connections, cylinder drains, hand pump clacks, tender and details, tender details, arrangement of driver's brake valve, **£1.10. 11** — Tender details, hand pump, wheels and axles, brake gear, pull rods, buffers, steps, grabrail, **£1.10. Complete set L.O. 81, £8.25.** Castings available.

Rob Roy

Plan L.O. 27

3½ in. gauge 0-6-0 Caledonian Railway tank engine



This model is coal-fired, and has outside cylinders. Designed especially for the beginner.

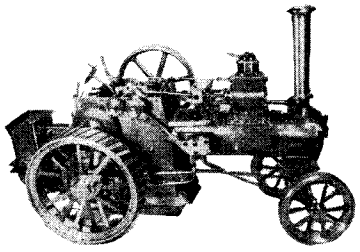
Sheet 1 — General arrangement, frames, buffer beams, main horns, axleboxes, hornstays, **80p. 2** — Driving and coupled wheels, axles, crankpins, coupling rods, connecting rods, cylinders, motion plates, crossheads, **80p. 3** — Plan of valve gear, valve gear details, **80p. 4** — Reversing gear, arrangement of crosshead pump, crosshead pump details, general arrangement of mechanical lubricator, **80p. 5** — Boiler, smokebox, steam and exhaust arrangement, spectacle plate and cab layout, **80p. 6** — Superheater, regulator, grate and ashpan, footplates and tanks, safety valve, buffers, turret and whistle valve, **80p. Complete set L.O. 27, £3.25.** Castings available.

Evening Star Plan L.O. 99

3½ in. gauge British Railways 2-10-0 locomotive

Sheet 1 — General arrangement, main frames, driving and coupled wheels, frame stretchers, horns, main axleboxes, **£1.10. 2** — Details of pony truck, coupling rods, boiler feed pump and eccentric, **£1.10. 3** — Full details of the boiler, **£1.10. 4** — Piston valve cylinders and details, alternative slide valve cylinders, crossheads, slide bars, connecting rods, guide-bar brackets, **£1.10. 5** — Buffer beam, drag beam, side elevation and plan of valve gear, left- and right-hand expansion link brackets, radius rods, eccentric rods, valve crossheads, union links, combination levers, expansion links, lifting and reversing arms, **£1.10. 6** — Valve gear for slide valve engine, double blastpipes, smokebox, steam brake and details, mechanical lubricator, alternative single blastpipe, **£1.10. 7** — End elevation of loco, cab, running boards, smokebox grate and ashpan saddle, superheat, snifting valve, **£1.10. 8** — Tender, firedoor, blower valve, boiler clack valve, **£1.10. 9** — Tender frames, injector and brakes, **£1.10.** Castings available. **Complete set £8.25.**

TRACTION ENGINES



Minnie

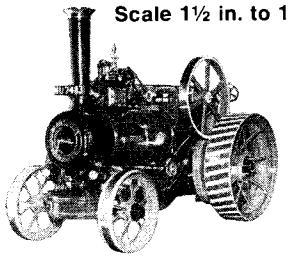
Plan T.E. 1

1 in. scale Traction Engine

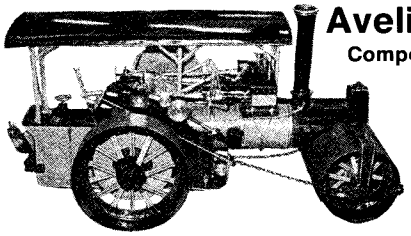
Sheet 1 — General arrangement, boiler and details, **£1.35. 2** — Hornplates, gears, crankshaft, rear axle, bearings, **£1.35. 3** — Smokebox door, water gauge, winding and brake drums etc., rear wheel parts and assembly details, **£1.35. 4** — Smokebox and details, perch bracket and details, front and rear axles, front wheel details, **£1.35. 5** — Details of the tender, and the cylinder, **£1.35. 6** — Details of cylinder, motion plate, crosshead, expansion link, exhaust pipe, blower valve and safety valve, **£1.35. 7** — Valve gear and details, reversing gear, motion plate saddle, steering gear, flywheel, **£1.35. 8** — Grate and ashpan, feed pump, bypass valve, regulator, blowdown valve and details of brakes, **£1.35. 9** — Details of the mechanical lubricator and the oil check valve, **£1.35. Complete set T.E. 1, £8.25.** Castings available.

Allchin Plan T.E. 11

Scale 1½ in. to 1 ft



Sheet 1 — Arrangement and details of tender, **60p. 2** — Details of hornplates, c/shaft bearings and brackets, axleboxes and dummy springs, etc., **60p. 3** — Arrangement and details of gearing and shafts, **60p. 4** — Compensating gear and hind wheels, **60p. 5** — Arrangement and details of forecarriage, **60p. 6** — Engine details, valve gear, cylinder valve chest, flywheel, **60p. 7** — Trunk guide, cylinder covers, piston rod, crankshaft, crosshead, **60p. 8** — Further engine details: reversing mechanism, valve gear, safety valve, **60p. 9** — Arrangement and details of boiler, **60p. 10** — Arrangement and details of smokebox, chimney, exhaust, blower and stop valves, **60p. 11** — Arrangement and details of boiler fittings and water pump, **60p. 12** — Arrangement and details of steerage, ashpan, fire-grate, water lifter and mechanical lubricator, **60p. 13** — Lubrication details, footboard, tool box, gear casings and drain cocks, **60p. 14** — Arrangement, details of governor, brake and drain cocks, **60p. 15** — Further details, **60p. 16** — General arrangement, with details of front wheels and of painting and lining, **60p. 17** — Injector and modified mechanical lubricator, **60p. Complete set T.E. 11, £7.25.** Castings available.



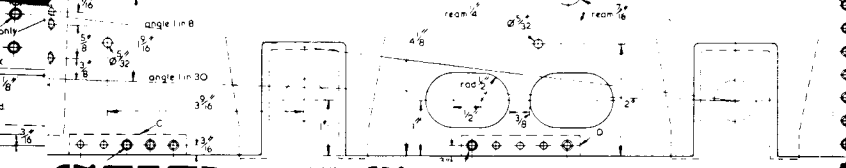
Aveling & Porter

Compound Steam Roller

Plan T.E. 14

2 in. scale

Sheet 1 — Details of boiler, steering saddle and chimney, steering fork, roll axle and shoe blocks, **£1.10. 2** — Hornplates, smokebox door, crankshaft bearings, rear axle bearings, cylinder layout, crosshead guides, **£1.10. 3** — Details of cylinders, pistons, covers, valves, crossheads, crankshaft, flywheel, connecting rods, eccentrics and eccentric straps, **£1.10. 4** — Section on rear axle, layout of valve gear, details of feed pump and striker gear, **£1.10. 5** — General arrangement of steam roller, firedoor and firebars, **£1.10. 6** — Front and rear rolls, arrangement of road gears, regulator and safety valves, **£1.10. 7** — Steering gear, driving gears, rear axle, details of tender, **£1.10. 8** — Details of tender, water tank, exhaust arrangements, regulator control and reverser, **£1.10. 9** — Details of awning, piping arrangement, layout of steam fittings, cylinder drain cock gear, **£1.10. 10** — Details of brakes, driving pins, lagging and cleading, ashpan details, details of painting and nameplates, **£1.10. 11** — Mechanical lubricator, plan of valve gear and front plate, **£1.10. Complete set T.E. 14, £10.00.** Castings available.



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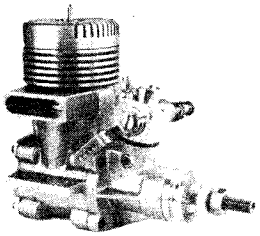

Jones .605

Plan P.E. 31

A 10 cc. single cylinder glow plug engine with Schnuerle porting for radio-controlled model aircraft. **£1.85**
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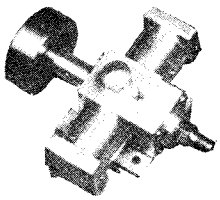
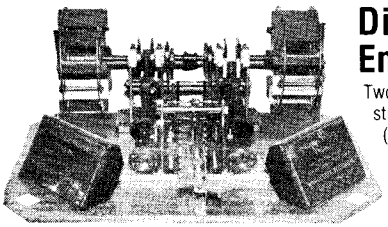
Cygnet Horizontal twin Single-acting steam engine

Plan M 13

½ in. bore x ⅜ in. stroke. *By Edgar T. Westbury.* (Vols. 109-110). Easy to build and capable of driving a light 3 ft. boat, **60p.**





Diagonal Paddle Engine **Plan M 9**

Two cylinders. ¾ in. bore x 1½ in. stroke. *By Edgar T. Westbury.* (Vols. 113-114). Two sheets giving arrangement and details, and accessories, **£1.35**
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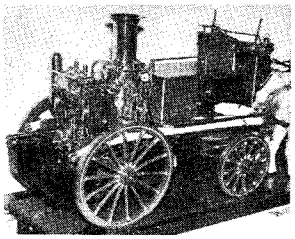
Shand-Mason Fire Engine

circa 1894

2 in. scale



Plan M 28

Sheet 1 — General arrangement, chassis, springs, forecarriage frame, **£1.35. 2** — Superstructure, chassis fittings, brake gear, **£1.35. 3** — Cylinder block, general arrangement and details of steam pump, **£1.35. 4** — Further steam pump details, bunker, feed tank and grate, **£1.35. 5** — General arrangement and details of boiler, grate, boiler fittings, road wheels, **£1.35. 6** — Water pump block, cylinder covers, steam chest and cover. **£1.35. Complete set £6.**

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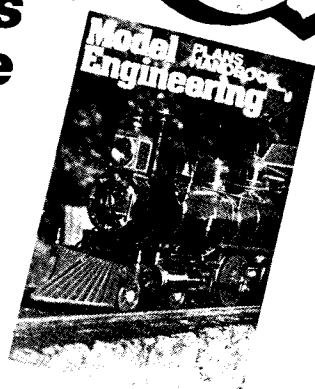

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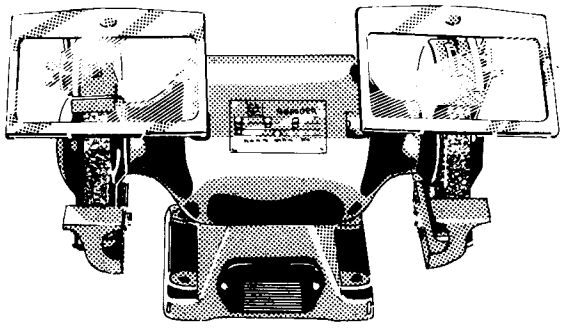

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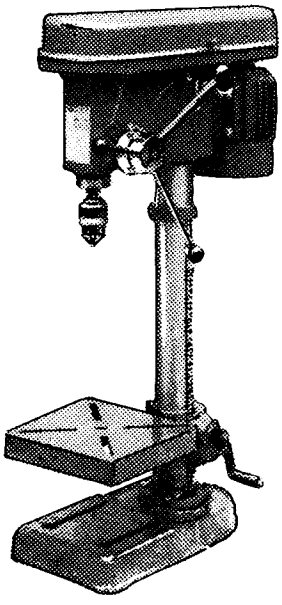

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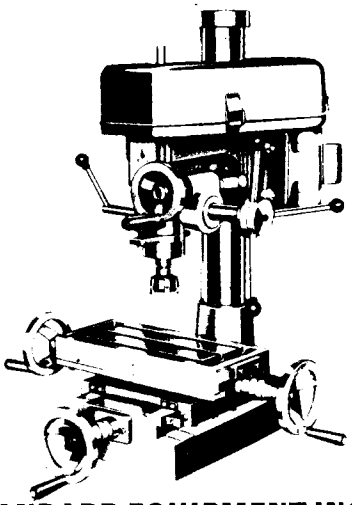

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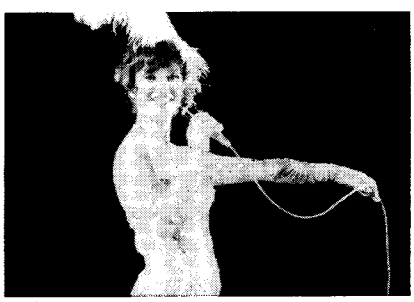

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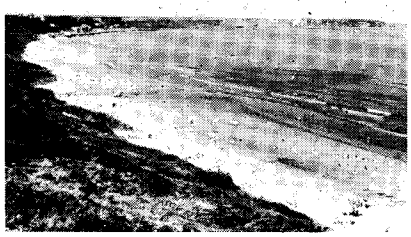

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Designed by Mr. O. B. Bolton. M.A.P. Drawings M.1

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Approximate dimensions: 9½" long x 7" wide x 8⅞" high. Cylinders. H.P. ⅞" bore, I.P. 1¼" bore, L.P. 1¾" bore × 1¼" stroke. Built in condenser with hotwell and feedpumps. Aluminium bedplate, the rest of the castings in L.G.2 Gunmetal.

Baseplate	1	L.P. Top cylinder cover	1	Condenser endcover, large	1
Plain side columns	4	H.P. Bottom cylinder cover	1	Condenser endcover, small	1
Condenser body with columns	1	I.P. Bottom cylinder cover	1	Vacuum pump body	1
H.P. Cylinder block	1	L.P. Bottom cylinder cover	1	Vacuum pump base	1
I.P. and L.P. Cylinder block	1	H.P., I.P. and L.P. Valves	3	Vacuum pump disc valve seat	1
H.P. Valvechest	1	H.P., I.P. and L.P. Valve buckles	3	Feed and hotwell pump bodies	1
H.P. Valvechest cover	1	H.P. Piston halves	2	Feed and hotwell pump v/boxes	1
I.P. Valvechest	1	I.P. Piston halves	2	Main steam valve body	1
L.P. Valvechest	1	L.P. Piston halves	2	Cylinder glands stick	1
L.P. Valvechest cover	1	Main bearing brasses	1	Pump bracket	1
H.P. Top cylinder cover	1	Connecting rod brasses	1	Pump bracket guide	1
I.P. Top cylinder cover	1	Eccentric straps	6	Weighshaft bearings. Stick	1

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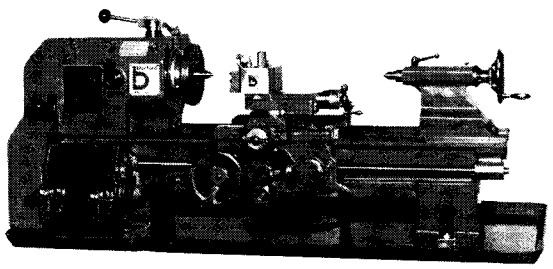

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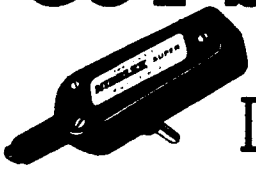

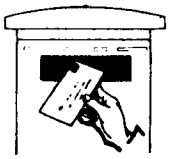

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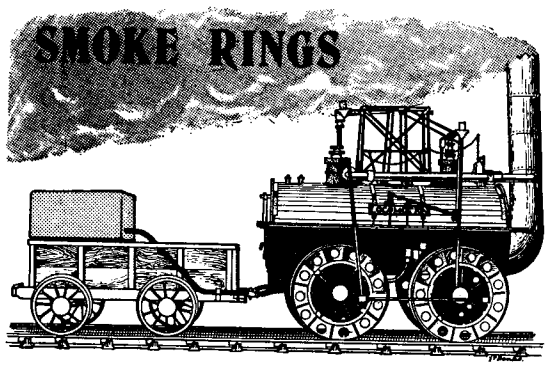


A Commentary by the Editor

Central Film Library

There have been more films added to the lists of the Central Film Library since the publication of the last amendment in November and an updated list was published in January. A few of the titles are associated with engineering and workshop safety. Most films are in 16 mm. and colour. A complete catalogue which will tell you about the additions and of course deletions is available for £1, post free from the Central Film Library, Government Building, Bromyard Avenue, Acton, London W3 7JB.

The Guild of Master Craftsmen

Readers may recall that The Guild of Master Craftsmen, in association with Winsor and Newton, ran a national craft award competition from which the winning entries went on display at the Victoria and Albert Museum. This year, during the Fine Art and Antiques Fair, to be held at Olympia in June, the Guild will stage an open workshop where members will put on a display of antique restoration. A new Directory of Members has just been published and can be obtained for £1 from 10 Dover Street, London W1X 3PH.

In reply to Alan Gettings

In the last issue, Alan Gettings, who we have met in these pages many times, made certain comments about the content of *Model Engineer*. I nearly said criticisms but I realise that for the most part our magazine has been to Alan's liking and I am very pleased to hear it. I hope the other 35,000 or so readers are in agreement. However, there were one or two points that may need a reply so let's start with the future issues. Alan is not the only reader who appreciated Colin Jones's 10 cc. glow engine, so many of you will be pleased to learn that Mr. Jones has doubled it up into a horizontally-opposed twin of some 22 cc. and will let us have details as soon as they are available. I have also had the promise of further i.c. engines from accepted experts including Peter Allen's "Fox" modifications.

Through popular request, having had a whetting of appetites last year, John Haining will do a constructional article on his Suffolk tractor when the current Countryman's Steam has finished. The response to the tether car racing article by Tony Higgins was little short of amazing so the interest is still there. Tony has already given me an article on how to build a centre pivot in case any club is thinking about laying a circuit and he is also working on an article for a 10 cc. racer to satisfy those readers looking for a relatively high performance model.

I agree that gauge 1 locos have not been featured often in *Model Engineer* — I have said so on several occasions — and I would emphasise here that in my opinion gauge 1 is just as much model engineering as 7¼ inch. I know that the Gauge 1 Model Railway Association is encouraging its members to submit details of their models so I am confident that the matter is in good hands. The maritime article as promised did not materialise and no one regrets that more than I. But I would also add that the Paddle Tug *Stella* is taking shape and drawings are in the process of production. Time being the enemy, I can only ask for the ship modellers' patience. Finally, the criticism about the making of tools and fittings leaves me a little bit blank for a reply. Now I do know that many readers enjoy this subject and I have the letters following Mr. Willett's article "A one-man show" to prove it. But I would still like to hear the views of more readers.

Roger Marsh

There has been something of a mishap up at Hinckley where Roger Marsh builds his narrow gauge locos to order. Apparently the winter has caused mayhem with the roof and rain has entered. So, if any of you have orders outstanding with Roger Marsh, would you please contact him straight away?

Unimat 3

Rex Tingey's article on the improved drive for the Unimat 3 may have caused a bit of head scratching due to the fact that some of the drawings included actually relate to another article on using and maintaining the Unimat 3 also by Mr. Tingey and which has not yet been published. The drawings concerned are "Large diameter running centre", and "Tailstock dieholder", both on page 44 of the issue. The "Extended toolpost" on page 45 also sneaked in uninvited. The drawings will, of course, be repeated when the correct article is published.

The Goss Formula

Mr. P. Andrews, whose letter on Swindon Draughting appeared in Post Bag on 19 January, has pointed out that the gremlins made a vicious attack during the setting stage and the formula made nonsense as printed. Here is what should have appeared:

$$d = .2D + .08h$$
$$b = 2d \text{ or } .5D$$
$$P = .32D$$
$$p = .22D$$

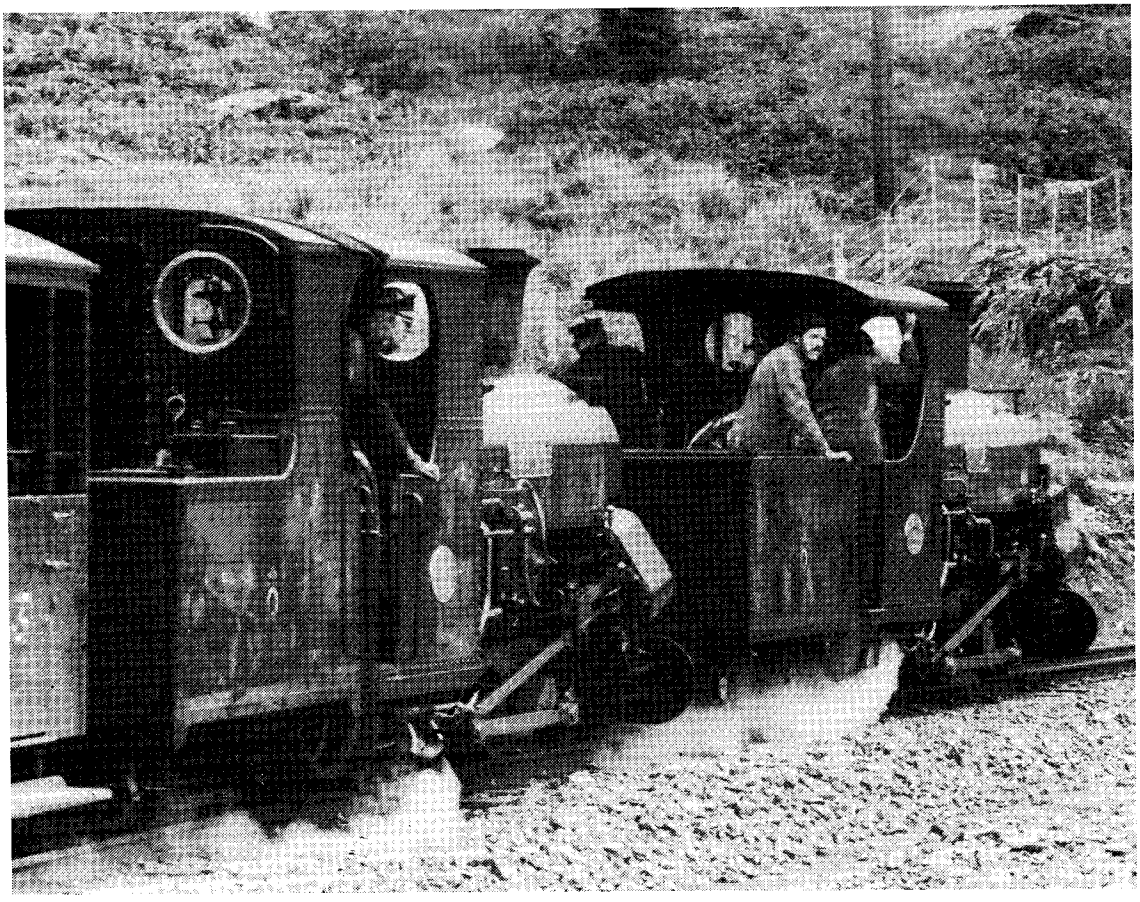
Mr. Andrews also points out that the bore of his 2½ in. gauge loco cylinders is 13/16 in. and not 3/16 in. Sorry about the confusion we may have caused.

Calling all artists

Take time off from the lathe to think about a poster for the promotion of a preserved railway, railway centre or museum and you could win a prize specially selected from the National Collection of Railway Exhibits which you may keep for a year. At the end of that year, your poster which has been on display throughout the summer season will be returned to you suitably framed and annotated. The event is sponsored by the Friends of the National Railway Museum, the Association of Railway Preservation Societies and the Association of Minor Railways. You should send six copies of your design in a tube to Oscar Whitaker, Poster Competition. Friends of the National Railway Museum, c/o The National Railway Museum, Leemans Road, York, to reach him by 30 April. If you can't rack your brain that fast, don't worry, it will be an annual event.

ARPS Award

The annual award of the Association of Railway Preservation Societies Limited has, for 1978, been presented to the Ffestiniog Railway Society Limited for its outstanding contribution to railway preservation. The particular event which won the award was the reopening of the line to Tanygrisiau by building a completely new route through the Welsh mountains using volunteer labour. The trophy, a coat of arms from the Royal train of the L.B.S.C.R., was presented on 27 January in York. The photo here shows *Linda* and *Blanche* of the Ffestiniog Railway.



JEYNES' CORNER

A Small Steam Tilt Hammer

SOME YEARS AGO one of my friends, the late Tom Wheatley, a well-known Gateshead model engineer, found a fairly large horizontal single-cylinder steam engine and a vertical multitubular boiler in rather a derelict condition, and purchased them with the idea of restoration; included in the deal were a number of bits and pieces which were evidently associated with the engine, and which had been spur gear driven by it; but more about these later.

The engine turned out to have a cylinder 2 in. bore with a stroke of 3¾ in. which had rather a peculiar drain system, just one cock in the centre of the stroke. The castings seemed quite well designed and made, and the engine had a feature which might well be included in any model steam engine I have looked at; the valve rod was guided by a slipper guide, and a tail, thus taking all the weight and side thrust off the glands.

The main bearings were inclined and seated in machined beds in the casting, the big end was of Thames, or marine type, and adjustable. The crankshaft was fitted with a spur gear which mated with a larger one fitted on one of the shafts that came with the engine. This shaft was also fitted with a round-rimmed flywheel close to the gear wheel, and at the other end was a four-nosed cam; two bearings, and one foundation block, and two collars completed this item.

Now regarding all the pieces of the machine, there was also a larger foundation block, and when all cleaned up, these proved to be parts of a mechanical hammer.

Tom sent me a set of photographs of the complete lot, and separate views of the various parts associated with the engine. He arranged the shaft with the spur wheel and flywheel in alignment with the engine, which was patently correct, but was rather puzzled as to how the rest of the parts were arranged, imagining that the hammer part would be driven from behind, as one of his photographs shows.

This conception was wrong, however, as I at once recognised it as a tilt hammer, and knew that the square holes in the brackets were for a wooden spring, either lance-wood, hickory or ash. Also the centre line of the hammer should be at right-angles to the engine, and the small foundation block fitted to the bearing next the cam should be at the other end of the shaft next the spur gear. The bearing would now be relieved of its foundation block and should be fitted on the block on which the hammer part was fixed, so that the cam could lift the hammer close to its head; the wooden spring providing the force of the blow struck by the hammer.

Sure enough the holes for the holding down bolts for the bearing were found filled up solid with all sorts.

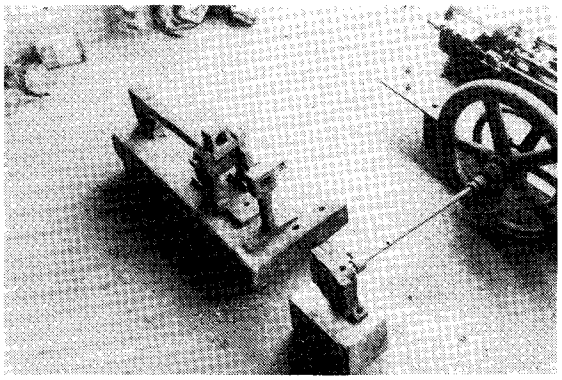
Now, some progress was possible, and Tom rapidly built it up into a working unit, and having previously completed the restoration of the engine and boiler, he had it working at the Chester-le-Street Rally in 1971. I mentioned this tilt hammer in my article in *Model Engineer* for 1 October 1971, which was accompanied by a photograph of the hammer, taken while it was working.

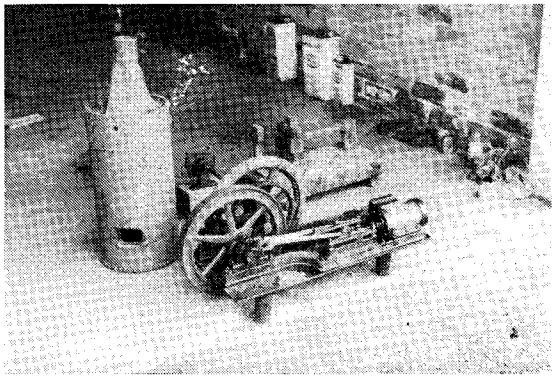
The boiler was of the multitubular type and had a most peculiarly-shaped smoke-box. It was of massive construction, the vertical seam had four rows of rivets and had rather a smallish fire-hole, but everything was thoroughly riveted.

Reverting to the hammer part again, the base-plate had two slots in it, into which the two tongues of the fulcrum bracket fitted, and worked up and down as the stress was put on the wooden spring and released; the blows had quite a nice *quick fire* sort of sound when working, just hitting the anvil.

We never managed to uncover its history, and it is quite possible that it was really a working unit in a small manufactory, and not a mere model of a larger one.

Left: An experimental lay-out of the parts.
Below: The hammer as purchased.
Photos by the late Tom Wheatley.



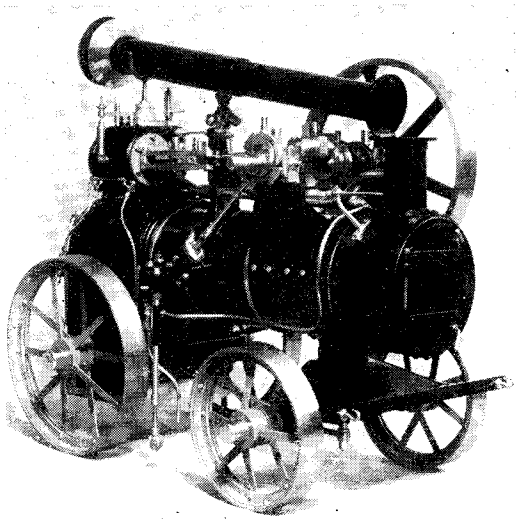


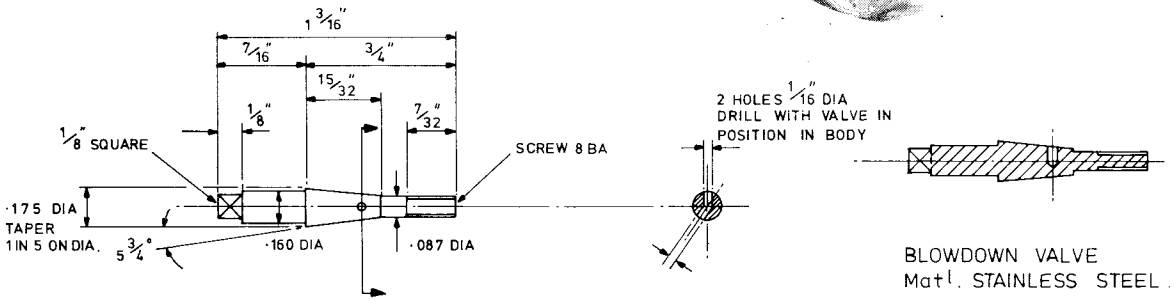
THE MARSHALL PORTABLE STEAM ENGINE

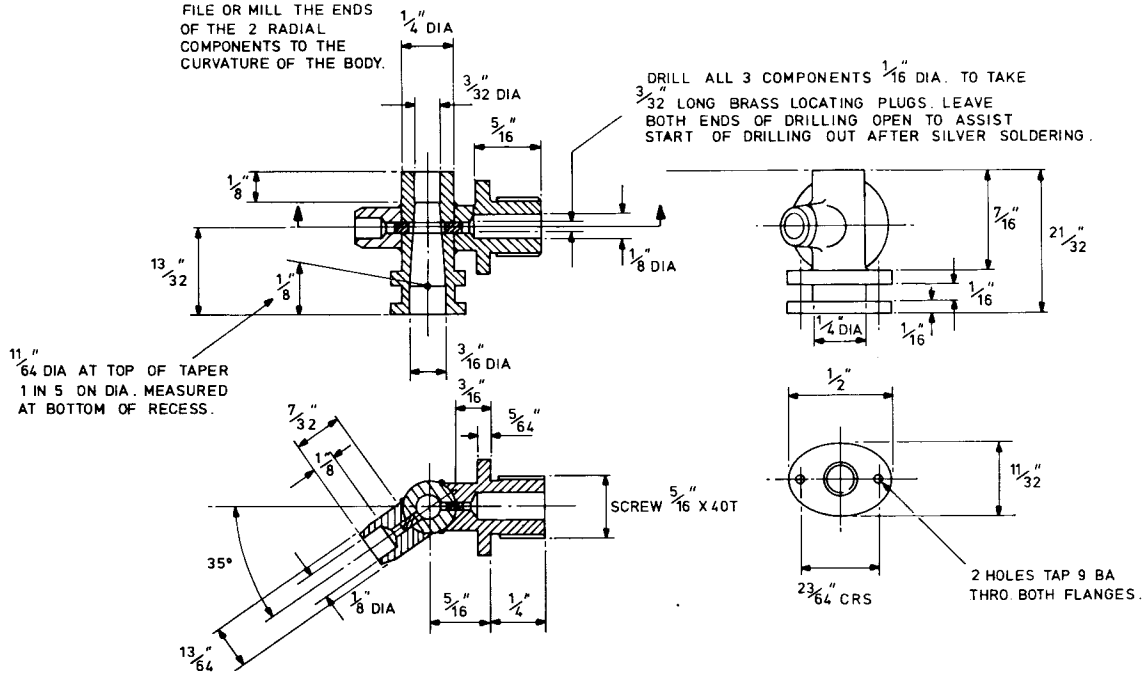
Part XXII *From page 277*

by R. L. Kibbey

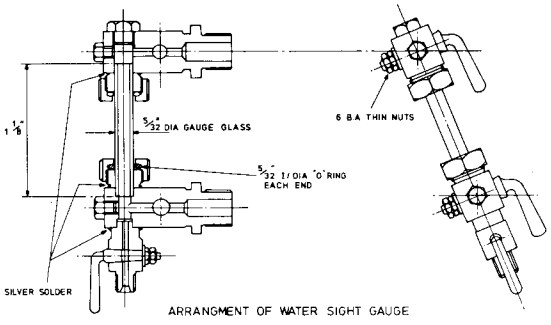
The blow down valve and water sight gauge



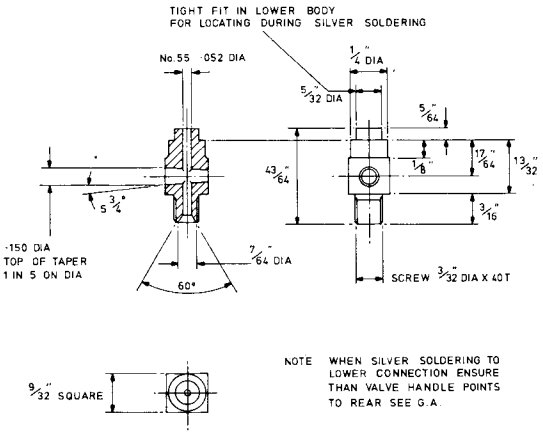




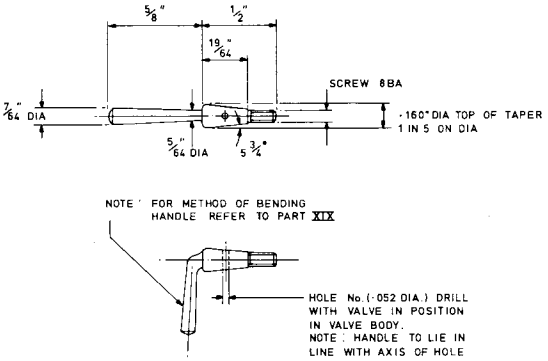
FABRICATION OF BLOW DOWN VALVE BODY.
Mat'l. - GM OR BRONZE BAR.



ARRANGMENT OF WATER SIGHT GAUGE



VALVE BODY - SIGHT GAUGE BLOW DOWN
Mat^{l} - PHOS BRONZE BAR

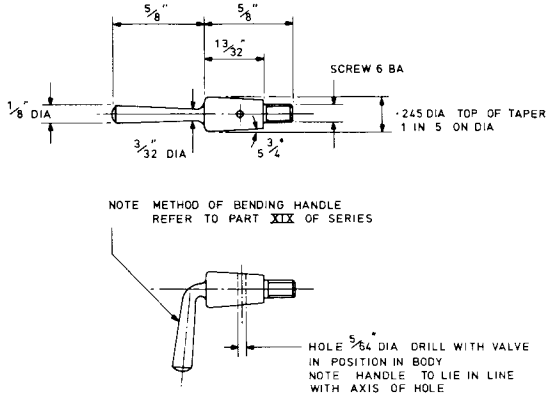


PLUG VALVE - SIGHT GAUGE BLOW DOWN
AND TEST COCKS - 3 OFF

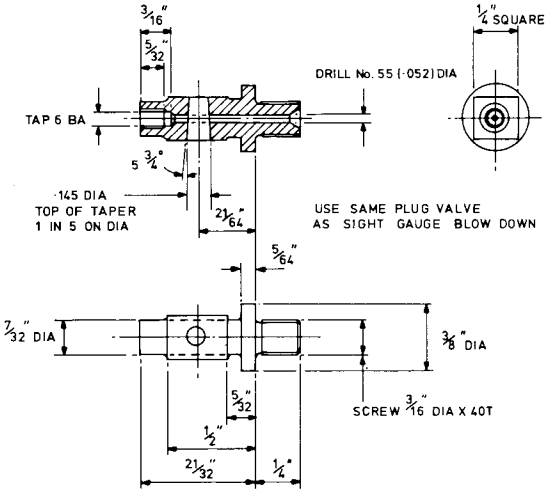
A SINGLE BLOW DOWN valve is fitted in a bush tapped 5/16 in. x 40 t.p.i. at the bottom centre of the backhead just above the foundation ring. It is of the plug valve variety, the valve has a square filed or milled on the end and provides an opportunity to make a special ring spanner for this which can go in the tool kit.

In discussion with the material suppliers, it was decided that, in view of its size, a casting for the valve body was not appropriate, and therefore, I have designed this to be made by fabrication exactly as I made mine. The 1/4 in. dia. groove through the flange is, of course, to simulate a packing gland housing and, when the flange is fitted with studs and nuts, looks exactly like the real thing.

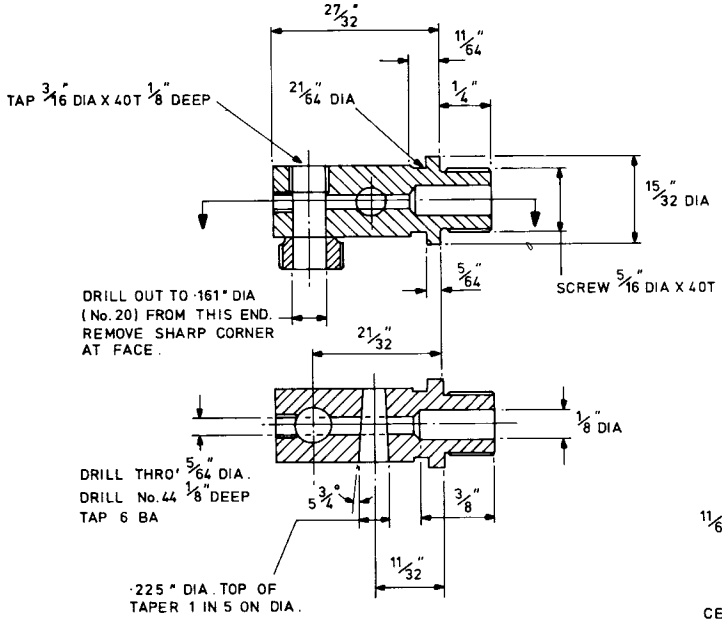
On a simulated casting as small as this, the fillets of silver solder require to be kept to a minimum.



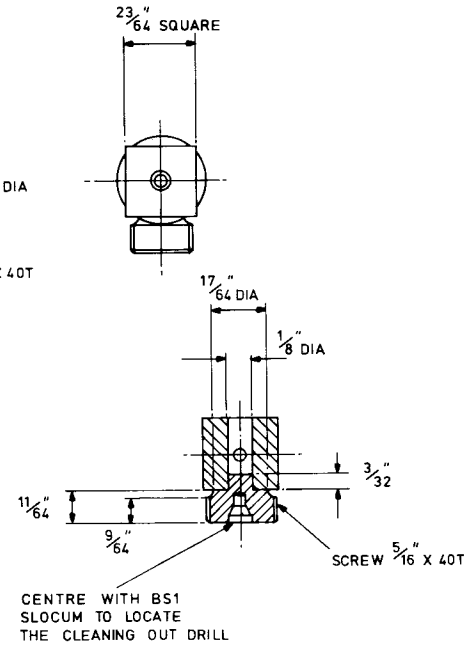
PLUG VALVE - WATER SIGHT GAUGE
Mat^{l} - STAINLESS STEEL - 2 OFF



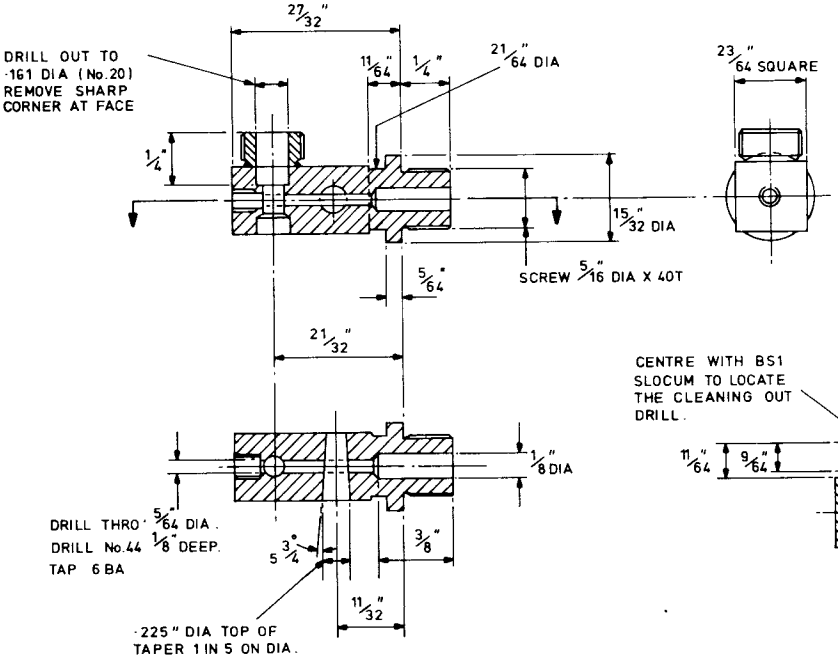
BODY - TEST COCK
Mat^{l}. - BRONZE BAR
No. OFF - 2



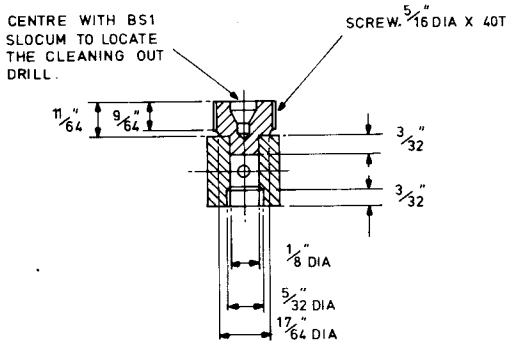
BODY - SIGHT GAUGE - UPPER
Mat'l.- PHOS. BRONZE DRAWN BAR.



SECTION SHOWING LOCATION OF SCREWED BOSS FOR SILVER SOLDERING.



BODY - SIGHT GAUGE - LOWER
Mat'l. - PHOS. BRONZE BAR.



SECTION SHOWING LOCATION OF SCREWED BOSS FOR SILVER SOLDERING

The trouble taken to shape the ends of the screwed boss and the outlet boss to conform to the curvature of the body, will assist in this. 1/16 in. dia. brass plugs are shown just long enough to locate the components for the silver soldering operation. When fitting the plugs, leave a witness of the 1/16 in. dia. drilling clear of plugs, this will ensure that the drill is correctly positioned when drilling out the plugs after brazing.

The plug valve itself is quite straightforward but, when cross drilling this in position in the valve body, remember to watch the feed and do not drill more than 1/32 in. beyond the centre line.

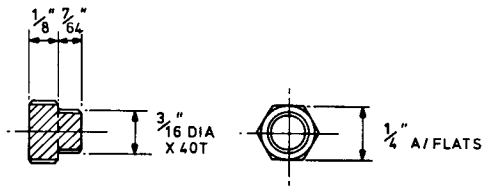
Next — the sight gauge fittings. These are based on the use of nominal 5/32 in. outside dia. gauge glass. I say "nominal" because I have usually found considerable variation in the diameter of two pieces, even delivered from the same batch at the suppliers. I would suggest that, having chosen a length of glass (usually about 6 in.), it is worthwhile to cut several gauge glasses from it, putting the spares on one side in case of future breakage.

The bores in the end fittings into which the glass locates should be at least .005 in. larger on diameter than the glass, the corners of the bores and the hole in the gland nuts should be radiused. I have shown these bores as .161 in. dia. (No. 20), it follows, therefore, that if the glass is, say, .010 in. oversize on diameter, the bores will have to be increased to 11/64 in. and a 7/32 in. x 40 t.p.i. thread used for the top plug.

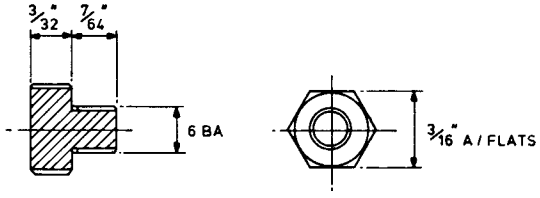
I used 5/32 in. bore silicone "O" rings for my glands, as supplied by M.E. Services, Chesterfield. Providing the end fittings are accurately made and the gauge glass bores closely in line in both upper and lower fitting, the gland nuts should not require to be tightened beyond finger tight to ensure steam sealing. Before fitting the glass, it is a good plan to make a metal bar a close fit in the bores and to ensure that this will assemble by "setting" the end fittings.

Returning to the making of the components parts of the gauge glass fittings, I make no apology for calling for the upper and lower bodies to be milled into square form from round bar. Bill Hughes' G.A. leaves no doubt that this is necessary to closely follow Marshall practice. It will be noted that the screwed boss for the gland nut in the upper connection is silver soldered to the connection in solid form, being located by an integral plug and with a centre drilled hole to ensure an accurate start to the drilling out operation. The squareness of the final drilling operation with the axis of the body is most important for the reason stated previously.

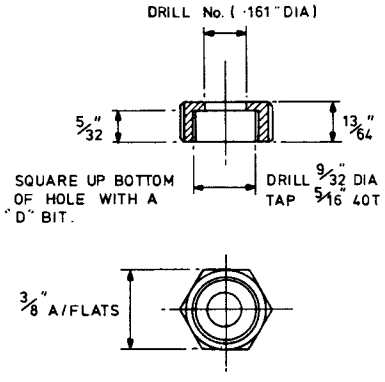
The lower connection has the addition of a further silver soldering operation to secure the sight gauge blow down valve body which has been provided with an integral location spigot. This blow down valve body can be made from 9/32 in. square



PLUG - SIGHT GAUGE
Mat'l. BRONZE OR G.M. BAR -1 OFF



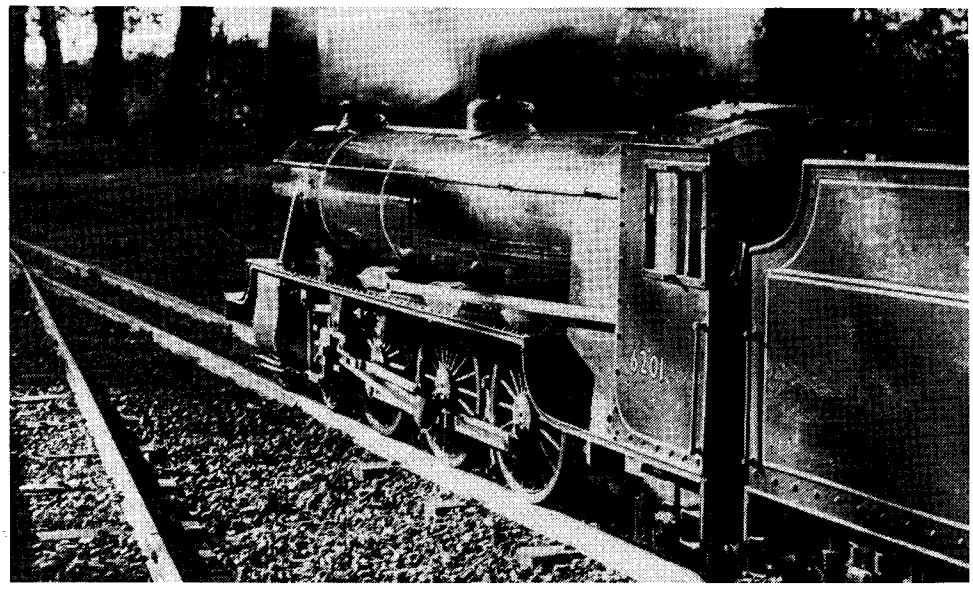
PLUG - SIGHT GAUGE & TEST COCKS.
Mat'l. BRONZE OR G.M. BAR
No. OFF - 4



GLAND NUT - GAUGE GLASS
Mat'l. - BRONZE HEX. BAR.
No. OFF - 2.

section bar if available. I made mine from round bar turned into square by facing in the four-jaw chuck. The 5/32 in. x 40 t.p.i. screwed end is fitted with nut and nipple for a 3/32 in. dia. blow down pipe. The run of this pipe is shown on the engine G.A. drawing (ref. Part II of the series). The nut and nipple are identical with those previously covered for the cylinder drain cock pipes.

The remaining fittings on the backhead are the two test cocks. I cannot see them fulfilling a necessary duty on the model, but for cosmetic reasons they are obviously essential. Again, milling from round bar is necessary. The test cock valve handles are shown on the rear elevation of the G.A. in the closed position. This conforms with the standard practice of drilling the hole through the valve in line with the axis of the handle. *To be continued*



THE WALSALL ARBORETUM RAILWAY

by Colin Cartwright

AS I HAD ALWAYS had a very keen interest in steam locomotives and railways in general it was a natural progression that led to the desire to operate and build a 7¼ in. gauge passenger-carrying line. My wants had in some measure been partially satisfied by the building of a garden line of approximately 400 yards, with covered station, end to end running with passing loops, and three lane loco shed.

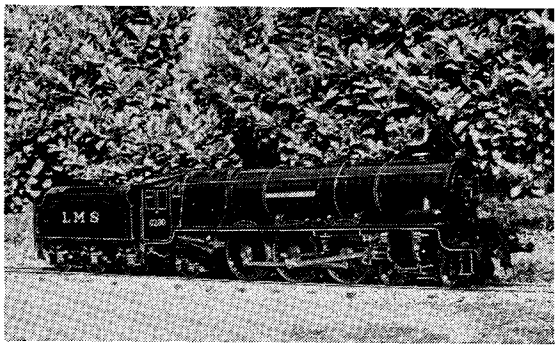
Even with this quite satisfying layout, my thoughts were still with scale locos pulling three or four coach trains and operating in a railway-like manner. For some years I had made tentative approaches towards the local County Borough Recreation Committee, and in 1975 I renewed my efforts, and this eventually led to my being able to rent a strip of land some one mile in length in the Town's Park or Arboretum, as it is known locally.

This site appeared an ideal setting. It had a double colonnade of trees for most of its length, which could accommodate double track down the centre and a slight gradient of approximately 1 in 110 levelling off at both extremities. In February 1976 a start was made with four enthusiastic helpers on preparing the track bed, making the track, laying and ballasting.

The rail section is heavy Cromar White in 15 ft. lengths, screwed to sleepers 14 in. long of 2 in. square section which were jig drilled to accept 1½ in. x 16 gauge round head sheradized screws. Some 5/8 of a mile was put down in single track using 80 tons of limestone chippings ballast and incorporating run round loops and platforms at each end. The new line then carried its first passengers on Easter Sunday and Monday, using a 4-6-2 Pacific and two Cromar White 0-4-0 battery electric locos.

The line proved to be extremely popular and ran every Saturday and Sunday using the above locos, with the added assistance of visiting locos, namely Arthur Glaze's 2-6-2, and Tony Hayward's 0-4-0. It was obvious on some of the busier days that the single track was a restriction on the passenger-carrying ability of the railway, and so before the August Bank Holiday, an all-out effort was made and half of the line from the Top Station was laid in double track. This was a great improvement allowing three trains to operate with more frequency, but had the disadvantage of a facing point on the up line as well as the 1/110 incline. At this time also the steam locos had to run tender first down to the Bottom Station, thus giving the passengers on the first coach very close proximity to the smoke and steam.

When the season finally came to a close in October, all the staff concerned were of one mind, we must have double track for the whole line, locos must be turned round, and we needed a large loco and carriage shed. Once more the winter was spent in making more lengths of track, drawing plans for the loco and carriage shed and acquiring two turntables. The track was laid, turntables were installed, engine shed erected, all in time for the Easter opening. We now had a 3-road loco and carriage shed, 1¼ miles of double track, two steaming bays and an engine run round.



Above: The Duchess of Buccleuch.
Left: The 4-6-2 Princess Elizabeth.

We also had two new locos. The first was another 4-6-2 Pacific *A. H. Peppercorn*, which had been purchased from John Mills of Leicester in a partially finished state, and completed by Arthur Glaze, and a battery electric G.W.R. railcoach by Cromar White. The latter proved to be a very powerful loco with two motors each of 1¼ h.p. thyristor control, and regenerative braking.

Three or four trains could now be in operation continuously, with locos waiting in readiness and backing on to trains at each terminal station, thus giving a different loco for the return trip and satisfying both steam and electric enthusiasts. As the up line had now been relaid in steel track we had also overcome the problem of excessive slipping and this greatly assisted the hauling capacity of the locomotives.

We were pleased to welcome several visiting engines, namely Geoff Stubbs of Wakefield with his fine B1, John Mills of Leicester with his A3 *Flying Scotsman*, and the continued loan of Arthur Glaze and his 2-6-0, not forgetting Tony Hayward and his 0-4-0 Welsh loco *Llanwryst*. I had also had the good fortune to acquire another 4-6-2 loco in response to one of my advertisements in *Model Engineer*. This was the superb *Duchess of Buccleuch* built by Sam Monks of Nottingham in conjunction with Harry Powell. This loco was in excellent condition, never having done any passenger hauling whatsoever, and it was a privilege to meet its owner, Tim Wood of Bristol, who now ranks as a good friend and is a regular visitor to the Walsall track.

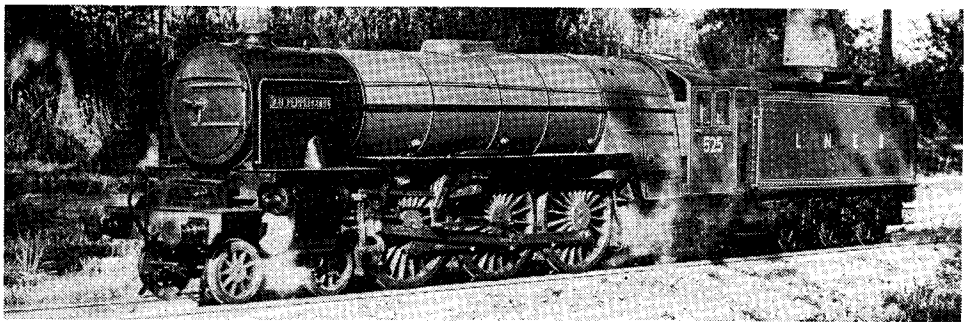
The second season of the Walsall Arboretum Railway came to its close in October, and we all looked back on a very satisfying seven months of enjoyable train operation, particularly some of the busier week-ends when as many as five steam locos were in service. I must express my thanks here and now to all the good people who have helped me so willingly; Bill and Margaret Whapples with sons Stephen and Peter, Tony Hayward, Arthur Glaze and John, Kevin Ellis, Richard Wall, and my son Richard.

We are now looking forward to our third year with even more enthusiasm, and have been working on the track to further improve the standard of running. Thanks to John Mills we will be installing colour light signalling with a remotely operated control console fitted with train warning system. We hope also to commence and possibly complete an extension over the stream to the car park, giving a really long run of over one mile from there to the putting greens by the top station. This will also mean that our present bottom station will also act as an intermediate halt, but certain trains will make a non stop run.

We shall welcome delivery of two new steam locos during this year; these will comprise an original *Royal Scot* and a 4-6-0 Black V. Both these locos are nearing completion at A. J. Glaze & Company and we look forward to their steaming trials in June or July. A further electric loco is also nearing completion and is a replica of the Hymek; once again 2 x 1¼ h.p. motors should make this another powerful hauler.

The original 4-6-2 Pacific has been overhauled, repainted and lined out, and named *Princess Elizabeth*. This face lift together with a new 8-wheeled bogie tender has produced a handsome and powerful loco.

My thanks to Neville Wright for his excellent photographs and I look forward to meeting many of *Model Engineer* readers during the season. Visiting locos are always welcome but prior notification would be advisable.



A. H. Peppercorn *on the track.*

"COUNTRYMAN'S STEAM"

John Haining describes the Valve Gear, Safety Valves and Regulator

Part VII

From page 286

THE VALVE GEAR is Stephenson, with the reversing lever in a quadrant on the right-hand-side placed, following the usual practice, on the opposite side to the steering wheel. The reach rod, connecting the weighshaft arm to the reversing lever, runs along outside the hornplate with a slight up-turn at each end where it joins arm and lever.

The weighshaft has a collar on the inside of the right-hand weighshaft bracket to prevent side movement and the lifting arm raises and lowers the reversing link by means of a single lifting link instead of the more usual pair — a layout adopted by several other makers at various times.

To prevent any tendency for the reversing link to tilt sideways, the lifting arm has a fixed pin integral with the end of the lever, and the lifting link has a similar pin at the top with ample width to prevent unwanted movement. The lifting and weighshaft arm and the lifting link are all fabricated from b.m.s. bar and mild steel plate, silver-soldered with Easy-flo. The lifting arm can be pinned in position on the weighshaft but the weighshaft arm is better left free on the shaft until the whole valve gear is assembled, when the shaft can be drilled from the lever boss after the full movement has been checked.

The eccentrics and straps are quite straightforward, the only point to remember being that the two lobes of the front half of each strap are one-sixteenth of an inch thicker than the back ones, to give added depth for the 4 BA tapped holes.

Each strap should be split before boring and the 1/16 x 1/16 in. relief in the bore should be an easy running-fit on the raised centre rib of each eccentric. So that a length of plain mild steel flat can be used for each eccentric rod, I have made each fork-end as a separate piece, scarfed into the plain rod-end and then silver-soldered.

As my mail has contained several requests lately, for hints on setting the slide valves, both for this engine and the two previous ones, perhaps the old hands will forgive me for dwelling on the subject in a little more detail. The valve gear is shown on the drawing with the lever in mid-position in the quadrant sweeps. The eccentric rods follow the "open" arrangement, the link being up for reverse and down for forward movement, and as shown with the link in mid-gear, theoretically hardly any steam should enter the cylinder.

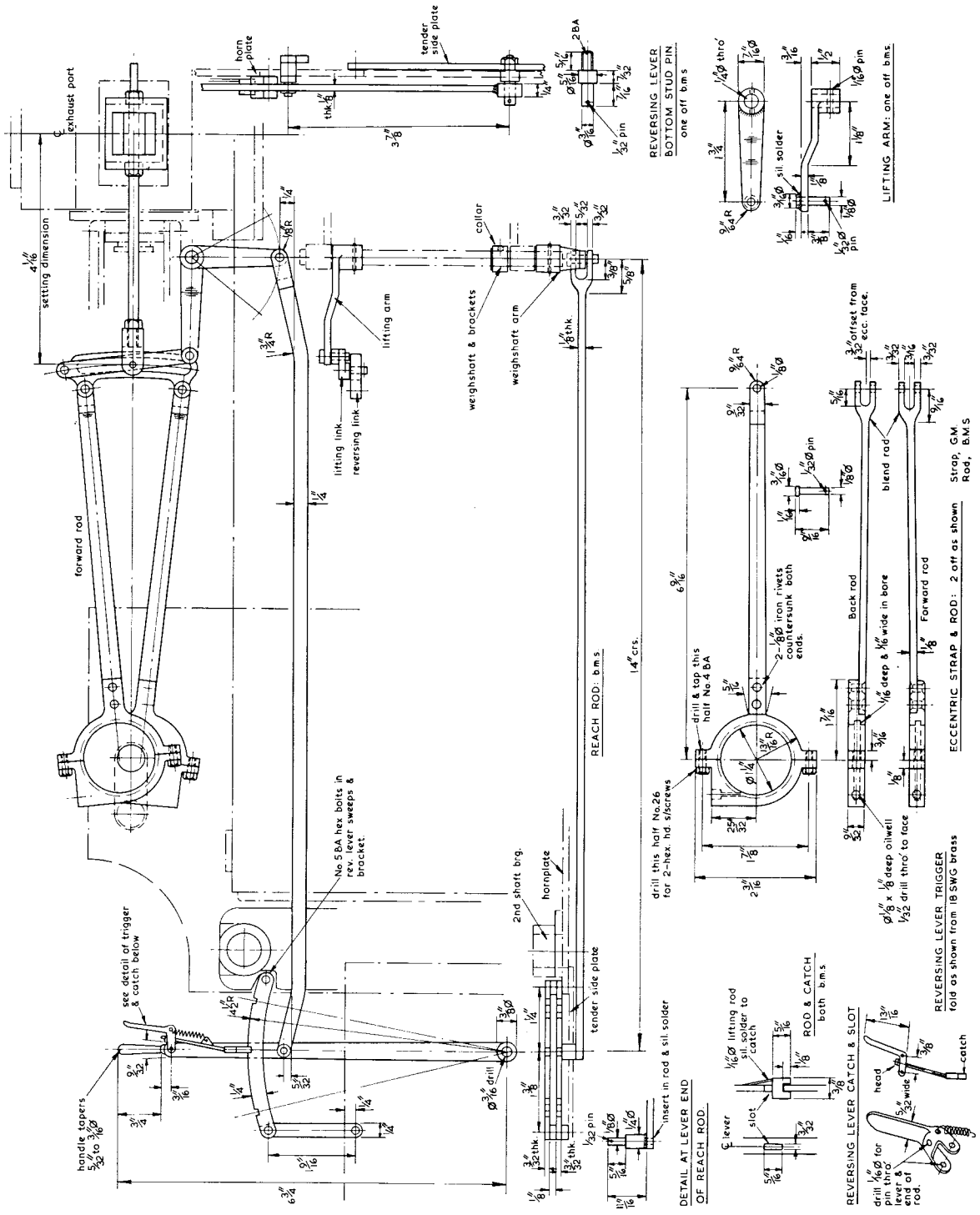
The inside edges of the slide valve cavity should line up when in mid-position with the inside edges of the two valve-chest ports, giving no exhaust lap and known as "line-in-line" while the outer edges of the slide valve extend over the outer edge of each port by the amount of outside lap 1/16 in.

Looking from the direction of the driving position the right-hand eccentric is the forward one. To set the eccentrics in their correct running positions, turn the crankshaft to *back* dead centre as shown, and position each eccentric exactly at 90 deg. ahead of the crank, the forward eccentric centre-line *above* the crankshaft centre-line, and the back eccentric centre-line below. Lightly tighten the grubscrews just sufficiently to maintain the eccentrics in this position on the shaft and then, having dropped the link to its bottom (forward) position, fit the forward eccentric strap and rod and insert the pin through fork-end and the ear of the reversing-link. Raise the link to the reverse position and do the same with the back eccentric strap and rod.

Both eccentrics are now set as shown on the drawing in advance of the crank by 90 deg. each, but both will require moving forward by a few degrees to give the required amount of lead or opening to steam at the commencement of the outward piston stroke, not less than 1/64 in. or more than about 1/32 in. for this engine.

It is very important to set the slide valve for equal lead so that with the crank on alternate centres the port shows the same amount of opening at each end in forward and reverse gear.

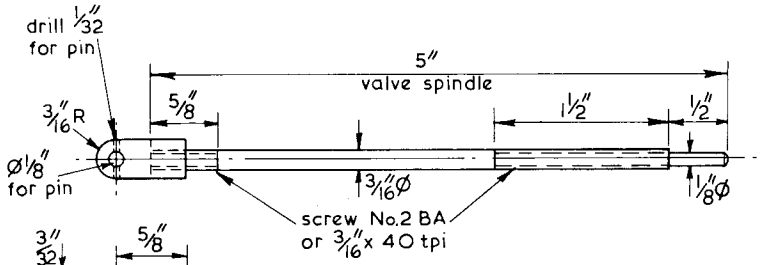
The slide valve can be adjusted a short distance in each direction by means of the threaded length of valve spindle running through the slot in the slide valve and once equal lead has been obtained, the eccentrics should be tightened on the shaft and a line scribed on each eccentric face to match with a similar mark on the crankshaft. This is a great time-saver if ever you have the misfortune to have an eccentric slip slightly from its correct position on

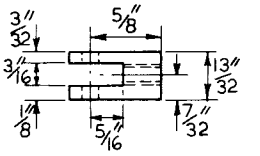


the shaft — this can happen occasionally with unkeyed eccentrics and a visual mark is a help in quickly resetting the valve gear.

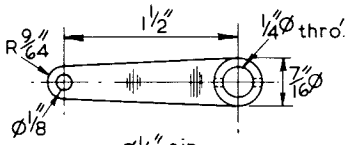
When setting the slide valve on full size engines, it was customary, once equal lead has been obtained, to move the valve about 1/16 in. or so towards the chimney end of the port face to allow for longitudinal expansion of the boiler when hot.

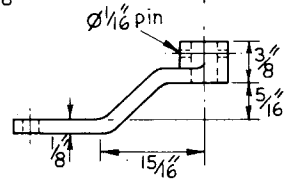
Even with the long eccentric rods used on this engine, the valve spindle has quite a length extending from the steam chest gland unsupported by any form of guide, and it is therefore important that the



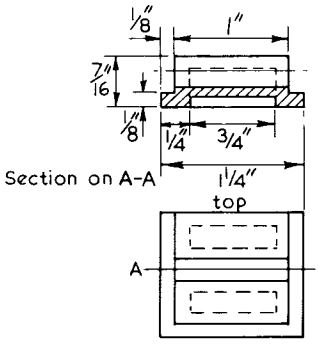


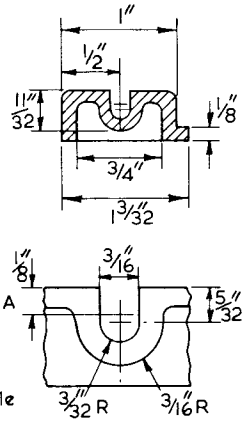
VALVE SPINDLE : one off b.m.s.





WEIGHSHAFT ARM: one off b.m.s.

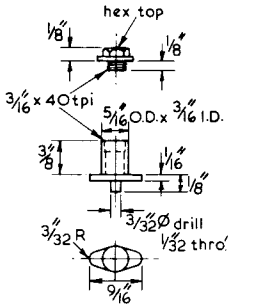




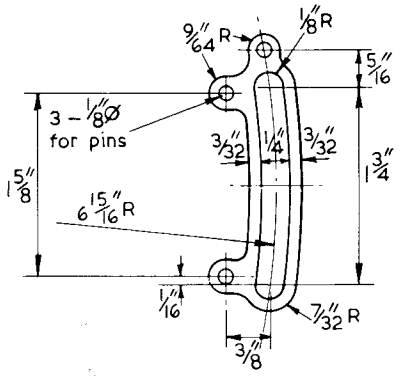
℄ of V. spindle

SLIDE VALVE
one off G.M.

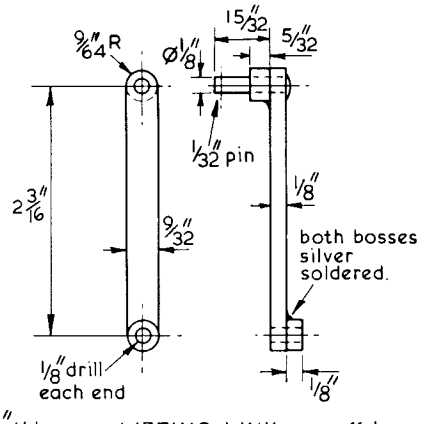
2/1 detail of slot for valve spindle.



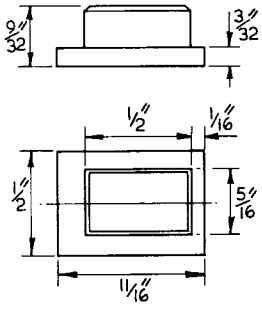
OIL CUP: 2 off brass
(one for top slide bar
one for conn. rod



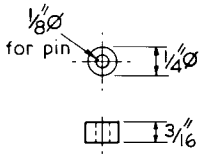
LINK: one off b.m.s 3/16" thk.



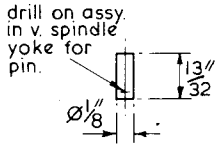
LIFTING LINK: one off b.m.s.



REGULATOR BLOCK
1 off g.m.

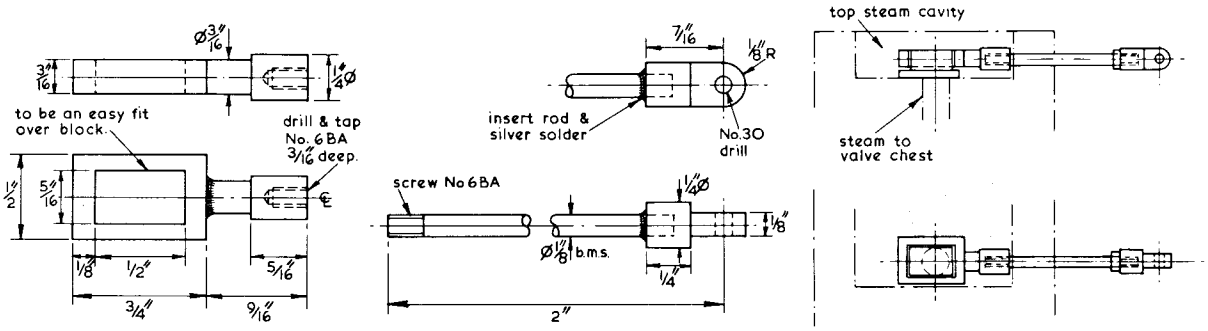


DIE BLOCK:
one off b.m.s.



PIN: one off
b.m.s.

Bright finish all b.m.s. items.
All pins & working faces casehardened.



REGULATOR BUCKLE: 1 off b.m.s.

REGULATOR ROD & END: 1 off b.m.s.

ARRANGEMENT OF REGULATOR

1/2 in. length reduced to 1/8 in. dia. at the end of the valve spindle is concentric with the major diameter so that it is a good running-fit in the tail guide screwing into the forward end of the steam chest; this must itself be absolutely concentric with the valve-spindle bore and gland at the back end of the chest.

A nut and thin locknut can be used each end of the slide valve once the valve has been set and checked, or a dab of Loctite used to secure a single nut each end of the valve slot, but allowance must of course be left for the valve to lift slightly off the port-face — 1/32 in. is in fact allowed so that condensate can be released.

Possibly as the result of an unfortunate and expensive "incident" when a nut unscrewed and jammed a slide valve, resulting in a badly bent spindle and cracked cover, I personally prefer to drill and pin a single nut each side of the valve, once the valve setting is O.K.

The reversing lever has a scratch moving vertically in a slot 3/32 x 5/16 in. in the lever; it will probably be found easier to mark this off with the lever assembled between the two quadrant sweeps. which are kept apart by a 1/8 in. thick spacer at each end, through which pass the 5 BA bolts securing the front of the quadrant inside the offside hornplate and the back to the 1/4 in. wide mild steel flat bar which should be given a "set" to pick-up both the quadrant and the inside of the tender side plate.

The 3/32 in. wide catch is attached by a 1/16 in. dia. lifting rod which passes at the top end through the bridge-piece of the brass trigger — see drawing. To allow for the slight angular movement when the trigger is pulled towards the lever handle, the hole in the little bridge-piece should be slightly elongated. The catch must be positioned so that the two lower projections sit a distance of 1/16 in. into the notches of each sweep, which should be marked-off and cut from the lever in back and forward-gear position, with a couple more notches cut for the intermediate lever positions in forward and reverse. As the drawing shows, the flange of the second motion and hind axle combined bearing bracket is cut away slightly to accommodate the front end of the quadrant.

I should have mentioned, when describing the reversing lever lifting-catch and lifting rod, that it will be found easier to silver-solder the lifting rod to the side and top of the catch and after threading the rod through the bridge-piece of the trigger, soft-solder a little collar over the top end in the right position to lift the catch when the trigger is squeezed. The full-size engine was fitted with a pair of the very widely used Salter Spring Balance Safety Valves, mounted in line on the flat dome cover of the cylinder casting. Unlike many contemporary engines the valves, together with the levers and lever-studs, were fully exposed to view instead of being neatly encased in an elegant "coffee-pot" casing.

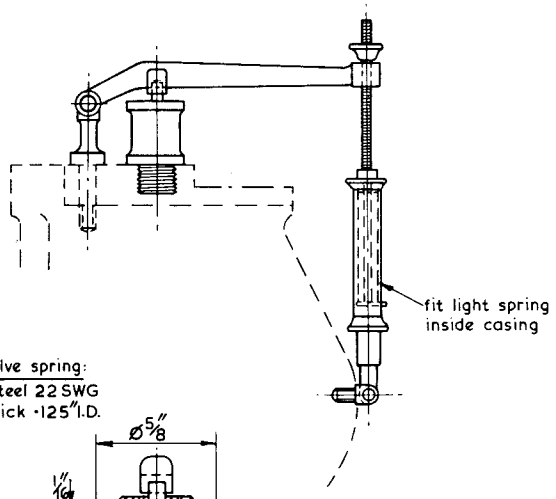
Each valve assembly consisted of a wing-valve held down onto its seating by a lever pivoted at one end in the fork of the lever-stud and pulled down at the other (outer) end by a spring-loaded plunger encased in a polished brass tubular casing anchored at its lower end to the outer curve of the cylinder casting.

Screwing down the knurled brass circular nut above the lever pulled up the balance-centre and by further compressing the spring in the brass casing increased the downwards pull at the lever end and so further loaded the valve itself.

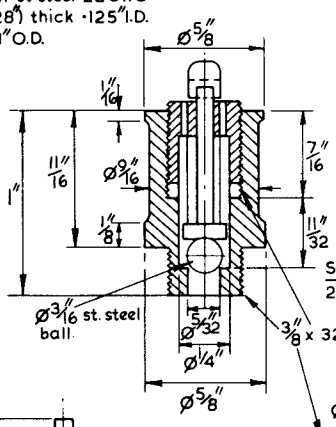
A narrow slot in the side of the brass spring-casing allowed a small indicator nib on the plunger disc to project through and thus indicate any increase or decrease in the safety-valve loading.

Although these valves were very extensively used in the early days, some drivers might, on occasion, decide to screw down a lever to obtain more steam pressure. To guard against this dangerous practice the working instructions issued by employers to their drivers often contained warnings of dire penalties for this offence.

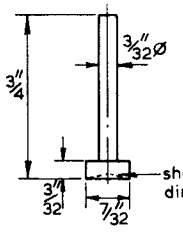
Although later replaced by safety valves of the Ramsbottom or similar double valves of a more compact and less readily accessible type, the Salter Balance valves could still be specified by customers



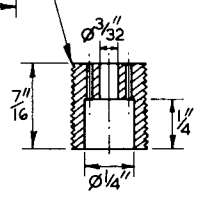
Safety valve spring:
2 off st steel 22 SWG (·028") thick ·125" I.D. ·181" O.D.

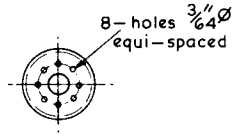


SAFETY VALVE BODY
2 off g.m. or ph. bronze

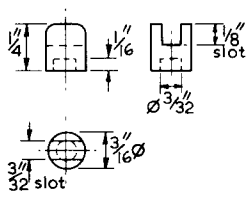


PLUNGER: 2 off st. steel

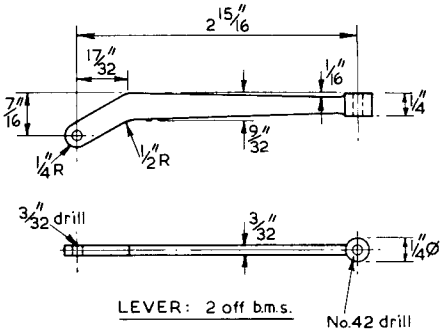




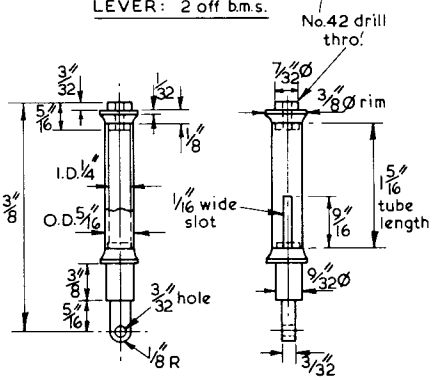
ADJUSTING CENTRE
2 off g.m.



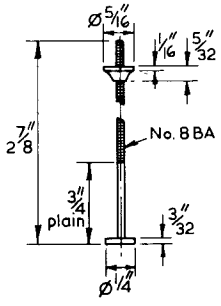
LEVER REST: 2 off b.m.s.



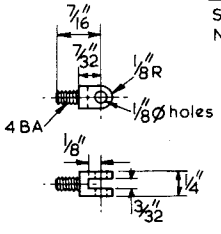
LEVER: 2 off b.m.s.



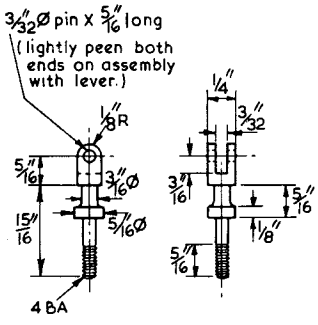
SALTER SPRING BALANCE CASING
2 off brass



BALANCE CENTRE SPINDLE AND ADJUSTING NUT. 2 off each
Spindle: b.m.s.
Nut: brass.



BOTTOM STUD:
2 off b.m.s.



LEVER STUD: 2 off b.m.s.

ARRANGEMENT OF SALTER SAFETY VALVES

who preferred this arrangement, and Fowlers for example offered them as an alternative right up to the last days of steam at Leeds.

Obviously the 2 in. scale Durham and North Yorkshire engine must be fitted with these characteristic valves as they are an important contemporary feature, but in this scale they do appear to have a slight tendency to dribble somewhat, as I believe several other users have discovered; they also seem a little temperamental to adjust at the balance end of the lever.

To get over these disadvantages, I have used two ordinary direct spring-loaded valves, combining them with a complete Salter arrangement but using a weak spring just sufficiently compressed to keep the lever down into the lever rest on the top of the valves. This way, we have easily adjusted non-dribbling valves doing the job but with the authentic period appearance.

The little indicator nib is not shown on the circular bottom disc of the balance centre, but this measuring 1/16 in. wide x 3/32 in. long is easily added. The lever, lever stud, and bottom anchor stud are fabricated from mild-steel and silver-soldered with Easy-flo.

Two flats can be formed on the 5/8 in. dia. base of the safety-valve body for use when screwing into the top cover, if required.

The spring inside the brass casing can be wound from 22 s.w.g. stainless steel or tinned wire, and the two ends are inserted tightly into the body of the tube and soft-soldered around the rim of the tube, using heat sparingly in order not to damage the spring inside or distort the 8 BA balance centre-spindle. The circular nut should be knurled around the outer edge to give the complete touch of authenticity, and should be reasonably tight on the threads of the spindle.

The regulator is shown on the same sheet as the safety valves, and follows the custom of push to open, pull to close, preferred by some makers as being safer on the grounds that if a driver was taken ill or fell he might grab the regulator lever, and unwittingly start or increase the speed of the engine with dire results before the arrival of assistance.

When pushed fully open the end of the regulator block and buckle comes up against the inside of the steam cavity wall, while pulled right back to close, the circular end portion into which screws the regulator rod will touch the opposite side of the steam cavity. The 3/16 in. dia. neck could well be fined down a little in order to allow steam as uninterrupted a passage as possible into the 5/16 in. dia. steam passage to the valve chest.

Included with these details is a drawing of the brass oil cup to be fitted to the connecting rod over the bearing brasses and the top crosshead slide bar. It should be made a press fit into a 3/32 in. dia. hole, detailed on the connecting rod but not shown on the slide bar drawing, where it should be positioned about the middle of the distance transversed by the crosshead. *To be continued*

CLUB DIARY

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

APRIL

6 Brighton & Hove Society of Min. Loco. Engineers. Return of Keith Carter (Films), Elm Grove School, Elm Grove, Brighton. 8 p.m.
6 Stockport & District S.M.E. A.G.M.
6 Romford M.E.C. Competition night.
6 Ickenham & District S.M.E. Probable departure date for North Wales trip.
6 Thames Shiplovers and Ship Model Society. Members' model evening — plus "Bring and Buy" sale. St. Botolph's Church Hall, Bishopsgate, London E.C.2. 7 p.m.
6 Rochdale S.M.E.E. General Meeting. Technical College.
6 Loughton & District M.E.S. A talk — "A Short History of Locomotive Valve Gears". Loughton Hall at 8 p.m.
6 N. Wilts. M.E.S. Annual General Meeting — Rodbourne Road, Working Men's Club, Rodbourne Road, Swindon, Wilts. 8 p.m.
6 Great Western Society Ltd. "Whiteball to Helston 20 years ago", P. Gray. Palmer Building, Reading University, Whiteknights Park, Reading. 7.30 p.m.
6 Great Western Society Ltd. Slide show — Old Town Hall, Leigh Road, Eastleigh. 7.30 p.m.
6 Dublin S.M.E.E. "The Corrosion Process' — J. E. Toomey, in the Star of the Sea School. 8 p.m.
7 Great Western Society Ltd. Members' slide show, Wyvern Theatre, Swindon. 7.30 p.m.
7 S.M.E.E. Rummage Sale.
8 Sutton M.E.S. Official opening of the new club house by Mr. Les Porter.
9 Clyde Shiplovers and M.M. Society Magazine Night — short items by members. Partick Halls, Burgh Hall Street, Glasgow. 7.30 p.m.
10 Sutton Coldfield & N. Birmingham M.E.S. Talk and Demonstration — Painting and Lining Models. Wylde Green Library, Sutton Coldfield. 7.30 for 8 p.m.
10 Basingstoke & District M.E.S. Meeting Night.
10 Guildford M.E.S. Executive Committee Meeting.
11 Norwich & District S.M.E. Meeting at Assembly House, Norwich, at 7.30 p.m.
11 Harrow & Wembley S.M.E. Traction/General meeting — St. Andrew's Hall.
12 Leyland, Preston & District S.M.E. Meeting.
12 Sutton M.E.S. Slides and photographs — a chance to show those that did not make it the first time.
13 Ickenham & District S.M.E. Good Friday — no evening meeting. Probable return from North Wales.
14 Cambridge & District M.E.S. Public Track Day. Fulbrooke Road. Refreshments. 2.30 p.m.
15 Stafford & District M.E.S. Working Party at Club track. 10 a.m. onwards.
15 W. Riding Small Locomotive Society. Season Opening.
15-16 Malden & District S.M.E. Public Running Days.
17 Great Western Society Ltd. "West of England Division through a crystal ball", J. Barker (Deputy General Manager, Western Region). British Railways Staff Assn., Temple Meads, Bristol.
17-22 Worthing & District S.M.E. Exhibition at Chatsmore R.C. School. Admission 40p adults — 20p children. 10.00 a.m. to 8.00 p.m. (6.00 p.m. on Sunday).
17-21 Nottingham S.M.E.E. 25th Exhibition, Oval Hall, Victoria Leisure Centre, Nottingham.
18 Guildford M.E.S. "Bits and Pieces" Competition.
19 Hull S.M.E. Discussion to arrange Summer Programme. Trades & Labour Club (Room 3), Beverley Road, Hull. 7.45 p.m.
19 Perranporth & District M.E.S. Illustrated lecture entitled "Some Magnificent Midland Models" by D. Piddington. Church Hall at Perranzabuloe (approx. 4 miles East of Perranporth and on A3075 Newquay-Redruth main road), at 7.30 p.m.
19 Sutton M.E.S. The first session of the Summer season.
19/20/21 Crewe M.E.S. Exhibition at Public Library, Prince Albert Street, Crewe. 19.09-20.00, 20.09-21.00, 21.09-17.00. Adults 20p, Child and O.A.P. 15p. Reductions for families.

48th Model Engineer Exhibition

The Duke of Edinburgh Trophy

by Prof. D. H. Chaddock

SPECIAL INTEREST always attaches to the outcome of this competition because it is a battle of the giants, models competing with one another which are so far removed from the average as to belong almost to another world. How then can a decision be reached between equal standards of perfection?

At first sight it might appear that perfection of workmanship might be the only and sole criterion but this is not necessarily so. Just as in the case of all other classes other factors such as quantity of work, suitability of materials, finish and especially originality and fidelity have to be taken into account.

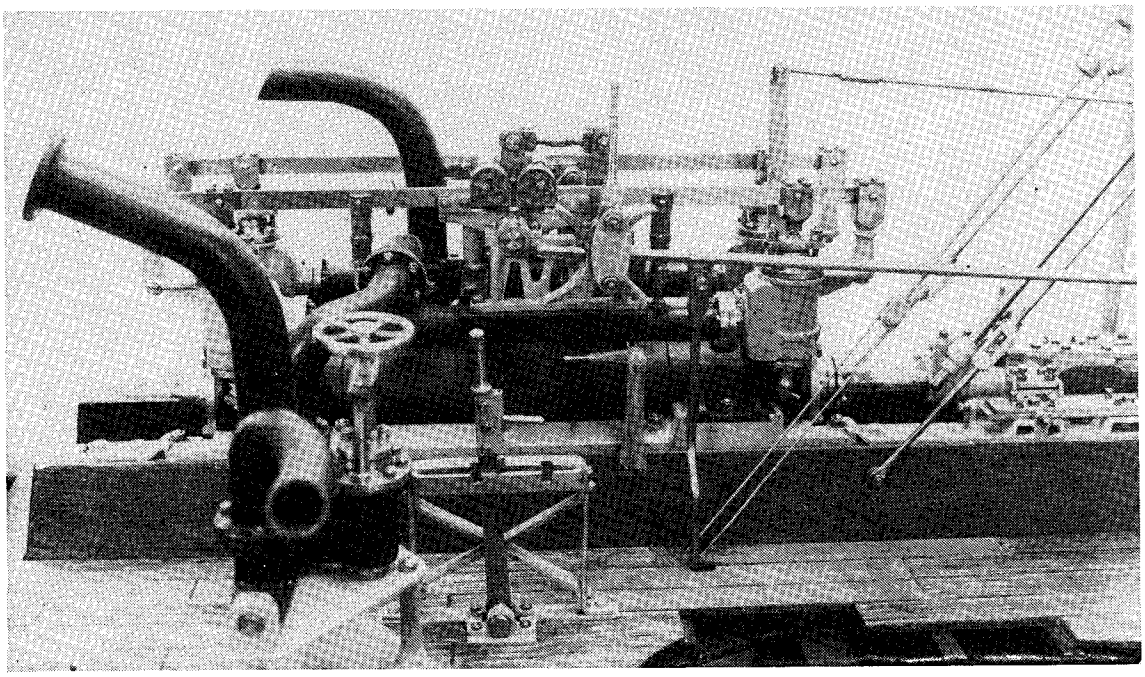
It was the latter which decided a needle match between Miss Cherry Hinds' Burrell Scenic Showman's Road Locomotive and Mr. Hartung's Starboard Engine and Part Hull of an American Stern-wheeler. The Burrell was perfection, no doubt of that, but how far was it original? The prototype is well known, an example was available to the builder of the model for photography and measurement so given the stupendous skills which all Duke of Edinburgh competitors possess the outcome was inevitable — a perfect model which could not be faulted.

The stern wheeler was rather a different kettle of fish. No prototype ever existed in this country and none now probably exists in the U.S.A. the land of their birth. A tremendous amount of research work must therefore have been done before construction could even begin and the result is a model which will enshrine for all time an outstanding phase of American boat building unknown in this country.

Another factor taken into account was that sheer

Below: A close-up of the cylinder and valve gear of Mr. G. Hartung's model.

Right: Miss C. Hinds' Burrell scenic showman's road locomotive.



miniaturisation, although it may lead to great delicacy of works, is not of itself over-riding otherwise a lady's wrist watch would always beat a long case clock in competition. The stern wheeler was therefore in some respects rougher in finish than the showman's engine but then so were the originals. They were built by carpenters, blacksmiths and millwrights to do a rough, tough job of work and this too should appear in the ambience of the model.

So after much heart searching, it was the unanimous decision of the Judges that the Duke of Edinburgh Challenge trophy should be awarded to the stern-wheeler engine as an outstanding example of model engineering with the Burrell as a neck and neck runner-up.

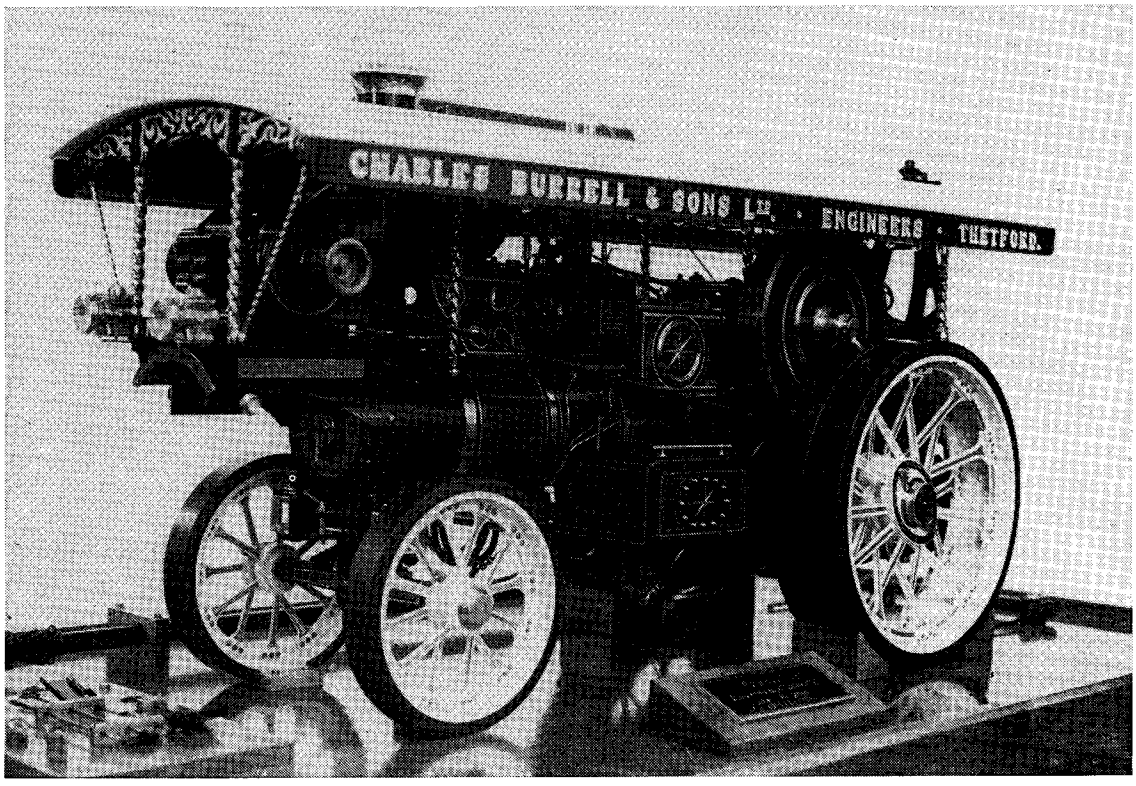
This is not the time or place to describe either model in detail, but it is perhaps appropriate to include a detailed close-up photograph of the valve gear of the stern-wheeler engine. This was taken when the model was out of its show case and which, unfortunately, was not very easy to see when it was on display. It is of particular interest because not only is it of the "gab" variety permitting almost instantaneous reversal or hand working of the engines, probably very necessary in negotiating the tricky waters of the Mississippi River, but it also incorporates a variable cut-off for the steam admission drop valves at either end of the very long stroke cylinder.

Mr. C. R. Amsbury's ex-G.W.R. Prairie 2-6-2 Tank Locomotive in 5 in. gauge also represented some research into the past and a meticulous piece of model engineering but it did not quite come up to the immaculate standard of the Burrell and so was placed third in the competition.

The research microscope by Mr. R. S. Shute was professional in all respects of fit and finish but the quantity of work, another criterion by which entries have to be judged, was perhaps rather less than in the preceding cases to which it had to give precedence.

A model of an entirely different class was entered by the Hawker Model Club. This was a scenic or display model of the "Harrier" final assembly line which showed all the operations which take place in a large workshop devoted to the construction of aircraft. Meticulously observed, every stage in the assembly was represented by partially built aircraft, components awaiting assembly as well as the jigs, tools and fixtures used in each process.

At such a small scale the actual modelling was representative rather than detailed, in some instances verging on the crude when closely examined, but the whole model lacked the verisimilitude of a real workshop. It was much too clean and tidy and lacked the litter of nuts, bolts and rivets dropped on the floor which seems inevitably to accompany any large scale assembly operation.



THE PISTON DROP VALVE ENGINE

by A. Haworth

Part XII

From page 266

STILL ON THE SUBJECT of the flywheel for a little while longer: if the rope grooves are accurately pitched, there should be a narrow gap remaining at the middle, that is at the joint of the two wheels. It is even worthwhile machining out a groove to provide this gap. We lose a rope, so what? The remainder will accept a 5 per cent overload. In this gap is formed the barring rack (see drawing). This adds a touch of professionalism and also serves a useful practical purpose. It is not always easy to move a flywheel through a precisely small distance, such as is often required in valve adjustment and the like.

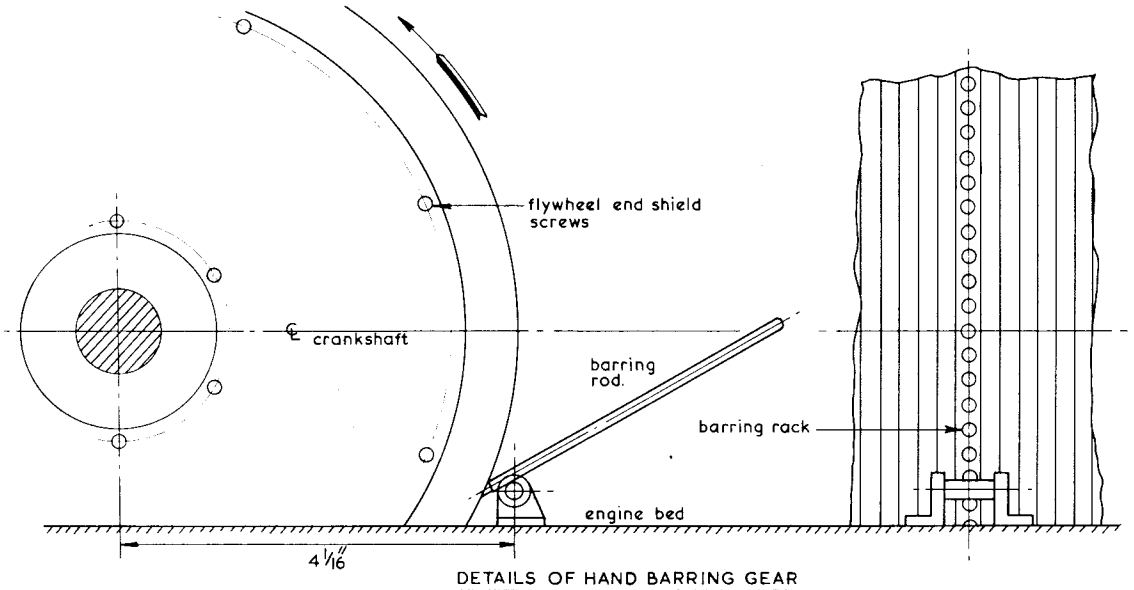
Many engines, though not all, had their own individual barring engine. To scale, this would mean a little engine 1/4 in. bore x 1/4 in. stroke, which would fit easily inside a matchbox! Our engine will therefore be barred by hand, with a steel bar. A short fulcrum bar is secured to the engine bed, immediately in front of the flywheel barring rack. Full size, the leverage distance was only about 6 in. With a bar 6 or 7 ft. long, the ratio is 12-14:1. Two hefty men usually wielded the bar.

The governor linkage is a system of rods, levers and shafts, which transmit the motion of the governor to the valve gear. It is also essential that these forces operate completely without 'play' or stiffness. No lost motion of any kind can be tolerated in a governor linkage.

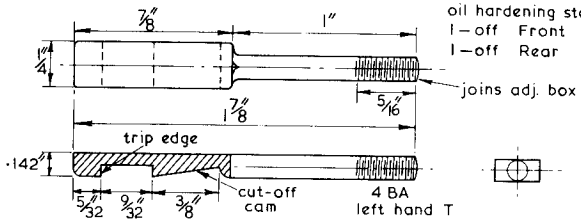
All rods transmitting motion in any direction must be fitted with adjusting boxes to vary the length while all levers must have an additional hole each side of the "designated" hole. This ensures a certain amount of adjustment in angular motion. The vertical movements of the governor are thereby transmitted to the cut-off roll situated on the cylinder. The interaction of this roll with the face of the cut-off cam on the valve rod determines the precise point of cut-off.

Even though the cut-off face is a simple flat inclined plane, it is still a cam, and will henceforth be referred to as such. Immediately below this is the safety cam, sometimes called the emergency cam. If the cut-off roll is in contact with this face, it means that the valve rod can never engage its lever and the valves remain closed. Or in other words, the governor has been "tripped", and must be reset before steaming can occur.

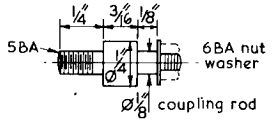
During the initial setting of this equipment it is advisable, nay essential, to pack up the governor to the level it occupies when running at its correct design speed. At first, adjust the gear so that the valve cuts-off at one quarter of the stroke, that is to say when the piston has travelled 5/8 in. - 3/4 in.



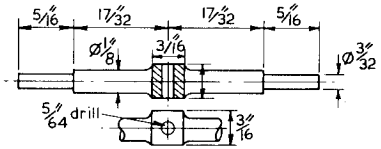
DETAILS OF HAND BARRING GEAR



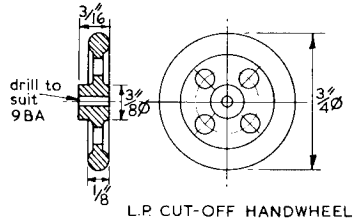
L.P. STEAM VALVE ROD (top)



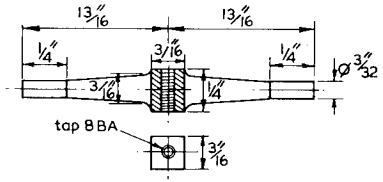
L.P. EXH VALVE LEVER SPACER PIN
2 off BMS



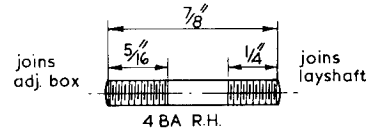
HANDWHEEL PIVOT SHAFT (L.P.) BMS



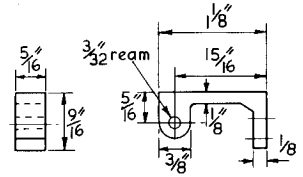
L.P. CUT-OFF HANDWHEEL
BMS



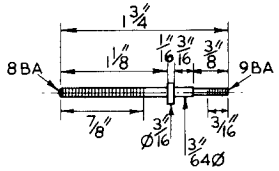
L.P. CUT OFF LEVER SHAFT BMS



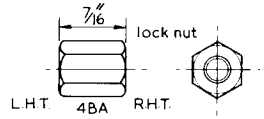
L.P. STEAM VALVE ROD (bott.)
2 off BMS



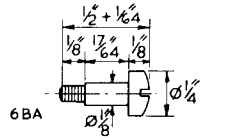
L.P. CYLINDER BRACKET: 2 off BMS



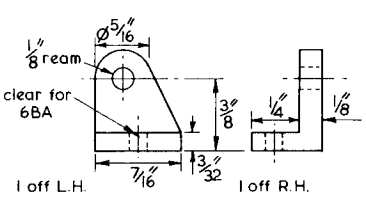
L.P. CUT-OFF ADJUSTING SCREW
BMS



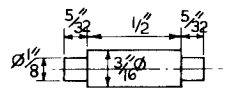
ADJUSTING BOX
6 off BMS



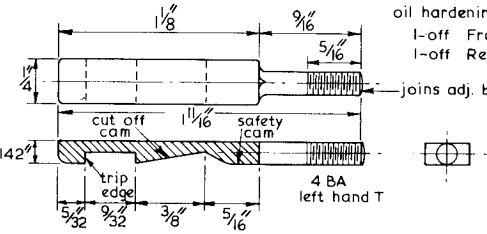
H.P. CUT OFF LEVER BEARING
PIN: 2 off BMS



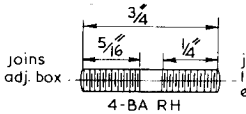
FULCRUM BRACKET
BMS



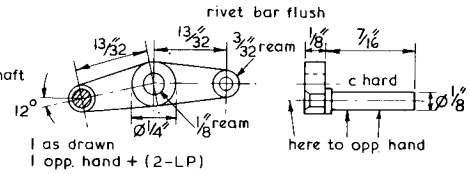
FULCRUM ROLLER
BMS



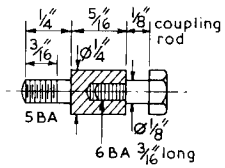
H.P. STEAM VALVE ROD (top)



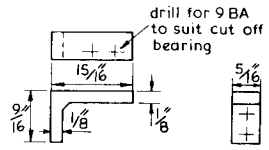
H.P. STEAM VALVE ROD (bott.)
2 off BMS



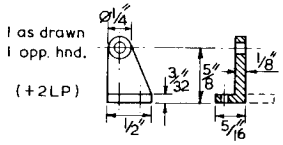
H.P. CUT-OFF LEVER & ROLL BAR: BMS



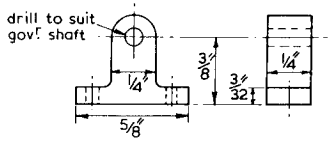
H.P. EXH VALVE LEVER SPACER PIN
2 off BMS



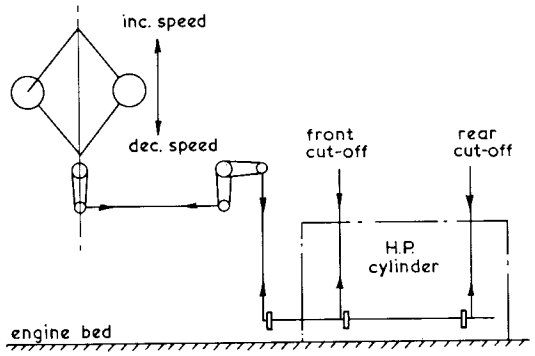
H.P. CYLINDER BRACKET
2 off BMS



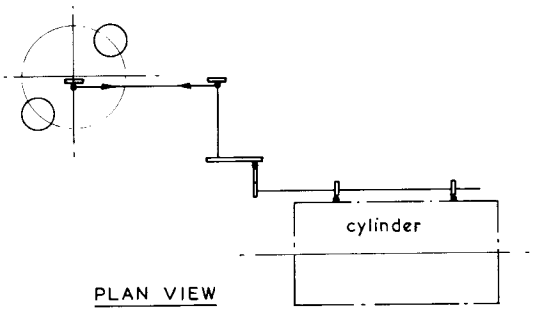
H.P. CUT-OFF LEVER BEARING: BMS



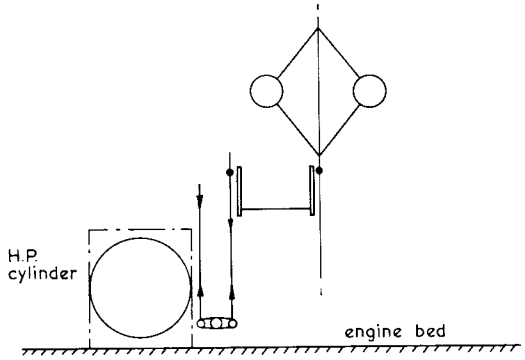
GOVERNOR SHAFT BEARING: 2 off BMS



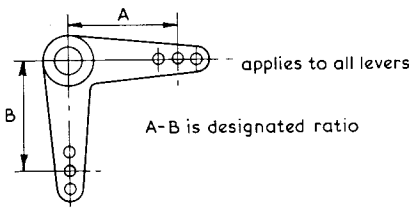
SIDE ELEVATION



PLAN VIEW



END ELEVATION



TYPICAL LEVER WITH MAX. ADJUSTMENT

SCHEMATIC ARRANGEMENT OF GOVERNOR LINKAGE

Lines unarrowed are semi-rotary shafts

from dead centre. It may now be appreciated regarding the so-called "palaver" about lengthening or shortening rods and angular motions. When performing this work, the stress is on caution, caution all the way.

Each and every engine has its own characteristics regarding governing. Eventually, after the engine has been run several times, you will achieve that nicety of balance that exists between governor and valve gear. It is great fun and also a practical demonstration to rig up a small experimental wooden brake and apply pressure to the *rim* edge of the flywheel to simulate load. The engine should not slow down, but you should notice that the valves are now steaming longer or, in other words, they are now cutting-off later.

The drive ends of the exhaust valve levers are fitted with spacer pins for the coupling rod. These enable the coupling rod to be placed at a distance from the cylinder side in order to maintain clearance from the throw of the layshaft steam eccentrics. It is seen from the drawing that the H.P. spacer pins are longer than the L.P. The reason is, of course, that the H.P. layshaft is much closer to the exhaust valve centre line. On the H.P. exhaust valve bonnets it will be necessary to file a clearance on the inner side to clear the eccentrics at maximum throw. This is not required on the L.P. cylinder where the centres are greater. Both H.P. and L.P. cylinders are drawn showing valve trip and cut-off gear.

The governor has no influence on the L.P. cylinder whatsoever. If the cut-off requires adjustment, it must be done by the cut-off handwheel. Even in full-size practice this rarely needed to be touched. It is provided solely as a means of equalising the load between the two cylinders. Since a model cannot be indicated by any method that I know of, it is impossible to say whether or not the load is equalised.

Generally speaking, the L.P. cut-off should be approximately the same as the H.P. Having been correctly set, it is advisable to lock the cut-off lever shaft by a pair of locknuts (not shown). It would appear to be somewhat fruitless to instal gear which will never be used, however that is the name of the game. Please note that the L.P. valve rods are not provided with emergency or safety cams.

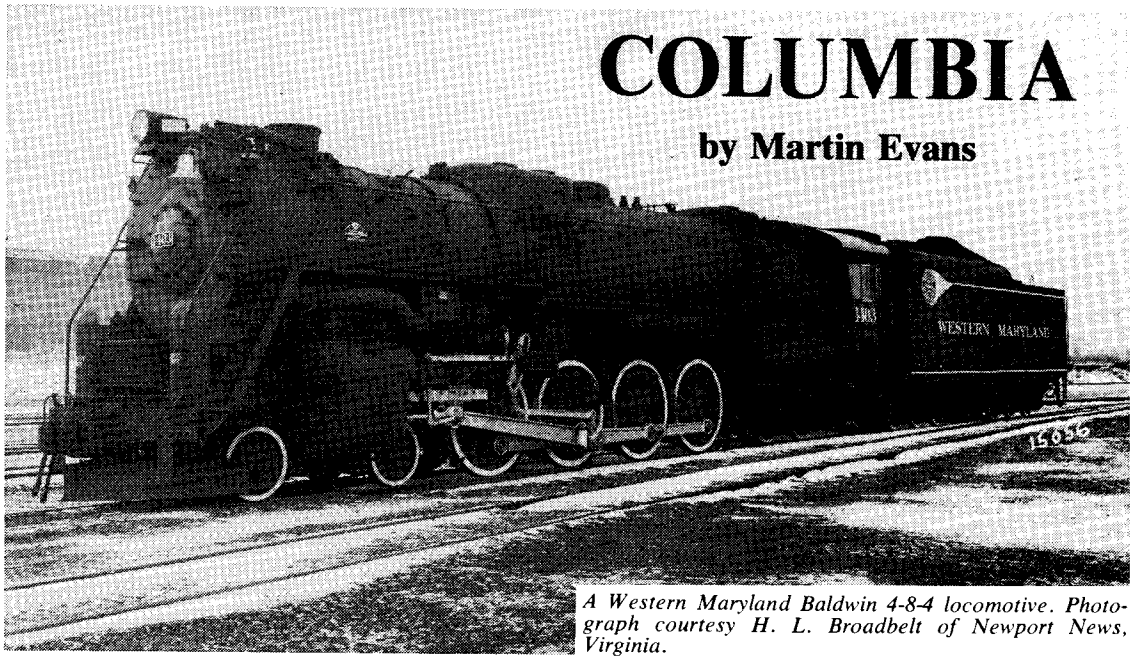
The cylinder brackets which support the cut-off levers etc., are simple cantilevers and a trifle unconventional by traditional standards. The load they are called upon to bear, however, is small and they are more than adequate for the job. Also, when in position, they are not unattractive.

It should be noted that the L.P. bracket requires a stud at the outer edge, which will be in the way of the pivot shaft bearing, which forms part of the bracket. The occasional spot of oil on these parts is all that is required.

To be continued

COLUMBIA

by Martin Evans



A Western Maryland Baldwin 4-8-4 locomotive. Photograph courtesy H. L. Broadbelt of Newport News, Virginia.

Part VI

From page 261

Martin Evans describes the boiler for his 3½ in. gauge Baldwin type 4-8-4 American locomotive

FOLLOWERS of these notes may perhaps be surprised to see the boiler of my 4-8-4 being described before the cylinders and motion and other "chassis" parts. However, there is a reason for this. Several builders, or prospective builders of *Columbia* wanted to know what material would be required for the boiler, particularly as regards the barrel, and at least one enthusiast had already started to build the boiler, basing it on some approximate dimensions I had given him. Apart from that, some locomotive builders prefer to make the boiler before the frames and motion parts, although they may be a bit nervous as to whether the firebox of the finished boiler will fit between the frames — a situation that won't worry *Columbia* builders as her big firebox sits on top of the frames!

One of the problems encountered when designing a big American type boiler is how to cope with the unavoidably very long barrel. In full size practice, such boilers nearly always had large combustion chambers, while the fireboxes were fitted with two or three Nicholson thermic syphons. Combustion chambers are not nowadays very popular in model boilers, as should a leak develop in them on hydraulic test, it is very difficult to deal with, being almost inaccessible.

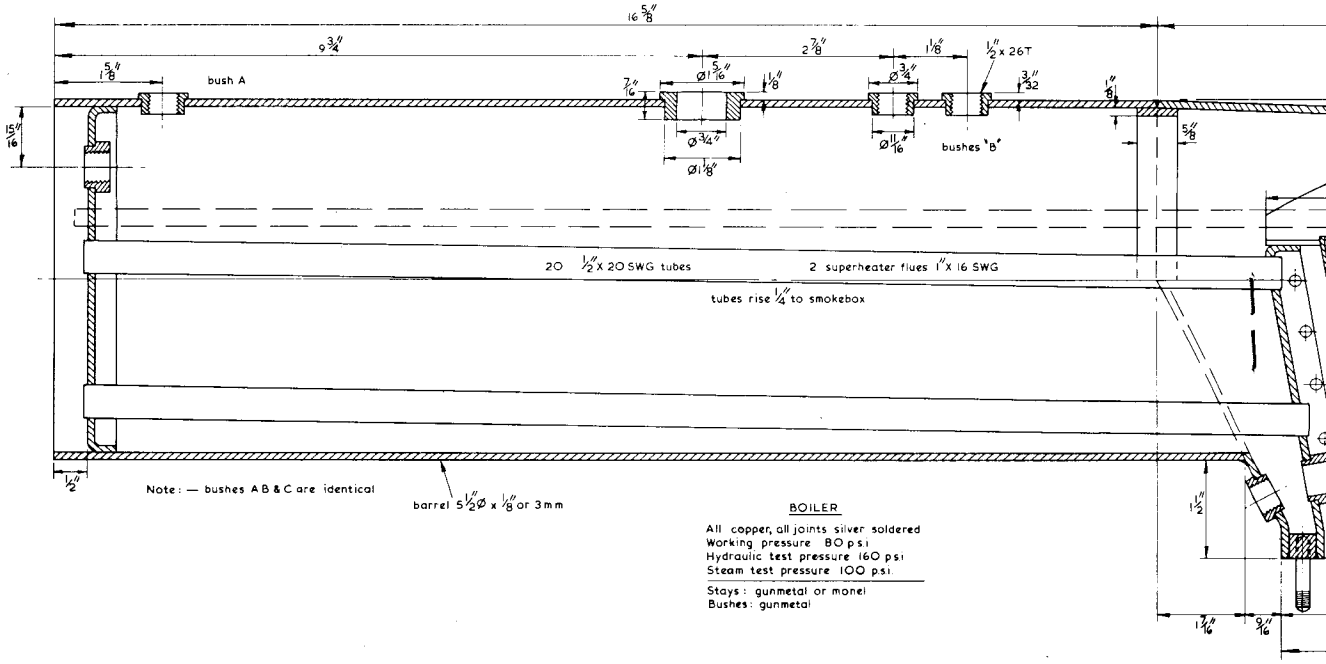
Although the fitting of thermic syphons does not in itself do anything to shorten the length of the tubes, the better circulation obtained by their use helps to offset the ill effects of overlong tubes.

The barrel of *Columbia's* boiler can be made from 5½ in. dia. seamless copper tube 1/8 in. or 3 mm. thick. If seamless tube is difficult to obtain the barrel can be rolled up from the sheet copper, the ends being butted together and a cover strap at least 3/4 in. wide, and the full length of the barrel (apart from allowance for the width of the tubeplate flange) riveted on the inside, the seam being then silver soldered.

Owing to the "tumble-home", typical of so many American locomotive boilers, it is hardly practicable to make the outer firebox wrapper from the same tube as the barrel, so a separate piece of 1/8 in. or 3 mm. sheet is used here, the joint between barrel and wrapper being strengthened by a "half piston ring", made from 1/8 in. sheet again, and 5/8 in. wide.

Contrary to the usual practice, I recommend that the four brushes on the barrel but not that on the rear end of the firebox wrapper, should be made up, fitted and brazed *before* the barrel is attached to the firebox wrapper. Apart from the fact that at this early stage, access to the bushes is easier, considerably less heat will be required. The bushes won't work loose when silver soldering the wrapper, throatplate or smokebox tubeplate.

The 1/2 in. x 26t bush at the front end is for the top feed fitting, and the two similar bushes to the



rear of the dome are for the safety valves. These bushes should be turned from drawn gunmetal. If a casting is used for the dome bush, make sure that silver solder is run all over it before fitting, otherwise it may well prove porous.

The five plates can now be flanged up, all from 1/8 in. or 3 mm copper sheet. For a "one-off" job, it is not worth while cutting out formers from solid mild steel. The method I use is to cut them out from steel about 3/32 in. thick, and attach this to hard wood — oak or beech does fine. The wood can be about 1/2 in. thick or a shade less.

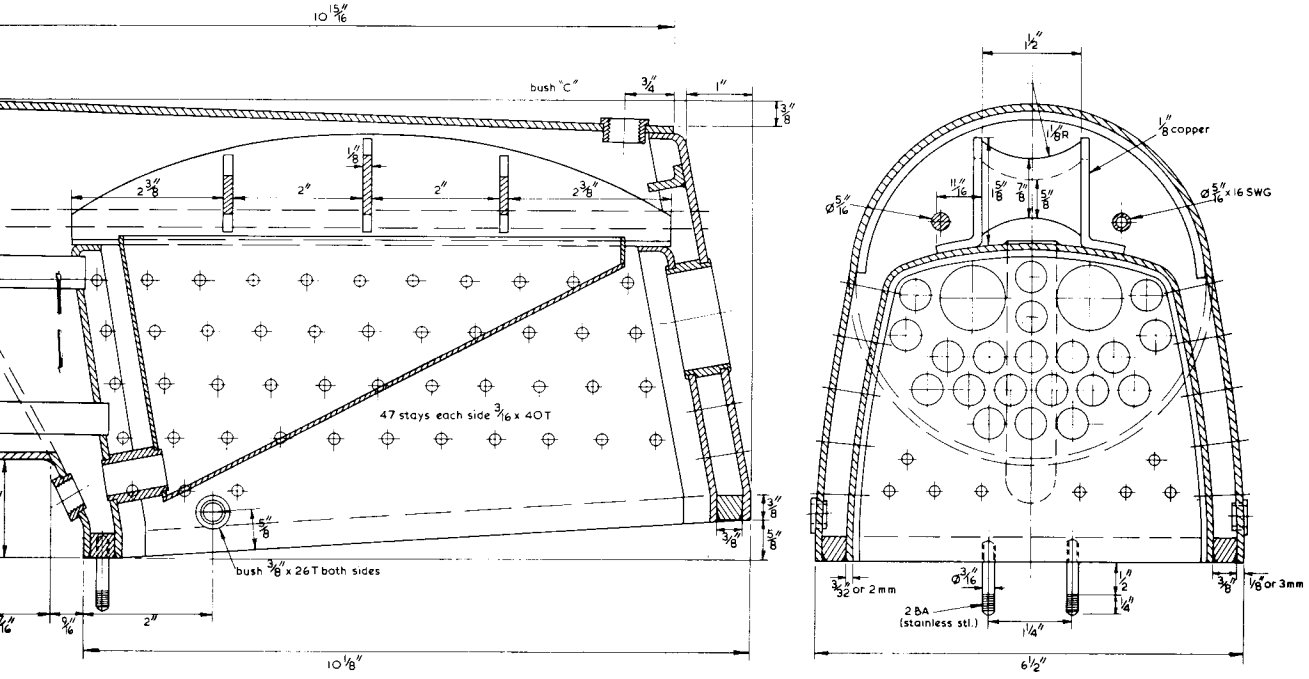
After marking out the centres of the tubes and flues on the firebox tubeplate, drill them 1/8 in. to start with, then use this as a jig for drilling the smokebox tubeplate, not forgetting that the holes will be 1/4 in. higher up, due to the upward slope of the tubes towards the smokebox.

The 1/2 in. holes in the firebox tubeplate should not be drilled or reamed to full size, but left a few thou undersize, this being accomplished by only using the "lead" of the reamer. As the firebox tubeplate slopes quite considerably, the reamer should be put partly through again, with the tubeplate held firmly at the required angle. If this is done on the drilling machine, don't hold the tubeplate in the hands, but hold it firmly with a large toolmaker's clamp. Actually, this operation is better done in the lathe, as most drilling machines, even on their slowest speed, run much too fast for reaming at this diameter.

Owners of the larger lathes will be able to bore out the 1 inch holes for the superheater flues on the lathe; here also, the holes should be left a shade undersize. Now file three or four small "nicks" in each of the tube and flue holes, not deeper than 10 thou; this will ensure that the silver solder penetrates properly. The holes in the smokebox tubeplate may be reamed out to full size and lightly countersunk on the outside.

The thermic syphon is not at all difficult to make; it is very similar to one I made for my 5 in. 2-6-2T *Firefly* some years ago. It is bent up from 1/16 in. or 1½ mm. copper sheet (after thoroughly annealing of course), the two sides and the bottom being in one piece. We then need a piece of similar thickness to form the front and a much shorter piece for the back. To hold these pieces to the sides, it pays to leave little "tags" on each side, and to rivet them on with 1/16 in. snaphead rivets. This will prevent things coming adrift when the heat is applied. The stays are now fitted, these being turned from drawn gunmetal and threaded 4 BA. There is really no need to fit nuts if every stay is given a good fillet of the silver solder on the outside. Experienced boiler makers can use 1/8 in. copper rivets, or copper rod, in which case they can be riveted over on the outside. This is not as difficult as it sounds, for as the top of the syphon is open, a bar of steel of suitable shape and 5/8 in. thick can be inserted to support the syphon and prevent the sides from being distorted.

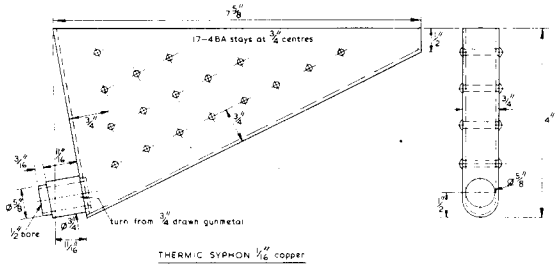
For the connection at the bottom of the syphon to the firebox tubeplate, a short length of gunmetal



bar is used, 3/4 in. outside diameter, bored through 1/2 in. and turn down at each end to 5/8 in. diameter for about 1/8 in. for the syphon and 3/16 in. for the firebox tubeplate. This can be made a tight push fit in the front plate of the syphon and brazed with something of rather higher melting point than Easyflo. Argobond or C.4 alloy (740-780 deg. C) would be ideal.

Incidentally, the hole to receive this tube in the firebox tubeplate should be left about 1/8 in. undersize in diameter at this stage; it can be opened out after the inner firebox has been completed.

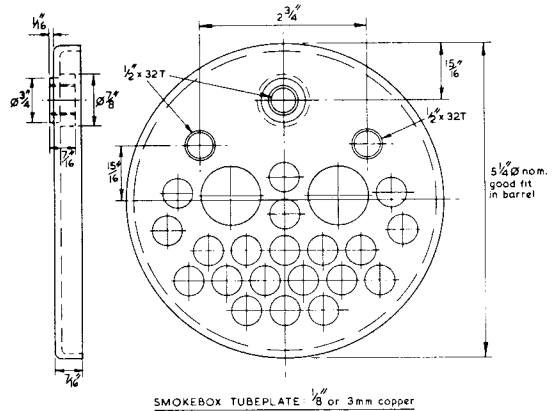
To return now to the throatplate, this has a large bush brazed to it, this being done before assembly. The bush is to allow for cleaning of the syphon connecting tube. To get the shape at the top of the throatplate correct, it is offered up to the barrel and outer firebox wrapper, when it will be seen how to obtain a nice fit. It should butt up against the end of the barrel, so that the pressure inside the boiler tends to force it against the barrel.



The inner firebox wrapper is made from 3/32 in. or 2 mm. copper sheet. It should be quite easy to bend, even without bending rolls. Hold it to the flanges of the firebox tubeplate with a few 3/32 in. copper rivets — just enough to keep it in place and to shape while silver soldering.

The next item on the agenda is the tubes and flues, which can now be cut to length and cleaned up. At the firebox end, they should be very lightly turned down for a length of 3/16 in. so that they can be just pushed into their holes by hand pressure. Don't overdo this or the tubes will be slack, only a thou or two will be sufficient. Owing to the slope of the firebox tubeplate, both the tubes and flues will vary somewhat in length, so to ensure that they are cut to the required length, put the embryo inner firebox temporarily into position, holding it there with the front section of the foundation ring — made from 3/8 in. square copper bar — and a couple of toolmaker's clamps. Now measure from the outer face of the tubeplate to the front end of the barrel and deducting 3/8 in. to allow for the smokebox tubeplate being some 1/2 in. inside the barrel. Actually the difference in length will not be much of a problem as the two superheater flues and the upper four tubes may be regarded as the shortest, while the third, fourth and fifth row of tubes will call for about an additional 1/8 in., 1/4 in., and 3/8 in. respectively. In any case it is better to err on the long side for obvious reasons!

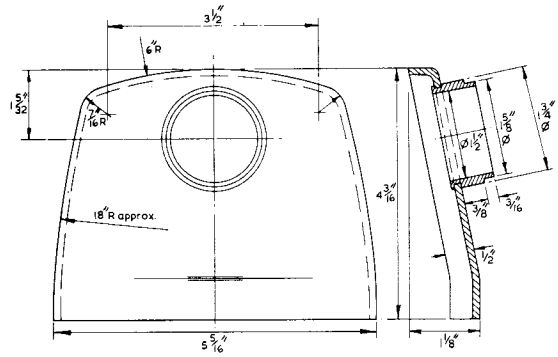
To make sure that the silver solder "takes" properly, it is a good plan to dip the tube ends in the



SMOKEBOX TUBEPLATE ⅛" or 3mm copper

acid pickle for 15 minutes or so, then washing in hot water before pressing them home in the tubeplate. The smokebox tubeplate is used to support the outer ends of the tubes and the assembly so far is up-ended for silver soldering the tubes to the firebox tubeplate. This can be done in the one heat if care is taken. I always use Easyflo No. 2, bending up little rings of the solder and slipping one over every tube, up against the tubeplate. Plenty of flux is then added and the whole heated up, the flame being mainly played on the underside. When the assembly has reached a dull red heat, the solder will flow all round the tube ends and will seep through the nicks made in the holes in the tubeplate. It should be possible to see a silver ring around every tube on the inside of the firebox, after pickling and washing. If any tube end looks doubtful, don't risk it, but heat up the whole assembly again, after cleaning out the doubtful place.

The thermic syphon is fitted next, the slot in the top of the firebox wrapper being filed until the syphon is a good fit all round. The syphon should protrude about 3/32 in. through the wrapper and



FIREBOX BACKPLATE: ⅛" or 3mm copper

being soft after brazing operations it can be very gently flanged over the wrapper all round, but don't overdo this on any account as it is very easy to distort the wrapper, being only 3/32 in. thick and very soft at this stage.

Where the syphon connecting tube comes through the firebox tubeplate, it can be silver soldered with Easyflo No. 2, so as not to melt or disturb the tubes just above it.

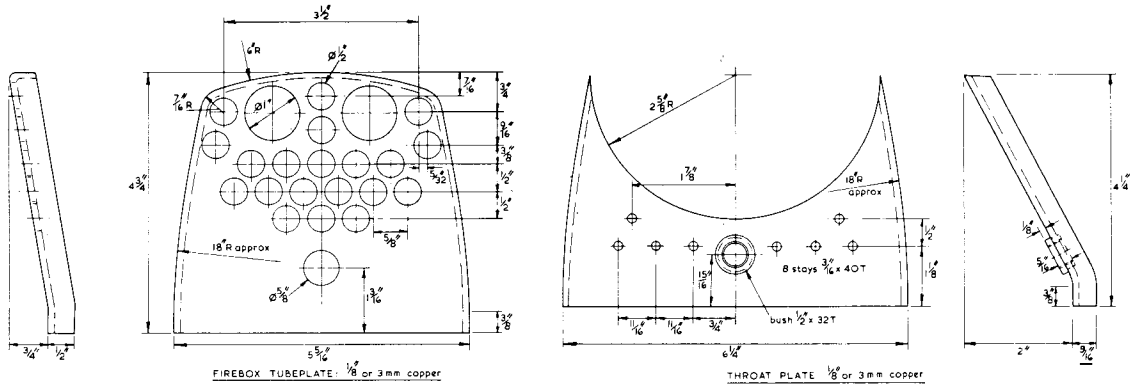
Crown stays

The crown stays are very easy to make. The two long members and the three cross pieces are all cut from the 1/8 in. copper sheet. The former must be the full length of the firebox wrapper as shown in the drawing. The cross pieces may be flanged at each side so that they can be riveted to the long members before assembly on the top of the firebox. About five 3/32 in. rivets to each long member will hold them down on the firebox, after which the whole is silver soldered, using Easyflo No. 2 again, and making sure that there are good fillets of the solder not only right along the long members, but at the joints between these and the cross members.

Our friends "down under", may not be allowed to use this method of staying, but as the syphon would get in the way of the usual type of rod stays, builders in Australia may be better advised to adopt the typical "LBSC" type of stay, continuing the long members right up to the outer wrapper. I would add, however, that the type of staying shown on the drawing is amply strong enough, and quite easy to make and fit.

Having completed the crown stays, the firebox backplate can be prepared, the firehole ring being turned up from 1¾ in. o.d. x 1/8 in. thick-walled copper tube, lightly flanged over on the inside and brazed; it can then be assembled inside the firebox wrapper, after which the whole inner firebox assembly can be inserted in the barrel and outer wrapper, the front and side pieces of the foundation ring fitted, and held in position with a few 3/32 in. rivets, and the tubeplate inserted — this being secured by three or four gunmetal screws, about 6 BA, put in around the periphery of the barrel and filed flush.

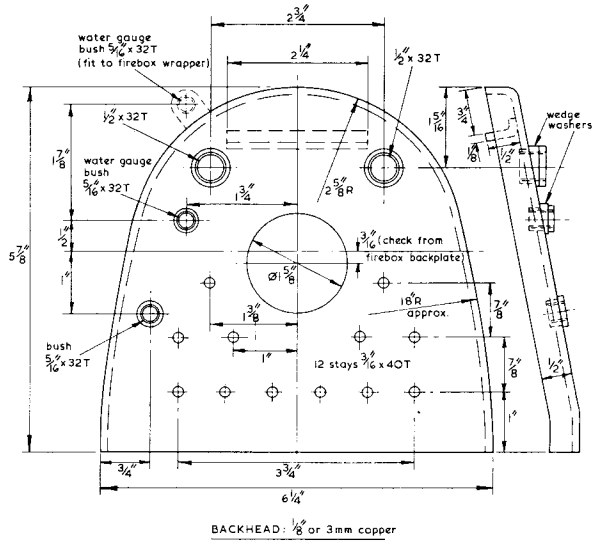
Beginners often have trouble in getting all the tubes through the holes in the smokebox tubeplate; a little coaxing with an ordinary pencil is a great help. The ends of the tubes can now be lightly expanded, for which we will need a couple of taper drifts. A taper drill shank will probably be right for the 1/2 in. tubes; for the flues, a drift can be quickly turned up from an odd length of 1 in. mild steel. Polish the drifts well, grease them and give them a couple of sharp taps with a hammer. A side tap will usually release the drifts; if not they can be pushed out from the firebox end. The tube ends and the periphery of the tubeplate can now be silver sol-



dered; the flame being kept mainly on the outside, so as not to risk burning the tubes. Wads of asbestos string pushed down the tube ends will help here.

The backhead can now be tackled. After flanging, it is offered up to the boiler and the position of the firehole marked out. Four bushes are required, one on the left being for the solid longitudinal stay, one on the right for the hollow stay for the blower, the lower water gauge bush, and one further down for a check valve for the hand pump delivery. The first four bushes mentioned will need wedge-shaped washers, cut from copper sheet, in order to bring them level, the backhead being sloped quite considerably. To ensure that they are level while being brazed, tap them — 1/2 in. x 32t. — but not right through, just enough to hold the tap firmly and in correct alignment. If the bush is then pushed home, and it will have to be quite a tight fit if it is to stay put, it will be possible to see if it is level. The check valve bush doesn't need a wedge washer; it can be pressed straight in.

As there is a fairly large flat area near the top of the backhead which is not stayed or supported in any way, a piece of 1/8 in. copper, bent to an angle section and about 2¼ in. long, is fitted on the inside as shown; it should be held positively by a couple of gunmetal screws, about 6 BA, and brazed in position before the backhead is inserted.



As we cannot rivet the backhead in position in the usual way, a few gunmetal screws should be turned up to be put in at strategic positions. If No. 42 holes are drilled through both wrapper and backhead flange, and these opened out with No. 34 through the wrapper only, the holes can be tapped 6 BA and the screws will then pull the wrapper in closely all round.

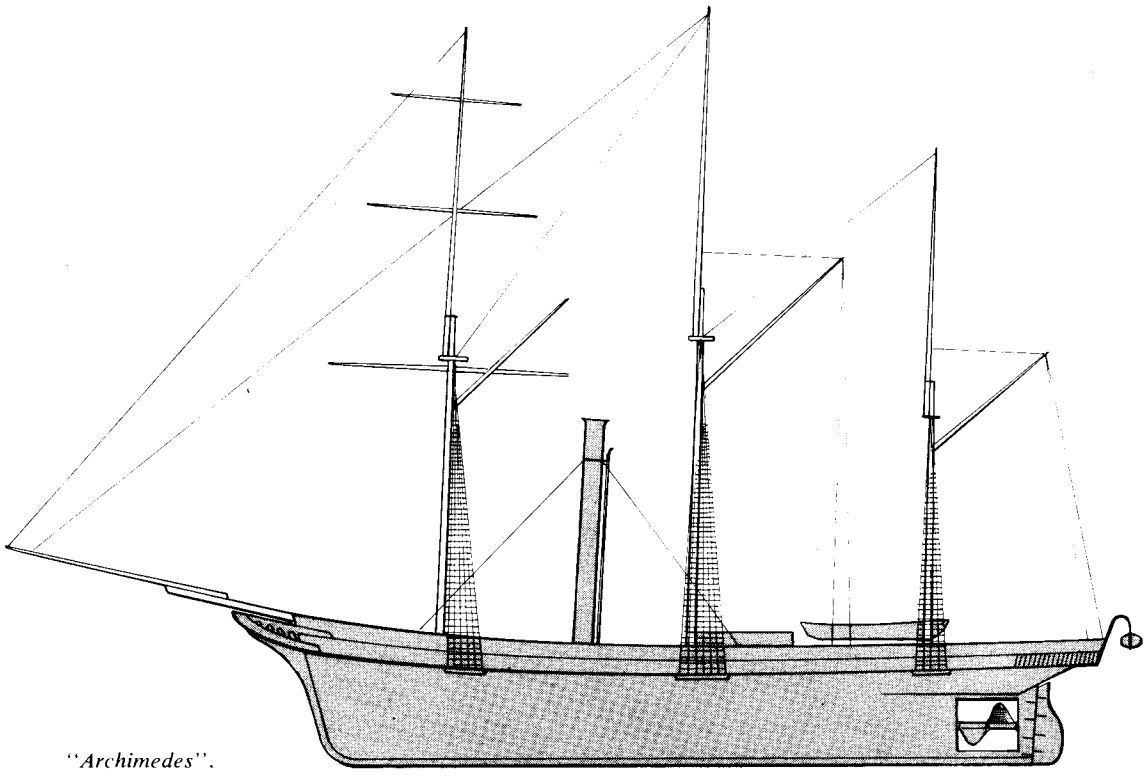
The rear section of the foundation ring is now fitted, and any gaps left in this ring filled up by slivers of copper driven in (there shouldn't really be any gaps if care is taken in fitting the pieces of square copper!) after which the firehole ring can be lightly peined over, the firebox backplate being supported on the back on a stout bar of steel held in the vice. We will then be ready for the final silver soldering job.

A tip for beginners. When making threaded bushes for boiler work, don't drill them right through, leave just a thin "wall" on the inside. Also do not complete the tapping, but use a "second" tap put in far enough to ensure that the threads can be "picked up" again later. The idea of this is twofold. If the tapping is done right through, the threads will be spoilt by the heat generated while silver soldering; the fact that the bushes are left "blind" saves having to plug them when giving the boiler its hydraulic test. When all testing has been completed, the bushes can be drilled out, using a tapping drill just a shade under the nominal size, and following up with a taper or second tap right through.

Erratum

Several readers have written to point out a slight error in the drawings of the truck pin stretchers on pages 139 and 140. The countersinking of the fixing holes should be on the underside of the stretchers, not on the top as shown.

To be continued



"Archimedes".

THE EARLY HISTORY OF THE SCREW PROPELLER

by Vic Smeed

Part II

From page 295

THE SUCCESS OF *Archimedes* led to many other vessels being fitted with a screw, and in particular the first screw ship built for the R.N., the *Rattler*. This 888-ton vessel, laid down in 1841 and launched at Sheerness in Spring 1843, was first fitted with the two-start half-convolution Smith propeller, but was tried with dozens of experimental screws. None gave better performance until a Smith type cut down to one-sixth convolution was fitted.

Rattler was tried (i.e.) raced against *Alecto*, a paddle vessel of similar displacement and h.p., and convincingly beat her under all conditions. One of the most telling races was in a gale force wind, from Cromer to Spurn Lights, about 60 miles; *Rattler* finished 40 minutes ahead. The two ships were then shackled stem to stern, and at full power on each the screw vessel towed *Alecto* at 2½ m.p.h.

Most important from a naval point of view was the disposition of armament allowed by the screw and the ability to site all the propulsion components below the waterline. These considerations, added to the superior performance of *Rattler* over 24 paddlers used for comparison, induced the Admiralty, already intending to embark on an

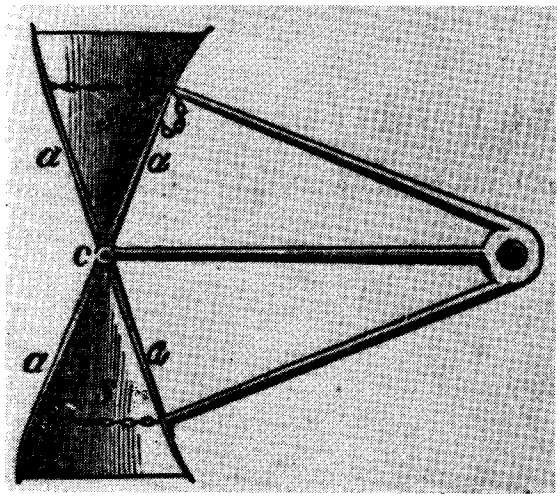
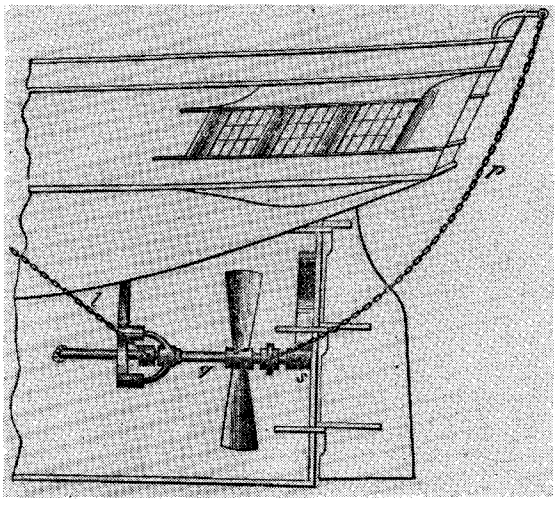


Fig. 8: William Joest (1841) had only limited success with his fishtail action screw.

expansion in 1845 , to order 23 ships to be built or remodelled for screw propulsion, under the supervision of F. P. Smith. A free hand was given to Boulton & Watt, Maudslay & Field, Robert Napier, Seaward, Miller, Penn, Fairbairn, Scott, and Sir John Rennie, for the new engines required, provided only that the engines were kept below the waterline, and some novelties emerged.

The only slip-ups occurred in the actual hull designs, several of which were very full-bodied, particularly in the run. *Archimedes* had been deliberately designed with a very fine entry and run and the fuller hulls were disappointing. An Admiralty engineer, Lloyd (actually Chief Engineer of Woolwich Dockyard), who had been associated with *Archimedes'* trials, pressed for experiments to clear up this point. The *Dwarf,* a 130 ft. iron screw vessel purchased (ex-*Mermaid*)

Fig. 9: Elijah Galloway's design for shipping a propeller.



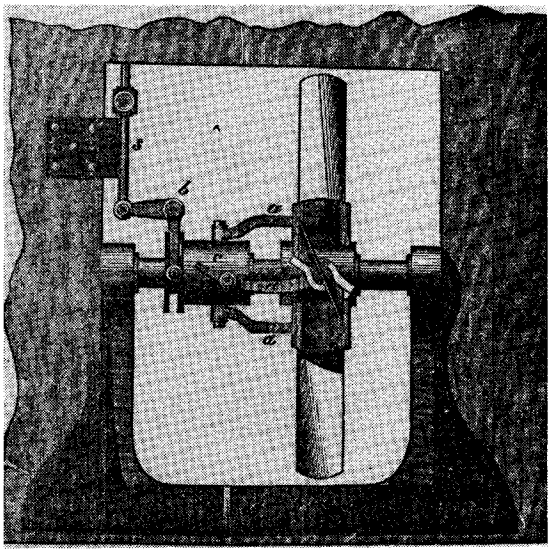


Fig. 10: 1824 Bennett Woodcroft's variable pitch screw.

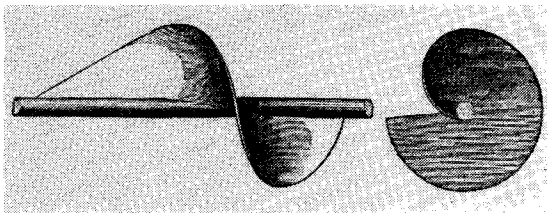
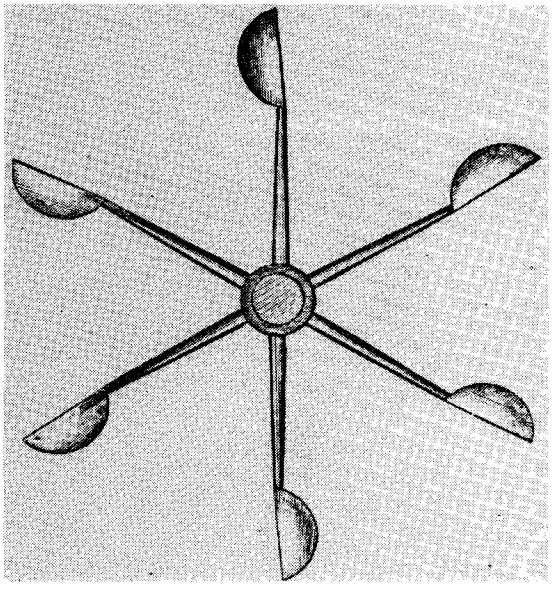


Fig. 11: Charles Forret's 1845 patent.

Fig. 12: Although difficult to appreciate, this 1845 design by Thomas Parlour is a screw. The blades are each half a hollow cone and the axis runs fore and aft.



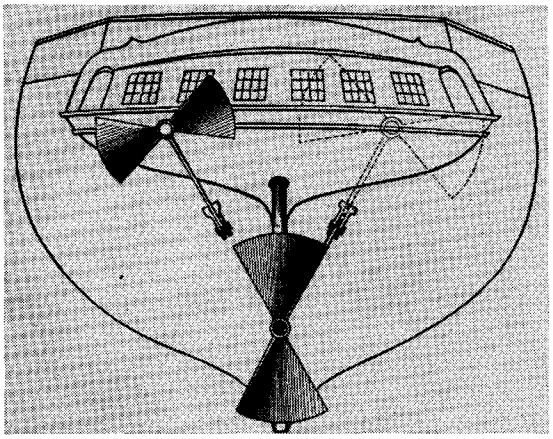


Fig. 13: An 1846 design by James Montgomery for unshipping propellers allowed different units to be used.

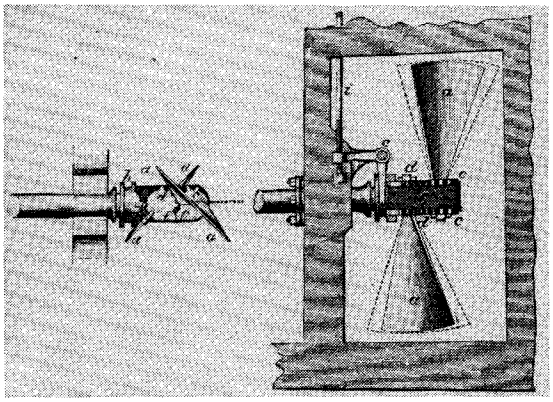


Fig. 14: An 1848 feathering prop by Joseph Maudsley.

Fig. 15: In 1850 John Beattie mounted the prop aft of the rudder.

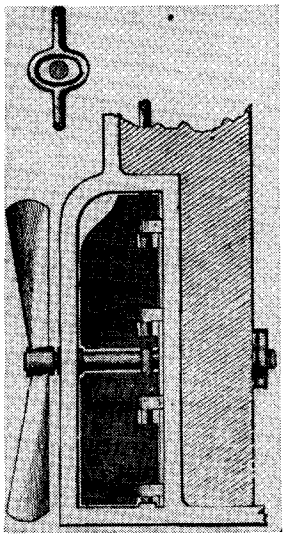
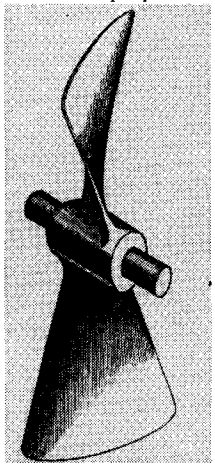


Fig. 16: Ultimate development by Francis Smith of two-blade prop.



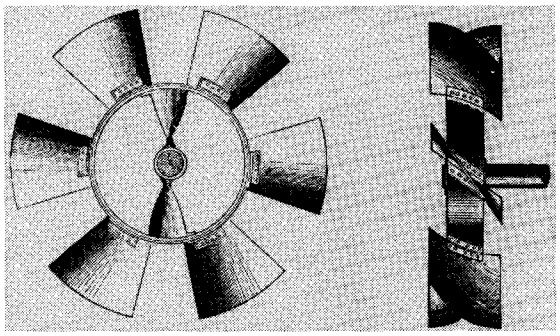


Fig. 17: Screw wheel by Captain Ericsson used by American ships up to 1850.

by the Admiralty in 1843 and thus the first screw vessel actually operated by the Navy, was taken into dock and her afterbody filled out by three layers of timber, each faired and capable of dismantling without affecting the layer beneath, to the full bodied form suspected of causing the trouble.

In experiments in October 1846, *Dwarf* produced 3.25 knots with the engines able to make 24 r.p.m. With one layer stripped off, she made 5.75 knots and 26.5 revs., and with no filling she was back to her normal 9.11 knots and 32 r.p.m. These experiments were followed by comparisons between *Sharpshooter* and *Rifleman* and another similar pair, *Minx* and *Teazer,* one of each pair being fuller bodied and able to achieve only 75 per cent of the respective finer-lined ship's performance. Finally, two ships, *Niger* (screw) and *Basilisk* (paddle) were built as identical as possible; extended trials came down in favour of the screw version.

The last factor which brought home the advantages of the screw was the eventual realisation that when a ship is under sail, she cannot in practice cancel the effect of the screw, while it is possible to overrun paddle wheels at relatively low speeds. In other words, a paddle-ship's speed under water is limited by the float speed of the paddles, and if she reaches that float speed under sail, the paddles cannot contribute any thrust. The combination of screw and sail can, however, produce a speed greater than that achievable under screw or sail alone. It may seem strange that this came as a surprise to those early experimenters, but since they were on new ground with little to guide them but imagination and ingenuity, one can only marvel at the speed at which they progressed.

In a future issue, Vic Smeed will discuss "Great Britain's" later engines. Replica engines are at present being built for display alongside the ship.

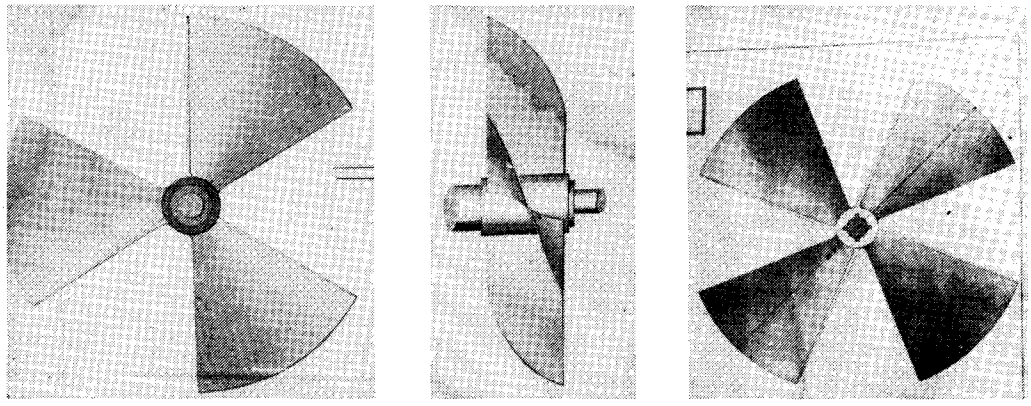
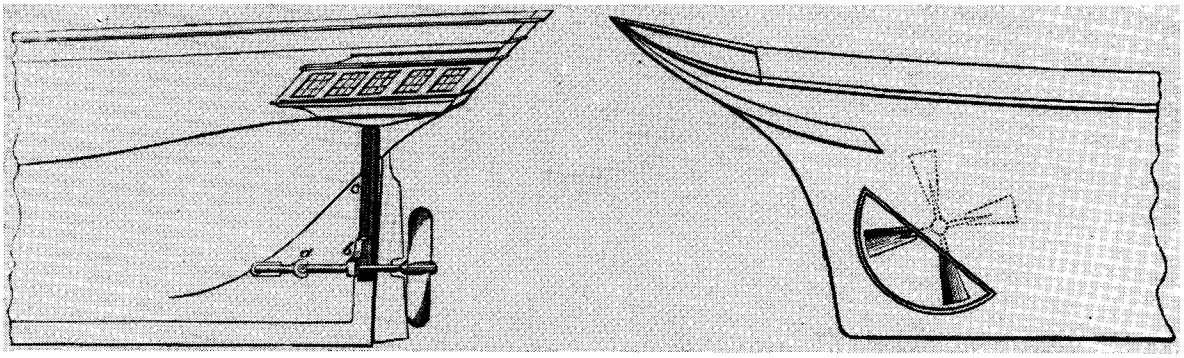


Fig. 18: Left and centre – 15 ft. 6 in. prop for re-engined "Great Britain" by Brunel. Right – Ericsson's frigate design.

Fig. 19: In 1850 Henry Wimshurst developed the propeller lift (left) and a bowthruster (right).



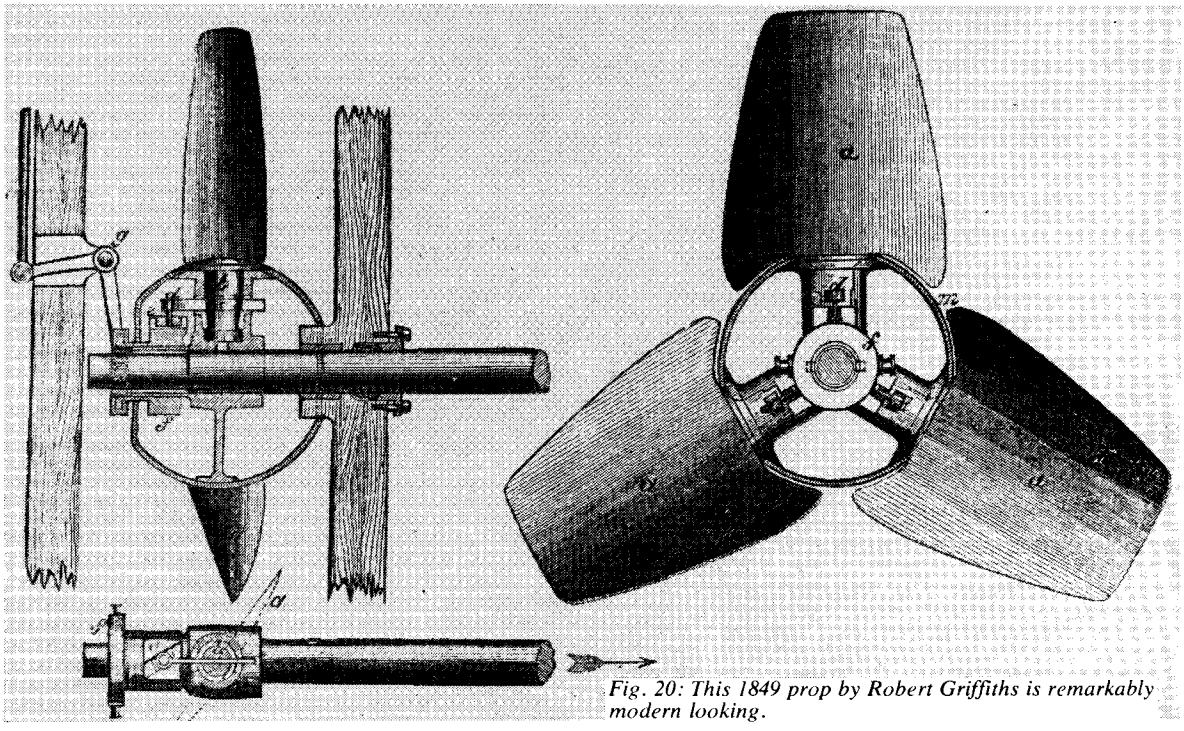


Fig. 20: This 1849 prop by Robert Griffiths is remarkably modern looking.

WHY NOT RUN A RAILWAY ?

by Doug Hewson

photographs by George Wainwright

Part II *From page 167*

The trackwork of the Gresley Central Railway

Trackwork

In dealing with the trackwork at Gresley Central I have decided not to describe how it was all constructed but to describe what should be done having gained, as the builder has, thirty years of ground level experience.

I hope the following description will assist Clubs and Societies and any individuals who are contemplating going ground level to build their tracks with most of the pitfalls removed. If you fall in any pits they will be ones that we haven't thought of.

If one intends to build a ground level line the area in which it is to be situated must be considered in deciding on the form of construction. Unfortunately these days the possibility of vandalism is never far from people's minds and when a lot of work is to go into a project like this it needs to be "permanent way". If the track was laid dead to scale not only could it be ripped up easily but could be distorted merely by someone tripping over it.

As in all good stories one needs to begin with a plan. A survey must be made of the area allocated with positions of any trees or fences etc. and any other fairly movable objects marked on the plan. If the ground is fairly level it helps but a few hills and hollows can make life interesting.

When the survey has been plotted the track layout can be decided upon using curves of a suitable size to allow most locos round. The sharpest radius at Gresley Central is fifteen feet, believe it or not, and a *Speedy* and *Maid of Kent* go round quite easily.

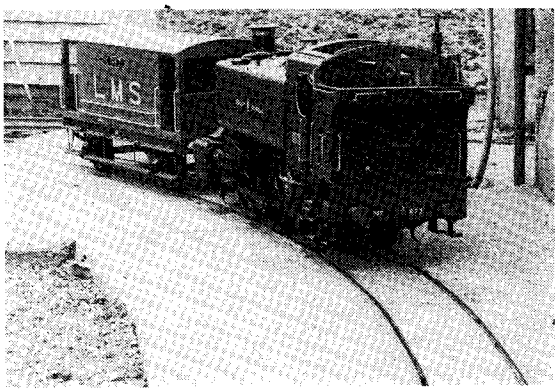
Once a scale plan has been drawn up the "limits of deviation" can be pegged out. It is recommended that wooden pegs are used and a pair knocked in either side of the line about five or six feet apart and at, say, fifteen feet intervals along the proposed line. See Fig. 1.

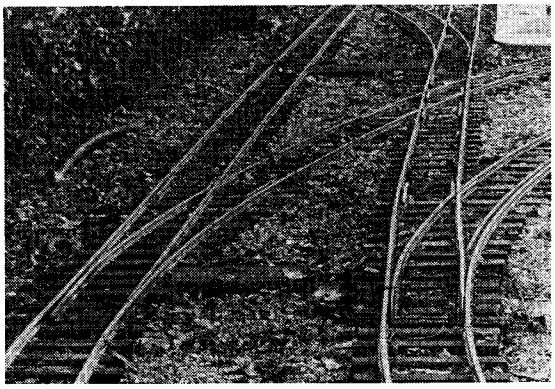
The next job is to take levels on the ground at the fifteen feet intervals (between each pair of pegs). A good levelling instrument can be made by using a hosepipe full of water with a piece of clear plastic tube pushed into each end. From the set of levels, the ruling gradients can be worked out, I would recommend no steeper than one in a hundred. Working levels can then be marked on the pegs using nails in the sides of the pegs to mark the level. The levels will have to be marked on at some known distance above or at the proposed rail level, never below. The depth of excavation or height of embankment can be determined by putting a lath across between the pegs and measuring the known distance *down* to required level. See Fig. 2.

If one has embankments of course longer pegs will be required. At this stage the type of track construction must be decided upon and basically there are three ways of tackling the job. One is to mount the track on heavy longitudinal timbers such as old railway sleepers, the second is to construct the track like the old "0" gauge track on longitudinal battens, in this case about 3 in. x 2 in. on edge. Lastly the scale track can be laid straight on the ballast. Curved track in any case should be battened somehow.

So you see the depth of excavation depends upon the type of track chosen. To make the track as vandal-proof as possible the first choice is the obvi-

Left: Speedy *on the 15 ft. radius curve.*
Below: Bankside junction, a close-up of the turnouts.





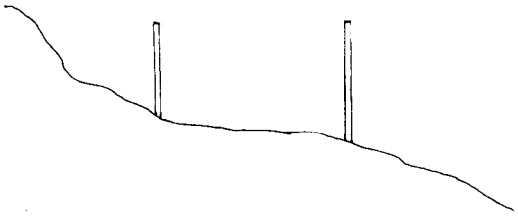


FIG 1

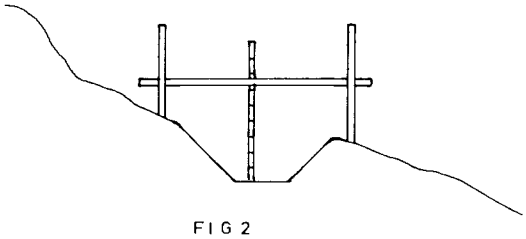


FIG 2

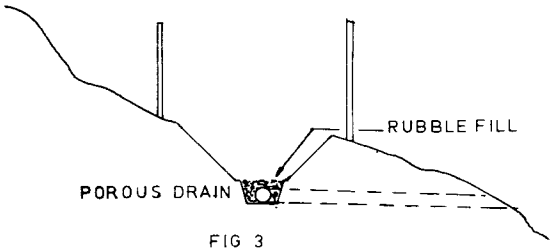


FIG 3

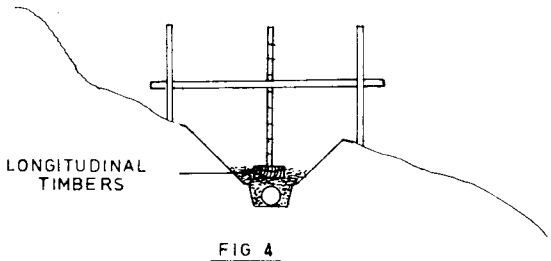


FIG 4

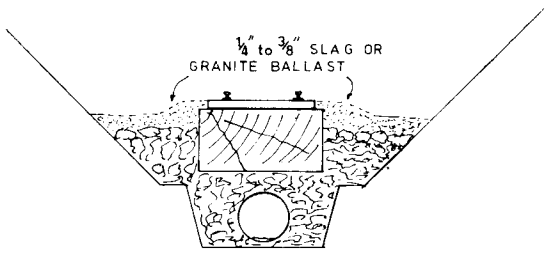


FIG 5

ous one but does of course require a fairly deep excavation. The extra effort though is well repaid by the lack of maintenance required once laid.

The next consideration of course is drainage and if the soil is heavy clay a deeper trench still will be required as adequate drainage will have to be incorporated under the track, see Fig. 3. When the excavation, if any, is to the required depth the pipes can be laid then the rubble or aggregate can be tipped in and consolidated.

If alternative one is being used the longitudinal timbers are now laid in and packed to the correct level with numerous bits of slate or asbestos sheet etc. They must not rock about. If alternative two is used some ballast can be put in first. When the timbers are down we are ready to begin laying our scale track, (Fig. 4). The finished article should look like Fig. 5.

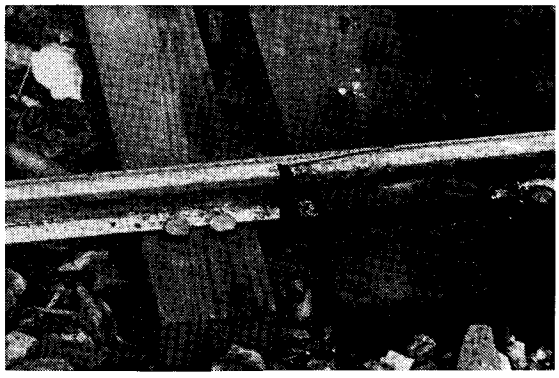
The track at Gresley Central has been down now for about thirty years and last year for the first time some re-sleepering had to be done and it is all on soft wood sleepers using aluminium flat bottomed rail.

The sleepers are 9 in. lengths of Douglas Fir or similar and are 1¼ in. wide by 1 in. deep. All require predrilling to a jig (Fig. 6) and as this job spells instant boredom it should be given to the most unpromising new club member as a deterrent. This way you will either get a good job done free as it were or he will leave after two weeks, either of which would be admirable.

Next you need an old five gallon drum or tins (or 25 litre in new money!) and pack it full of the drilled sleepers, ends upwards then top it up with creosote. You may need to finish off with a couple of bricks to stop the sleepers floating. After a couple of weeks soaking they need to drain and dry out otherwise you'll get messy making the track.

For making straight track it would be best to make a jig then the sleepers could be laid in, at 3 in. centres, the rail put on and spike away. The spikes are merely 1 in. galvanised plaster board pails of the large headed variety. They do not go through the rail but trap the flat bottom under the head, see

An expansion joint.



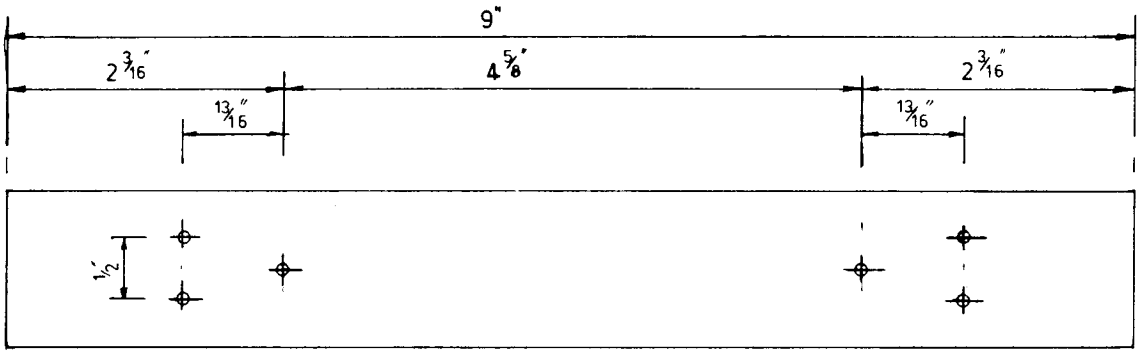


FIG 6. SLEEPER DRILLING

photos. For curved track only one rail should be spiked down and the second one added after laying temporarily in place.

For joining the track sometimes scale fishplates have been used and in other places pressed slide on ones similar to "00" track have been used.

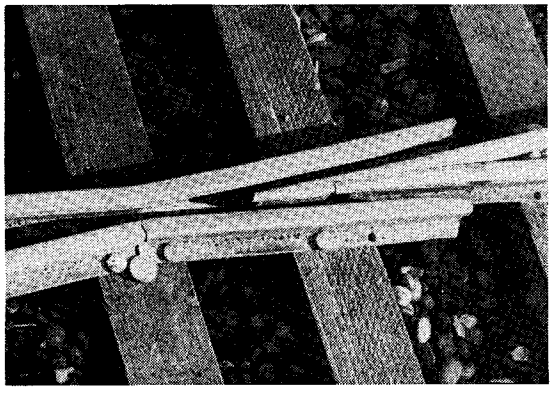
Now we can move on to building the points and crossings and ballasting.

Pointwork and Finishing off the Trackwork

Before we get involved in the manufacturing processes of the P & C work we had all better be familiarised with the correct terminology for the point and crossing parts. From what I have heard, unless people are connected with the permanent way industry in any way they stick to the terms which are wrongly perpetuated by the model railway press. One hears people calling turnouts, points on sets of points or pairs of points and that awful word "frog" is really the crossing.

For good running and freedom from derailments all turnouts must be set out correctly and clearances must be strictly adhered to, in addition to this all axles running on the track to the dimensions given must have wheels with a minimum back to back dimension of 4⅝ in., and preferably the recommended *M.E.* standard of 4.687 m.

A crossing nose showing point and splice rail.



I have given a table in Fig. 7 showing some recommended dimensions for turnouts. The longest turnouts on Gresley Central have a crossing angle of 1 in 7 and go down to about 1 in 5. The longest wheel based engine on the line is the B.R./W.R. 1500 class "Speedy" and she seems to have no bother so you see one can have quite a comprehensive layout in a fairly small space using reasonable sized engines.

The first recommendation is to make a template to the desired turnout curve which will enable you to draw out a turnout in chalk on the workshop floor or footpath or better still on a large piece of 3-ply then it can be used over and over again.

The sleepers are not sleepers but crossing timbers but can be the same cross section as sleepers i.e. 1¼ in. x 1 in. All turnouts definitely require battens under the timbers for rigidity and can be made from the same section as the timbers.

The battens are first laid on the template to the arrangement as shown overleaf and then the timbers cut to the appropriate lengths and nailed to them at 3 in. centres. This should provide a rigid framework on which to build up the turnout.

The first rail to lay is the straight stock but the flange must be cut away as shown in Fig. 9 to accommodate the curved switch planing, hold this in place with a few temporary spikes. The crossing nose comes next and this calls for a bit of machining or arduous filing. The ideal machine is a horizontal miller but the job can be done on the vertical slide with an end mill. First the point rail has to be bent to half the crossing angle and then one side straightened off by machining the head and foot away, see Fig. 8. Next the other side has to be machined off to the appropriate crossing angle leaving a flat nose 1/32 in. wide.

The splice rail is so called because it is spliced into the point rail in the machined slot as shown.

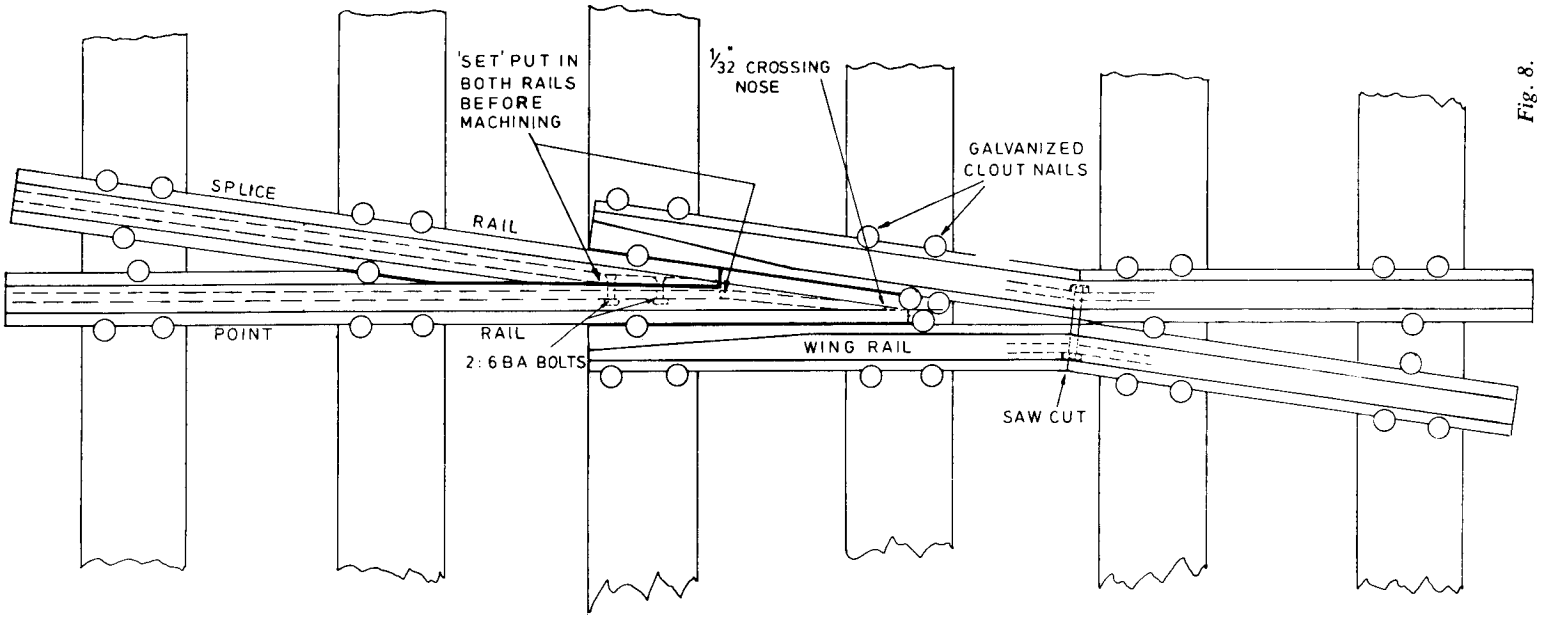
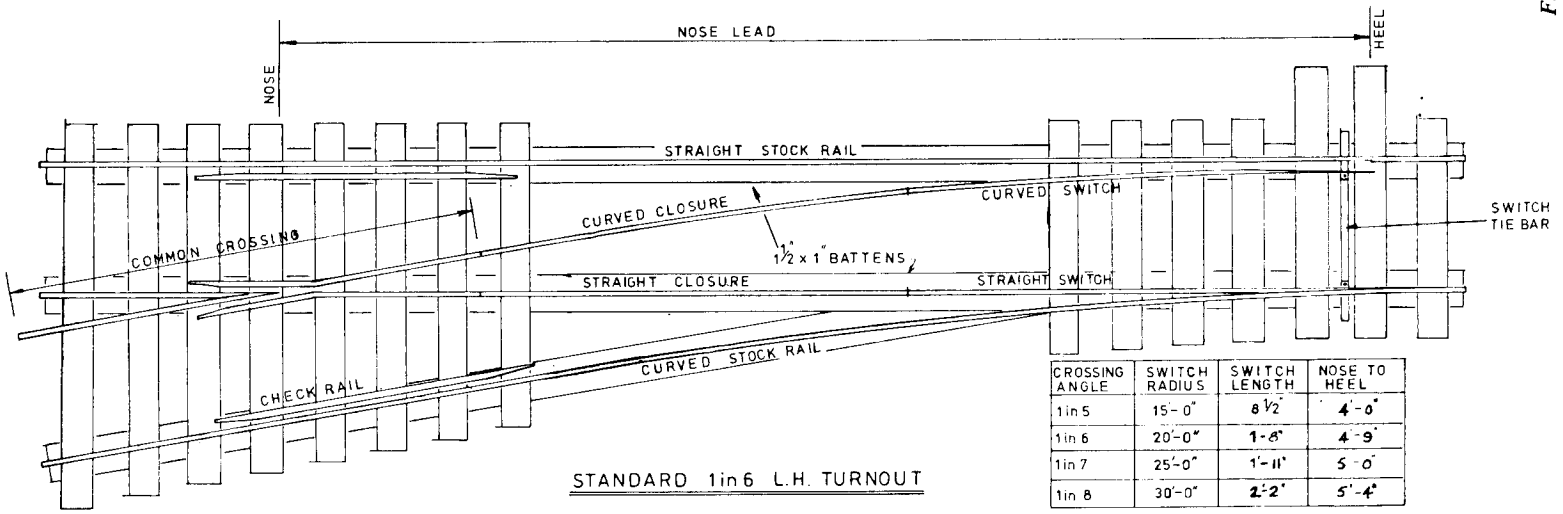


Fig. 8.

STANDARD 1in7 COMMON CROSSING.

Fig. 7.



STANDARD 1in6 L.H. TURNOUT

CROSSING ANGLE	SWITCH RADIUS	SWITCH LENGTH	NOSE TO HEEL
1in 5	15'-0"	8½"	4'-0"
1in 6	20'-0"	1'-8"	4'-9"
1in 7	25'-0"	1'-11"	5'-0"
1in 8	30'-0"	2'-2"	5'-4"

STANDARD 20FT. RADIUS SWITCH

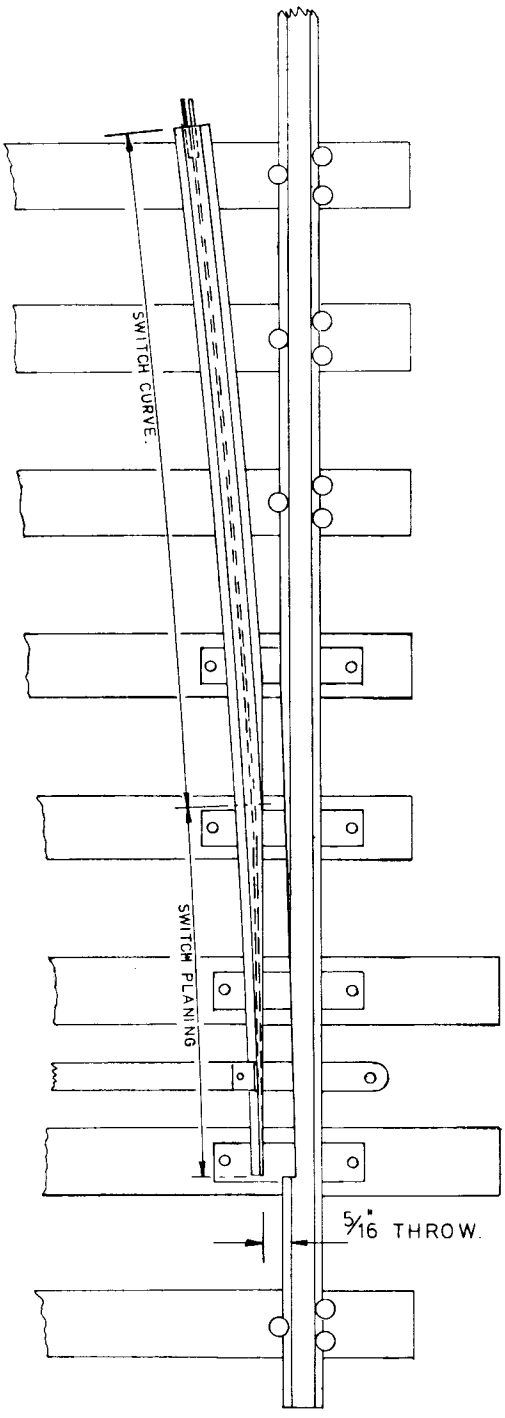
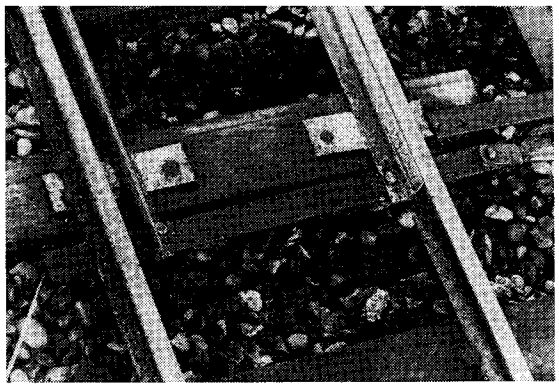


Fig. 9.



The switch blades and bar of a typical turnout.

The splice rail itself has to have an initial set put in it similar to the point rail and then has to be machined to fit the point rail and bolted to it with a couple of 6BA countersunk bolts.

The wing rails and closures can normally be made in one piece and merely require a saw cut in the bottom flange to assist with bending and the end chamfered off to form the check rail. The curved one of course requires bending to the template.

At this stage the common crossing can be trial assembled on the timbers and after checking to see that the gauge is correct a few spikes can be put in here and there to hold things in place — remember to pre-drill the spike holes otherwise you will split the timbers.

When all is lined up and "Hunky Dory" you can then put the curved stock rail on but don't forget the recess for the straight switch.

The timbers carrying the switches will require some "slide chairs" making. These can be made from a bit of 16 or 18 g x ½ in. wide half hard brass strip in varying lengths depending on the radius of switch being used.

To make the switches they need similar treatment to the point rail including the initial set again before machining. The switches are connected to the closures with scale fishplates, this should give enough flexibility for smooth operation.

The switch tie bar is a length of 1/4 in. x 1/16 in. brass strip bolted to the rails with some small angle brackets made from the same material. Finally chamfer and fit the check rails. You should now be ready to have a test roll with a bogie and if all goes well you can then put all the remaining spikes in and load it onto a bogie flat with an "Out of gauge load" sign on it for delivery to site.

When the pointwork is all laid in and tested with a lightly loaded vehicle the track can all be ballasted almost to the sleeper tops making sure everything is packed tight then you are about ready for the ribbon cutting ceremony.

To be continued

Club Chat... with the Editor

Let's start again this week with the news from the AGMs beginning with **Stafford & District M.E.S.** who held theirs on 30 January. Here is the line-up of the new officers: Chairman, Malcolm Armstrong; Vice-Chairman, Denis Edwards; Secretary, Tony Goddard (21 Trinity Rise, Stafford, ST16 1RX. Tel. Stafford 55557); Treasurer, John Griffiths; Events Organiser, Roy Marshall; General Committee members, Bill Walker and Dave Cooper.

At **East Sussex Model Engineers** the 12th AGM has just been held and all main officers re-elected. This is the club that lost Claude Reeve as President and the post is now filled by another founder member, Reg Barnes. The Hon. Sec. is R. W. Taylor who lives at 24 Mitten Road, Bexhill-on-Sea, Sussex (Tel. 216486).

At the AGM of **Cambridge & District M.E.S.** the new committee has got under way in no small measure by deciding to replace the existing track with a ground level for 3½/5/7¼ in. gauges. They hope to start work in the near future but feel that a visit to an existing ground level track at another club would be of benefit. Mr. M. J. Berry, the Hon. Sec. (9 Hemingford Road, St. Ives, Huntingdon, Cambs.) has asked me to pass on the congratulations of his club to the Leicester club for their part in the Midlands Model Engineering Exhibition. I will do that and add mine to them.

The new Hon. Sec. at **Milton Keynes Model Society,** following the AGM on 23 January, is G. Davis of 10 Highview, Deanshanger, Milton Keynes (Tel. Milton Keynes 563454). Nigel Cox of this club paid a visit to the Open University Model Electric Car Club and as a result has suggested a contest between the two clubs. If this comes off then I hope that someone can let *Model Mechanics* have details. The Publicity Officer and Editor at Milton Keynes is Bryan Mason who can be found at 3 Hertford Place, Bletchley, Milton Keynes (Tel. M.K. 77605).

Here's a new name in these pages. The **Surrey S.M.E.** started last June but kept pretty quiet until they found their feet. Meeting at the Baptist Church Hall, Lower Road, Great Bookham, Surrey on the third Thursday of each month at 8 p.m., the club is or has just completed negotiations for ground in the Leatherhead area. Several guest speakers have attended these meetings and the Society has also paid a few visits to places of interest around. The secretary is Mr. J. E. Cook who lives at 27 Vallis Way, Hook, Chessington, Surrey (Tel. 01-397 3932). He tells me that they have applied to join the Southern Federation of S.M.E.s.

At the AGM of **North Cornwall Model Society** on 6 February, Ken Stanton-Nadin was elected Chairman and Allan Mackintosh Secretary-Treasurer. The latter gentleman lives at Springfield, Marshgate, Camelford, Cornwall. For prospective members, the club meets on the first and third Tuesdays in each month either at Melbourne Cottage, Boscastle or at Springfield, Marshgate. The club has been in existence only three years and new members would be very welcome.

Another AGM, this time at **Cleveland Association of Model Engineers,** put Norman Reed in the Chair, James Featonby in the Treasury and William Sharp in the Hon. Sec. position. Mr. Sharp lives at 3 Coverdale Road, Fairfield, Stockton-on-Tees, Cleveland. This club is also relatively new — only two years old in fact but already it has a club loco in 7¼ in. gauge based 'loosely' on LBSC's "Invicta".

The **Model Engineers Society N.I.** held a meeting on 2 February to elect new officers as the AGM in January was not well supported no doubt due to fuel shortage and the weather. So the poor old committee has served an extra month. We haven't yet heard the outcome of the meeting so no doubt next issue should see some new names for this club. The new track which has been mentioned many times in *M.E.* has not yet been officially opened but is ready for the coming season. Readers may recall that the Cultra track is now a big one and drivers are reminded to carry sufficient coal and water to complete the run.

At **Bracknell Railway Society,** Les Darbyshire, the secretary, has resigned and his place has been taken by Mr. D. J. Ranson of Great Oaks, Brockenhurst Road, South Ascot, Berks. The club has a 3½/5 in. track and public running days are listed in "Club Diary".

Two changes occurred at the AGM of **Witney and West Oxfordshire S.M.E.** They are for the President who is now Dr. Saville Bradbury, and the Hon. Sec. who is Mr. A. R. Penny of 34 Laburnum Crescent, Kidlington, Oxford (Tel. Kidlington 4669). The club holds its Open Day on 19 May. An interesting project for the club is the installation of automatic solid state signals.

Aberdeen M.E.S. is currently building a track and concrete posts are being made by a builder but it looks as though the heavy stuff of digging out will be by sweat of brow. Keep us posted on progress, lads.

The AGM at **Southampton and District S.M.E.** was held on 28 March so we have to wait for any changes in officers. Over this winter the club has been trying to complete its track laying programme which started last year. They have 600 feet to be re-laid so the best of luck and I hope they made it in time for the new season.

North London S.M.E., fresh from another triumph at Wembley, and, I hope, their annual dinner/dance on 17 February, are now back into regular club meetings and future arrangements for the coming year. They hope to have Open Days on 17 June and 9 September. An important future engagement for this club starting next year will be the competition for the LBSC Memorial Bowl which up until now has been held at the M.E. Exhibition. This year, as readers will have realised, there was only one entry and it was decided that the competition would be better supported if a club were to be hosts during the summer. The North London club, of course, are already well-known for their LBSC Rally in 1977 which they held to commemorate LBSC's death ten years earlier, and have kindly agreed to take on the task. However, more of that later.

The **Vale of Aylesbury M.E.S.** is another club which is currently building a track and the frozen ground has meant a delay in the heavy work progress. Going by the Newsletter there are some Arctic conditions to be found around Aylesbury.

The AGM at Blackgates, where **West Riding Small Locomotive Society** live, was scheduled for 31 March so more about that in a later issue.

The **Ascot Locomotive Club** lost a very treasured member on 27 January with the death of Henry E. May at the age of 64. Mr. May was Chairman, Treasurer and Founder Mem-

ber of the club and his locos, a 2½ in. L.M.S. 4-6-0 Jubilee, a 3½ in. L.N.E.R. 4-6-2 A1/1 and a 5 in. L.N.E.R. 4-6-0 B1 *Nvala* will be a permanent memorial to his efforts. At the time of his death, Mr. May was constructing a 5 in. gauge New South Wales Government Railways 4-8-4 + 4-8-4 AD60 class Beyer-Garratt from the original Beyer-Peacock drawings. Mr. Alford, Hon. Sec. of the Ascot club, tells me that when finished, the loco should find its way into some railway museum, so high was the standard of construction. It is possible that we may see photos of it in *M.E.* before long. The raised track now owned by Bracknell Railway Society and the first 1900 ft. of Ascot's 3000 ft. ground level track were all welded up by Mr. May and in addition to his obvious devotion to the club, and the Ascot Fire Brigade in which he served for 42 years, his family automobile business, started by his father in 1912, reached a standard of workmanship which enabled it to service H.M. The Queen's vehicles at Windsor. Mr. May was President of the Windsor, Eton and District Royal Warrant Holder's Association, and Trustee and active member of Ascot Ex-Servicemen's Club. I am sure that all club members will join me in expressing our sympathy to Mr. May's wife, family and club.

April 14-16 sees a three-day Mini Steam Spectacular at Elvaston Castle, Derby which has been jointly organised by **Midland Counties Miniature Steam Engine Club** and Derbyshire County Museum Services. On display will be 00 and N gauge layouts, a 7¼ in. loco on a trailer, 1½ and 3 in. scale Burrell traction engines, 3 in. Marshall drum, 3 in. baler and many others. Vintage farm equipment will be there for the enthusiasts and stationary engines on display. By the way, what's a wellie wanging competition? The Hon. Sec. at Midland Counties is Mrs. E. Renshaw of 21 Windsor Drive, Spondon, Derby (Tel. 673303).

The South Ribble Borough Council has given permission to **Leyland, Preston and District S.M.E.** to extend their track at Worden Park, Leyland. Like the existing track, the new one will consist of steel rail slotted into hardwood sleepers on an elevated steel channel subframe. There will be a double fence as per B.R. standards and a deep cutting allows for a convenient access for the public to the inside of the track via a bridge. The official opening is in May — date to be announced — and some new locos should make their appearance.

Two associations come up for mention now just in case any reader has not been told of their existence or where they are. The first is **The National 2½ in. Gauge Association** whose secretary, Mr. P. R. Weise, lives at 6 Halliwell Road, Redcliffe Bay, Portishead, Bristol. M.A.P. list quite a few 2½ in. gauge locos in its plans service and of course Martin Evans has now started his new one in *Model Mechanics*. The Association helps its members to find castings and materials for these locos and also publishes its own design list for members and details of clubs with 2½ in. tracks. The other Society is the **7¼ in. Gauge** which aims to further the interest in the size of loco. At present the membership is around the 350 mark and all these benefit from the publication of *7¼ Gauge News*, a quarterly magazine which makes very interesting reading. Various visits to tracks and clubs are arranged and details of these are published in the magazine. If the uninitiated think that 7¼ in. locos are too big for them, they have only to look at the saddle tank *Holmside*, for example, to realise that not all this gauge needs a fork-lift truck to move them around. The Hon. Sec. is Mr. D. Walters of 16 Station Road, Kenilworth, Warks. (Tel. Kenilworth 53244).

You may recall that in the 16 February issue of "Club Chat" I mentioned a Steam Gala to be held on 17 June by **Kinver & West Midlands S.M.E. Ltd.** Alan Harris, the Chairman of the club, has written to tell me a few more details about it. The Gala will be on the club track at Marsh Playing Fields, Kinver and organised as a joint effort between the club and Staffordshire Building Society, the latter agreeing to pay all the expenses incurred with the programme printing and catalogues. Lucky Kinver. In return the club has agreed to exhibit some of its work in 12 of the Society's office windows prior to the Gala. Staffordshire Building Society will pay for three advertisements publicising the event so it looks as though this happy relationship can only benefit all concerned. Perhaps some of you secretaries ought to look around your own areas for similar ventures. However, the club is endeavouring to provide many different types of model at the Gala and to maintain a steady steam-up to most of them. Traction engines and road vehicles should be up on last year and will be performing in the centre of the track. For those who may tire of the models (I believe such people do exist) fun-fair type entertainment will be laid on. The Staffordshire Building Society will be launching its hot-air balloon from the playing fields in the afternoon and a full-sized traction engine seems certain to be on show. All in all a good day out for everyone and of course an invitation is extended to all other clubs — if you can take along a traction engine or road loco, so much the better. And thanks for the invitation Alan, I hope I can make it soon.

Down at Beech Hurst the **Sussex Miniature Locomotive Society** held their AGM on 24 March and we await comments. I see from the *S.M.L.S. News* that a new club badge is to be introduced based on the Schools class nameplate. The week-ends during the summer that this club will be running start on 7 April and finish on 30 September. A few Wednesday dates are also thrown in and I'm pleased to note that the newsletter gives all the dates of Bank Holidays. Now I have something to refer to when I wish to know a date.

At **Norwich and District S.M.E.** there has been provisional agreement to operate the track for public running on the first and third Sunday afternoons in the summer months, that is from May to September inclusive. Prospective members should note that the Hon. Sec., Arnold Hoskins, lives at 5 Hellesdon Road, Norwich (Tel. 22308).

David Piddington, who will already be well known to personal customers at A. J. Reeves, has written to tell me that he will be the guest speaker at the **Perranporth & District M.E.S.** on 19 April. David is a member of the Perranporth club in addition to the Birmingham S.M.E. so he is not on strange ground. His talk will be on "Some magnificent Midland Models". Any other model engineers in the area I am sure will be welcome on the night at Church Hall, Perranzabuloe, which is four miles east of Perranporth on the A3075. The lecture starts at 7.30 p.m.

I've got to get the typewriter spelling right now — the **Rheilffordd Llyn Tegid-Bala Lake Railway's** passenger journey for 1978 was 51,835, an increase of 11 per cent over 1977. An addition to the railway are two new bogie coaches, 30 seat with centre corridor, inward opening doors and swing arm suspension to the bogies. The wheels have roller bearing axle boxes. This year at peak periods two trains will be operating, passing at Llangower. They are ex-Dinorwic Quarry Hunslet 0-4-0ST *Holy War*, and Severn-Lamb diesel hydraulic *Meirionydd*. *Maid Marion* is due for an overhaul as the poor lady has had a lot on her plate over the past four years. Over the week-end of May 5-7, Llanuwychllyn station is holding a steam gala where we will see a display of 7¼ in. Wrens under construction, working 5 in. gauge locos, a 2-foot Wren and various other interesting items.

The winter took its toll at **North Wilts. M.E.S.** where work on the new track extension at Coate Water Park, Swindon came to a halt in mid-December. However, over two-thirds of the concrete base has been cast and perhaps by now the remainder has been completed. *Nigel Gresley*,

the latest 5 in. club loco, is progressing and should feel the track late summer. A representative from this club, John Bond, won the Miniature Locomotive and Driving Competition organised by the Urmston & District M.E.S. last June at Manchester, driving his 5 in. gauge G.W.R. *King John*.

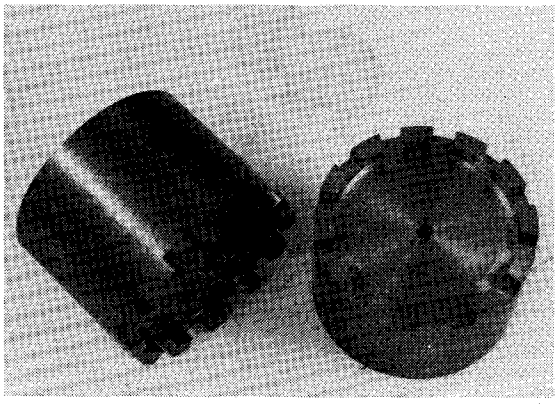
A big one at **Nottingham S.M. & E.E.** from 17-21 April with the club's 25th Exhibition of Model Engineering. Anyone who saw the Nottingham stand at the Midlands Exhibition will look forward to this event at Oval Hall, Victoria Leisure Centre, Nottingham. I know I am. A little bit of history about the club would not be amiss here. The date was 7 February, 1929, the venue "Cricketers' Rest". There were thirteen men present and from that meeting grew the present club of 110, two of whom, John Witty and Tom Lawson, were among the original 13. In the past 50 years, the club has had four different workshops, the present one being on the canal side and from what I can gather, is a vast improvement over some of the other three. Using a portable track up to 1957, the club now has a permanent raised track at Valley Road, thanks to the Nottingham Corporation. It was opened by the Lord Mayor of Nottingham on 27 July 1957. Originally the track was 843 ft. long but it has grown to 1136 ft., each extension being opened by President A. J. Witty. Now it has a station and cutting and plans are under way for a tunnel although priority must be given to the ground level 7¼ in. line and engine shed due to be completed this summer. The Exhibition in April follows the club's 50th Anniversary celebrations and will be held not far from Barker Gate where it was born.

Perhaps readers may not realise that the rail crash at Hampton Court in February nearly made front page stuff for *M.E.* One of the photographs published in the papers showed the derailed coach overhanging an embankment, inches above the ground level track at **Malden & District S.M.E.**

Taking a look across the world now we arrive at **Castledare Miniature Railway of W.A. (Inc.)** where *Cinders and Soot*, the newsletter, is published. Mine is all about Christmas so I dare say I am a bit behind the times but the facts are the same. A new raised 2½/3½/5 in. track is nearly complete and the engine shed needs some more work yet. Remember this club is holding the Steam Convention and there's work to be done. One of the photos published in this issue shows Pete Smith's "Hudson" with a caption referring to emptying the ashpan. Any chance of a copy of this one for *M.E.*?

We don't often have a copy of the **Melbourne S.M. & E.E.** newsletter because, as secretary Mr. C. L. Grinter tells me, "our journal is published infrequently". That's all right, Clyde, better that than never. Quite a bit of the journal is historical and would be very useful to the Australian loco enthusiast, and there are notes by our friend Bert Kirby who will also be known for his editorship of *Big Wheel News*. There is also a piece about Sir Ronald East, who is no stranger to the pages of *M.E.* Looking at the coming events I see that "Hot Air Engines" are on the agenda for 11 May, "Brazing", 10 June, "Quorn" on 10 August and an annual exhibition on 14 December. There are a few more dates but these are in "Club Diary".

Ivan Law's dog clutch parts shown on the S.M. & E.E. workshop at the recent Model Engineer exhibition. When the two parts are fitted together you can hardly see the join! Photo by Laurie Lawrence.



Big Wheel News is, of course, the journal of **The Steam Locomotive Society of Victoria** and the latest edition I have refers to their annual country week-end, last year's, of course. The event started on the Friday night and finished Sunday afternoon. Bert Kirby organised an auction on Friday night which raised $200 for the funds, and on the Saturday and Sunday a good steam-up was under way well-supported by country members. I hope our own IMLEC week-end goes as well. Although I have not yet asked for official entrants, there are a few coming in but remember, we are after 3½ and 5 in. gauge locos. This year the 3½ in. locos will be competing separately and so all you chaps who up to now have felt that you didn't stand a chance, you do now.

Another celebration this year is the Rotorua opening. The **Auckland S.M.E. Inc.** will be there in force and there is limited accommodation in 4-8 berth bunk rooms with shared kitchen facilities on the Te-Amorangi site. The club has suffered from damage to signals by vandals so it isn't confined to this country — still they have repaired the damage with an improved design of lamp so the wind may not have blown so very ill. The AGM here was on 7 November and we await the outcome of new officers. It's hard to believe that while we have been battling against the elements in the U.K. just to get to work, our friends down there have been enjoying their summer.

At **Salisbury S.M.E.** they have missed their loco efficiency trials at Rainhill Park for three years now due to the priority given to the track extension which has now been completed at .468 km. So, on 5 November, the trials were renewed with six locos on the track and ten engineers to drive them — obviously a test of man as well as machine. The formula was

$$\frac{\text{load} \times \text{distance} \times \text{time}}{\text{mass of coal} \times 30}$$

and at the end of the run the safety valves had to be blowing. Winner was Mr. S. Nixon on a *Firefly*, and it is interesting to note that the same loco was also fourth. A *Simplex* came in second, seventh and tenth.

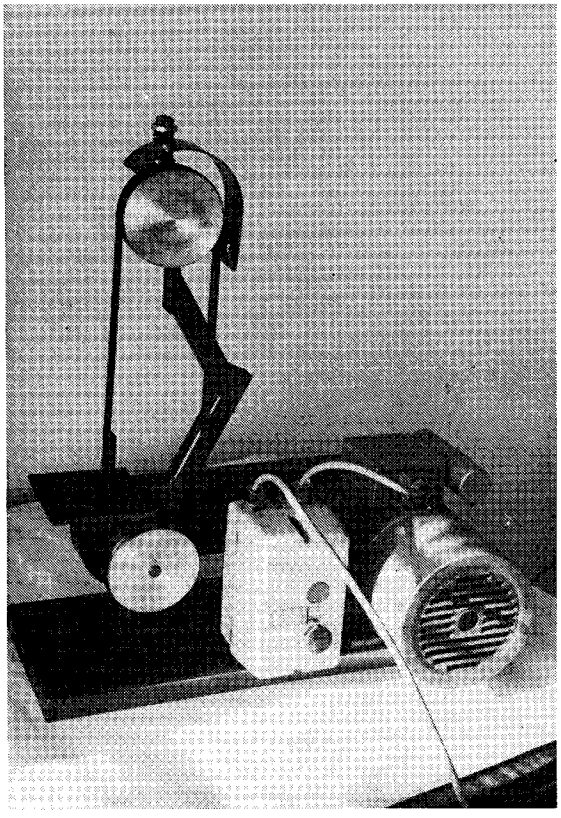
The AGM at **British Columbia S.M.E.** is done with for another year and the new committee met on 11 January. As a result *Royal Scot* will receive her overhaul followed by "73" which is propane powered and which will also receive a box car to hide the tanks. Secretary here is Lindsay McDonnell of 3651 Lynndale Crescent, Burnaby, B.C. (Tel. 294-3905).

Bob Escher, of Gilbert/Commonwealth, Jackson, MI, is the new Secretary-Treasurer of the **American Engineering Model Society,** a post he will hold for the next three years. I'm glad that the gremlins do not live entirely in Hemel Hempstead — the Newsletter of this Society gives details of Awards made annually to various areas but the coveted prize is the "Greatest Achievement Award" which takes the form of a very attractive plaque. Unfortunately, those nasty little creatures which frequent editorial offices all too often, referred to the award, presented by Ed Guard, Chairman of the Awards Committee, as "this cherished plague". It must be the same type of gremlin which puts white spots all over the car when somebody has his television on.

WHAT'S IN STORE

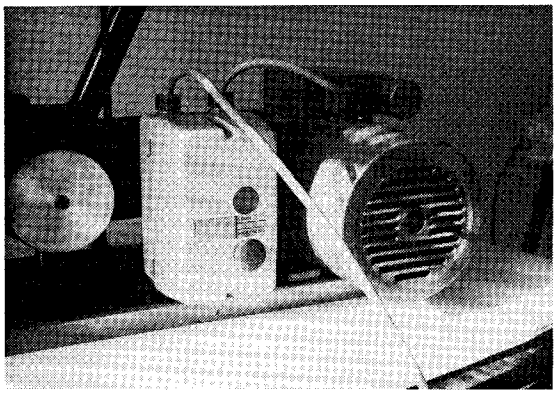
Where possible, the items reviewed are seen and tested by "M.E." staff. However, where this is not possible reviews are given solely on the information received from the manufacturers and we cannot accept responsibility for products which do not measure up to the claims made for them.

The Little Gem Linisher



The linishing machine as supplied.

Below: The motor and on/off starter switch.



"I call it the poor man's milling machine", said our visitor, designer and manufacturer of the Little Gem band linisher. This rather ambitious statement was obviously made with reference to the straightforward machining of flat edges such as with locomotive frames and in this respect we would not disagree. It is with the other, more intricate operations which a milling machine performs that the linisher would not meet with this claim.

Most linishers, or belt sanders, use a horizontal surface and are to be found in the carpenter's, rather than the metalworker's department. Not so with the Little Gem which operates in the vertical mode and is just as happy tearing off metal as it is with wood, so long as the correct belt is fitted. In fact the belts, measuring 42 in. x 1 in., are supplied in various grades for differing materials and it is essential that the correct type is selected. The coarse, metalworking belt would rip wood apart so quickly that accurate control of the machining operation would be very difficult.

The linisher as supplied to us had, quite naturally, a belt designed for metal cutting and as a new rear frame had to be made for the gauge 1 Green Arrow — due to an error in bending the previous one — it seemed a good opportunity to test the machine on the 3/32 in. thick mild steel from which strips had already been cut leaving the usual jagged edges. In fact we had already asked Little Gem if rough edges, such as those left after drilling a line of holes for removing an awkward shape, would require to be levelled first by file to avoid damage to the belt. The answer, however, was an emphatic "No", so we decided to let the machine feel the jagged edge straight away — without any apparent ill effects.

For a job of this nature, the wider the belt the more straight an edge is likely to be machined and the rather narrow, 1 in. belt meant that a smooth, horizontal feed of the metal was necessary. The fact that a good straight edge was obtained simply indicates that the modifications we suggested are not strictly necessary but could make the job easier. These modifications are enlarged upon later in this review but in this instance we felt that a straight shoulder against which to rest the job would have helped in moving the job along the belt in a direct line. Without such an attachment it is possible to rock the job and end up with a series of scallop-shaped cuts. In fact there is no reason why the base plate on which the job rests should not be drilled and slotted in the manner of a face-plate to take a series of attachments all of which could be of assistance in accurate machining. This plate on the Little Gem can be tilted for the machining of bevelled edges — or even the sharpening of tools, but this latter operation would require a protractor for accurate angular setting.

Although, as with any machine of this nature, one should wear protective spectacles, we found that the metal removed as a fine dust collected mainly on the base immediately below the lower belt pulley and very little swarf was carried around the belt. Cleaning, therefore, amounted to a quick wipe off with a soft brush.

The 1/2 h.p. Czechoslovakian electric motor is of the capacitor start type and has a speed of 2,800 r.p.m. which, in fact, gives a belt speed of around 2,800 ft./min. If you think that the belt, travelling at that speed, is rather exposed, you will be interested to learn that a safety certificate has been issued for this machine to be used in light industry. This is one of those times that the Factory Inspectorate is in the position to give confidence to the model engineer in a universal machine, a machine which can perform many of the tasks of a bench grinder without the hazards that accompany them.

Two types of switchgear are available. The one shown in the photograph is of the starter variety with an instant action knock off button and a cut out to prevent overloading. An alternative is available in the form of a simple

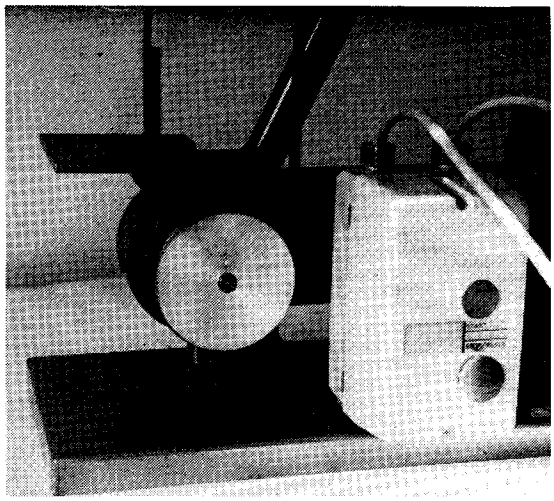
on/off switch and this variation comes a bit cheaper. On the question of prices it is good to know that people buying the Little Gem linisher through the pages of *Model Engineer* or *Model Mechanics* can obtain a handsome saving by mentioning the names of these magazines. Normal selling prices for these machines would be £125 and £115 respectively but Little Gem is offering them to readers at £110 and £100. If, on the other hand, you have a spare 1/2 h.p. motor available you could obtain a machine for around the £60 mark less motor, and a line shaft in your workshop would eliminate the need for the motor.

The robust construction is based upon a 20 in. x 8 in. heavy gauge stand to which is bolted a 1 in. square tube vertical support for the two 4 in. dia. belt pulleys. Drive is by standard V belt from the motor to the linishing belt. The working table as supplied measures 4½ in. x 4 in. although at a suggestion from us, Little Gem confirmed that a larger size, 7 in. square, was available at no extra cost. If your work involves the machining of large strips of metal, as with frames, the larger plate is the better choice. The overall height is 23½ in. and width is 12 inches. So the Little Gem fits easily on the average work bench and the weight is sufficient to obviate the necessity for bolting down. Belts are changed by depressing the spring loaded plunger by the top pulley which slackens the belt sufficiently for it to be removed. The test piece which we used is by no means the limit of the machine's performance and the designer has shaped, as a test, a hemisphere on the end of a 1 in. square bar of mild steel without any other tools. This kind of work must rely upon the eye for accuracy as the machine lacks the facilities of the lathe for measuring, but we tried a well-worn hammer face on the belt with admirable results.

The modifications we suggested to Little Gem had, perhaps not surprisingly, been already considered by him and hopefully will be incorporated in future production models. The working top has already been mentioned and buyers should specify the size they require. The spring loaded belt release is a bit uncomfortable on the hands and will be replaced by a black plastic knob. The belt, which on our model runs flat, can be made to form a convex shape by replacing the standard work rest behind the belt with one shaped for this purpose. This deflects the belt so that internal radii can be machined. But perhaps the most important part of the linisher as far as modifications are concerned is the lower belt pulley. How many machines in an average workshop stand idle for much of the time because the operations necessary for a model construction do not call for its relevant functions? And how many machines have to be bought to perform certain functions when one good machine with a sufficiently powerful motor can be adapted to do the lot? Here on the Little Gem linisher there is a 1/2 h.p. motor driving two pulleys in an anti-clockwise direction and the modification of the lower pulley to take, for example, a Jacobs chuck, means that such attachments as a small grinding wheel or polisher, or even a flexible drive could be driven as required, making a simple machine into a very versatile piece of workshop equipment at relatively low cost. Well, Little Gem have even thought of that and we await the outcome with considerable interest.

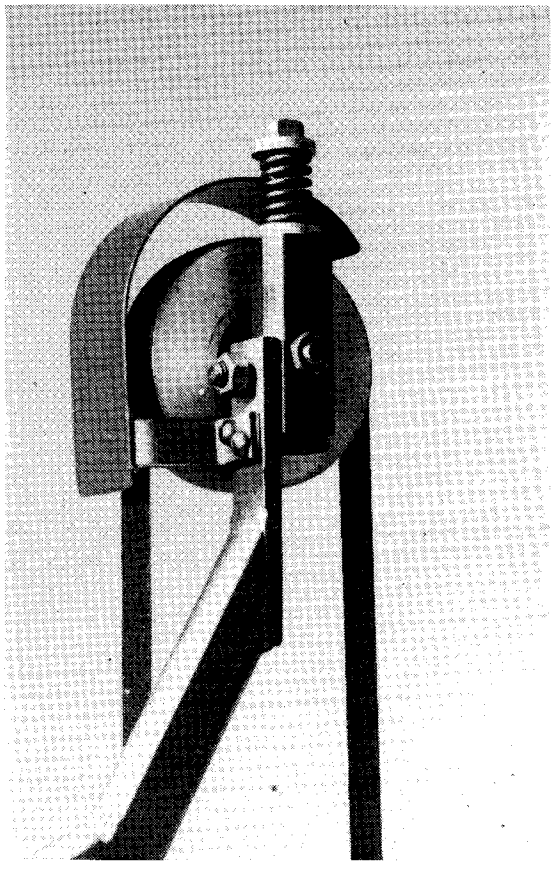
At our suggestion that the belt be made wider, the designer pointed out that a wider belt means wider pulleys, which means a more powerful motor and a higher cost. Point taken. However, a 2 in. version is in the pipeline.

This then is the Little Gem linisher, a machine which, while not perhaps fully taking the place of a milling machine, nor indeed offering accurate machining facilities other than the good old eye method, will certainly make a lot of files, sweat and tears redundant. For more information contact Little Gem Models, Lower Common Road, West Wellow, Hampshire.



Above: The working table and lower pulley arrangement. Removal of the table allows slack belt grinding — useful for fettling rough castings.

Below: The upper pulley with tensioning device and guard. The nut holding the pulley to the frame also allows the pulley to be pivoted. This may be necessary to accurately position the belt for true alignment. Narrower belts can be obtained for certain operations.



Post Bag

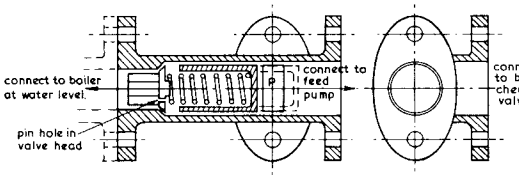
The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

Boiler Feed Topics

SIR,—It is always interesting to read of unusual principles being made use of, as in Mr. Tingey's feed pump using a hydraulic lock to maintain boiler water level.

A rather simpler application of the principle was included in the design of Barber's steam wagon about 70 years ago, and described in the engineering press at the time.

The "lock" took the form of a spring-loaded piston working in a cast body about 3 in. long x 1 in. dia. and bored about 3/4 in. for the piston to work in.



When water is low, piston reciprocates over port P in time with feed pump. When filled with water, piston is blocked and covers port P.

The idea is clear enough from the sketch. There was a very small hole in the valve head to let the water away from behind the piston when the boiler level fell, and the usual spring-loaded relief valve at the pump returned the surplus water to the tank as the water regulator closed.

I once thought of using this on a water tube boiler of small capacity in a rather powerful non-condensing launch on fresh water, but decided that an expansion tube regulator on the lines of an ordinary steam-trap was more dependable.

For a model the scheme might work because one only uses clean water so the tiny hole in what Mr. Tingey terms the 'sensor valve' is less liable to choke and upset the working. Also in a model with any pretence of efficiency there would be a feedwater heater, which the launch did not have, and which caused me some doubts as to whether a full flow of cold feedwater might cool the valve body and piston and so stop the feed reaching the port P.

It is a matter for wonder that although IMLEC has been going for some years, I cannot recall a single entry carrying a feed water heater.

If only 10 per cent of the steam is consumed in the injector, that is 10 per cent of the fuel, though the feed could be made still hotter by exhaust steam and/or waste smokebox gases at no cost at all in fuel.

Now that water supplied is no longer recorded by IMLEC it is not possible to calculate the "pump horsepower" needed to feed the boiler, but it is a far smaller fraction of the power developed in the cylinders than an injector's steam consumption divided into the boilers steam production.

It would be a refreshing innovation if the Society of Model and (operative word) *Experimental* Engineers were to enter a "horse" for IMLEC!

Penrith. Harold A. Illingworth

Etching Nameplates

SIR,—In reply to the letter (Postbag, 6th October, 1978) referring to my article on etching nameplates: I have used ammonium persulphate for analysis, regeneration and in a super-proportional reducer for over 30 years without recourse to its formula $(NH_4)_2S_2O_8$.

In my photographic technical books; Dr. Baines, for example, refers to ammonium persulphate, and the American ones call it ammonium persulfate, of course (same formula). In the reference library "Van Nostrand's Scientific Encyclopedia" and "New Dictionary of Chemistry" both refer to the same name and formula. A 1910 edition of Encyclopaedia Britannica, again ammonium persulphate (the oldest reference I could find amongst all I have checked). B.D.H. catalogues the chemical and gives no cross-reference or mention of ammonium perdisulphate, which Mr. Thomas insists is the name of the chemical. Photographic grades have no formula printed on carton or bottle, just "Ammonium Persulphate".

Ammonium Perdisulphate and Ammonium Permonosulphate are unlikely to be found in reference book or catalogue which the reader is likely to encounter, and I see no point in giving the formula. I have found that there is sometimes more danger in presenting the formula when the layman might accept a slight variation as being a substitute, where he would reject a chemical with a variation in name alone.

Holywood, County Down. Rex Tingey

Metric Screwcutting

SIR,—In a most interesting letter I have received from Martin Cleeve, relating to my recent article on screwcutting metric threads, he tells me that he had previously worked out a train using mongrel wheels that had the same conversion ratio as those I dealt with, but had not realised at the time that regular wheels could be substituted to make high value approximation trains. He also tells me of the Colchester Lathe Co. patent of a train that has extremely high conversion accuracy, and as he says is valuable on account of its low number primes, the train being:

6
8 7
11 12
19

which as it stands, would mean a pitch of 2.5 millimetres with a 4 t.p.i. leadscrew. Obviously the intention is to use wheels with tooth numbers that are multiples of those shown.

Being apparently something of a change wheel addict, Mr. Cleeve also presents me with some of his own high value approximation trains using wheel numbers not always in the regular range. But the main reason I am writing you this is because, as Mr. Cleeve points out, there is something wrong with the second train in the text of my piece, the lower one on page 1224. The third and fourth wheels should be 25 and 63 as in Table 1 for 1 millimetre pitch. This is not a typo., just one of those slips on my part over which I cry myself to sleep. I must have taken the 63 and 40 from the first train, the one at top of page when typing out the copy. I hope that publishing this letter will save quite a bit of correspondence. Fortunately the rest of the article is not affected.

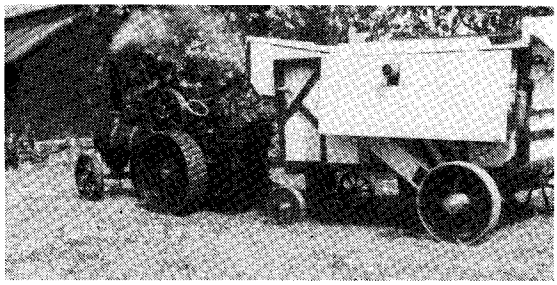
Weston Turville. A. Shackell

Threshing by Steam

SIR,—I enclose photographs of my 2 in. scale Burrell engines, special scenic *Evening Star*, and 7 h.p. General Purpose Single with Clayton and Shuttleworth drum. The Showman's engine took me nearly twelve years to complete, and this year has seen the conclusion of her steaming trials. I first learned to drive a traction engine in the early 'thirties, when I was nine years old. My love of steam began in that far-off era when steam reigned supreme in our rural scene.

My lifelong friend and tutor, the late Walter Nevard taught me all the lost arts of threshing by steam, when I was his constant companion in the stackyard, tending his lovely Burrell 7 h.p. single and well turned out tackle.

When attending steam rallies I often think how different the engines look in preservation, no working engine ever looked so resplendent as these during its working life. I have never seen in our area engines bearing names, several instances come to mind when they were called a few, but the engines I remember were never painted and lined out in the fashion seen at many rallies. One could discern the original paintwork and lining under many coats of varnish, all brass and copper being polished when time permitted.

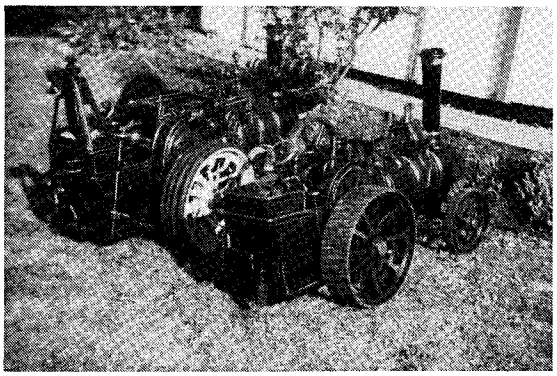


The slack period in threshing, generally being from April to the end of May, at this time the whole tackle was overhauled and re-furbished in the yard.

The engine being washed out and cleaned, the boiler lagging being rubbed down with fine pumice stone, and all the paintwork being varnished, the drum and pitcher undergoing overhaul and cleaned and varnished in the same fashion. As the years roll by, fewer people remember the thrill of seeing a set of steam threshing tackle actually at work in a stackyard.

The engines presented a never-to-be-forgotten sight, with the bottles of cold tea stacked on her sideboard warming against the boiler lagging, the driver's oilskins festooned over the fairlead bracket, the bags containing "elevenses" slung over the hind wheel naves, and the soft exhaust beat deepening when a sheave is fed into the drum, this sending the smoke skywards from her copper capped chimney.

My first instruction was in looking after the engine when stationary and maintaining water level and steam pressure. Starting the tackle from rest coming only after considerable instruction in regulator control. I well remember the instruction "Well matey I have left you with half a glass of water and her valves just lifting, see how you get on". I fear my early efforts did not result in good steaming. Walter would peer over the tender at my flagging steam pressure and falling water level and remark



"You ain't doing very well old mate"; he would then inform me that you have to talk to her from time to time. He would then say "Come on old gal", spit deftly over the top of the chimney, make precise adjustments to the feed pump, and fire twice round the box with small coal. To my chagrin steam pressure and water level would both return to a healthy condition with safety valves just lifting and over half a glass of water being indicated on the gauge glass.

Some of the most pleasant memories I recall were the early morning cycle rides, with the mist hanging over the meadows when we would be the first arrivals in the stackyard. The first task was to unclothe the engine, run a brush through the tubes, rejuvenate the banked-up fire and oil all round. As soon as 50 lb. showed on the gauge we used to run the belt on to the drum, remove the governor belt, gently ease open the regulator and let her "tick over" to pull the fire up.

At the height of the busy season it would be dusk before a stack was finished, the boards being swept down and the tackle run empty to clear the drum. The hands being casual labour would gladly assist in the move to the next job in the hope of being taken on for further work.

We used to move with the aid of swing oil lamps, a carbide light on the engine and sometimes by the rising moon to be greeted at the next farm by the irate farmer concerned for the safety of his gateposts. After being assured we would only knock one down, the tackle would be left for the night to be set early the following morning. This particular job was far from straightforward, great care being taken in blocking up and levelling the drum. How the engine stood was also important, baulks of timber being run under her front wheels in some instances to bring her up by the head, this giving good steaming.

I often note at steam rallies that many drivers wear locomen's caps, the normal gear I remember being the trilby, well weathered and oil spotted. I once recall some years ago at a local rally seeing an engine crew in spotless white boiler suits, most working drivers I remember wearing a two-piece outfit of overall trousers and short jacket.

Threshing contractors as a rule employed two men to each set of tackle, driver and steersman, the latter doubling as drum feeder when at work. Some contractors also employed a regular chaff man; in this capacity I recall a weathered ancient called Bob — the good book says "All men are but dust", in Bob's case it was chaff.

Old Bob had the stuff in his hair, ears and whiskers, one could even discern a few grains in the brim of his Sunday trilby.

The years have rolled away and with them old Walter's little cottage. No longer do I see the polished chimney top of his remaining Garret No. 4 over the hedge. Now two new houses stand in their place.

Do we live in a better world, and are we better off for all these changes? I feel we have lost more than we will ever know. To the young and those that come after us we can only say "Too late".

Brightlingsea. A. E. Payne

Swindon Draughting

SIR,—Re the very interesting comments of Mr. N. Matthews, November 17th issue, Lionel Woodhead was the man responsible for working out the original arrangement, not myself. He is a far more capable person than myself, but unfortunately I could not persuade him to put his findings into an article. I stuck my neck out and submitted what he gave me, so of course, the comments descend on my head.

Anyway, Lionel tells me that he never intended his readings to be the last word on the subject, but rather as a basis to start working from. If anyone liked to experiment then there was little doubt that even better results could be obtained.

Mr. Matthews has obviously done so, and all credit to him. At the recent trials at IMLEC I was approached by the Rolls Royce contingent from Glasgow, who had also done quite a bit of research into it, with very interesting results. Perhaps they also would be willing to give readers the benefit of their efforts.

In his report of IMLEC Laurie Lawrence tells of tubes and smokeboxes choked with ash because of the heavy blast that the anthracite fuel issued, demanded.

With its 3/8 in. dia. blast pipe orifice I was doubtful if my *Gladstone* would even be able to run at all on the stuff, as the blast and the beat is very soft. Several competitors prior to my run had difficulty in even getting it to light at all, from the charcoal of the lighting up. I therefore instructed John, my driver, to light up on a mixture of charcoal and anthracite and not worry about fuel consumption, as he dearly wanted a 30 minute *non stop* run, which had only been accomplished up till then by the first entrant, the 3½ in. gauge G.N.R. Atlantic.

I needn't have worried! Steam was raised in our usual five minutes and he stood on the steaming bay for some ten minutes or more with a boxful of bright anthracite!

Once on the run he had no trouble at all. He looked all set to carry on for another 30 minutes, and quite a lot of fuel was spilled overboard between cab and tender during the excitement of the run. At the conclusion of the run, I opened the smokebox door, and there was hardly any ash in the box, the tubes being quite clear. For this I thanked not only Lionel's Swindon draughting, but also the *stainless steel arch*, which he also always specifies, and with which *Gladstone* is equipped.

Had I known that the draught arrangements would cope with the anthracite just as well as its diet of *Welsh*, less fuel would have been debited, and *Gladstone* would certainly have been higher up on the score board.

Sompting, Sussex. Bert Perryman

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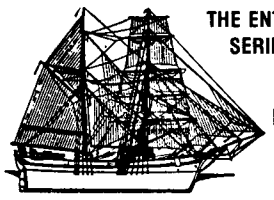

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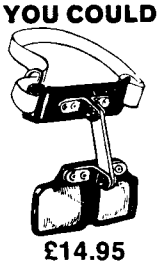

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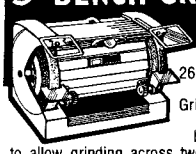

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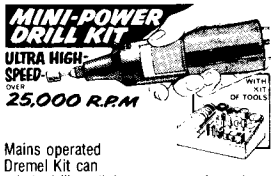

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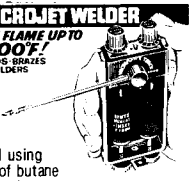

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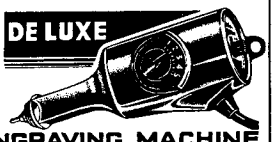

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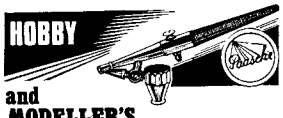

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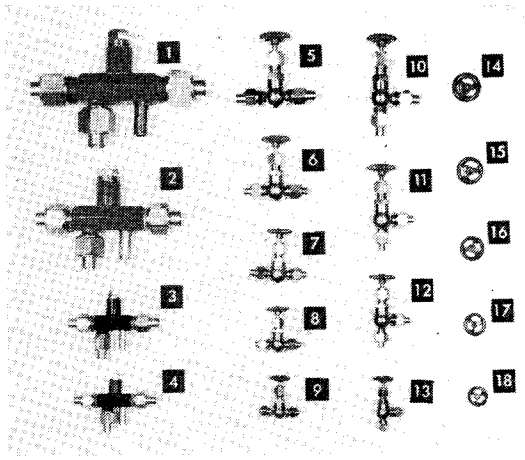

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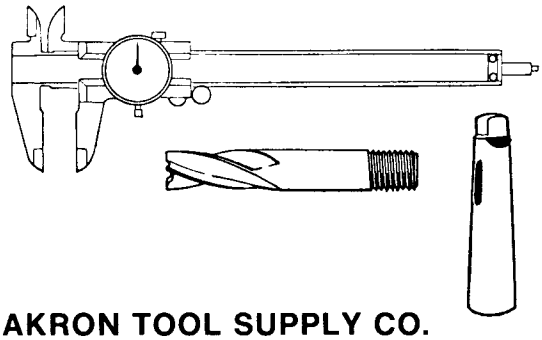

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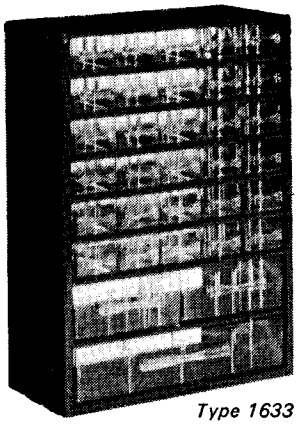

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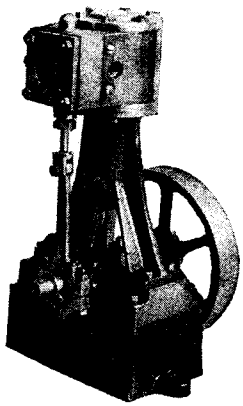

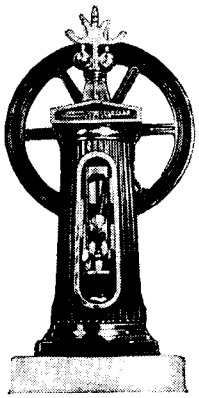

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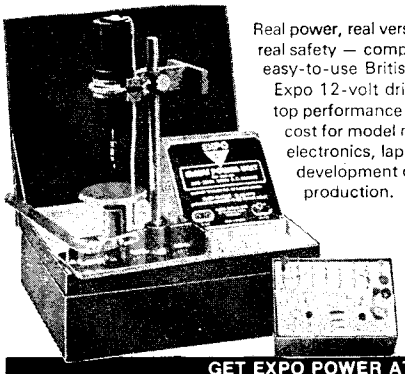

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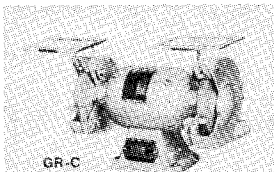

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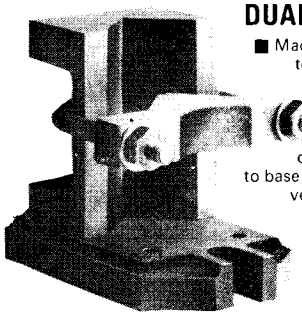

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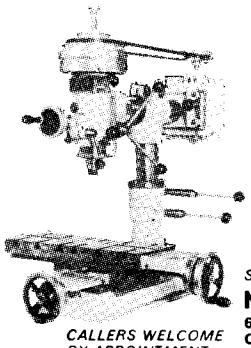

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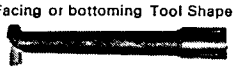
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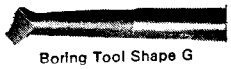
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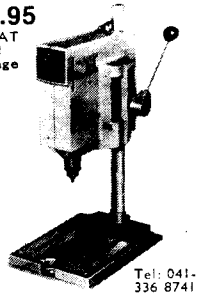

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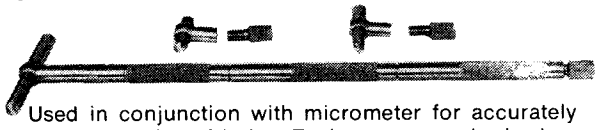

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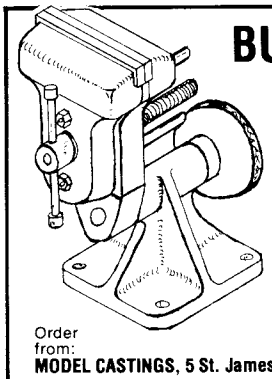

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Unit Steam Engines, boilers, steam engines, casting kits, pop-pops, etc. SAE for leaflet to: 41 Church Street, Twickenham, Middx. Tel: 01-892 9997. KLM

Early model Stuart Turner Simplex single cylinder vertical steam engine, £35. Tel: Peterborough 42083. K

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Live Steam "00" Gauge Locomotives. The 0-6-2 tank locos have all been sold and I am now producing a small batch of "Coronation Scot" 4-6-2 Pacific locos to a scale of 4 mm.; 1 ft. Price £140 each. Commissions for one-off undertaken. For further details write to: Mr. D. R. Taylor, 33 Trafalgar Road, Southport, Lancs. I-N

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BOOKS & PUBLICATIONS

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Books Wanted: "The Garratt Locomotive" by A. E. Durrant (David & Charles). "Locomotives Of Rhodesia Railways" by A. Croxon. Steam On The Veld", Pearson, "Sunridge", St. Francis Road, Studley Green, Bucks., HP14 3UZ. K

Model Engineer unbound 1947 to 1963, also some 1938 and 1974/75, total 860 clean copies, £40. Lovegrove, Tel: Frome (0373) 61072. K

The largest range of **MODELBOOKS** can be obtained from the following:
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  Foyle's, Charing Cross Road, London (Dept. 7), Mon.-Sat. 9-6.
- ★ Also worldwide mail order, write for lists or see the MODELBOOK advertisements in this and other modelling magazines.

For Sale: Model Engineers 1949 through 52 inclusive, 1955 through 65 inclusive, 1975 through 77 inclusive. Offers to: Groome, Beccles Road, Loddon, Norwich. Buyer collects. K

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Model Engineer. For sale: bound, unbound, individual copies. Collections bought. Tel: Watford 26128. I-R

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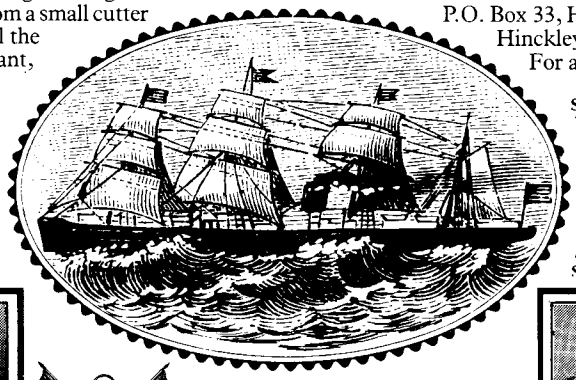

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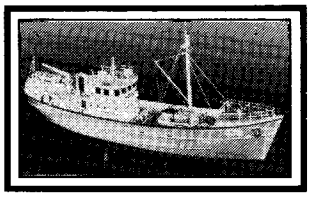

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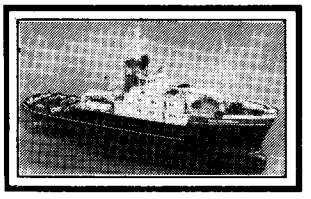

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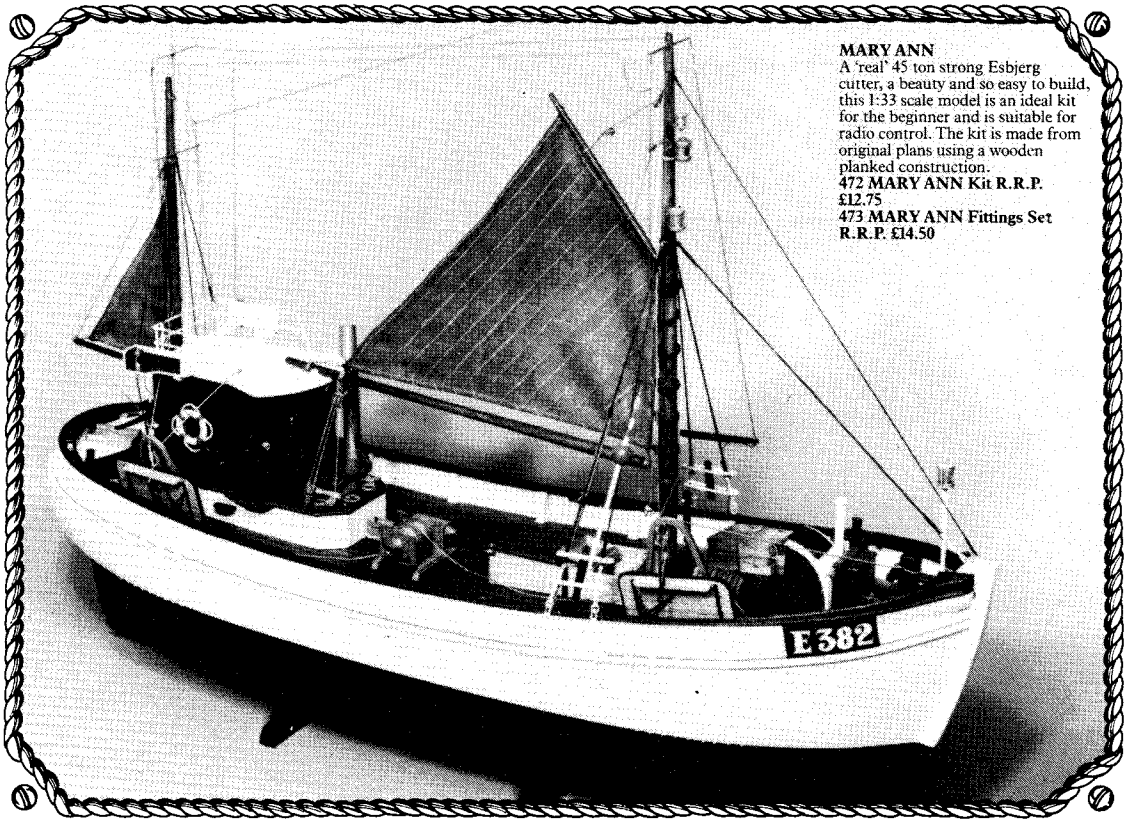

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