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MODEL & ALLIED PUBLICATIONS LTD

COVER PICTURE

The paddle steamer "Bristol Queen". Colour photograph by Arthur P. Fox.

NEXT ISSUE

Improvements to the $3\frac{1}{2}$ in. gauge locomotive "Molly".

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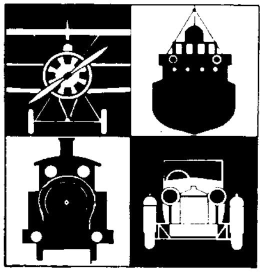

45th Model Engineer Exhibition

30th December 1975 to 10th January 1976*

MODEL LOCOMOTIVES, BOATS, AIRCRAFT, TRACTION ENGINES, MILITARIA, CRAFTS

At SEYMOUR HALL, MARYLEBONE, LONDON, W.1. (JUST NORTH OF MARBLE ARCH)

WHAT WILL BE FEATURED

All the popular features of past years will again be provided. M.E. Workshops with expert consultants and well-known contributors, plus S.M.E.E. members: S.M.E.E. Passenger Track with steam locomotives. MARINA 98 ft. by 28 ft. for r/c boat demonstrations. Large flying circle for Electric R.T.P. aircraft—better than ever. Trade Stands: Demonstrations: Plus all the beautiful competition entries: Militaria: Craft Demonstrations.

ENTRIES

Every kind of model is eligible to entry. Over twenty trophies; over £300 in prizes, plus the pleasure of displaying your efforts and seeing those of other people. Rules & Entry Forms now available. All small models displayed under glass to keep them clean and untouched.

PRIZE POOL ALLOCATION

Classes attracting six or more entries have 1st Prize £5, 2nd £3, 3rd £1. Over 12 entries 1st £7, 2nd £4, 3rd £2, 4th £1. Under six entries 1st & 2nd only, or at judges' discretion may be combined with other classes.

CLUBS

Club parties are especially welcome. Some clubs are arranging, with us for a special day, when they will put their boats on the pool, arrange for their best locomotives to enjoy "track time" and even have their varied contest entries grouped as a combined "club show." If yours can do something special please tell us soon so that we can work it in. Individual boating demonstrators also welcome.

MILITARY MODELLING

In addition to contest classes, we shall be staging war games sessions. If your club wants to take part, or have good experts available to steward please tell us.

STEWARDING

We can always use a select band of stewards expert on model subjects. If you have time, strength (it's a hard day!) and knowledge please tell us.

CLOSING DATE

Model entries should be in by Monday 13th October — please enter early, it helps us.

COMPETITION CLASSES

A	Locomotives. $2\frac{1}{2}$ in. gauge and over.
A1	Locomotives—to any L.B.S.C. design $2\frac{1}{2}$ in.-$3\frac{1}{2}$ in. gauge (including steaming).
B	Locomotives. In gauges 1 and 0.
BA	Locomotives. In gauges smaller than 0.
C	Rolling Stock and Accessories. Gauge 1 and 0 or larger.
CA	Rolling Stock and Accessories. Gauges smaller than 0.
D	Steam and Motor Ships of any period. (Non-working.)
E	Power Driven Boat Models. (Complete with power plant.) Scale or Freelance.
F	Sailing Ships of any period. (Non-working.)
G	Working Yachts and Sailing Ships.
H	Hydroplanes and Speedboats.
I	Miniature, Length of hull not to exceed: 9 in. for $\frac{1}{8}$ in.—1 ft. scale or larger; 10 in. for 1/16 in. scale: 12 in. for 1/25 in. scale: 15 in. for 1/32 in. scale. No limit for smaller scales.
J	General Engineering Models (including stationary and Marine Engines). (working models)
K	Internal Combustion Engines. (working models)
L	Mechanically Propelled Road Vehicles (including tractors). (working models)
N	Tools and Workshop Appliances.
O	Engineering Scale Models. (Non-working.)
P	Scenic and Representational Models (including Architecture).
Q	Horological Craftsmanship—not otherwise classified.
R	General Craftsmanship—not otherwise classified.
S	For any type of model (other than military) or mechanical work by a junior under the age of 16 by 31st December, 1975.
AA	Flying models of all types: (a) free flight, (b) control-line and (c) radio control.
AB	Scale flying models of all types, rubber, glider, power, control-line or radio control.
AC	Scale non-flying models.
AF	A piece of radio control equipment built to a design published in Radio Control Models & Electronics, Aeromodeller or Model Boats, from a commercial kit, or of original design.
MA, MB, MC, MD	Classes covering miniature figures, dioramas, artillery, etc., detailed on official entry form.
WA	Piece of Modern Furniture.
WB	Any work in glassfibre or other plastic as main constituent.
WD	General Craft work—musical instruments, carving, marquetry.

Junior Prize additional in each class with three or more entries. (Under 16 on 31st December, 1975.)

Schools can enter for Schools' Competition under Craft Section.

*NOT open on Sunday.

Entry Forms and Advance Bookings from:

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MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION

The scene at the laying of the last spike in the new track of the West Riding Small Locomotive Society at Tingley. Photograph courtesy Leslie Overend.

SMOKE RINGS

A Commentary by the Editor

Northern Models Exhibition

The Northern Association of Model Engineers is to hold the 16th Northern Models Exhibition in the Preston (Lancs) Polytechnic from August 23rd to August 30th.

This Exhibition is expected to be one of the largest provincial model engineering exhibitions of the year. It will be a competitive one, with classes for locomotives, stationary engines, ship models, workshop tools and appliances and many other items. There will be trophies for juniors and engineering apprentices. There will also be many loan exhibits.

It is worth noting that the Rail 150 Exhibition at Shildon is being opened by the Rt. Hon. William Whitelaw on Monday, August 25th, so it will be well worth while for readers in the South making the journey to Lancashire to take in the Shildon event as well, as Shildon is not so very far from Preston.

New Society down under

A new model engineering society has been formed in the Hornsby area of Sydney, Australia. Named the Hornsby & Dist. Model Engineers' Society, it already has 46 members. A $3\frac{1}{2}$/5 in. gauge permanent track is planned, which will be at ground level. The first stage of track will include a section at 1 in 80 and a steel truss bridge; a later stage will have a formidable gradient of 1 in 60, a siding being provided for banking engines to assist trains up the grade.

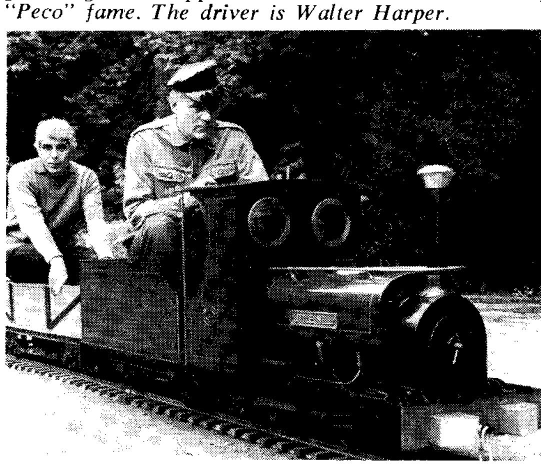
Full details can be obtained from the President, Bob Farquhar, 26 Parklands Road, Mount Colah, 2079, Sydney, N.S.W., Australia.

Model Engineering Class

The Class for model engineers held on Monday evenings at the London Nautical School has now been in operation for almost a year, and will be

continued on next page

A $10\frac{1}{4}$in. gauge locomotive built by Richards Engineering and supplied to Mr. S. C. Pritchard of "Peco" fame. The driver is Walter Harper.



continued in September. Members are building several locomotives, including a *Bridget*, a *Tich* and a *Simplex*, a stationary engine and several items of workshop equipment. Details can be obtained from the Tutor in charge, Evening Institute, London Nautical School, Stamford Street, S.E.I.

Visits to London Transport Works

Ten of London Transport's Bus and Underground Works will be on show to the public this summer. There will be visits to Acton Rail Works on August 20th and September 17th, to Neasden Rail Depot on August 27th and September 17th, and to Lots Road Generating Station on July 30th and August 20th. Details of these and several other visits can be obtained from London Transport's Public Relations Officer at 55 Broadway, London, S.W.1H 0BD.

The "Model Engineer" Steam Roller

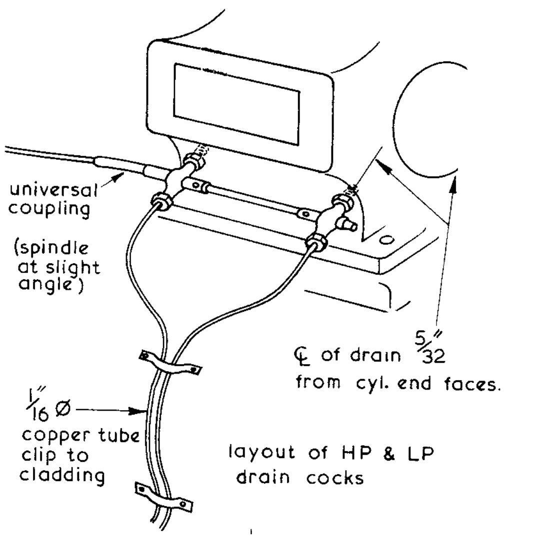
An Aveling & Porter 2 in. scale Compound

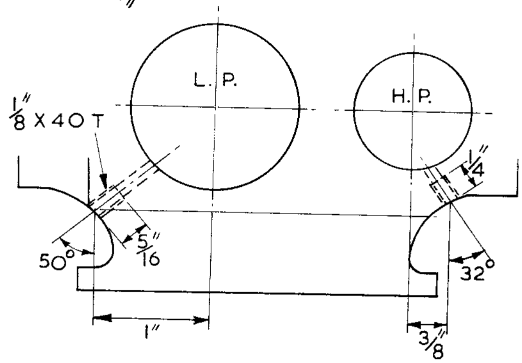
Part XV — ***Built and described by John Haining*** — *From page 616*

WORK ON MY OWN ROLLER has lagged behind the rough timetable I set myself, due to several reasons; the principal one being the pressing need to get ahead with seeding and planting a large vegetable garden after yet another disastrous spring in which it was impossible to even contemplate working my heavy clay ground; the other reason is my involvement with a thirty year old "British Anzani Iron Horse" which I was fortunate to buy recently, complete with both straked and pneumatic tyred wheels and single furrow plough. The machine, weighing some 10 cwt and powered by a big single-cylinder J.A.P. engine was, without doubt, designed by someone brought up in the old tradition of making things to last and never mind the weight — all the early I.C. tractors followed the same pattern, of course, with their massive traction engine type steel straked wheels and slow revving engines.

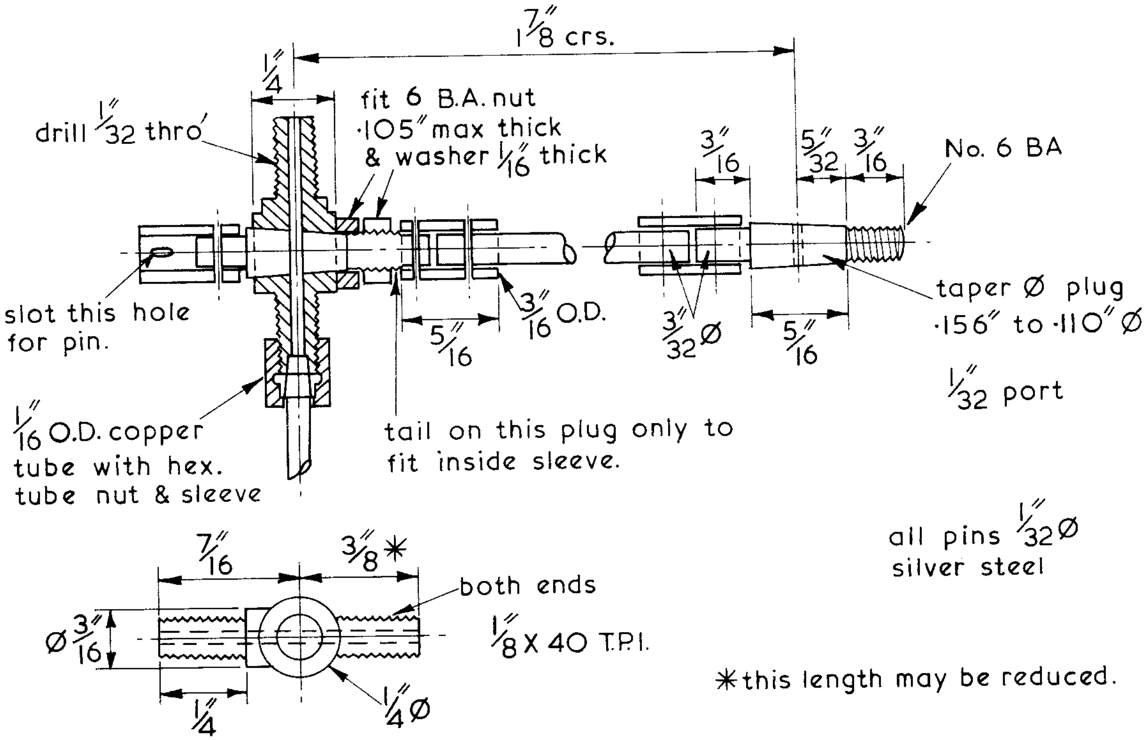
I have waited a long time to acquire an "Iron Horse" and was amply repaid when, after cleaning off about two-hundredweight of good Hertfordshire soil and grass seed and cleaning up ignition and carburration details, the engine spat forcibly twice, and then ran as smoothly as when new after only four pulls on the starting handle. My son and I, after some very necessary de-rusting and oiling of the two dog-type steering clutches, cut our first furrow with the Anzani last week, but — and I have only myself to blame — after a brief stop in mid-field to adjust plough depth and breast angle I foolishly attempted to re-start the big "single-lunger" by pushing *down* the starting handle instead of pulling up — a stupid thing to do with an engine fitted with impulse starter in the magneto drive in any case, and fully deserving the cracked and badly bruised thumb-bone which followed, and which makes writing painful and bench work out of the question for some time to come!

However, with much of the roller "written-up" it is perhaps time anyway to review our progress





CYLINDER DRAINS



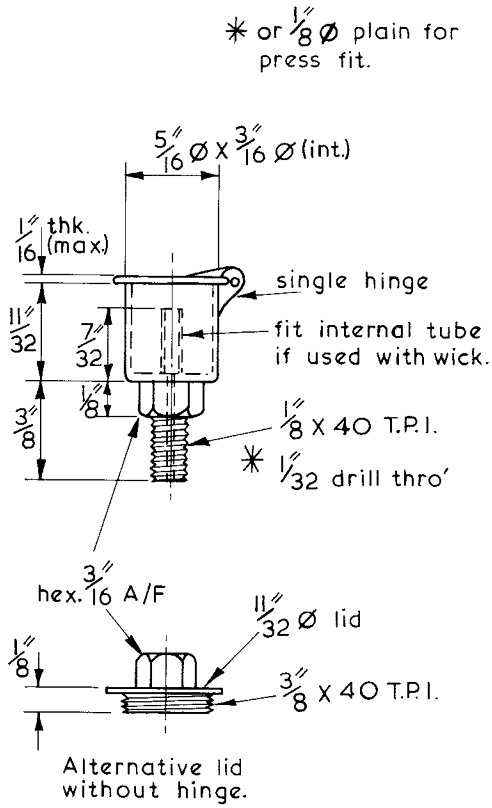
CYLINDER DRAIN COCKS — 2 off — brass or GM
COUPLING SLEEVES — 3 off — B.M.S.
RODS (length on assembly) — B.M.S. or s/steel
} per cylinder

with the job, and look ahead to see how many other parts still have to be drawn. The Aveling parts-list covering the earlier compound slide-valve types illustrates some parts which are common to the later type rollers as well; such things as awning, ash-pan, oil cups, and cylinder drain cocks and supports all appear to be common, but I have written to Messrs. Aveling Barford's Public Relations Department to ask for some further information and drawings in order that certain ambiguities may be cleared up before I finalize the drawings and details for publication.

Looking ahead, then, the following have still to be checked-on and then drawn; awning and supports, motion side-covers, scraper plates and brackets, safety valve cover, cylinder drain cocks and operating rod from manstand, oil cups, blower valve and pipe from cylinder block to chimney, ashpan, and brake gear with fulcrum bracket and finally the mechanical lubricator and the three oil lamps, and the piping layout. The famous brass horse, so prominent on the steering headstock of all Aveling rollers and the smoke-box door of steam wagons, traction and ploughing engines and steam tractors made by the firm, I will conclude with an article on painting and finishing to the Aveling livery. I am experimenting with one of my spare R.E.M.E. cap badges to see if I can adapt the rampant horse which is a major feature of the badge.

This will involve parting the horse from the chain securing him to the globe beneath his hind feet — horse-power chained to the world, but known by another and rather more ribald description in the Corps! Reading the above list again, the order in which I have listed the remaining items is not necessarily the order in which they will be covered; the piping layout, covering boiler feed water, steam to injector, etc., will be dealt with quite early, and not at the end of the list as I have shown, as many people will want to steam their rollers probably sometime before they start work on the awning, or brake gear, for example.

The scarifier and differential gear will both be dealt with as extras, the latter being shown on Aveling drawings, and listed in their catalogue as an extra, while the former is offered as being of the "Price", "Morrison" or continental wheeled



OIL CUP brass

types. In connection with the cylinder drain cocks, the Aveling works drawings show bosses below the steam chests, cast in the sloping lower sides of the cylinder casting. The drain cocks themselves are the non-lever type, the plug rotating in the cock body, both plugs being coupled together by a short spindle and the back plug connected via a small universal coupling to a rod each side of the footplate partially rotated to open H.P. or L.P. cocks. I dislike out-of-scale drain cocks, and these on the Aveling being of such a neat compact type small enough to be quite unobtrusive, I would like to keep the cocks themselves as near to scale as possible. This involves some rather trying-to-the-eyes small work, as the male screwed neck of each drain cock, to screw into the cylinder casting or fabrication, will be only $\frac{1}{8}$ in. dia. x 40 T.P.I. with a 1/32 in. hole through neck, cock body, and rotary plug. An alternative is to make the screwed neck 3/16 in. dia. x 40 T.P.I. which comes a little easier on the eyes, but not much, as we still have to make the couplings and connections for the operation rods, and these will look bad if out of proportion.

I did not include any bosses on the cylinder block, either on the cast or fabricated version, for drain cocks, as there is more than enough metal to drill and tap into without adding unnecessary metal anywhere.

The oil cups, shown in sketch, are fitted at the following points; one on each connecting rod big end, one on the top of each trunk guide, one on each valve spindle guide, and one on the cap of each crankshaft main bearing. I have omitted the small oil cup and elbow fitted to each connecting rod small end as being almost inaccessible anyway in 2 in. scale. These little oil cups may be made with either a screwed $\frac{1}{8}$ in. x 40 T.P.I. or a plain neck to press into the hole; some years ago I managed to buy a few of the neat little oil cups with snap hinged lid which were fitted to bicycle hubs to facilitate oiling the spindle bearings. These oil cups were just about right for two-inch to the foot scale, and saved a great deal of "fiddly" work on the lathe etc.

I used some on my single-cylinder Fowler ploughing engine, and gave a few away to other people with engines of 2 in. scale and full expect that it is now impossible to purchase such things in this un-enlightened age unless one is able to discover an old fashioned bicycle shop still in existence.

The awning fitted on the class AD roller is termed in the Aveling parts list a full-length type. A short part-length one is also illustrated which extends only over the actual tender and manstand, supported at the rear of the tender and just above the crankshaft, in fact fixing to clear just ahead of the main bearings on the front section of the thickening pieces. The full-length awning used the same two mounting points and two more coming off the chimney end of the cylinder casting with an extension pipe and cover taking the safety-valve steam up through the awning top.

The vertical legs are strongly braced with flat steel bars to make a rigidly constructed frame, and the awning top has small section rain guttering running down each side to prevent drips falling onto the driver. Despite our dreadful climate, some old drivers tell me that they really preferred an engine without an awning, as the roof threw back noise and made the manstand very hot in summer — obviously summers were real ones in the good old days of steam!

Making small Live steam Injectors

by D. E. Lawrence

Part VII

From page 640

Aside from showing up the odd error in my notes and drawings, feedback from Bertie and Derek chiefly concerned the meaning of words and also that some explanation was needed in places where it had been omitted. In the instructions about silver soldering the parts of the casing together, I used the word *gently* to describe how they should be held in the jig. The metal will expand when hot and it is essential to allow for this in the jig, otherwise there could be constriction and shortening of the casing can result. So please interpret *gently* as a *little loosely* or a *trifle sloppily* according to individual assessment of my meaning. Also, on no account overheat the metal; it needs heating just enough to the melting point of the silver solder and no more.

Incidentally, I advised 1/32 in. dia. Easyflo wire for the casing job, but if memory serves me correctly, the stuff I used was smaller than this. I bought some from Whiston's a long time ago and it was probably only 0.5 mm. (0.020 in.) diameter. I used it for small fittings, for which it is ideal, in preference to Easyflo paste. I have recently checked with Johnson Matthey and they tell me that 0.5 mm. is an on-the-shelf stock size.

It would be best to check the length of the casing after silver soldering. I had no trouble myself as, by good fortune, an earlier job had shown me what precautions to take. I cannot emphasise too much the need for *accuracy;* trying to compensate for errors can lead one up the garden path. It is essential to check the dimensions of each part as one proceeds and junk anything which does not pass "inspection". As Derek said—he tightened up the inspection department with happy results. Another thing which can cause trouble is drilling the cones. A high mandrel speed is necessary and the Super 7 top speed is about the lowest suitable. Bill Carter's high speed drilling spindle was described in the M.E. of 1st November 1974 after the main body of this article was prepared. Bill's tailstock drilling spindle is almost an essential on any modest speed lathe for drilling injector cones. I imagine overhead milling/drilling spindle drives are not a common feature of the average model engineer's workshop, useful though they may be. My own lash-up for this sort of thing was to fix my portable electric hand drill in a stand and clamp this to the windowsill about 3 ft. or so away from the lathe and roughly in line with the saddle. Drive was by a round plastic belt on an arbor mounted pulley (plastic) to whatever gadget I was using at the time. I cannot recommend this as anything more than just a lash-up; useful for odd jobs but that's about all. Two small but important things about an arrangement of this kind:— the drill must be located to give *contra-rotation* so that the revolutions are those of the drill *plus* mandrel; the drive must be fairly long, about 3 to 4 feet away, otherwise the belt may run off the pulleys when they are not quite in

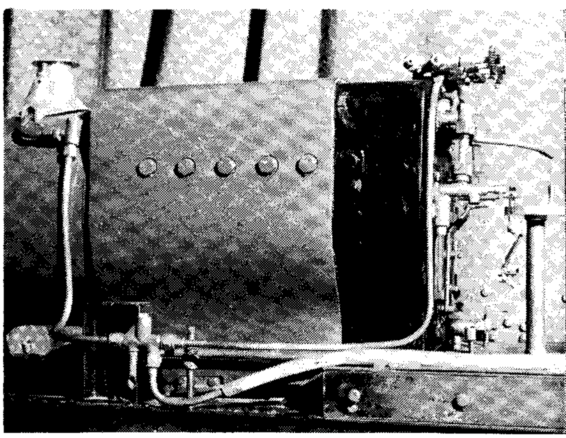


Fig. 45: Clean pipe runs with easy bends. One clack high up and short pipe to top feed.

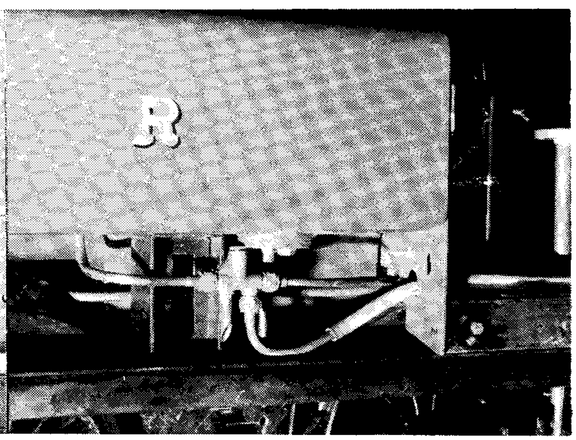


Fig. 46: The side tank hides some of the piping. Overflow angled to clear footplate.

Fig. 47: The author had an enjoyable session injector testing.

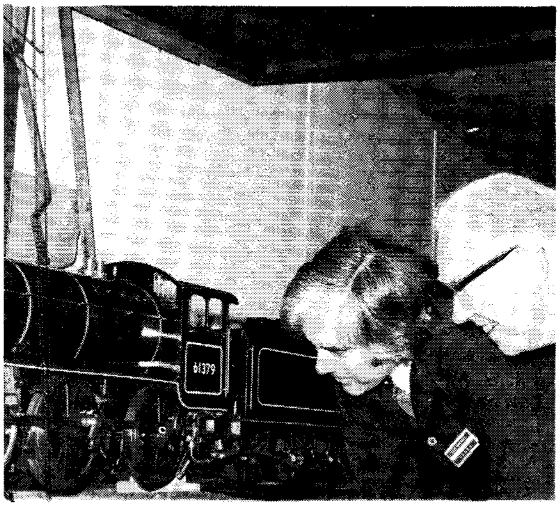
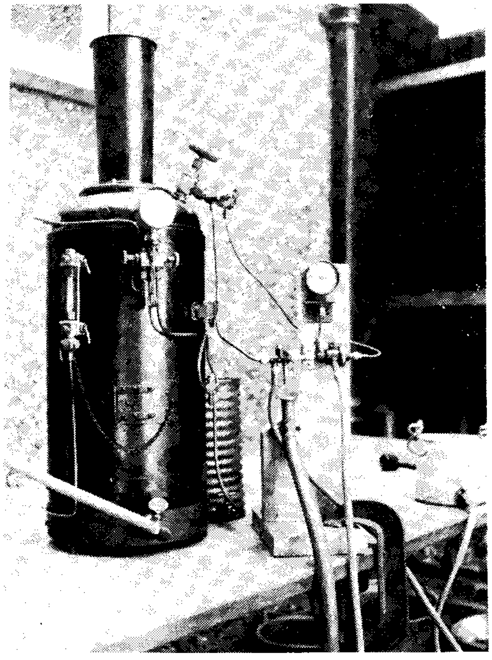


Fig. 49: Smiles from Bertie Green and Dave Edwards when the "thing" worked!

line as the drill is fed into the work.

There were a couple of other matters of some importance on which Derek and Bertie needed some guidance. I was able to give them advice on the plumbing arrangements of their locomotives. In Derek's case, he made some minor alterations to the pipes and replaced the clacks of his locomotive's injector delivery by one of the vertical pattern illustrated here. The upper end of the dry range of his existing commercial injector promptly went up from 60 to 90 p.s.i. In Bertie's case, rather more alterations to the plumbing were required before any success came his way. In the section headed *Arrangement of Piping and Auxiliaries,* I explained how important it is to get the easiest passage possible. The working of a good injector can be completely upset by restrictive piping and clacks etc. I regret that I cannot give individual advice to prospective makers of small injectors, so if you will forgive the repetition, do get the plumbing sorted out with ways not less than the bore of the pipes specified and no kinks in the pipes and easy bends.

Fig. 48: Bill Carter's test rig, gas-fired stationary boiler with an injector being tested.



Lastly, there must be an adequate supply of steam to the injector. With due respect to people who design model locomotives, those who design and sometimes build, do not always operate. Even LBSC who produced and built very many small locomotives, had no experience of public passenger hauling on a club track, i.e. "operating". On such tracks, when you get the *green,* you have got to go; there is little time for making good deficiencies. It is my firm opinion, based on a fairly long experience, that all the auxiliaries on an engine must at least be adequate for their job, but I prefer to make them a little larger where there are control valves involved. You can always regulate via a valve, but if it is not big enough, once it is wide open, there is no more. Which leads me to the steam valve supplying the injector; the port and ways through the valve *should be not less than* the bore of the steam pipe. For the

Standard, I normally use a drill size for the steam vave port and take off nipple of No. 34, 0.113 in. dia.; No. 37, 0.104 in. is the minimum I would recommend. Also, there should be enough clearance round the valve head to permit free passage for the full rate of steam flow. I can give drawings and describe a suitable spin open positive shut off captive type of steam valve if there is a demand for it.

Final Comment

The Standard No. 1 injector has an open overflow and this means that a small amount of air may be drawn in through the overflow and into the delivery tube by the water jet. All that "chirruping" one often hears when an injector is feeding means that it is drawing in a lot of air and working inefficiently. Anyway, steel boilers do not like air in the feed water as the oxygen in the air will do damage to the steel in time. Anyone fitting an injector to a locomotive with a steel boiler should ensure that the boiler has a regular examination as well as a normal pressure test. In full size, injectors have arrangements to close the overflow whilst feeding water, but since our small locomotives in the popular gauges have copper boilers as a rule, a little air in the feed water is of no consequence. I have had a go at producing an automatically sealing overflow, but I have never really considered the extra work entailed as being worth it. I do not claim to be any sort of "expert," I have only written about what I have done. I feel sure many model engineers who attempt making injectors will no doubt find their own way of doing things and to those who follow these notes and those who branch out on their own I wish every success.

A BRIGHTON "BALTIC"

Part II

By A. C. Perryman

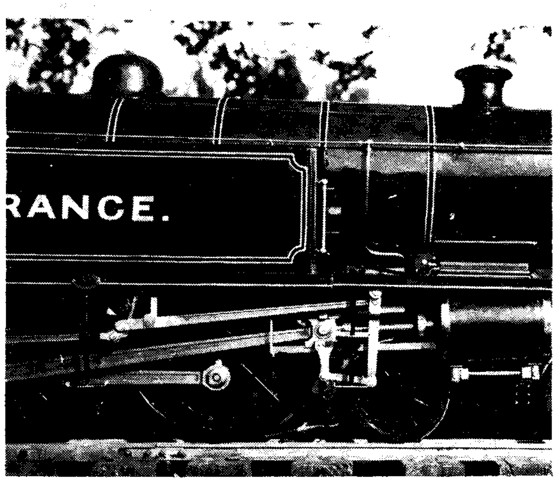
From page 644

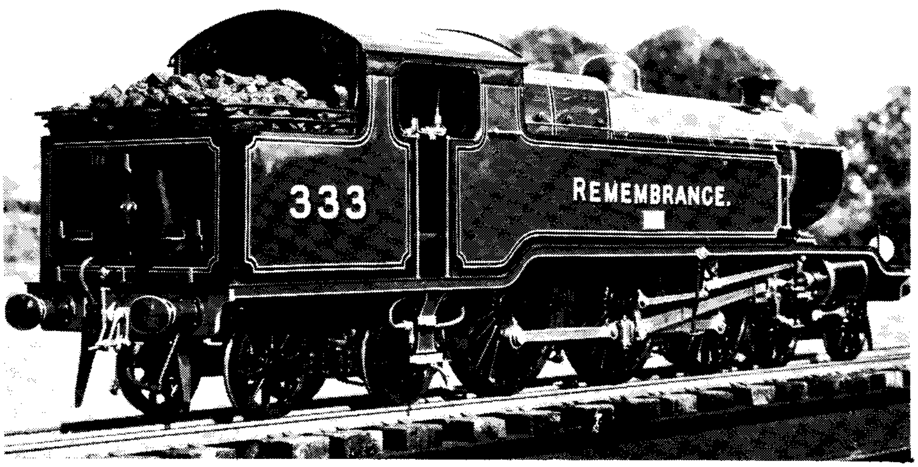
The handbrake lever, again to scale, operates the brake gear as on the prototype, but the brakeshaft carries the arms for the brake cylinders, should it ever be decided to fit same.

Turning now to the chassis. Owing to the peculiar shape behind the coupled wheels, it was decided to cut this down to a straight line to avoid having frame plates inside the bunker, which meant a false bottom and loss of water capacity. This left the frames very narrow above the rear bogie wheel openings, and in lifting a heavy engine like this with buffer beams 4 ft. 6 in. apart it was deemed adviseable to use 3/16 in. thick frames, 5/32 in. being unobtainable.

Very few model locomotives can claim that their frames came from their prototype's birthplace I'm sure, but in this case they did! Brighton Works supplied two lovely pieces of 3/16 in. black steel, as they used for tanks and bunkers. These were bolted together and cut to the exact shape on the G.A. drawings, with drills, hacksaw and files, and a tough exercise it proved to be. Although the prototype had "dished" frames at the front, I decided against this in this thickness, and compromised by spacing them 4 in. apart, instead at the now usual 4¼ in. for ⅛ in. frames. No proprietory patterns or casting existed for this job, but the late A. Hebbelthwaite, a craftsman of no mean ability, consented to make these for me, and a fine job he made of wheel, smokebox saddle, hornblocks, and boiler mounting patterns. All iron castings were supplied by Stuart Turner Ltd., and the non-ferrous by a local foundry. I originally intended to use ball races in the axleboxes and the hornblocks were opened out to accommodate these. I later decided that firebox ash would not be very kind to them so reverted to phosphor bronze bushes in mild steel axleboxes and cast iron hornblocks. The keeps of all axleboxes are hollow and have spring loaded felt pads bearing on the journals. Car type grease nipples point inwards and downwards below the

A close-up of the motion work.

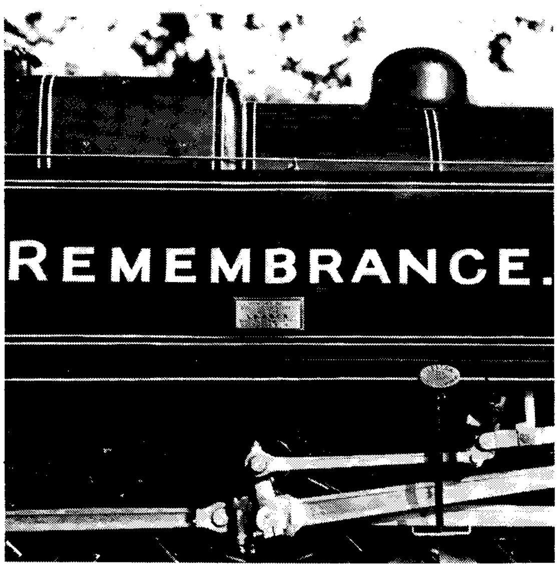




A view showing the bunker, and some of the details at the rear. Picture taken by Ron Isted before cab lining was completed.

bushes, and a long spouted oil gun introduced between the spokes of the opposite coupled wheel delivers oil under pressure to the keeps and pads. This does away with the oil in the top of the box, always a source of grit entry. Axles are $\frac{7}{8}$ in. silver steel for the coupled wheels, bushes protrude from the insides of the boxes and had lengths of steel tubing, a nice sliding fit over the axles on assembly and supported by these bush ends. This helps greatly in excluding grit. The leaders could not be so treated because of the pump eccentric mentioned previously. Bogie axles are $\frac{5}{8}$ in. dia., relieved in the centre, but without the steel tubes. Bushes protrude here also, as in full size, these were covers containing felt dirt excluders.

A close-up of the name and memorial "plaque".



The centralizing gear on the bogies of the full-size job was quite complicated and resembled the rocker gear of an O.H.V. push rod petrol engine, and no doubt largely contributed to the remarkably steady riding of these engines at speed. I did not anticipate attaining anything approaching 80 miles-an-hour with my locomotive, so decided to simplify this. This has proved very satisfactory, as the principle is the same, and the engine has proved very steady at speed at Beech Hurst.

The most radical departures from prototype are the cylinders and valve gear. The prototype had 22 in. x 28 in. cylinders controlled by 10 in. piston valves having 5 3/32 in. travel, and were incapable of being notched up beyond about 35%. I located some automobile piston rings of 48½ mm x 1/16 in. and decided they would do nicely. Cylinders were therefore bored to 48½ mm, which makes them a little undersize for scale, but around 1 15/16; with a stroke of 2½ in. to compensate for this. Two rings are fitted to each cast iron piston.

The cast iron back covers support the bottom slide bars which are of gauge plate, and relieved at each end so that the crosshead will not wear a ridge in them. The top bars do not reach the covers but are supported on lugs attached to the housings for the rocker shaft. The late LBSC advised screwed glands for locomotives meant for real work, and that's how mine came to be so fitted. This was decided early on and I always regret this decision. If ever a locomotive could have studded glands this one could, as there is no top slide bar in the way. I compromised by making the screwed gland to prototype dimensions, it was circular anyway, not oval. The threads however are external on the cover stuffing boxes with proper neck rings inside, so the packing will not catch up in the threads.

The piston valve liners have a bore of 1 in. and the chambers had to be considerably lengthened to accommodate the bobbins, which have a travel of ¾ in., giving a scale equivalent approaching 9 in., a considerable advance on 5 3/32! Luckily, the extra long P.V. chambers went into the "scale" superstructure and cleared the front inspection plate, but it was a very different story at the back end. The valve spindle crosshead was connected to the inner arm of the rocking shaft, via a short link, to compensate for the arc of swing in the rocker arm. The long chamber required all this gear to be shifted rearwards.

The late K. N. Harris became resident some 9 miles from me in the 1950's and he took a great interest in the progress of this locomotive. I now decided to consult him on my valve gear problems. He consented to sort it all out for me, thinking he would alter it in no time. The more he delved into it, the more he realised what he had let himself in for! We had several sessions on K.N.'s drawing board, and he eventually evolved a scheme which meant shortening the main connecting rod by ½ in. This in turn meant a longer piston rod and slide bars. Upon trying this out I found that the leading end of the coupling rod would not clear the lengthened slide bars, so we were back to square one. The problem was finally solved by going back to scale rod and bars, but supporting the top slide bar on a lug on the front of the rocker housing instead of the back. This enabled the crosshead to pass the rearward-moved rocker housing, but the rocker lever itself had to be redesigned to pass over the slide bar instead of in front of it. The combination lever, drop arm, return crank, and expansion link all had to be lengthened, and the rocker lever given unequal arms to secure the increased valve travel. Luckily these engines had one of the longest union links ever used in British practice. This now had to be shortened, and is now about the usual proportion for our country's practice so is not very noticeable.

K.N. wrote about his headache in "M.E." at the time, but he enjoyed it and afterwards thanked me for the chance to sort out such an unusual problem. It is a great shame that he passed away just before the loco's first trials at Beech Hurst, so that he never saw the fruit of his labours.

The original prototype engine was sprung throughout with helical springs including the bogies. After near disaster at speed near Hassocks, when the leading coupled wheels left the track, and then miraculously re-railed themselves about a couple of hundred yards further on, she was taken into works with her, then, only sister No. 328, and fitted with laminated springs throughout, except the driving wheels. Brighton was fond of helical driving springs on most of its classes. I decided on helical springs throughout because they would be easier to change and alter, to get a satisfactory weight distribution for adhesive purposes.

The only thing left now to "Swindonise" was the exhausting and draughting and Lionel Woodhead delighted in this, produing from Sam Ell's formula the necessary smokebox dimensions.

Each piston valve chamber was furnished with a oval flange at each end, all four of course being inside the frames as were the chests themselves. These led into four ½ in. bore copper pipes making a rough elongated "X" but with a length of ⅞ bore copper pipe in the centre to accept the four branches. This in turn was saddled with a brass fabrication containing a baffle to direct all steam upwards, instead of along their opposite arms.

This had a bore at the base of about 1¼ in. and tapered upwards to accept a screwed on blast nozzle of 13/32 in. dia which in turn held down a blower ring containing 3 jets drilled No. 70, on to a locating step formed on the blast pipe itself. Unscrewing the nozzle allowed the blower ring to be withdrawn, but having jets that protruded from its flat top, they could be cleaned with a Primus pricker much easier than drilled holes in a circular pipe ring. The chimney liner of course, had the necessary taper of the above formula.

Early in December 1972 the great day arrived, and steam was raised in my garage with the aid of a calor gas burner poked thro' the firehole. The chassis had previously been tried on air some weeks before, and several adjustments made. Steam took a long time to raise, the long flame from the burner hitting the tubeplate, and deflected downwards, burning all the paint off the frames in the vicinity of the throatplate! The burner was turned down to stop this and at last I had steam. The locomotive had been packed up to bring the wheels clear of the ground. The regulator was eased open and with water exuding from the holes which would eventually hold the cylinder cocks, she was away! The burner proved hopelessly inadequate for the cylinders' appetite in its turned down state, and pressure rapidly fell. Not before it had been established however that all was well, and steam trials on the track could be undertaken.

Easter Saturday 1973 saw the locomotive make its debut on the Brighton & Hove's up and down track in Hove Park. Several adjustments were required to valve setting, but eventually all was well, and it was tried by all the members present, with very favourable comments; the acceleration up the bank, even with a good load, being phenomenal, in spite of 7 3/16 in. driving wheels. Several more sessions took place in the season and the locomotive took its turn on the duty rota without further trouble, other than the whistle episode described earlier.

Next came the trials on the continuous track at Beech Hurst during the Summer. Here a new trouble developed. As soon as steam was turned on, the comparatively small mass of the piston valve bobbins expanded rapidly taking up the very small clearance between them and the large much cooler mass of valve chambers plus cylinders. It was found best to open the cylinder cocks, with a just cracked regulator move the engine about slightly to let steam get all round the cylinder block and even up the expansion. Once this was achieved, no further trouble was experienced, and the locomotive entered the passenger hauling stud. Trials were completed in September, with a seven hours continuous spell of duty, taking some fairly good loads in view of the loco's newness. Steaming was excellent, so much exuding from the safety valve and chimney that it was necessary to lean sideways to see ahead! The beat was very subdued owing to the large blast orifice. Water had to be carried in a plastic can on the driving car as the tanks were not yet finished. To clear the grate, at first the rear bogie had to be detached and the grate withdrawn backwards and downwards through the rear ashpan. After reading Don Young's excellent idea for a grate in two halves, mine was rendered thus, and it is now possible to fit and remove the grate in two sections through the firehole, without disturbing the bogie. Thanks Don!

Returning to the valve gear, the valve cross-heads have been deepened and now look like "Allan" expansion links, with straight sides. These house a bronze die block which pivots on the pin in the end of the rocker arm. Thus the block can move up as it transmits the arc of the rocker arm into the straight line of the valve spindle. There wasn't room to incorporate the prototype's short link, so the Swindon method of operating the outside piston valves was modified and adopted. A standard type of oscillating cylinder mechanical oil pump, driven from the right hand valve crosshead looks after the lubrication. The delivery pipe has a tee fitted just inside the smoke-box saddle, and two equal length pipes deliver direct into each steam pipe. The supply is more than adequate on its lowest setting, which I suppose is a good fault. The running season over, the finishing off was tackled next, starting with the tanks. Now a lot of rubbish has lately appeared in various publications concerning the Brighton "Baltics". Someone erroneously said that they were unsteady and converted into well tank engines! The other writers all copied it without bothering if it was correct. Well, they weren't! The point all these writers missed is that the "Baltics", like many other large tank engines, carried the bulk of their water in their bunkers. 1350 gallons of it! The top of the tanks behind the side sheets were lowered less than two feet, and still held 450 galls a piece, and were NOT dummies as stated by the above writers. The well tank itself held a paltry 450 galls and could only supply the "Weir" feed pump. The injectors drew their supply from the bunker. My tanks contain water to their top limit but the filler caps are just invisible below the side sheet as prototype. I need all the water I can carry, each tank contains about 3½ pts, as although long, they are very narrow. The bunker holds approx 1 gallon, giving me roughly the same as the average small tender locomotive. Tanks are balanced by rubber pipes ½ in. bore under the cab floor each coupled to the bunker which as the prototype's two air escape pipes leading up to the rear of the cab roof, the bunker being a closed vessel. Coal rails were made of 5/32 in. steel split pin wire and has the true "run" of the prototype and "T" section brackets at the rear. Tank fillers are true to prototype, the cap itself swivels on its hingebar and locks with a stainless scale T headed bolt.

The boiler is lagged with ¼ in. thick asbestos matting, covered with .017 in. thick phosphor bronze cladding. The handrails terminate in two dummy valves fabricated from bronze stock, which are secured to the lagging. In full size these valves supply steam to the Westinghouse + Weir pumps. Their control rods run back to the cab through the correct shape brackets. Dummy pipes run from these valves and terminate at nipples in the smokebox saddle. The second rod on the left hand side operates the dummy blower valve on the smokebox side. Opening tool boxes of correct profile are fitted on top of the bunker sheet in the cab, and the cab opening doors have correct type, spring loaded catches.

Lubrication

A fourteen feed dummy Wakefield mechanical lubricator is mounted on the right hand running plate, and an eight feed one on the left hand side. The pipes from both of these just terminate as free ends, as both running plates lift off without undoing any fixings; this makes it easier for lifting the loco with hands over the front buffer beam.

The lubricators both have moveable stainless hand wheels, and their lids are secured by swivel bolts fitted with 12 BA wing nuts, filed up from the solid, one of the worst jobs on the whole locomotive! Both also have shut off cocks with working handles. The large, oval, stainless buffers have the proper "concealed" keys of the prototype which eliminates an unsightly keyway in the underside of the shank. The sockets are spigoted into the front buffer beam by $\frac{3}{8}$ in. dia. force fit spigots. The four 9 BA bolts just hold the sockets to the beam, so that if a stranger goes to lift, and lifts on the buffers, the weight will be taken mostly by the $\frac{3}{8}$ in. spigots. All components of the screw couplings, and the hooks themselves are in stainless steel and of correct profile. In service buffers and screw couplings get sweaty fingers trying them out. Nothing looks worse than rusty components here and it's a devil of a job trying to de-rust a screw coupling. All the bright parts on this locomotive are in stainless steel for this very reason, the only exception being the motion work which is always oily anyway. The diameter of the main crankpin is overscale at $\frac{3}{8}$ in. to help the big end stand up to heavy haulage as it is rather narrow. The big ends on the prototype always had a pronounced "knock", being split adjustable brasses. Mine are solid bronze bushes with a square face, another "Swindon" idea, and the outside dimensions of the connecting rod can thus be kept "Scale" in spite of the oversize crankpin.

Details

All other details are true scale. The front double lamp brackets are typically "Brighton" I don't remember any other company using them. The lamps were made from F. C. Hambleton's drawings in the "M.E." of 1950 vintage. They have the correct raised louvres, and their bulls-eye lenses were turned from perspex bar, then polished. Reflectors are fitted, and "grain of wheat" bulbs as used by the "OO" and "N" gauge fraternity can be fitted inside. Coupled to two 6 volt radio batteries in series, concealed in the bunker they give a bright beam that would have delighted the hearts of the full size drivers. Cylinder cocks are spring loaded plug cock type worked by a complicated system of rods and cranks from the cab. They have the correct shape and dimensions of the full size steam operated ones. Two steam chest drain cocks are also fitted, and a large snifting valve in the bottom of the smokebox is coupled to the hot tender of the superheater by twin large bore pipes to help eliminate the vacuum in the large cylinders when coasting.

Lastly painting and lining. The former was carried out by a professional car sprayer, with the Rover car co's "Mexican brown" cellulose on an etching primer base. Smokebox, chimney and cylinder lagging in the etching primer only, to resist heat. The colour has been pronounced "just about right" by experts who remember the old livery. It is edged with a darker shade of the same colour. These colours of course, darkened with service. The lining was done by club member John Bateup, with a long signwriter's brush. He made an excellent job under very difficult conditions as when the painter's masking tape was removed, it left a very rough surface just where he had to put his lines.

The high gloss finish has been criticised. I would say this. The policy at Brighton was to give a high gloss finish. Several coats of varnish were applied to achieve this. Just after the great war, supplies of high gloss black paint were unobtainable, and rather than paint their best engines in dull black they used their plentiful supplies of umber for the passenger classes. I have a photo of "E" 0-6-0T No. 137 so painted outside Brighton shed, and the reflection of light from the boiler tanks has to be seen to be believed. If a goods engine looked like that you can imagine how their "sacred shrine" engine called "Remembrance" would have looked had they ever have had the chance to paint her in their umber livery.

Why did I paint it umber when the prototype only appeared in first, red oxide unnamed then dove grey named, and finally "Southern" "sage" green and named? This locomotive was created as a memorial to the old London Brighton and South Coast Railway, on which I spent many happy working hours as apprentice, and its dedication plate I altered to "In memory of the 619 locos of the LBSCR which terminated December 31st 1922." It was only right and proper that it should carry its old company's full livery, and not the grey livery which Brighton bestowed on all locomotives which were to be officially photographed, for a class record. The grey livery had nothing to do with the "sombre occasion" that the locomotive represented, as recently set down by a well known writer.

Did the results justify the modifications? In service the engine will start out of Beech Hurst station with a heavy load. The reverser can be wound in as soon as she's on the move and she will sail up the 1 in 100 bank on about 30% cut off. Once over the top the gear can be wound in to virtually mid gear and the regulator swung right over just as G. J. Churchward intended it to be! As she strikes the curve and bank at the start of the second lap she begins to slow. Without touching the regulator the reverser is advanced a quarter turn. The response is immediate and the slowing is checked. As the bank steepens another slight touch on the reverser, and she sails up the bank in fine style, just like a G.W. loco tackling Dainton!

Principal dimensions — 2 cast iron cylinders 48½ mm bore x 2½ in. stroke, 2 solid bobbin piston valves 1 in. dia. x ¾ in. travel.

Valve gear — Walschaerts outside, transferring to inside valves via rocking shafts.

Coupled wheels 7 3/16 in. dia. Bogie wheels 3 11/16 in. dia. all treads coned 1 in 20.

Boiler 6 in. O.D. x 10G Copper: Belpaire firebox: single large dia. safety valve exhausting through the 4 columns of the case, pressed to 75 p.s.i.

Boiler feed, 2 live steam injectors.

Grate area 23.38 sq. in. 32 tubes 7/16 in. x 20G. 4 flues ¾ in. x 20G.

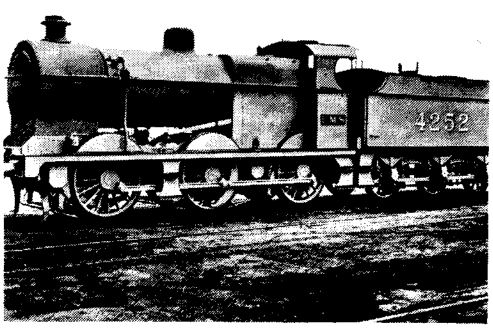
"Semi" radiant superheater with "Incoloy" elements.

Water capacity approx. 2 galls. Weight in working order 250 lbs. approx.

Time to construct:— 10/12 years spread over the period 1949-1974.

This locomotive was awarded a Silver Medal and the "Crebbin Memorial" Cup at the 1975 "M.E." exhibition.

For the unfamiliar:— The prototype was the last of class of 7 engines turned out in April 1922 by the old LB & SCR for express passenger duties. It was named *Remembrance* to commemorate those company employees who lost their lives in the Great War, and carried dedication plaques on the side tanks to that effect.



"DERBY 4F"

A simple locomotive for 3½in. gauge

by Don Young

Part XII *From page 648*

VALVE SETTING is carried out as follows:

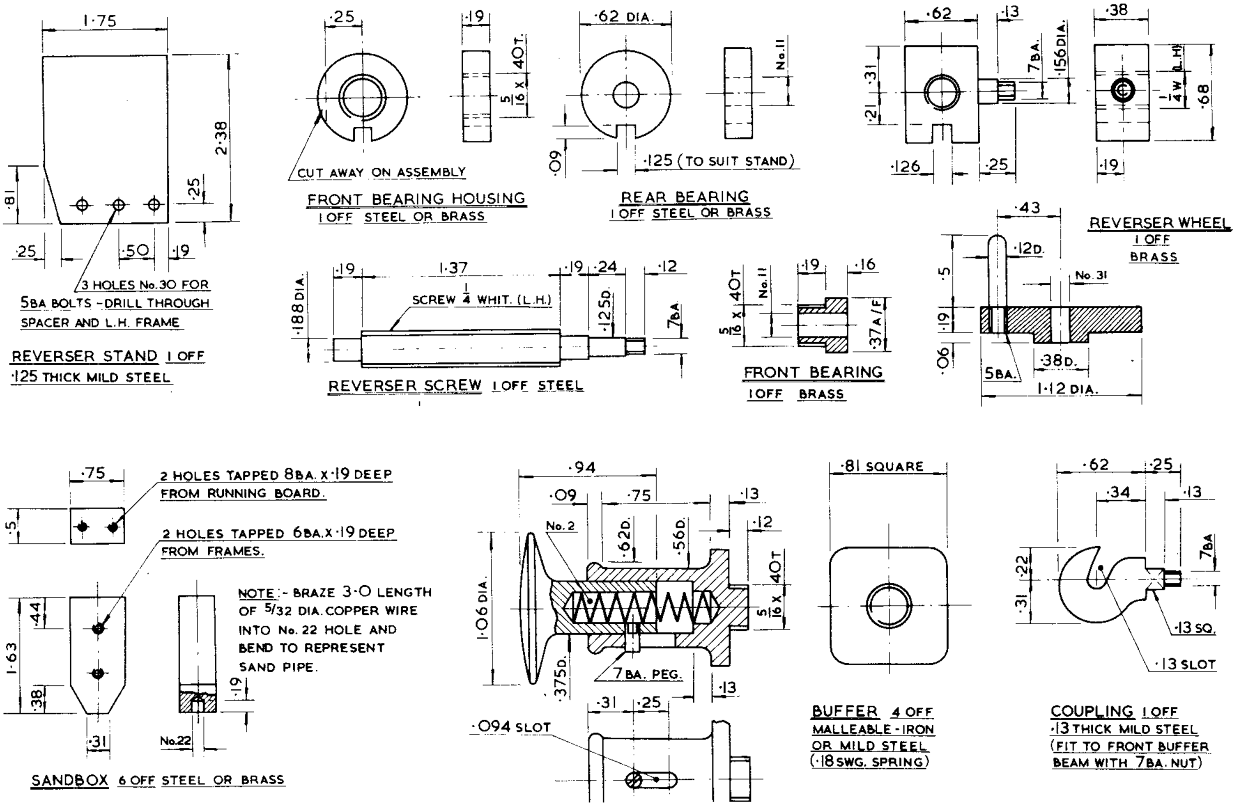
Leave the reverser nut in the previous position and turn the wheels to see if the valves are central over their ports, it will be a miracle if they are. Oh, I forgot the instruction that in order to view the valves the steamchest cover must be removed! To get the valves central, remove the pin at the valve spindle forks and screw the fork ends in or out as necessary on the valve spindles, until the valves "crack" the steam ports equally. If my homework on the valve gear is correct then that is the end of valve setting, quite the simplest gear to make and set; no I must withdraw that statement or the devotees of slip eccentric valve gears and the like will descend upon me! At least there is no messing about with eccentrics and eccentric rods, and all builders of Joy gear engines seem to agree there is nothing better in service.

Buffers, couplings and sandboxes

It was at this point in the penning of the rough notes that the move to the new abode occurred, occasioning quite a break in the continuity; I trust readers may excuse any slight duplication as the threads are picked up again. During the interlude, a letter from Professor Chaddock appeared in "Postbag" posing the question of the need for detailed process specifications for all components. In the usual way of things the penny did not drop, until the point was diplomatically raised by our worthy Editor. This series being expressly aimed for beginners, yours truly will continue, with the Editor's approval that is, to provide a more detailed description than might be thought strictly necessary, but Professor Chaddock's "sugared pill" has certainly been swallowed.

On with construction, starting again with the buffers, where malleable iron castings are available for both stocks and heads. Chuck the stock, by its shank, in the 4-jaw chuck and set to run as true as possible; because of the little bead, pieces of packing may have to be introduced under each chuck jaw. Face off and turn the spigot for beam attachment to 5/16 in. dia. and ⅛ in. long, screwing 40T.

Chuck your 5/16 in. x 40T screwed adaptor



and fit the embroyo stock to this; clean up the profile, centre and drill down at No. 2 to 27/32 in. depth. Follow up with a 3/8 in. drill to 5/8 in. depth and finish square with a "D" bit. Clean up the flange with a file and offer up to the beams, finding by trial and error which one lines up best in each tapped hole. If you do not favour this procedure, use a plain 5/16 in. diameter spigot and fix to the beams with four 10BA screws in the corners of the flange. Whichever method is adopted, drill three No. 41 holes on the bottom centre line and open out into the slot shown, using the drill as a gauge.

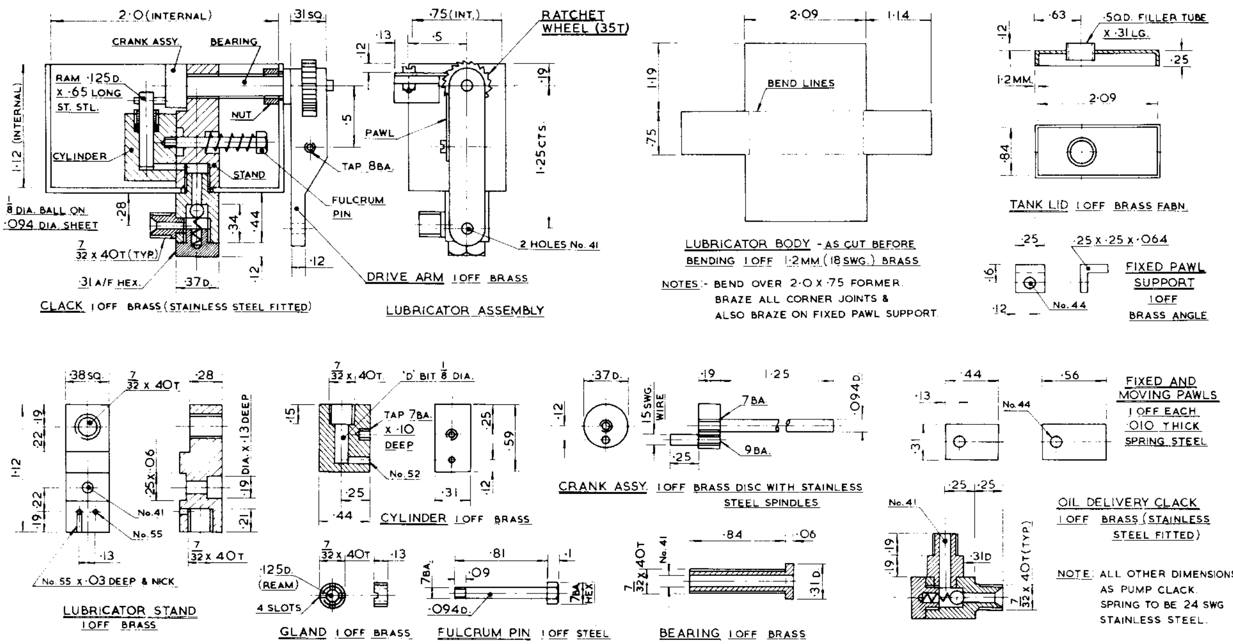
To machine the buffer heads, grip by the head portion, centre and bring the tailstock into use before turning down the stock to 3/8 in. dia., a nice sliding fit in the stock. Drill down No. 2 to 5/8 in. depth then reverse in the chuck and fashion the head. Drill and tap 7BA at 5/32 in. from the end of the shank for the little peg and make up this latter item. All that is needed now is the spring, about 1 1/8 in. free length, the test being that when the whole is assembled you can just fully depress the buffer in your hand.

The coupling is a pure adornment on the front buffer beam; if any owner of a Derby Class 4F wants to be the train engine when double heading then I recommend a somewhat more robust coupling. You can spend as little, or as much time on fashioning this coupling as you wish, finally fastening to the beam with a 7BA nut.

Basically the sandboxes are also an adornment, but I have made good use of them for attaching the running boards. Make them from 3/4 in. x 1/2 in. brass or steel bar, spot back from the frames then drill and tap the 6BA fixing holes. Drill in at the bottom at No. 22 and braze in the 5/32 in. copper wire, shaping this as shown on the General Arrangement drawings. Make sure that the "outlet" is clear of both wheels and track.

Lubricator

Having described this LBSC type of oscillating cylinder lubricator several times in the recent past I do not propose to repeat the performance, but will merely point out that the most critical part is to ensure that the cylinder and stand faces are in good contact throughout the oscillation. To the new recruit my earnest advice is to purchase a complete lubricator from one of our

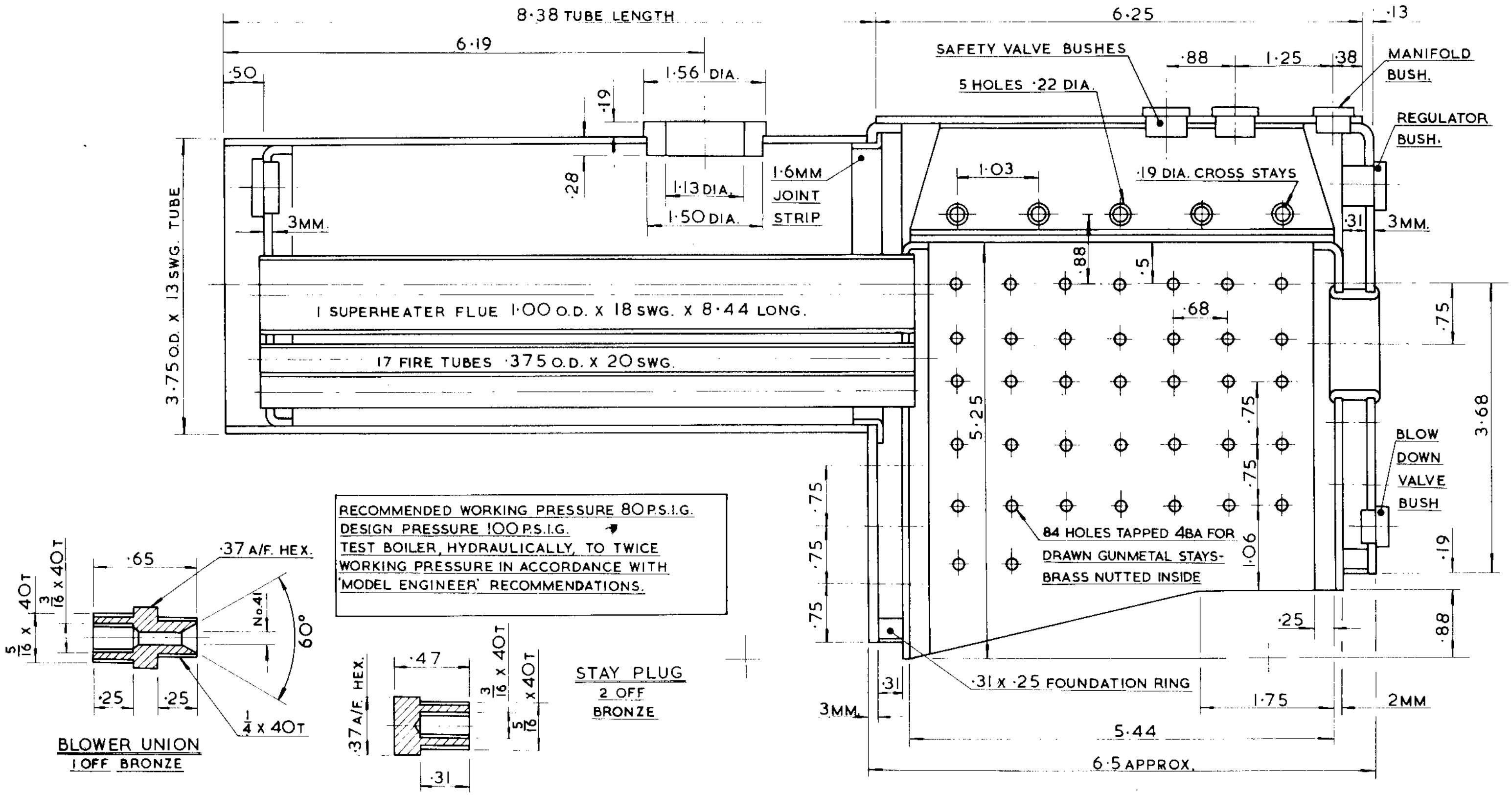


suppliers and to this end the overall sizes correspond with a stocked "standard", though of course there are some detail differences. My favourite Gresley "Pacifics" all had Wakefield mechanical lubricators fitted, together with the same manufacturer's oil atomising system, so you are in good company in purchasing your own equipment complete and ready for installation. The main criterion is to ensure an adequate supply of lubricating oil arrives at the cylinders, the transfer of which we shall deal with in just a moment.

For ease of fitting a "standard" lubricator tank, the decision was made to move the fixing angles from the inside to the outside of the frames for the front buffer beam. In doing this small modification I forgot to check the notes and as a result the description is for conventional fixing. The amendment should be that clear holes be first drilled in the buffer beam fixing angle, this then being offered up to the frames and either clear or tapped holes produced in said frames. Those who have already marked out and drilled the holes in their frames need not worry; first clamp the fixing angles to the frames and drill off, then offer up the buffer beam and drill for the rivets; sorry about this error.

For the oil delivery clack, chuck a length of $\frac{3}{8}$ in. brass rod, centre and drill down at No. 43 to $\frac{3}{4}$ in. depth. Follow up with a No. 11 drill to 5/16 in. depth and "D" bit at 3/16 in. dia. to 11/32 in. depth; tap 7/32 in. x 40T to 7/32 in. depth. Run a 3/32 in. reamer through the remains of the No. 43 hole and then part off at 11/16 in. overall. Reverse in the chuck and turn the union connection. Turn the cylinder block connection from 5/16 in. brass rod, and when parting off leave a spigot about 3/16 in. dia. and 3/32 in. long. Mike up the spigot and drill the clack body to a press fit, this makes thing a lot easier when brazing up. Screw the connection into the block, align the clack body, braze, pickle, wash off and clean. Run the 7/32 in. x 40T tap into the hole and then seat an $\frac{1}{8}$ in. rustless steel ball, before turning up the cap from 5/16 in. A/F hexagon brass. Finish with a 3/32 in. o.d. x 24 s.w.g. stainless steel spring, of just sufficient length to ensure the ball always returns to its seat after delivery, for cylinder oil is quite viscous. Connect from the pump outlet to the cylinders with 3/32 in. o.d. thin wall copper tube, routing the pipe in the manner shown on the chassis arrangement drawing.

The last feature to complete before we move on to the boiler is the lubricator drive; this has been omitted from the drawing details as it is best made to place to avoid all the obstacles between the driving axle and the lubricator drive arm. Start with a length of $\frac{1}{4}$ in. x 3/32 in. strip and drill a No. 34 hole about $\frac{1}{8}$ in. from one end. Remove the bottom bolt from the feed pump eccentric strap and insert the strip under the head. Twist the strip through 90 deg., as sharp a twist as found practicable, when I find that a second, No. 41, hole can be drilled about $\frac{1}{2}$ in. below the



THE BOILER FOR THE DERBY "4F"

No. 34 fixing one, clear of the twisted portion.

Make up the two fork ends, generally as for the valve spindles, but dimensioned to suit the little arm just made, and also the drive arm on the lubricator. Both fork ends are tapped 7BA to accept a length of 3/32 in. dia. steel as the drive rod. I make the length of this rod roughly 10⅝ in., but you can quickly find this out to place, bending as necessary to miss all the obstructions en route. Even if you make a mistake the first time, another length of 3/32 in. rod will not constitute a major financial disaster, which is one reason why this part can confidently be left to the builder.

The Boiler

It has been said, with a great deal of truth, that the Belpaire type of boiler is not as suitable as the round back pattern for a beginner. However the package deal offered by some of our suppliers who regularly advertise in *Model Engineer*, which includes all materials for construction, all necessary plates being flanged, entirely relieves any worry in this direction, and I can only recommend that all beginners avail themselves of this excellent service. The ensuing text will make this assumption, and it will save valuable space which I am sure our worthy Editor will applaud!

The description of how to true up the boiler barrel for *Mountaineer*, which yours truly will freely admit was not so simple, brought forth a letter from Alex Russell in Australia. Alex, who is building two No. 1 Rail Motors, said that with his 5 in. centre lathe he merely chucked the barrel, by the bore, in his 3-jaw and squared the barrel with a knife edged tool at the headstock end, the outer end of the tube remaining unsupported. What Alex failed to realise, because I did not repeat the statement often enough, was that all my descriptions revolve around a 3½ in. centre lathe and that the operation as he described it was physically impossible on this smaller lathe. Maybe I am wrong in assuming that the majority of model engineers around the world perform on a lathe of 3½ in. centre height or thereabouts; perhaps a census could be taken on this subject?

Anyhow, our Derby 4F boiler barrel can be squared to length by the method that Alex propounds, taking care to have the tube end clear of the chuck jaws, by extending slightly towards the headstock. With the knife edge tool still in place, lightly scribe a line right along the barrel, which will represent the top centre line. Remove any burrs produced by the facing cuts in the bore of the tube, otherwise our smokebox tubeplate may be too slack a fit later on.

Our next requirement is a 10 in. long strip of ⅝ in. x 1.6 mm (16 s.w.g.) copper. Wrap this first around the boiler barrel and then introduce into the rear end, with about 7/16 in. projecting, trimming off as necessary to form a neat joint.

On the top centre line, at 6 3/16 in. from the front end, scribe a circle 1½ in. diameter for the dome bush. This latter item is a simple turning job from the casting supplied, a composite one which includes for the dome flange as well. Because of the possibility of a porous casting, our worthy Editor much prefers to specify drawn gunmetal bar for this application, which our suppliers can provide. Drill a row of holes, say No. 30, inside the scribed circle on top of the barrel, open these holes out until they begin to break into one another, then remove the centre. File out the hole until the dome bush is a nice neat fit; we are ready for our first brazing operation.

When Gordon Chiverton and yours truly tackled our first boiler, the first requirement then was a Government surplus 5 pint blowlamp, purchased from Messrs. Gamages; I still have it as a museum piece. The requirement nowadays is for a propane torch, with as many nozzles as you can afford, they all come in handy in their turn. All brazing must be carried out outside of the confines of the workshop, no matter what its construction, otherwise all your ferrous tools and materials will rust; the same proviso applies for soft soldering. The recent move has highlighted the problem of storage cylinders; the Insurance Company refused to give cover until provision was made to keep the cylinders clear of the insured buildings, which included the workshop.

This boiler, as are all my humble designs, is for construction using the conventional silver solders, having lapped joints and therefore not being suitable for manufacture using the higher melting point spelters which require a welding technique for application. Therefore the builder should avail himself of about six sticks of B6 alloy in the first instance, together with roughly the same quantity of Easyflo No. 2, plus of course the very necessary flux.

Brazing hearths are not nearly so vital, thanks to the high heat output from the propane torch, and my own 'table' consists of a sheet of asbestos millboard, placed on top of a dustbin which has outlived its useful purpose by reason of the bottom falling out!

The last item, and the one that seems to cause beginners most concern, is a pickling bath, or rather the concentration of acid therein. My own bath is a glazed Belfast sink with the plug hole sealed up.

To be continued

A Simple Ball Turning Tool

by Robert Saunders

Mr. Wilding, in his articles in the Horological Journal on clock making, shows the tops of his alarm clock weights as dome shaped. Although this is by no means essential I thought I would have a go, but distrusted my ability to do this with hand tools.

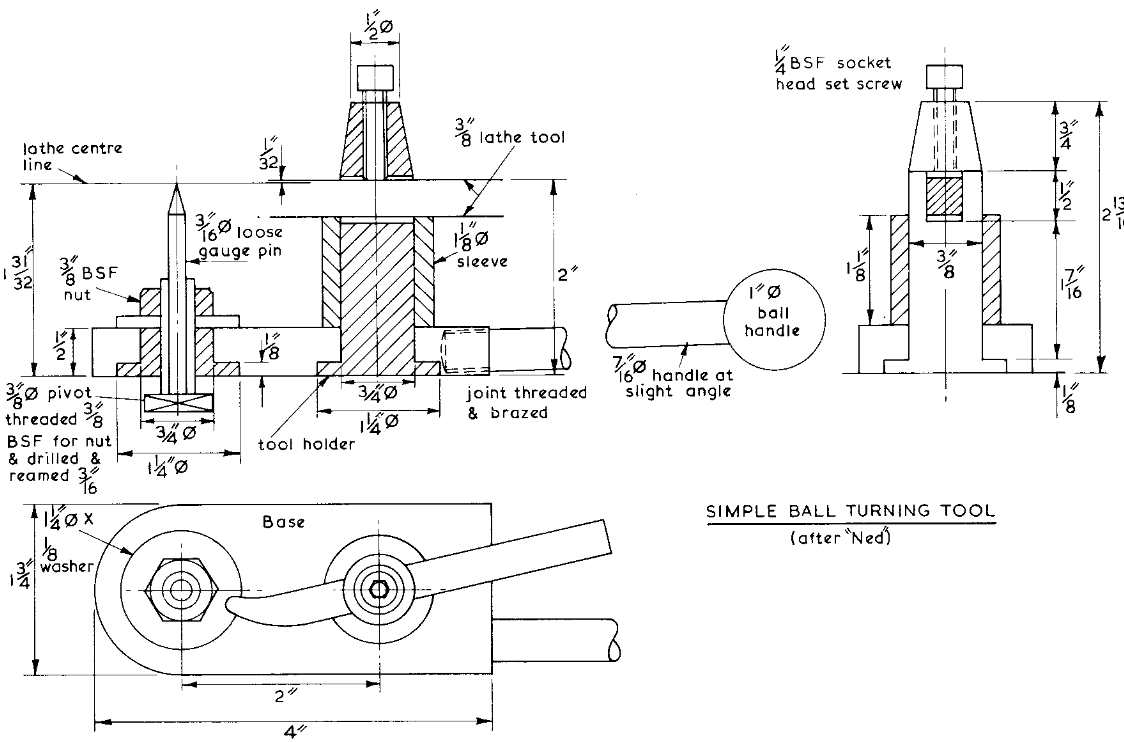
You referred me, when I enquired, to an article in the "Model Engineer" for May 12th, 1949. Basically this design by "Ned" is excellent and simple to make which is what I wanted. My lathe is an ML10 and this didn't exist in 1949. Also I have made slight modifications so I am enclosing a drawing and photograph showing what I have produced as it may help others.

The materials used were what I had to hand. The $1\frac{1}{4}$ in. diameter pivot bush and washer, and the tool holder would be $1\frac{1}{8}$ in. diameter if this is available and would save a lot of machining. This pivot bush should be a shade thicker than the base to allow the latter to swing freely. The bottom of the tool holder may be flush with the base or slightly recessed.

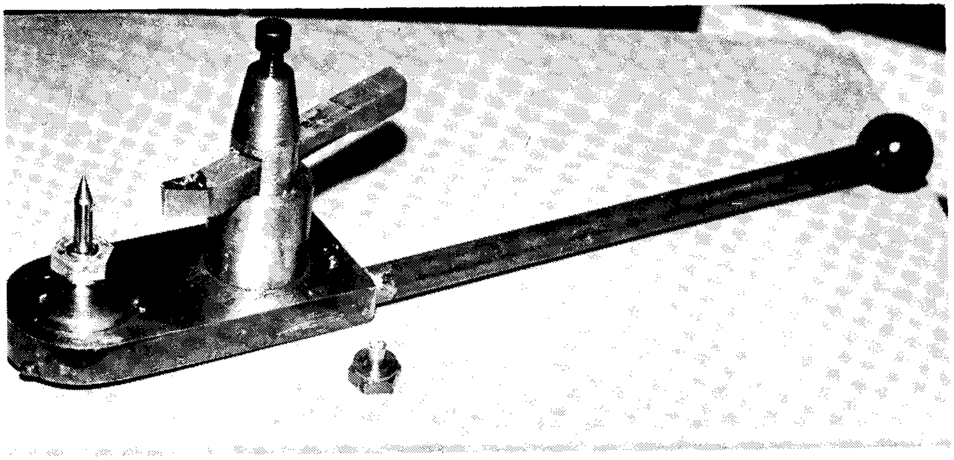
On the ML10 the lathe centre line is 31/32 in. above the boring table and I used a Myford $\frac{3}{8}$ in. square tool. The slot in the tool holder was made $\frac{1}{2}$ in. high to allow for variations in the position of the tool point relative to the top surface of the tool steel, and the sleeve was kept slightly short as it is easy to pack a tool if necessary.

The 3/16 in. S.S. gauge pin is removed, of course, before turning commences and swarf tends to fall down the hole so a small brass plug (shown in the photograph) was made. This incidentally is used to secure a piece of card on to which all swarf falls and prevents it landing on the boring table and possibly scoring between this and the base of the tool.

In practice, as Ned advised, rough setting is by the projection of the tool, but if one used a bent tool (again as shown in the photograph) fine adjustment is obtained by slightly rotating the tool. I think it works very well, at any rate



SIMPLE BALL TURNING TOOL
(after "Ned")



The completed ball turning tool.

my clock weights are satisfactory. You can even turn up the ball on the end of the handle of the tool itself!

I may, sometime, extend the scope by slotting the base (with file and Woodruffe cutter) so that the tool holder positions may be varied.

STEAM ENGINE VALVE GEAR

Sir,—A horizontal steam engine should be so designed that, when running in its normal crank direction, the link is "down". Then, should breakage of a pin allow the link to fall, it will merely put the engine into full gear. If running with link "up", the same mishap would cause sudden reversal into full gear before the driver had time to shut off steam. This could have disastrous results, and may well have been the reason why it became customary to fit crossed-rods motion on "four-shaft" type traction engines and road rollers.

In any engine, lead increases from full to mid gear with open-rods and decreases with crossed-rods. The terms refer solely to the state of the rods when both eccentric sheaves are toward the link, regardless of whether this puts the main crank on front or back dead centre.

Winterborne Zelston. H. S. Gowan.

ELECTRICAL WIRING

Sir—Regarding Mr. Jeynes' letter concerning earthing terminals. I would like to refer to current IEE regulations, under Section D—protection against earth leakage currents. Regulation D6 states—"At every lighting point an earthing terminal shall be provided and connected to the earth-continuity conductor of the final sub-circuit".

The terminal disputed is available normally for the earthing of metallic light fittings, essentially for fluorescent lighting fittings and necessary to comply with the above regulation for which no exemptions can apply.

Mr. Jeynes appears confused with two-way lighting. A terminal box is necessary to connect the switch changeover leads and earth bondings, so why not centralise the connections and decrease the confusion. However, I do not dispute switch link-in terminals are available for use on a single way lighting installation, even so the ceiling rose would require four terminals being LIVE (link in) switched live (bulb feed) neutral and earth.

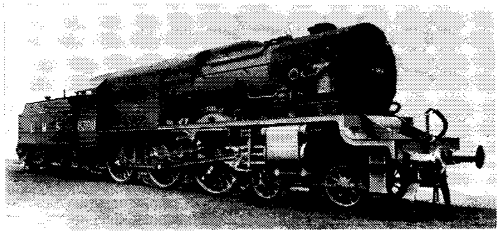
Also all earth wires bared at joints and fittings must be installed with insulating sleeving Reg. D29 (11) which shall be green or green/yellow Reg. B54 therefore inhibiting confusion regarding identification.

I conclude that if any persons are not absolutely sure of their ability to connect electrical fittings and apparatus correctly, they should seek advice from a competent electrician; for their own safety and the safety of others.

B. L. GREENWOOD,
Brierley, Nr. Barnsley.

ERRATUM

Making Injectors, page 585. Fig. 25. The internal diameter of the exit of the steam cone type 1A should be 0.074*in, not* 0.076*in.*



"FURY"

A High Pressure Compound Locomotive for 5" gauge

by Martin Evans

Part XIII

A High-pressure Boiler

From page 553

WHILE I WAS drawing up the boiler for *Royal Engineer*, I thought I might as well tackle that for *Fury*, as the two boilers are almost identical from the outside, though quite different inside. The main differences are of course that heavier material has had to be used throughout, as the *Fury* boiler has to stand the comparatively high working pressure of 160 p.s.i.

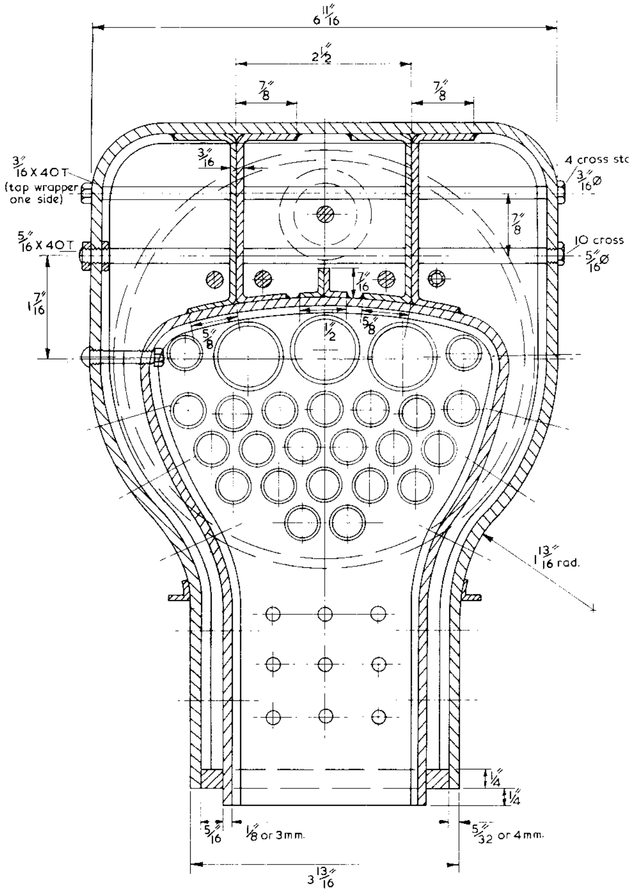
At the same time, as the exhaust of the Compound is likely to be softer than the "simple", I thought a wise move would be to specify large diameter fire-tubes (at ½ in. rather than 7/16 in).

Another small difference is in the barrel. I do not think that seamless copper tube 6 in. outside diameter can be obtained in 5/32 in. (or 4 mm) thickness, and ⅛ in. did not give me a sufficient margin of safety. So the barrel will probably have to be rolled up from sheet copper. The question of the longitudinal joint then arises, and as this joint is the most important in the whole boiler, I would strongly recommend that it be silver soldered, using a well-tried silver solder such as Easyflo No. 2. This is about the lowest melting point silver solder available, but it is also a strong and ductile one, and I don't think it can be bettered in this instance.

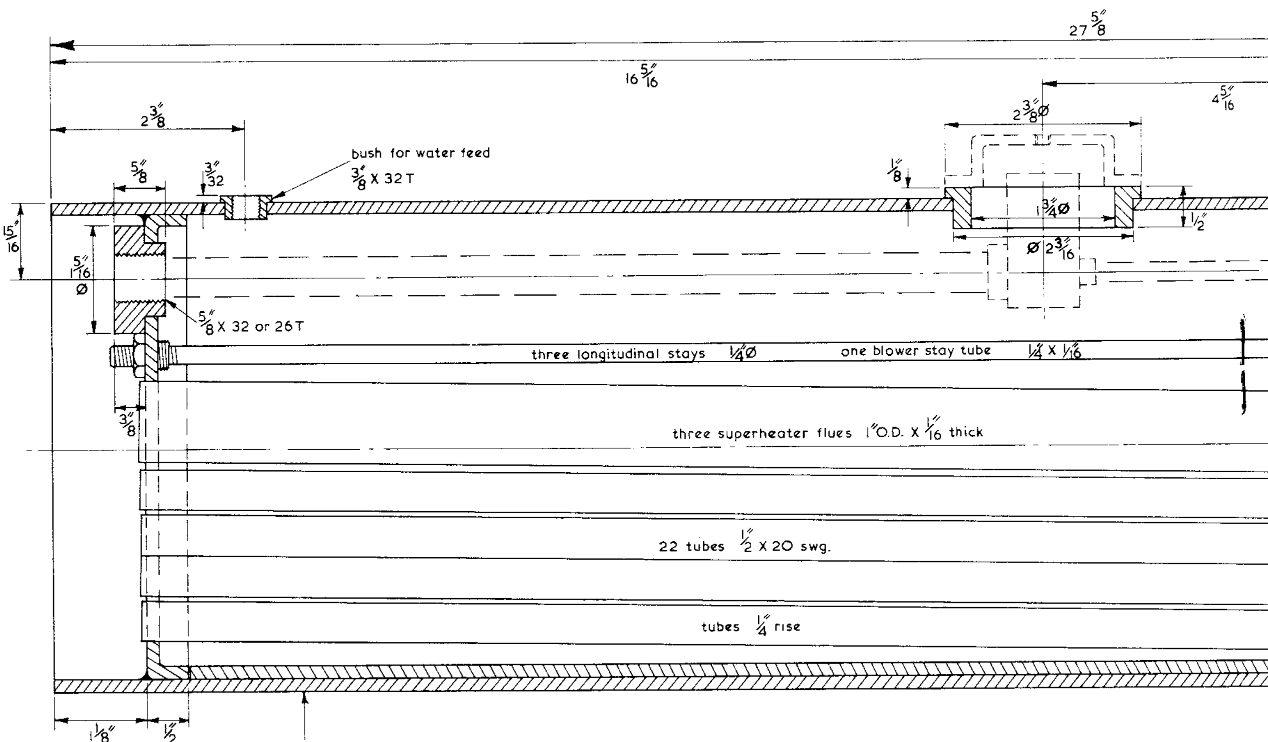
Whether the join is first made by a "coppersmith's joint" or by butting the end, and fitting a cover strap is immaterial; both methods are sound. If the cover strap is used, it must be at least 5/32 in. thick, and about 1 in. wide.

One other small difference may be noticed — an additional flanged ring is put in at the back of the throatplate, to strengthen the important joint between the barrel and the throatplate. I prefer this type of ring to a plain "piston-ring" type, which is often seen in model boilers. It should not be difficult to make. I suggest the way to go about it is to obtain a length of ½ in. square copper, anneal thoroughly and bend up to as near a true circle as can be obtained "freehand". Braze the joint (which may be stepped or scarfed so that the ends can be held with a small rivet while brazing), then set to run as true as possible in the 4-jaw, and finish turn to a nice fit over the end of the barrel.

I have shown the throatplate as rather wider over the flange than usual. I think this will make flanging this rather thick copper easier, but repeated annealing will be the answer.



CROSS-SECTION THROUGH FIREBOX

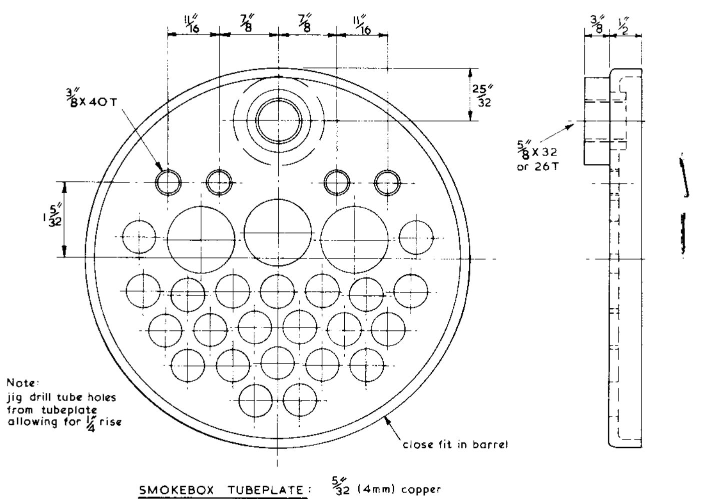


barrel 6 O.D. X 5/32″ or 4 mm.
joint by coppersmith's joint
or cover strap as shown in
5/32 copper X 1″ wide

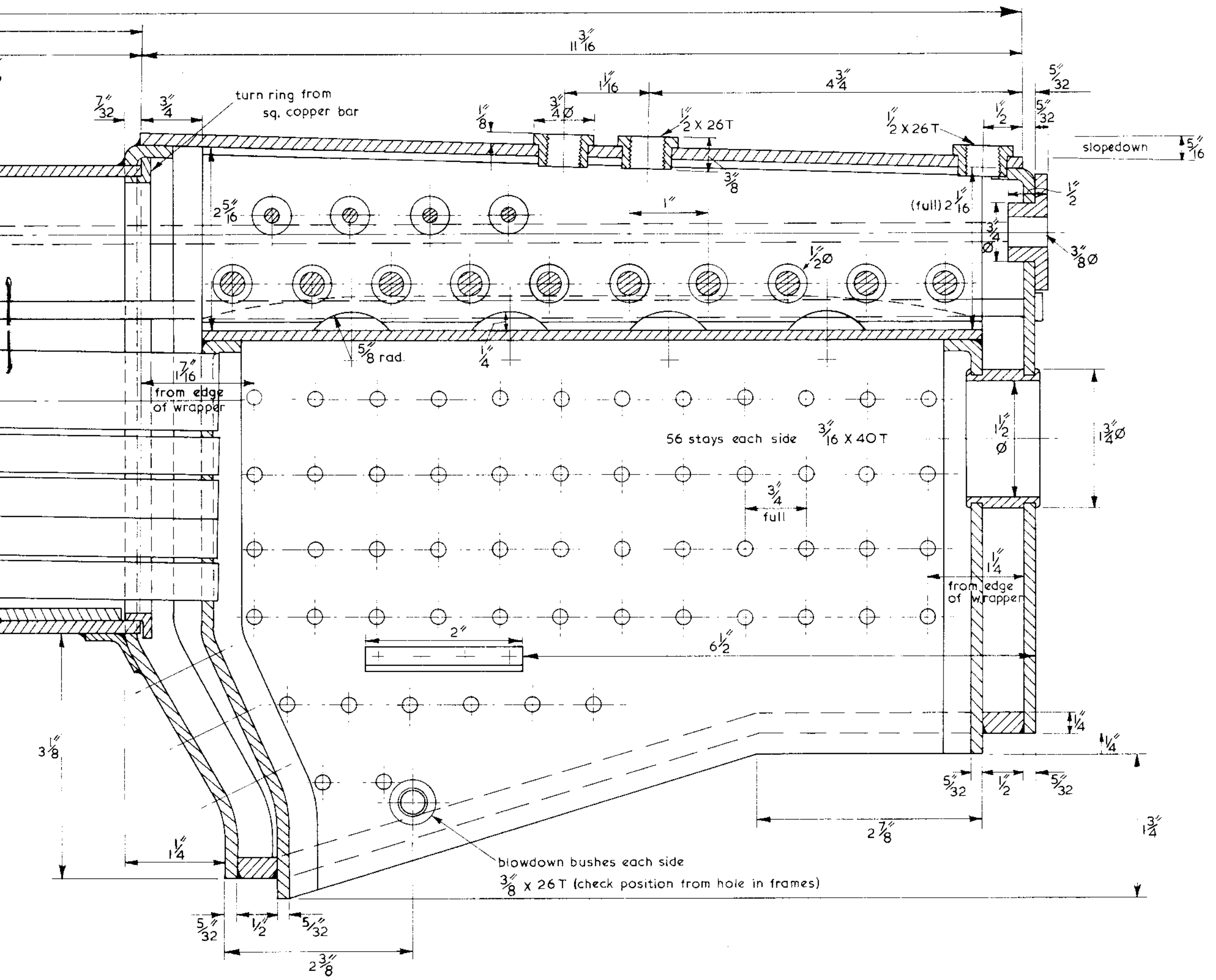
BOILER all copper, all joints s/soldered
bushes gunmetal. stays mon el or gunmetal
working pressure 160 p.s.i. hydraulic test pressure 300 p.s.i.
steam test pressure 170 p.s.i.

The backhead must be fitted with the stiffening ribs on the inside, these can be cut from 3/16 in. copper sheet, and a couple of gunmetal screws put in to hold them in place while brazing, and to prevent any chance of their dropping off inside the boiler during later silver-soldering operations.

There are four longitudinal stays this time, so nothing is taken to chance, and the smokebox tubeplate will be nicely supported in view of the large tapped bush for the superheater header. The three solid longitudinal stays should be of monel metal, the fourth is the usual hollow stay for the blower. The firebox side stays may also be in monel metal with advantage, though gunmetal is strong enough. Do not use copper, unless the builder is prepared to space the stays a good deal closer, and on no account use any ordinary commercial soft solder, as at working pressure, this



SMOKEBOX TUBEPLATE: 5/32 (4mm) copper



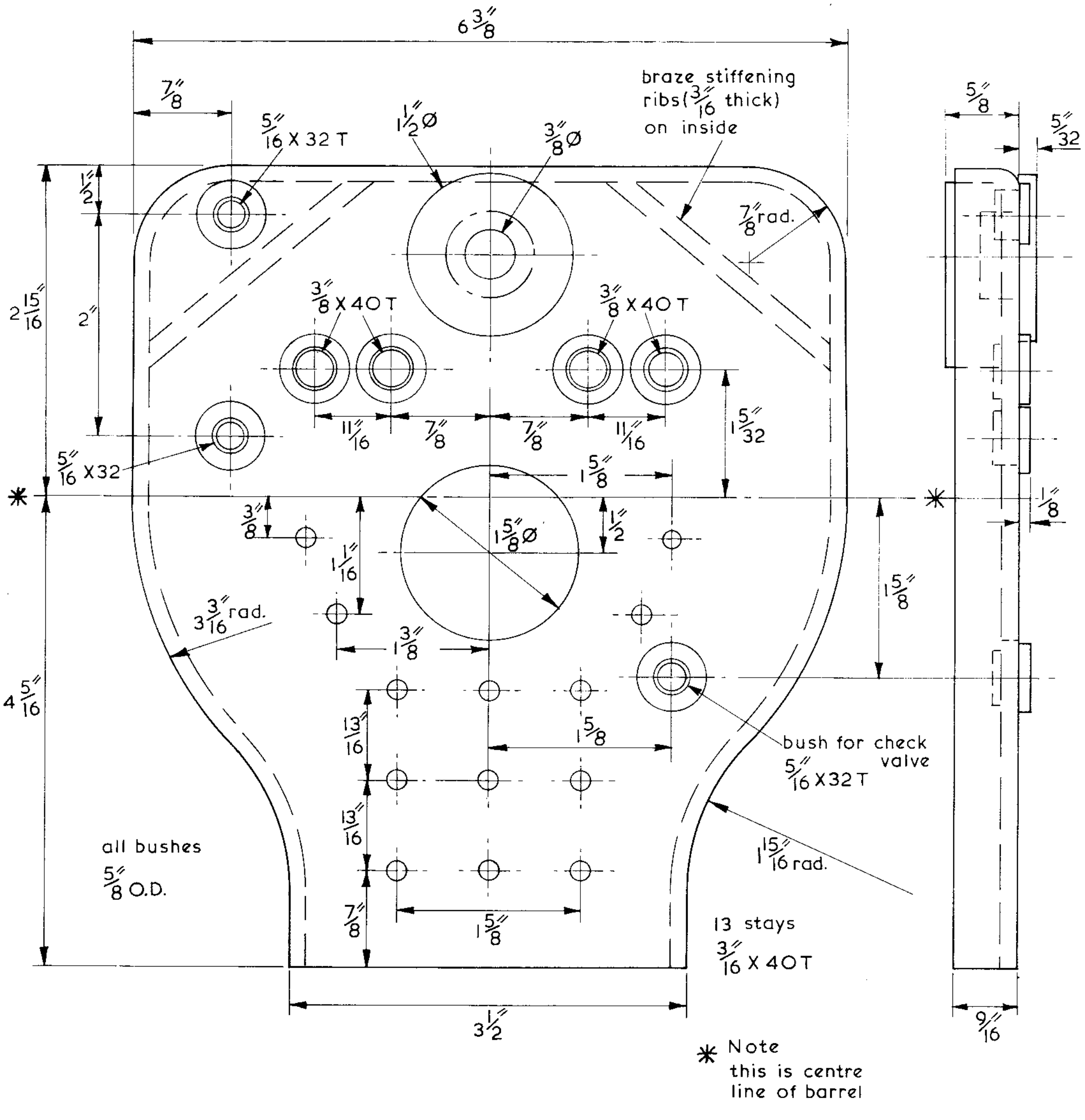
would very quickly melt. In fact, I would recommend that all stays in this boiler be run over with silver solder, to be on the safe side.

The transverse or cross stays above the inner firebox are arranged in two rows, but the top row may be a short one, owing to the slope down of the outer wrapper leaving a smaller area of flat surface to be supported. These stays can be fitted as described for the *Royal Engineer* boiler, the wrapper on one side being tapped, the other side having clearance holes only.

The backhead, again, is almost identical to that for "Engineer", apart from the increased thickness, but as we have a bush for top-feed, we will only need one bush on the backhead, either for one of the deliveries from the injectors, or for a hand pump.

Experimental boiler

Several readers have asked me what has happened to my experimental boiler with water-tube firebox; apparently, they expected that I would be describing a similar boiler for*Fury*. The fact is that I have not yet been able to try the boiler out on a locomotive, and I would not like to describe anything which is still definitely in the experimental stage. On test, using a blowlamp, the boiler makes steam very rapidly, while the circulation does not seem unduly fierce, so I am still confident that it will prove a success. Having



BACKHEAD: 5/32" (4 mm) copper

no stays whatsoever, it is an attractive proposition for builders. *Royal Engineer's* boiler may be more or less conventional, but I will be very surprised if it does not produce all the steam the engine can use.

DRAWINGS FOR "FURY"

LO.942. Sheet 1. General arrangement and main frames.

*Sheet 2. **Wheels and axleboxes, buffer beams, horns** and stretchers.*

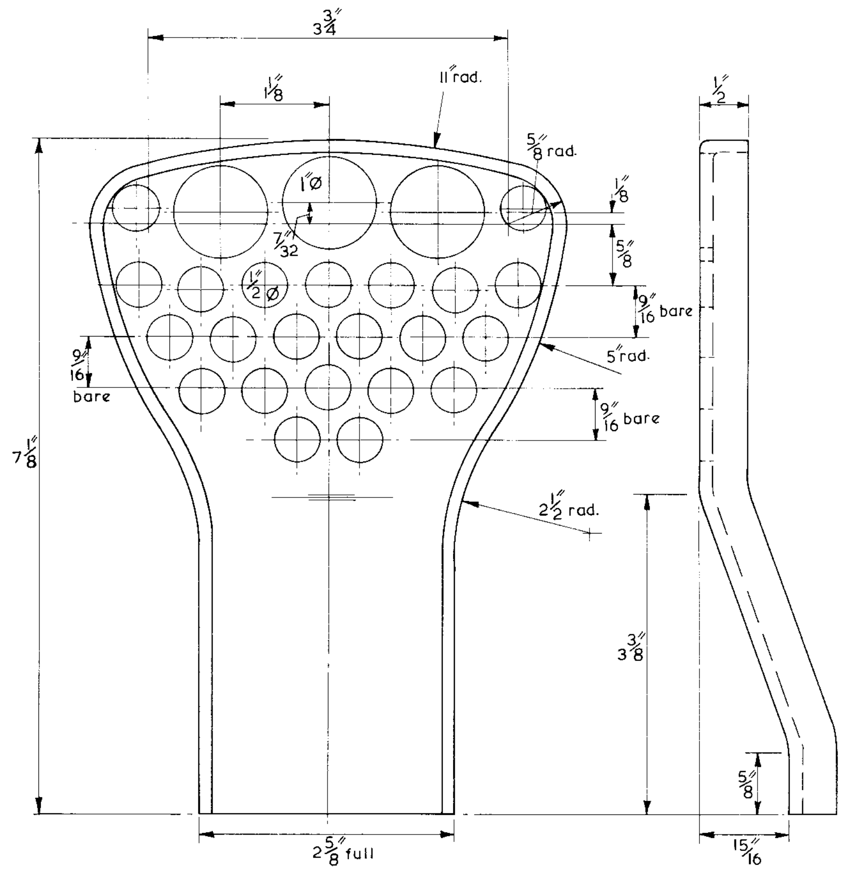
Sheet 3. Coupling rods, inside motion, inside cylinder, simpling valve.

Sheet 4. Inside valve gear, inside crosshead and motion plate, outside cylinders and details.

Sheet 5. Inside connecting rod, inside valve gear details, outside motion plates, crossheads, slide bars, valve crossheads.

Sheet 6. Outside valve gear, connecting rods and link brackets.

Price 70p each inclusive of post and VAT.



Note: See next page for details of the throat-plate.

FIREBOX TUBEPLATE: 5/32 (4mm) copper

A Small Steam Wagon

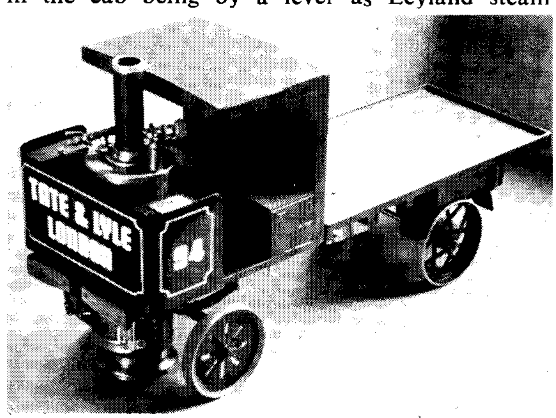
by J. S. Madron

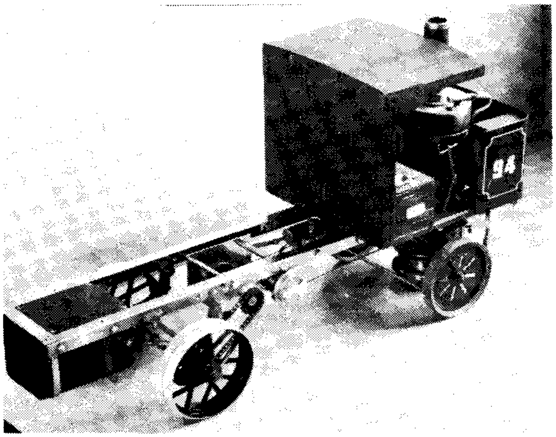
THE MODEL DEPICTED is a freelance design based generally on the 1913 Leyand undertype wagon and to approximate scale of 1:12.

The boiler and engine are German made (Marklin) the former being a centre flue design, spirit fired, and the latter a piston valve unit. The chassis is constructed from ½in. U shaped brass, and the gearbox, springs etc., from 1/16in. brass plate. Length 20in., width 3½in.

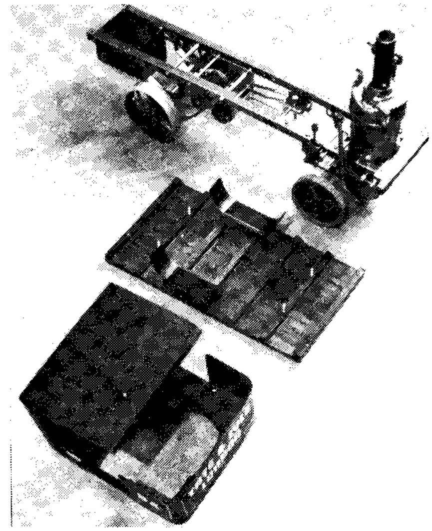
The engine and gearbox are of unit construction. Two speeds and a neutral are provided with reductions of 15:1 and 20:1 Meccano gear wheels, spindles, sprockets and chain have been used. Drive to the rear sprocket is by a single chain, the sprocket being spigoted too, and driving the off side wheel only, thereby obviating the need for a differential gearbox. The rear wheels are as used in the "Mamod" model traction engine, and are mounted on an axle ¼in. diameter.

Ackerman type steering is used, the control in the cab being by a lever as Leyland steam





Two views of the model steam wagon under construction.



wagons were never fitted with a steering wheel. Messrs. Meccano again supplied the front wheels. "Pneumatic" rubber tyres are available for these 3in. diameter wheels; those shown on the model were trimmed with an electric saw. The procedure is as follows. Mount the wheel and tyre on a spindle or arbor, underneath the edge of the bench with the required amount projecting. Fix, with clamps, and at the correct distance from the edge of the table, a long batten. When pressed against this batten, the electric saw (fitted with a fine toothed wheel) should, with the right hand, be moved steadily to and fro. At the same time the left hand, *well away from the saw blade,* slowly revolves the combined wheel and tyre.

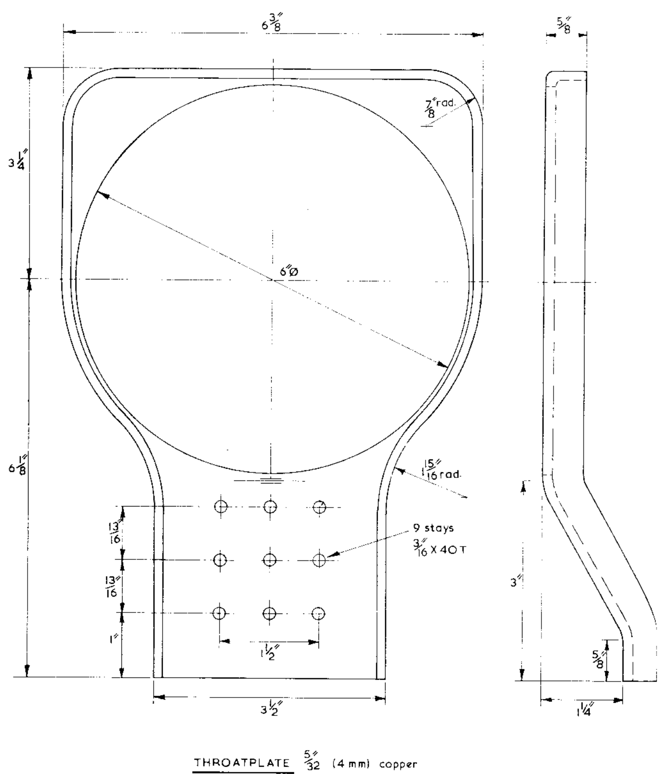
The flat platform 12½in. x 7in. wide is of wooden planked construction with seven cross members. It is secured to the chassis by four long bolts and nuts. The cab is 7in. wide, 7½in. deep and 6½in. higih. It is detachable as a single unit, being secured to the chassis by three nuts and bolts. The back is of wooden planked construction with cross pieces. The roof and front apron name-plate are aluminium. The wooden floor has been cut away to clear the boiler, steering column and gear lever.

A model of this type provides the constructor with a considerable amount of scope for varying the details and design to suit his own idea; for that reason only the main dimensions have been given as guidance.

With a working pressure of 12-14 p.s.i. (a safe maximum for this type of boiler) the model, on test, has performed quite well. A speed of about 2 m.p.h. can be attained in top gear, whilst in botom a load of 6lbs. has been carried.

The model will not, of course, win any medals, not even a bronze one. It sufficiently resembles the prototype as to be pleasant to look at. In construction only a few simple hand tools are required, plus a little time and patience. Its appeal should be to those who do not possess machine tools, and the skill and time required for the construction of those very advanced models so well described in *Model Engineer.*

Details of the throatplate for the "Fury" boiler



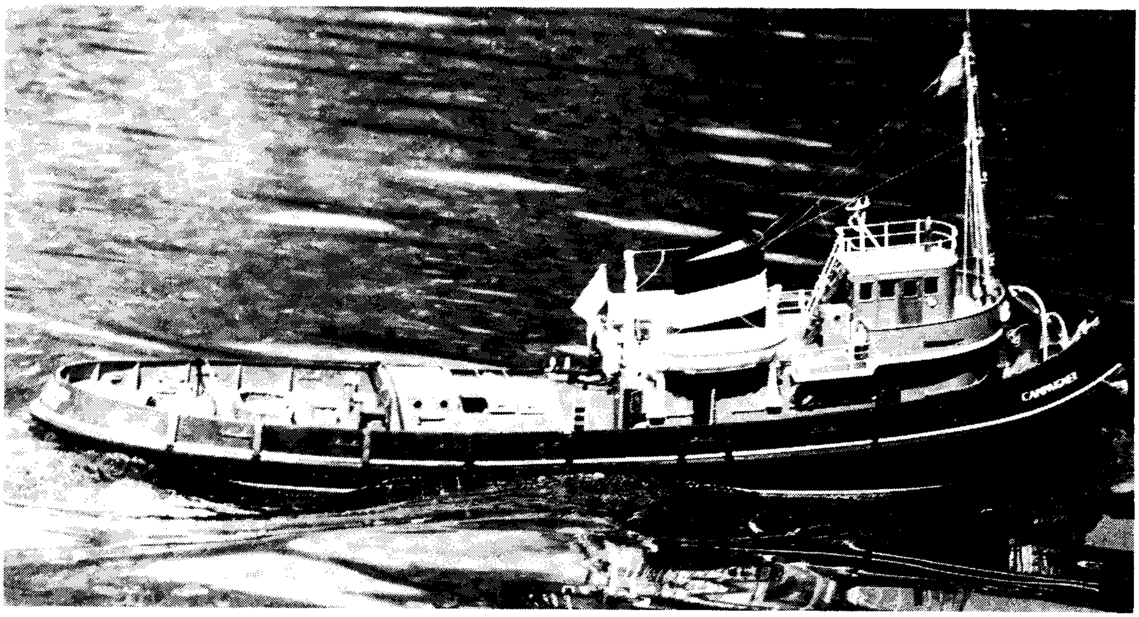
A PRIZE-WINNING STEAM TUG

by K. Clover

BUILDING SCALE MODEL boats is most interesting and rewarding, and having built a number of electric and I.C. powered models, I decided on a steam-driven radio controlled tug. Steam plant is so appealing with its bright steel and copper work and a tug packs the most machinery into a given length. I could not resist the elegance of A. Underhill's drawings of "A Sea Going Tug". She was built by James Lamont of Port Glasgow, and launched in 1947, and has a length of 114 ft. and a breadth of 28 ft. The present owners, The Cory Ship Towage Co., were kind enough to send me details of her colour scheme and photographs of the vessel at sea.

I decided to build the engine first and a set of excellent Stuart Turner Double 10 castings was obtained and work commenced in the summer of 1972. The engine is built to specification, except for the crankshaft. It was felt that positive lubrication to the bearings would be an advantage, and the crankshaft was fabricated using 9/16 in. dia. silver steel rod and mild steel for the balanced cranks. Having drilled the shafts and crankpins 1/16 in. the ends were reduced in diameter for a distance of 5/32 in. and made a press fit into the webs and silver soldered. The oilways from the crankshaft to crankpin were connected by 1/16in. drillings through the crank web and blanked off with drive fitting plugs. Exit holes 1/32 in. were drilled through the crankpins and mainshafts in line with the main bearings and eccentrics. Shallow grooves were machined in the shaft at these points to maintain a constant flow of oil. The ends of the shaft were blanked off similarly to the crank webs. In order to control the throttle by radio, a small needle valve was fitted at the inlet manifold. The needle was threaded 3/16 in. Whit, a coarse thread being chosen to get enough advance of the needle with the half a turn of movement permitted by the servo unit.

Oil is supplied from a reservoir and is made from $1\frac{1}{2}$ in. O.D. x 20 S.W.G. x 4 in. long brass tube with silver soldered on end plates of 1/16 in. thick. The reservoir is fitted with a small pressure gauge 0-80 lbs. and an air valve for connecting to a cycle pump, which when removed serves as an oil filler. When pressurised, oil flows through a 1/16 in. O.D. dip tube to a small needle valve with three 1/16 in. stainless steel outlets, one to each main bearing. A second needle valve controls a drip feed to the two trunk columns. The valves, when opened about $\frac{1}{4}$ of a turn, supply sufficient oil to the bearing; the residue dripping



into the sump.

To the rear of the crankshaft is fitted a 6:1 reduction worm and wheel, driving a 3/16 in. O.D. shaft in ball races to a 0.9 in. throw crank. A 3/16 in. I.D. ball race is used on the crankpin. The feed pump is a conventional type, being fabricated from $\frac{1}{2}$ in. diameter brass. The valves are 5/32 in. diameter stainless steel balls on $\frac{1}{8}$ in. I.D. seats. The ram is hollow and $\frac{1}{4}$ in. diameter stainless steel. The delivery is regulated overboard via a by-pass valve.

The water inlet is taken from a point low in the hull and passes through a large stainless steel gauze filter. This filter also supplies a hand feed pump.

The boiler is 9 in. long x 5 in. diameter x 10 S.W.G. copper. The flue has six $\frac{1}{2}$ in. cross tubes and a plumber's 2 in. Yorkshire bend, with female ends, is used to lead the uptake through the boiler drum. The end plates are flanged in the usual way, from 12 S.W.G. copper sheet. Owing to the uptake being within the end plates, the four 3/16 in. stays could not be evenly spaced and a relatively large area would be unsupported at the uptake end of the boiler. Before brazing up, this end plate was thickened by brazing on to the inside, an additional copper disc 3/32 in. thick. This was well worth while for on hydraulic pressure test of 200 P.S.I. this end plate showed no signs of distortion.

The steam dome was formed by dressing in the end of a 2 in. x 16 S.W.G. copper tube on a hard wood former; the copper being frequently annealed during the process. The ends were dressed in until a $\frac{1}{4}$ in. diameter hole remained. This was machined to receive a copper bolt. The dome was cut to length and shaped to match the boiler drum. The bushes for the steam valve and pressure gauge were silver soldered in. $\frac{1}{8}$ in. holes were drilled on a $\frac{7}{8}$ in. radius and a centre hole tapped 2BA in the drum. The dome was bolted in position and silver soldered. Fittings to the boiler include two clack valves for feed water, gauge glass, blowdown valve and a pop safety valve.

A paraffin blow lamp was made to fire the boiler, the nozzle being 1 in. O.D. with $4\frac{1}{2}$ turns of 3/16 in. brass evaporator coils. A bottled gas burner was also constructed from a camping Gaz stove, the nozzle being a fish tail paint stripper.

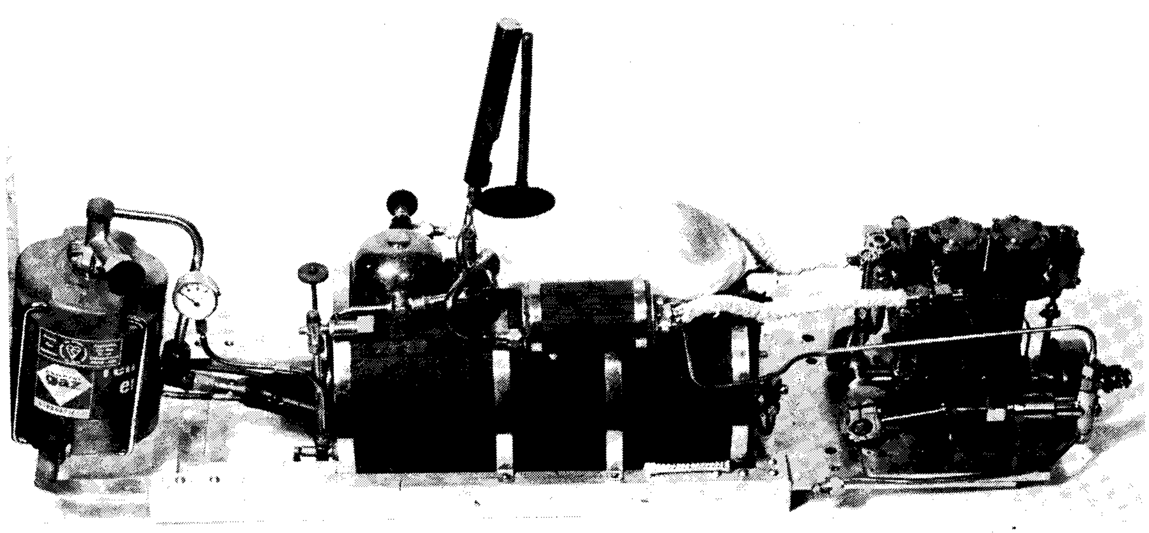
The steam is superheated by feeding four coils of the steam pipe through the smokebox.

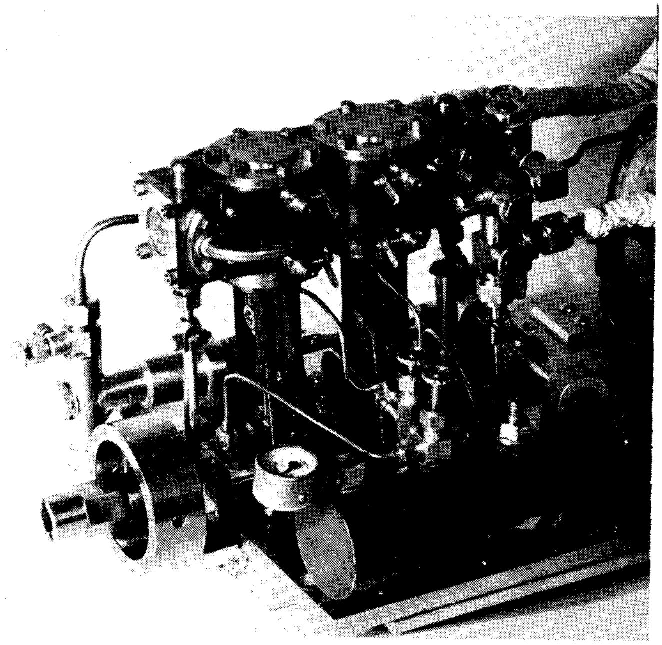
A feed water heater is fitted, which consists of a $1\frac{1}{2}$ in. dia. brass tube with end plates silver soldered, through which the exhaust steam passes. The feed water pipe makes a hairpin bend in this chamber before reaching the boiler. The boiler and feed water heater are lagged with teak planks $\frac{3}{8}$ in. x $\frac{1}{8}$ in. and held in position with $\frac{1}{4}$ in. brass bands. These also fix the boiler to the aluminium angle support frame.

A hull moulded from fibre glass was favoured and, although I had had no previous experience with this material, the advantages were considerable for its strength and durability and lack of internal structures.

This work was commenced in May 1973. A wooden hull was first made, as far as the rubbing strake, using the plank-on-frame method, upside

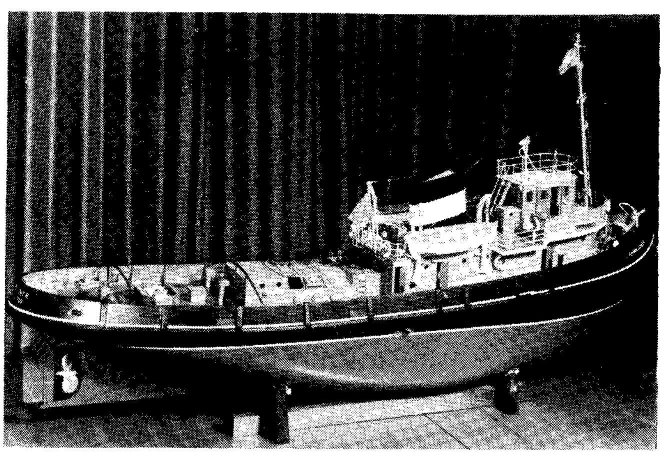
The power plant of the model steam tug.





A close-up of the engine.

down on a $\frac{3}{4}$ in. chipboard building base, stiffened with a length of 3 in. x 3 in. timber. Twenty-four frames were suitably cut to reach the common Datum line, from 5/16 in. plywood and notches cut to receive the keel and screwed to the board with $\frac{3}{4}$ in. square battens. The keel was built up from $\frac{3}{8}$ in. thick oak and glued into the frames. The hull was planked with $\frac{1}{2}$ in. x $\frac{1}{8}$ in. ash, being pinned and glued to the frames. If a $\frac{1}{2}$ in. or so length of wood is used behind the pin head, better clamping is obtained and also the pins are more easily withdrawn. The rubbing strake was 5/16 in. x $\frac{3}{8}$ in. ash, steamed and bent to shape. A 1/16 in. wide groove was sawn along the hull bottom and around the stem to receive a $\frac{1}{4}$ in. x 1/16 in. brass



strip, later to be cemented in with Araldite.

When complete, the pins were removed and the holes filled. The hull was sanded smooth and brought to a high finish with paint and a final coat of polyurethane varnish. The frames were now sawn through and the hull released from the building board.

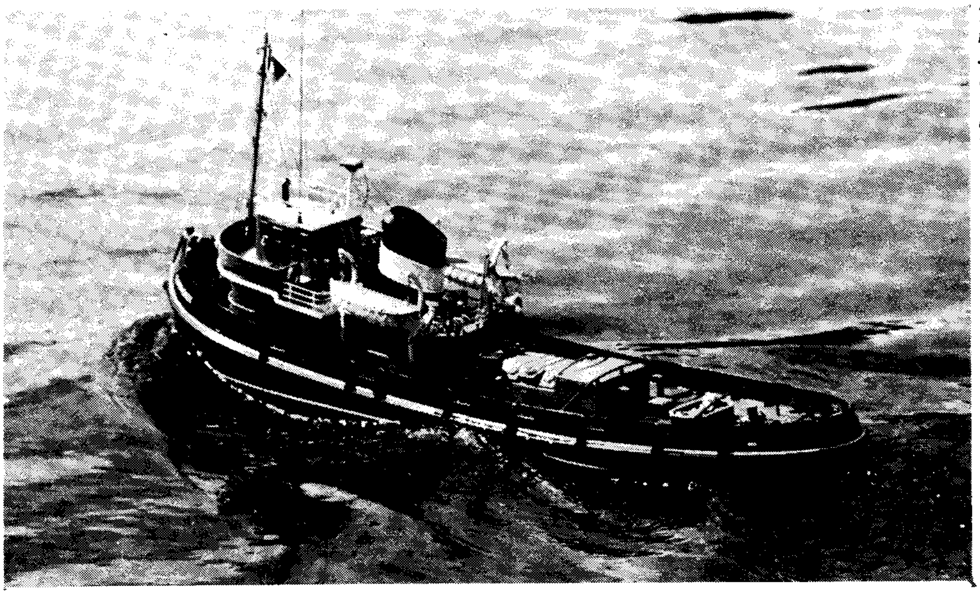
To ensure the release of the plug from the mould, it was necessary to make the mould in two halves. A 1/16 in. plywood wall 1 in. high was cut to shape and held in position along the centre line of the hull with plasticine. This surface and the appropriate half of the mould were polished and release agent applied, and followed by a gel coat. When set, four layers of $1\frac{1}{2}$ oz. cut strand mat and resin were laid up and left to harden.

The plywood was then removed and wax and release agent applied to the other half of the plug and the vertical section of the existing mould. The second half mould was then laid up. Before removing the mould, holes 4 in. apart were drilled through the vertical flanges to facilitate the accurate re-alignment of the two halves. After 24 hours the mould was removed from the plug by driving wedges between the flanges. The inside of the mould had quite a good finish and small imperfections were repaired with resin filler and polished.

The moulds were then wax polished and release agent applied and bolted together. Paper patterns were cut to the inside shape of the mould and the $1\frac{1}{2}$ oz. mat cut to this shape. Three layers were laid up, the resin having a black colouring agent added. The joins were made to overlap by 2 in. The rubbing strake and lower part of the stem were formed by mixing chopped strand mat with the resin to form a dough and pushed into the cavities, and then overlaying with glass mat and resin.

The following day, I fought with the mould to release it and finally with a loud crack it came away. The hull had quite a good finish; the flashings and some small imperfections were rubbed away with wet and dry emery.

The fibre glass stem as formed was easily chipped, therefore it was filed off and a 1/16 in. groove was cut to receive a 1/16 in. x $\frac{1}{4}$ in. brass strip. Excess glass mat was trimmed to the deck level, and 5/16 in. square ash was used for the inwale, being cemented with Araldite $\frac{1}{8}$ in. from the deck edge. Deck beams were shaped to the deck camber from beech $\frac{3}{8}$ in. thick and notched into the inwales. The deck was planked with $\frac{1}{8}$ in. oak, such that a 7 in. wide centre section remained. 16 S.W.G. aluminium was screwed to the inner edge, projecting $\frac{1}{2}$ in. above the deck.



The model steam tug "Campaigner" under way.

The anchor housings in the bows were bent up and soldered from tinplate and cemented into holes cut in the bows, and a further layer of glass mat resin was applied inside the hull around these housings. The hawse pipes were made from ¼ in. brass tubing.

A 9/16 in. dia. hole was drilled in the stern to take the stainless steel shaft tube which houses a ball race at the engine end and a plain P.B. bearing at the other. A grease nipple is silver soldered to the tube. Aluminium engine mountings were shaped to the hull bottom and held in position with Araldite. When set a fillet of glass mat and resin secured them firmly to the hull.

To ensure correct alignment of the engine and propshaft, the engine was bolted into position and the shaft attached to it. The shaft tube was then cemented through the hull with Araldite and faired in with polyester resin filler. The shaft is ¼ in. stainless steel, screwed ¼ BSF for the propeller. The top rudder bearing is ⅛ in. I.D. phosphor-bronze, cemented into the hull. The lower bearing is 5/16 in. square stainless steel, extended by 3 in. with ⅛ in. dia. rod, and set into a hole bored in the stern.

The propeller is 3 in. dia. and has a pitch of approximately 8 in. 3/32 in. wide slots were end milled in three faces of a ⅝ in. AF hexagon bar, and then machined round. The blades were cut from 3/32 in. brass plate and silver soldered into the slots. The blades were then shaped to match a smaller propeller of known pitch.

The 45 bulwark stays were cut from 20 S.W.G. steel plate, with a tang at the lower edge, and pushed into position around the deck and secured with Araldite. Card patterns were cut to the shape of the bulwarks, the joints being made at the outer supports. The bulwarks were cut from 24 S.W.G. tinplate and holes cut for the sea valves before being soldered to the stays. Strips of steel ⅛ in. wide were curved and soldered around the top edge. ⅛ in. x ⅛ in. angle brass was cemented to the rubbing strake and bulwark sides.

The lining and raised rim to the rope eyelets were turned from brass, annealed and formed to an oval, and soldered into position. The hinges for the sea valves, as with the other hinges on the ship, were bent up from 26 S.W.G. tinplate around a 1/32 in. hinge pin and riveted into place.

The wood grating at the stern was made on a circular saw bench, by cutting a number of grooves 3/32 in. x 3/32 in. x 3/32 in. apart, in a ¼ in. thick oak plank. Grooves were then cut at right angles to these. Strips of oak 3/32 in. wide were glued into grooves of one direction and sanded flat. A piece large enough to cover the floor of the bridge deck was made in this way. The centre portion of the stern grating is rebated and runs in grooves, and can be slid out to gain access to the rudder shaft.

The superstructure and engine casing were fabricated from 24 S.W.G. tinplate and made to lift off in one piece. It was built round a wooden former and soldered and riveted together. The engine casing was made separately and riveted to the main structure. The inside of the superstructure was stiffened with angle brass and 20 S.W.G. steel webs. The bridge deck was first covered with 1/32 in. plywood and then planked with timbers 3/16 in. x ⅛ in. Black photographic paper was glued between the planks to resemble pitch. The wheelhouse top was planked directly on to wood beams. The funnel is double skinned and the cavity filled with glass wool.

The centre deck at the stern lifts off and is of 20 S.W.G. steel plate riveted to a $\frac{1}{4}$ in. angle steel frame curved to the deck camber. To this deck is fitted the stern towing rope guard.

The lifeboats were carved from solid wood, in two halves and glued together. The davits are of aluminium and the luffing gear from $\frac{1}{8}$ in. x $\frac{1}{8}$ in. angle brass. All pulley blocks are fabricated from 26 S.W.G. plate with turned brass sheaves. The stanchions were turned from $\frac{1}{8}$ in. brass and screwed 10 BA for fixing to the deck. No. 68 holes were drilled from a jig to take the 26 S.W.G. rails.

The portholes are brass lined and glazed with pieces of microscope slide fixed with Araldite. The curved windows in the wheelhouse were made by laying them on curved surface and heating them in a muffle furnace until they softened and took up the curve. The mast was made in two parts, and screwed together. The miniature lamps and mast lamps were fabricated from $\frac{1}{4}$ in. channel brass and perspex.

The anchors were cut from aluminium and fixed by a swivel pin to the brass stock. The winch was fabricated from brass and commercially available brass gears. The chequer plate around the deck I thought might be a problem, until I found some plastic packing case binding, which had a perfect scale diamond check embossed on both sides. This was glued to the steel steps and rudder chain guards.

A motorised rope-making machine was constructed on the lines of the machine exhibited in the Greenwich Maritime Museum, and the ropes spun from 50 denier sylko. Miniature rope of this material hangs very neatly.

The hull was painted with black eggshell finish polyurethane above the water-line and Humbrol red below. Several coats were applied and rubbed down with finest wet and dry emery, before the two final thinned coats. The superstructure was first given a coat of red oxide inside and out, and then two thinned coats of Humbrol gloss followed by a coat of matt varnish. The deck is red oxide paint, varnished with matt polyurethane.

The power plant was installed and steamed in the bath, using the gas burner. The feed pump by-pass valve was roughly set.

First trials on the local pond were a great success. Steam was raised, using the paraffin blow-lamp and the model launched with the gas lamp installed. About 500 revolutions produced a good scale speed, with scale wave patterns along the hull. Final adjustments to the pump by-pass valve ensured a balanced feed to the boiler. The gas lamp maintains a boiler pressure of 60 p.s.i.

The radio equipment is installed in a plastic box in the stern. Since the first launch I have made a steam whistle, which is operated from a third servo. Although the range of movement on the radio-controlled steam valve is only half a turn, this does give a reasonable control of the engine revolutions, from a slow tickover to about 500 R.P.M.

The time spent on building the model has been most enjoyable and well worth while. The realism of the ship under way on the water is most impressive. In fact, a passing Scotsman recognised the ship, and from ten yards distance exclaimed, "That's a Clyde Tug!"

A home-made Height Gauge

by Alan Mackintosh

IN A LETTER accepting my recent article on an optical centring device for the lathe our Editor remarked that it presupposed that precision measuring equipment was available in the shop. This of course is so, but it sometimes is not realized what a lot can be done with a surface-plate, height gauge, dial indicator and/or scriber and, of course, a little simple trigonometry. The dial indicator is likely to be on hand in most amateur shops, but the surface-plate and height gauge are expensive items if they have to be bought.

The surface-plate can be improvised very satisfactorily from a rectangle of heavy plate glass, $\frac{1}{2}$ in. or $\frac{3}{4}$ in. thick and mounted on a piece of carpet in a wooden box. The glass has to be treated with quite a lot of care if it is not to become scratched, but that also applies to a bought surface-plate although steel or granite is considerably less fragile than the glass. I have a plate made out of $\frac{3}{4}$ in. polished plate, 18 in. x 24 in., and cut from a broken shop window but, as a matter of fact, I only use it where extreme precision is required; normally I use my height gauge on a piece of $\frac{3}{4}$ in. plywood faced with Formica and find that this is quite flat enough for normal machining layout.

The height gauge is a different matter and although excellent Japanese ones can be obtained nowadays that are much cheaper than English or American ones, a 12 in. gauge still represents an outlay of £40 or £50 which could well be spent on other useful equipment. Mr. Evans' letter made me consider how I would go about making a 12 in. height gauge in my shop.

To begin with, a good engraved scale 12 in. long and marked in tenths and fiftieths of an inch is within the budget of most of us. These are made on precision engraving machines and, commercially, it is no more difficult to make them accurately than inaccurately; in fact, a good scale is held within a tolerance of ±.001 in. and this is sufficiently accurate for a useful height gauge, provided that we can make a vernier for it.

Although, in my opinion, inches and their fractions are more convenient for machining purposes, since Britain has now gone over to the metric system, it may be preferred to make a height gauge metric. In this case a scale marked in centimetres and millimetres will be required and the vernier will read to tenths of a millimetre instead of thousandths of an inch. I am probably prejudiced, but I think that a tenth of a millimetre is rather large for good machining while one hundredth of a millimetre is definitely too small; one thousandth of an inch is just right, but the situation cannot be helped and, in any case, all this has been thrashed out in past pages of "M.E."

The scale has to have some kind of support and the most convenient and cheapest for this is a piece of ground flat steel stock. This is an easily obtained commercial item and we will select it 1¾ in. wide by 5/16 in. thick (if inch measurements are no longer available, take the nearest metric measurements and alter later dimensions to suit). This comes in standard lengths of 18 in. and 36 in. (probably ½ metre and 1 metre now in England) — the 18 in. length will be long enough for our purpose and even so we will have to part off some of it for a 12 in. gauge. It is a good thing to have a little extra length to accommodate the length that will be taken up by the main

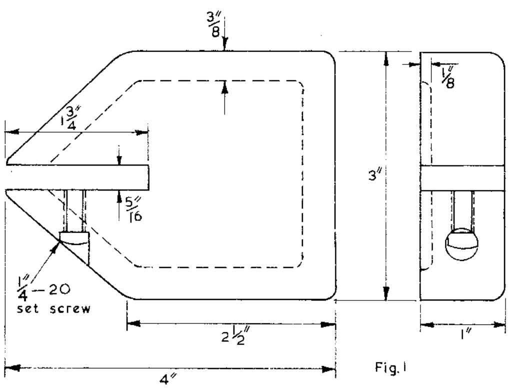


Fig. 1

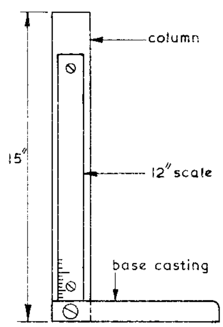


Fig. 2

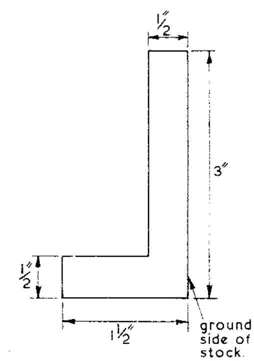


Fig. 3

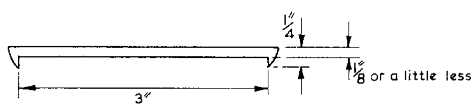


Fig. 4

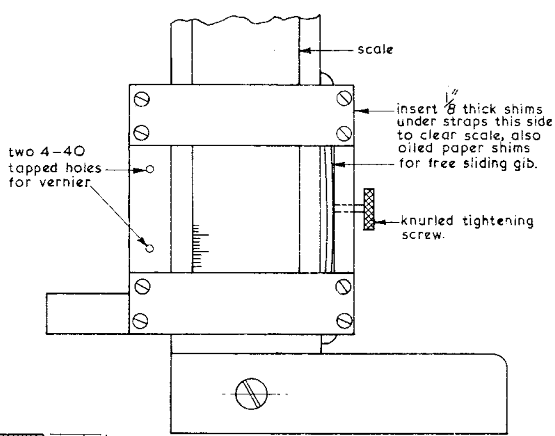


Fig. 5

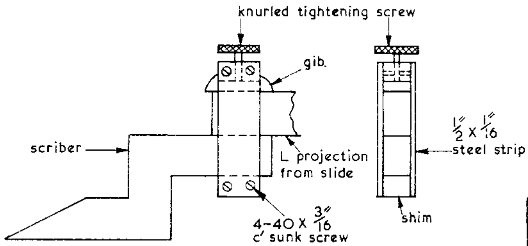


Fig. 6

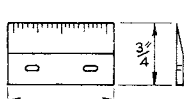


Fig. 7

slide that carries the scriber or dial indicator — we will cut it off at 15 in.

The base for the ground steel column is best made from an iron casting. This should be fairly heavy and suggested measurements are 4 in x 3 in. x 1 in. thick; the front of the casting which carries the column should be in the form of a wedge, rounded at the point as shown in Fig. 1.

When making the pattern for the casting, the bottom corners may be left sharp but all other corners should be rounded off, also the interior of the bottom should be cut away for a depth of about ⅛ in., as shown, so as to leave a shelf about ⅜ in. wide. The raw casting should be cleaned up and the shelf at the bottom should be lapped flat. The 1¾ in. x 5/16 in. slot in the front should be a tight slide fit for the column and is a simple job of milling in the lathe — care should be taken that it is at right angles to the lapped bottom of the base.

The scale should be a good one and although they are quite expensive, it does not do to compromise here. If it is of steel, the lines should be sharply engraved and easy to read. If any difficulty is found in getting one which is considered satisfactory in this respect, very satisfactory scales may be obtained from draftsman supply houses made of boxwood and what used to be called "ivorine"; these are generally about ⅛ in. thick and are clear and accurate. There are a number of manufacturers — I have one made by Keuffel & Esser.

A full-scale drawing should be made of how you intend to arrange the height gauge and the scale should be attached to the steel column with two small countersunk screws, making sure that the zero position of the end of the scale is approximately in the right position so that the vernier can read zero when it has been made and mounted in the slide.

The base is provided with a locking screw as shown in the drawing and the steel column is then set into the base. Since this is to be a permanent fixture, it is a good idea to use Loctite and to use a machinist's square to see that the column is strictly vertical to the base; the set screw is then tightened up and helps the Loctite to keep it in position. The side view of the assembly is shown in Fig. 2.

Assuming that the width of the scale is 1¼ in., there will be ¼ in. of steel exposed on each side and this will serve as a bearing surface for the slide.

Next thing is to make the slide. We still have 3 in. left from the 1¾ in. x 5/16 in. ground stock and this is cut into two pieces ¼ in. and 1½ in. wide respectively less, of course, the width of the saw cut. The 1½ in. wide piece is cut into an L-shape as in Fig. 3, the arms of the L each being ¼ in. wide; the back of the L is the original ground side of the stock. The cut sides of the L are cleaned up with a file and stoned, also the other cut side of the ¼ in. wide piece. It is necessary here to make a very good job of the L and to see that the inside sides of the L are straight and at right angles to each other; a machinist's square and a feeler gauge will ensure that this is satisfactory.

We next require a piece of stock ¾ in. wide x 1/16 in. thick and about 12 in. long, this is to make straps to hold the two sides of the slide together; if we have a spare piece of ground stock of this size handy, well and good, but it is not necessary to use such expensive material for this and ordinary bright mild steel strip is excellent. This is cut into four pieces 2⅝ in. long (1¾ in. width of column, + ¼ in. width of L, + ¼ in. width of other side piece, + an extra ⅛ in. to accommodate a gib). Four countersunk screw holes (4-40 x 3/16 in. long screws, or thereabouts) are put into each piece as shown in Fig. 5. Clamp them together in pairs and drill right through, countersinking on the outside. Keep the pairs together!

The gib is made from mild steel, 5/16 in. x ¼ in. and is dimensioned as in Fig. 4. This is a rather fiddly piece to make and is best milled. An alternative is to put a recess in the centre for the end of the tightening screw and trust to that, but there is nothing more annoying than to have the gib slide out in the middle of a layout, and the tightening screw has a habit of working out from time to time. The final thing to do before assembly of the slide is to drill a hole in the middle of the ¼ in. side of the slide for a tightening screw, tap it and make a knurled screw to fit it. 6-32 is a good size for this, it should not be so large as to be clumsy, and 4-40s have a habit of twisting off before the end of the thread is reached unless the die is very sharp. The gib should be bent by hand into a slight curve so that it bears on the ends.

Assembly of the slide is best done by putting the two sides of the slide against the column, together with the gib, and clamping, using a machinist's square to see that they are level. Under the straps on one side, ⅛ in. shims are placed in order to give clearance over the scale and, in addition, oiled paper shims are added in order to give sufficient clearance for a good slide fit. The straps are then put into position and holes spotted for the screws; the screw holes are drilled right through the L-piece and ¼ in. piece and tapped — if you have kept your pairs of straps together as recommended, you will have no difficulty in getting the screws in the right place.

When assembled, the whole should look as in Fig. 5. With the screw slackened off, there should be smooth movement up and down the column without appreciable shake.

The stirrup for the scriber is fairly simple to make and, since all that it has to do is to hold the scriber firmly clamped to the 1 in. x ½ in. projection from the L, it is only necessary to give sufficient clearance with shims to allow it to go over the projection. It also is provided with a knurled tightening screw and a small gib; the latter is not strictly necessary, it is only there to protect the surface of the projection. The stirrup is shown in Fig. 6, with scriber.

Modern height gauges are designed so that when the vernier reads zero, the scriber is sitting on the surface-plate on which the height gauge is set. This was by no means the case with older height gauges and I have done plenty of work by setting the scriber on a gauge-block and subtracting the height of the gauge-block from the reading given on the height gauge. For the sake of economy, this method may be preferred; the mental gymnastics are simple and one soon gets into the habit of subtracting from every reading—in this case you can make your scribers from straight ½ in. x 5/16 in. ground flat stock. The flat stock is necessary here because the sides are strictly parallel and the scriber has to be hardened and ground on the cutting edge. If you decide to go the whole hog and to hell with the cost, you will require another piece of ground stock 1¼ in. x 5/16 in. and will have to carve it into shape shown in Fig. 6; this will clear the thickness of the base and, of course, you will take advantage of the ground sides of the piece for the bearing surfaces. A holder for a dial indicator is easy to make and I will not go into that!

The Vernier

The height gauge is now complete and ready to go to work, except for the vernier.

The theory of a vernier is very easy, it is based on the fact that the human eye is much better at matching two lines that it is at determining a distance. Take a look at your vernier caliper. If it is metric, you will find that the main scale of the caliper is in millimetres but that the vernier scale has 10 divisions covering a distance of 9 millimetres. If it is in inches, you will probably find (if it is a modern one) that you have a vernier scale with 25 divisions covering a distance of 1.225 in. If you have opted for a metric height gauge, all you have to do is to make a vernier scale 9 millimetres long divided into 10 equal divisions.

If, on the other hand, you have decided on a height gauge in English measurements, a little maths is necessary. It is unlikely that you have been able to locate a scale marked in 40ths of an inch, as is your caliper. Your scale is much more likely to be marked in 50ths but it is easy to apply the principle: one fiftieth of an inch is 20 thousandths, so we require a vernier of twenty divisions covering a distance of one fiftieth less than the distance on the scale. The size of the vernier does not matter so long as the principle is applied, so we will decide that we will blow up the vernier by a factor of three since 50ths are rather difficult to read. The length of the vernier will then be 1/50 in. x 3 x 20, less 1/50 in., or 1.180 in. and this must be divided into 20 equal divisions of .059 in. This will fit nicely into the 1½ in. that is available between the straps on the slide.

Engraving the divisions

Take a piece of stainless steel or, better, aluminium (easier to work) 1¼ in. long, ¾ in. wide and 1/16 in. thick, and bevel one edge at a narrow angle to approximately 1/64 in. thick; polish the bevelled side. Using the topslide of the lathe set around parallel with the ways, engrave 20 divisions of 0.059 in. centred on the 1¼ in. length of the vernier. The actual setup for the engraver I leave to you as you will probably have your own favourite method for doing a job of this kind. Don't make the lines too long as they will be difficult to read — I recommend ⅛ in. for Nos. 0, 10 and 20; 3/32 in. for Nos. 5 and 15; and 1/16 in. for the remainder. With a metric vernier with only 10 divisions, I recommend ⅛ in. for Nos. 0, 5 and 10 and 1/16 in. for the remainder.

Drill two holes for 4-40 bind-head screws and elongate them for adjustment of the vernier. Place the vernier in its place on the slide and with the 4-40 holding screws half tightened and with the scriber sitting on the surface-plate (or, if you have opted for the straight scriber, sitting on a block 1.250 in. thick), adjust the vernier until it reads zero on the scale — tighten up the holding screws hard and you are in business. The vernier is shown in Fig. 7.

I must confess that I have not built this height gauge because I have a very nice (and much more complicated) one made in Japan which I bought many years ago when they were much cheaper than they are now. I have gone over the procedures carefully and I hope there are no bugs that I have missed. The height gauge described will do all that my complicated Japanese one will do (and should be easier to read!).

ELLIPTICAL TURNING

by "Tubal Cain"

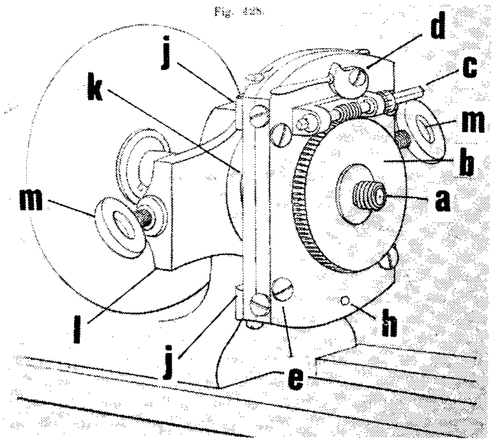
WHEN DESCRIBING the making of the glands for the Horizontal Engine, I remarked that I knew of no way of making the oval save by filing . . . "or not one at a time, anyway". As it happened, shortly after writing that piece I was faced with the task of making several dozen elliptical flanges which, though differing in their "front ends" were all of the same oval proportions. Although the turning operation required specialist equipment I thought it might interest readers to know how it was done. Better, perhaps one of our Blob-and-Gadget-Designers might contrive a similar piece of equipment to fit the normal model engineer's lathe.

The apparatus used was the "Elliptical Chuck" on my Holtzapffel ornamental lathe. A diagram of this chuck is shown in Fig. 1 — in fact, is photographed from Holtzapffel's book on the subject. The large circle is intended to represent the belt pulley. A brass frame, L, is attached to the front of the headstock by two screws, M, which engage in accurately positioned centre-holes in the headstock casting. On the front of the frame is a steel ring, K, and by adjustment of the screws M this can be offset horizontally from the mandrel centreline.

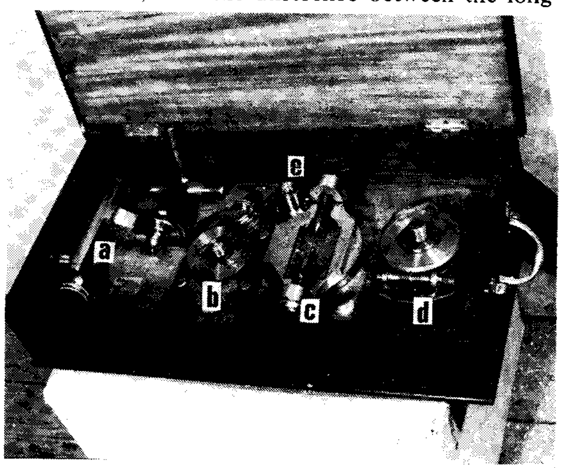
Attached to the mandrel nose is a brass slide plate, which can barely be seen in the photo, on which can slide the front-plate E. The latter is fitted with two steel rubbing strips, JJ, which are carefully adjusted just to bear on the steel ring K. Thus, if the ring is offset, the front-plate will slide back and forth twice every revolution, the long axis of the motion being horizontally across the lathe bed. This is the basic requirement for turning an ellipse. However, the device adds some refinements as shown in the photo. B, C, and D comprise the "tangent screw adjustment" enabling the work to be set with the desired axis of its ellipse in line with the axis of the chuck. (In Ornamental Turning it serves also a number of other purposes, which need not concern us here). Finally, A is a replica of the mandrel nose screw and register, so that work-chucks can be attached to the elliptical chuck. Fig. 2 is a photo of one of these chucks shown at B and C, though this one, very much older, has only a ratchet in place of the tangent screw. As a matter of interest, the other chucks shown in this photo are, at A, an "Upright" chuck, enabling previously turned work to be held at right-angles to the former axis of rotation; and an "Eccentric Chuck" which does just what its name implies—sets the work eccentric to the mandrel axis; a very useful accessory! E is simply a "pigs-tail chuck", used in wood-turning.

Fig. 3 shows the machine set up. A brass cup-chuck is screwed to the nose replica of the elliptical chuck, and into this is driven a piece of boxwood. The work — brass pipe-flanges and some glands — was finished in all respects, except for the machining of the profile, on the Myford, and the design had been adjusted so that the bosses were all the same diameter. A hole was bored in the boxwood to accept this diameter, and a screw arranged to hold the work back against the previously faced piece of boxwood. Because the elliptical chuck is rather large in diameter the slide-rest had to be set athwart the lathe bed, and a side-cutting tool used for the machining.

The setting of the chuck and slide-rest is relatively simple. If the cam-ring is offset by an amount "x", then the difference between the long



Left: Fig. 1



Right: Fig. 2

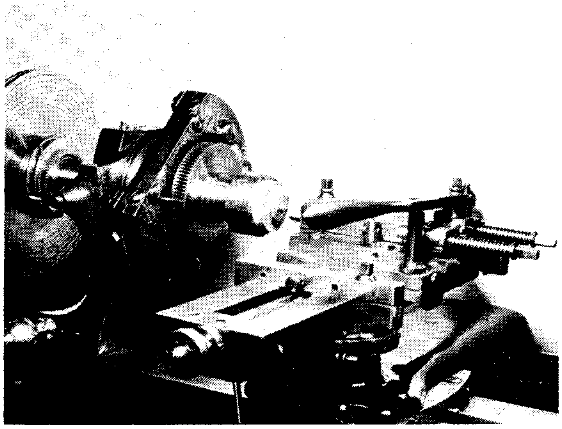


Fig. 3: Oval turning chuck in use.

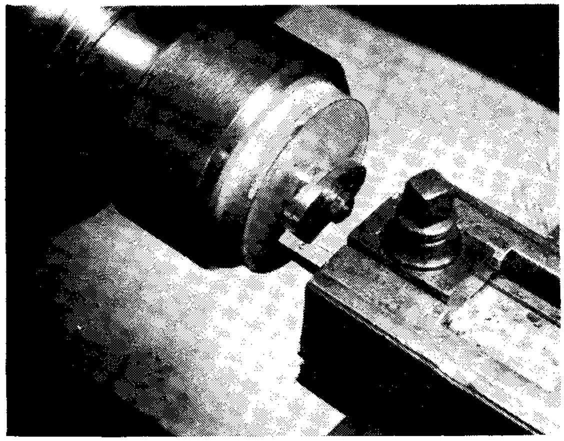


Fig. 5: Close-up of tool and work.

and short axes of the oval will be 2x; and if the tool be set "y" from the lathe centre-line, the short axis of the oval will be 2y across. It is thus only necessary to determine x and y and set the eccentricity of the cam ring, and the stops on the slide-rest (yes! This is another lathe that has saddle-stops!) accordingly. The value of "y" alters, of course, as the cut is put on, but it is the final value that matters.

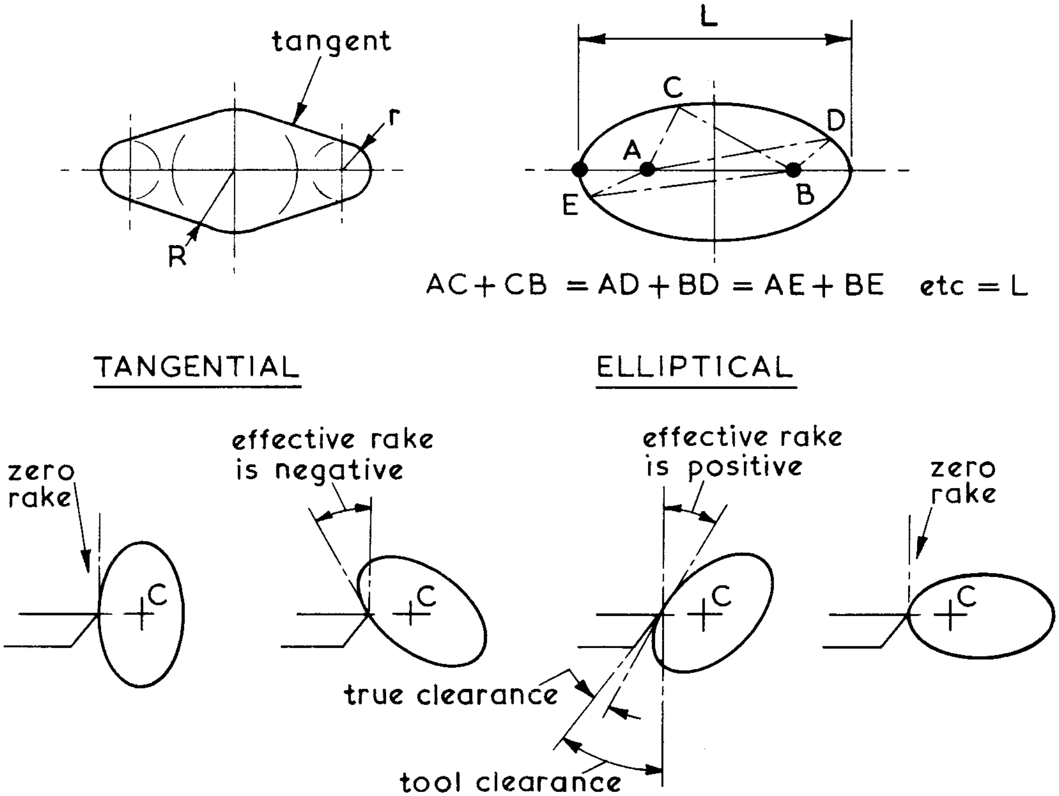
Fig. 4 shows a couple of factors which have to be borne in mind when tool-setting—especially with work of small dimensions. It is clear that the rake will alter as the work rotates, from positive to negative, twice each revolution. (The cutting speed alters, too). This means that the device cannot be used on materials which are at all sensitive to rake angles. Careful examination of the finish showed no detectable difference on brass or gunmetal, and iron was almost as good. But steel and aluminium alloys display a marked difference in surface finish around the oval.

The second factor brought out in Fig. 4 is the need for a considerable clearance angle. I did not appreciate this when first setting-up, and the effect was remarkable. There was considerable knocking in the chuck itself, and the belt slipped at times as the work rubbed on the front face of the tool. Increasing the clearance to about 40° completely cured the ill, but the increased fragility of the tool edge necessitated a much lower cutting speed than would be normal. (The tool was carbon steel).

Apart from this, the only problem to arise was that on two occasions the flange lost its grip in the boxwood and a "right jam-up" resulted. On the first occasion the flange only just escaped scrapping, but on the second all that happened was that the flange rotated under the tool till the lathe was stopped. The cause of this in both cases was "inattention on the part of the operator" —feed on this type of slide-rest is put on with a lever under the control of a restraining-screw, and if the latter is not retracted after each cut the feed is uncontrollable. The lever and control screw (the second screw is another slide-stop!) can be seen in Fig. 3. Fig. 5 shows a close-up of the tool and work; cuts of about .015 in. could be taken quite happily, but the first cut onto the rough (cast) edge of the flange needed care. Cutting was done at 150 rpm, the long diameter being $\frac{7}{8}$ in.

Once the initial hesitations and experiments were over the floor-to-floor time for machining these parts worked out at about $2\frac{1}{2}$ minutes each. Including setting-up time and tool alterations, the overall time for 40 components was $2\frac{1}{4}$ hours. More important, however, was the vastly improved appearance of the flanges, not least in the uniformity of shape. The latter point would, I think, justify the setting-up time even for three or four flanges.

As I remarked at the beginning, few model engineers will own an elliptical chuck. However, it would make an interesting project to contrive an alternative. Similar work can, of course, be done on a modern relieving or "backing-off" lathe — though as few of these are less than 18 in. swing that point is somewhat academic! — and it would seem that a similar principle could be applied to a Myford or Boxford. The elliptical chuck is, of course, clumsy and heavy; It is intended to take work up to 5 in. or 6 in. in diameter and, moreover, the design dates from the early 19th century; my own being made in 1900 is quite a modern one! It would probably be much easier and certainly more positive in action to arrange means for oscillating the cross-slide rather than the work-chuck. Perhaps Prof. Chaddock could oblige?



C = position of mandrel centreline

Fig. 4

TOOL GEOMETRY IN OVAL TURNING

Elliptical flanges

TAILPIECE. The m.s. for this article had just been sent off when Mr. Wynne Williams' letter appeared (18Apr75). Full marks, I think, to Mr. Williams for ingenuity! I think that if I were using that method, though, I should do so to make a filing jig, as being quicker in the long run.

His letter does, however, raise one point. The drawing has been drawn and redrawn from the original draughtsman's *representation* of the shape, as drawing an ellipse is not easy. And I'm not sure that I didn't put in the 3/16 in. figure to indicate that the ends should be rather larger than is strictly necessary to seat the nuts. So, it is wiser to make a largish drawing to get the length and the width right and a nice shape than to rely on traces of compass-points for centres.

In fact, the shape of such flanges varies a lot. Most of those we used in the works had tangential sides to two radii, but a few were elliptical. As a matter of accuracy, NONE were "oval", for to be strictly correct, oval means "the longitudinal section of an egg" — one end smaller than the other! The construction of the ellipse is shown in the sketch and it will be seen that no part is truly a radius. Also in the sketch is shown the "tangential" shape, easier to draw but not that much easier to make. Mr. Williams' shape is probably more convenient.

DRAWINGS FOR "ROYAL ENGINEER"

LO. 943. Sheet 1. General Arrangement and main frames.

Sheet 2. The boiler.

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JEYNES' CORNER

E. H. Jeynes talks about Lifts

Of all the models I have seen up and down the country, in private collections, museums and exhibitions, I have never yet seen a working model of an electric lift: although I suppose someone has constructed one somewhere sometime. The nearest thing I have seen is a working model of a colliery shaft, heapstead, etc. which is not quite the same sort of thing.

Most people enter lift cages without giving a thought to the intricate system of locks and interlocks etc. incorporated into the electric wiring to safeguard their journey upwards or downwards; in fact, they have come to regard the automatic working of the lift as part of their daily life routine. Therefore, when the cage does not respond to their jabs at the long suffering push buttons, they feel affronted, and really do miss the convenience afforded by it, as their feet tread the unaccustomed stairway. Really, all said and done, it does not take much to put a lift out of action, but the cause often takes some time to locate; such a thing as a match stalk has been known to prevent a gate properly closing, thus leaving an open circuit.

The faulty circuit is quickly located, but where there are a number of floors, it is a time consuming job examining each gate, especially if there are two gates per floor. Of course there are failures of component parts, both mechanical and electrical, but these are rare, when the lift is under a regular maintenance scheme. Where the lift is haphazardly maintained, only being attended to when something goes wrong, often by someone with no real electrical or mechanical knowledge, the only safeguard is the inspection by Insurance Engineers. I once came across a damaged gate lock which had been cut out of circuit, to get the lift working, and left in this condition; a real danger, as the gate could be opened when the cage was not at that floor level: misguided ingenuity.

During the working life of an automatic lift, there could be said to be three periods; divided into early teething troubles when the lift is first installed, then the normal working period, and lastly, the period when breakdowns can be expected, due to wear and tear of components, and general mechanical depreciation, such as the wearing of the rope grooves, and wear of the guides, so that no adjustment of the guide shoes is left. Then there is the fatigue of metals, to which the dead shaft of some lifts on which the main suspension pulley runs is particularly vulnerable; this short shaft which is carried by two dead plummer blocks, has been known to fracture after a long period of heavy use. I have one case in mind where the shaft fractured neatly at the edge of one plummer block, throwing all the weight of the cage on the two studs holding the keep of the other block: the shaft when removed showed lack of lubrication, being badly scored.

Of course during the normal working period of the lift, which depends upon the usage of the lift, there will be failures of components, such as the breaking of springs, burned contacts etc, etc. which can usually be rectified by the lift attendant if one is employed, and has some knowledge of the lift's peculiarities, acquired over a long period of working the lift, and assisting the maintenance engineer on his visits from time to time.

Where the original design and the materials used were good, little can be done about the early teething troubles, or the wearing out period when trouble can be expected; but with reasonable use and maintenance, the normal working period can be expected to give a long and almost trouble free working life. Failures during this period will generally arise from some kind of misuse; overloading is probably the most frequent cause, also the jabbing of the push buttons with umbrellas by bowler hatted gentlemen will eventually cause what might be termed 'Chance Failures', which no amount of care and maintenance can avoid. Then of course, there is the 'Power Cut' which can cause great inconvenience, especially if any 'Important Persons' are trapped in the lift between floors. I had the doubtful pleasure of being the recipient of some of the late Bernard Shaw's caustic remarks, after I had released him from imprisonment in a Malvern lift shaft after a long wait, (I had to be located, and then travel four miles), meeting him that evening in Sir Barry Jackson's lounge however, he apologised handsomely for his ill-tempered outburst. Where the lift installation included a single phase rectifier, there was also the possibility of further electrical failures; a three phase rectifier incorporating a Westinghouse convertor was a much more reliable affair.

Small service lifts in hotels often presented problems; one reported seize up turned out to be several pseudo-silver plate tureens jammed into a shapeless mass, but just the right size to jam the lift mechanically, requiring a hammer and chisel to dislodge. Called to another kind of stoppage of a service lift, one of the hotel waiters got out when I had wound the lift down, after a rather uncomfortable imprisonment of some hours.

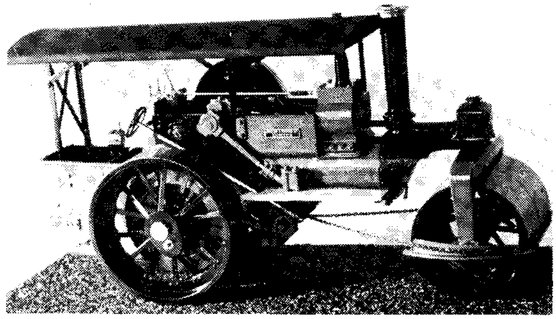
In the early days, I was sent to refix some tappet boxes in the well of a Smith Major and Stevens two phase lift which served the four floors of the old Daimler machine hall, I had instructed the lift attendant not to come down to the ground floor as I was going to work in the well. The Managing Director however had been up in the toolroom which was on the top floor, and entering the lift asked for ground floor, the attendant forgot all about me, and came down full sail, the trailing flex warned me in time to throw myself flat. I let fly with the two pound hammer I had in my hand which interested the great man, who promptly ordered the dismissal of the attendant: that was one of my nine lives!

When the lift cage is fitted with automatic levelling to all floors there is a lot more maintenance required, but not many of the old lifts I serviced were fitted with this, therefore the work of ensuring that the cage drew level with each floor was much more exacting, more careful adjusting of the brake, limits etc. This drawing level with each floor was a kind of lottery, as one cage load might be four 16 stone gentlemen, and the next possibly two 8 stone ladies.

Modern lifts are fitted with more safety devices these days, some to slow down and arrest the progress of the cage if the rope goes slack from the breaking of a shaft, or rope running off a sheave pulley, and ultimate limits cut off current if the normal stopping limit is over run. Messrs Pickerings also manufactured industrial hoists, rope haulage systems etc as well as lifts, and I had close acquaintance with many of these in different parts of the country.

A Model Steam Roller

by Leslie Clarke

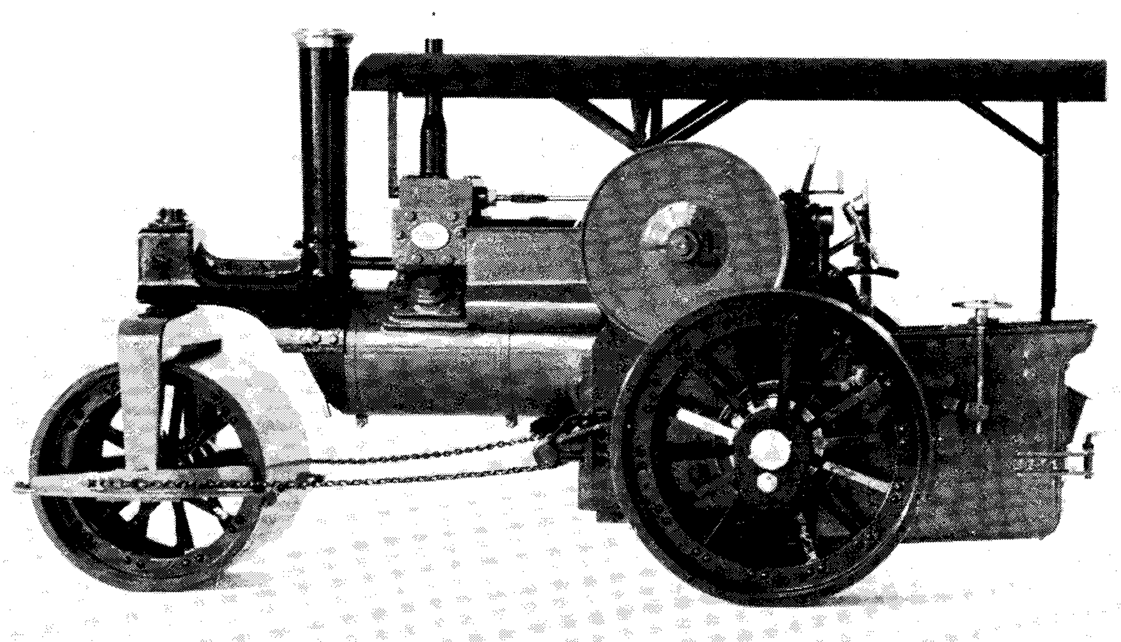


MANY YEARS AGO, when I first decided to model a steam roller, I wrote to the principal manufacturers and they were good enough to send me two prints. One showed the general arrangement of a roller and the other the gearing layout. A drawing was then made to a scale of $\frac{3}{8}$ in. to 1 foot, this being chosen as about the smallest size for a working steam model, yet not too small for the details to become lost. Later on, when I came to make a start on construction, it was found that the drawings were of one of the last types of roller to be built, whereas all available photos showed an amazing variety of different types, no two being quite the same and none of them resembling the drawings.

Some time was spent in trying to find more information until it was discovered that some local Councils had placed their discarded rollers in parks for children to climb over. Once again these were all very different and many of them had twin cylinders. However, they were useful in giving the shape of the various details. As a consequence of all this, I have made a model which is typical Aveling & Porter and has all the features of a 10-ton roller without being quite an exact copy.

The construction is very similar to that of the average traction engine and only due to the small size has any change been necessary. The wheels and front rolls are one instance. In larger models the spokes are all made separately, fitted into milled slots in the hubs and fixed with screws before adding the cover plates which form the outer part of the hub. In this size, there was not sufficient room for a screw in each spoke, so each group of spokes was made as a complete spider cut from a disc. Each spoke was then set and cut to length while mounted in a jig.

To be continued



CLUB NEWS

News from Auckland

At the April meeting of the Auckland (New Zealand) S.M.E.E., 40 members turned up. Basil Oliver showed his *Jubilee* boiler, which has a ¼ in. thick throatplate, to avoid the necessity of flanging, while the tubes are welded into the tubeplate.

Alan Gasteen produced a pattern for the Dore-Westbury vertical milling machine. Alan Pritchard had his fourth *Tich* boiler with him. Lou Whyman showed a Mikado smokebox and a disc-type regulator. Murray Lane gave a talk on pattern making for locomotive wheels, supported by the patterns and castings for his 5 in. gauge Heisler locomotive.

Secretary: Peter Baker, P.O. Box 1352, Auckland, N.Z.

Norwich Society

The weather for the Norwich Society's first public running session of the year was most unseasonable, but Norman Crew's *Simplex* kept things going. On the 18th May, things were better, though Dick Allen's *Simplex* suffered a derangement of its valve gear. Grahame Hewitt's *Butch* was also not on its best behaviour, leaving Norman Crew on his own again to end the afternoon. On June 1st, it was more like a normal service, with Douglas Eastoe's *Maisie*, Grahame Hewitt's *Betty* and Norman Crew's *Simplex* all in steam and running well.

At the meeting on May 14th, it was reported that the Exhibition was a great success, the stand of the King's Lynn Society being a bright spot. In the Competition section, the H. O. Clark Trophy was awarded to C. R. Newing for a 1½ in. scale beam engine, and the Howard Brown Trophy to J. Christie for a ½ in. scale clinker built rowing boat.

Secretary: A. W. E. Hoskins. 5 Hellesdon Road, Norwich, NR6 5EB.

CLUB DIARY

Dates should be sent five weeks before the event. Please state venue and time.

July 18 Stockport & District S.M.E. Talk by Mr. J. H. Harrison on Manual Surface Finishing. Wellington House, Wellington Road North, Stockport. 8 p.m.

July 18 Rochdale S.M.E.E. General Meeting. Springfield. 8 p.m.

July 18 Romford M.E.C. Track Night. Ardleigh House Community Centre, 42 Ardleigh Green Road, Hornchurch, Essex. 8 p.m.

July 18/19 National Traction Engine Club. Ulster Traction Engine Club Rally. The Rt. Hon. Lord O'Neill and Ulster T.E.C. Estate Office, Shanes Castle, Antrim, N. Ireland.

July 19 and 20 Guildford M.E.S. Model Traction Engine Rally and Model Engineering Display. HQ, Stoke Park. 12 noon–6 p.m. Saturday. 10 a.m.–6 p.m. Sunday.

July 19 Lea Valley Railway Club. Model Railway Exhibition. Indoor layouts. Exhibits – 2½in. gauge 7¼in. narrow gauge, Railwayana and practical demonstrations. 5in./7¼in. steam passenger carrying railway in operation outdoors. Refreshments available. Car parking free. Dig Dag Hill, Hammond Street Road, Cheshunt, Herts. 10 a.m.–9 p.m.

July 19 Romney Marsh M.E.S. Portable Track at Appledore Fete. 2 p.m.

July 19 Hull S.M.E. Exhibition of models at Riley High School, Parkfield Drive. 2 to 6 p.m.

July 19 Chesterfield & District M.E.S. "Sid's Day". Chairman's mystery event at the track, Hady, Chesterfield. 2.30 p.m.

July 19 Birmingham S.M.E. Annual Fete for Muscular Dystrophy Research. Illshaw Heath.

July 19 West Midlands Federation of Model Making Societies. Quarterly Committee Meeting. St. Leonards Church Hall, Marston Green, Birmingham. 2.30 p.m.

July 19 Cambridge & District M.E.S. Public Track Day. Fulbrook Road, Cambridge. 3 p.m.

July 19 Wigan & District M.E.S. Meeting. Co-op Guild Room, Whelley, Wigan. 7.15 p.m.

July 19/20 National Traction Engine Club. Masham Steam Engine and Fair Organ Rally. Low Burton Hall, Masham, N. Yorks. W. A. Wise, 8 Leyburn Road, Masham, Ripon, North Yorks.

July 19/20 National Traction Engine Club. Polegate Steam Engine Rally. Main A27, Lewes Road, Wilmington, Polegate, Sussex. A. Hanmore, Woodcote, Wannock Road, Polegate, Sussex.

July 19/20 National Traction Engine Club. Chilcompton Traction Engine Rally. Chilcompton, Nr. Bath, Somerset. E. F. Alford, Somerset Traction Engine Club.

July 19/20 National Traction Engine Club. Midlands Festival of Steam. County Showground, Stafford.

July 19/20 National Traction Engine Club. Weeting Traction Engine Rally. Fengate Farm, Weeting, Brandon, Suffolk. Mrs. S. A. Parrott, Fengate Farm, Weeting.

July 20 Birmingham S.M.E. Meeting. Illshaw Heath.

July 20 Worcester & District S.M.E. Public Running Day. 3½in., 5in. and 7¼in. gauges. Waverley Street, Diglis, Worcester. 11 a.m. to 6 p.m.

July 20 Southern Federation of M.E.S. Mid Season Rally — Malden & District S.M.E. Claygate Lane, Thames Ditton.

July 20 Rugby M.E.S. Return visit by Sutton Coldfield & North Birmingham M.E.S. Our track at Rugby.

July 20 St. Albans & District M.E.S. R.C. Pilots Finals. N. Birmingham M.P.B.C. (Red House Park, Birmingham).

July 21 City of Leeds S.M.E.E. Templenewsam — Informal Meeting.

July 22 Romney Marsh M.E.S. Track Meeting. Rolfe Lane, New Romney. 6 p.m.

July 23 Birmingham S.M.E. Meeting. Illshaw Heath.

July 23 Northern Mill Engine Society. Meeting. Freemasons Hotel, Milnrow (within ½ mile after entering Milnrow turn-off of the M62 Motorway). 8 p.m.

July 23 Swansea S.M.E.E. Meeting. Club HQ, Heol-y-Gors, Cwmbwrla, Swansea. 7 p.m.

July 23 Sutton Coldfield Railway Society. A look at Austrian Railways — Dr. Brian Veitch. Wylde Green Library, Emscote Drive, Little Green Lanes, off Birmingham Road, Sutton Coldfield. 7.30 for 8.15 p.m.

July 23 Harrow & Wembley S.M.E. Loco running and efficiency trials. B.R. Sports Ground, Headstone Lane, Harrow. 7.45 p.m.

July 26/27 National Traction Engine Club. Rousham Park Steam Engine Rally. Nr. Bywater, Combe Pyne, Water Lane, Steeple Aston, Oxford.

July 26/27 National Traction Engine Club. Kegworth Carnival & 22nd Annual Traction Engine Rally. Kegworth, Nr. Derby. P. G. Haywood, 49 Nottingham Road, Kegworth, Nr. Derby.

July 26/27 National Traction Engine Club. Farnham Steam Rally. A325, Holt Pound, Farnham, Surrey. P. Coxall, Smokey Cottage, Lion Lane, Haslemere, Surrey.

July 26/27 National Traction Engine Club. Netley Marsh Steam & Vintage Vehicle Rally. Meadow Farm, Ringwood Road, (A336) Netley Marsh. D. Burdle, Fernbank Cottage, Ringwood Road, Netley Marsh, Southampton, Hants.

July 27 Birmingham S.M.E. Meeting. Illshaw Heath.

July 27 Bristol S.M.E.E. Public Running Day. Ashton Court, Bristol.

July 27 Kinver & West Midlands S.M.E. Kinver visit Sutton Goldfield.

July 27 Harlington Locomotive Society. Open Day. High Street, Harlington, Middx. 2–6 p.m.

July 27 St. Albans & District M.E.S. Grand Regatta. Victoria M.S.C. (Victoria Park).

July 28 Stafford & District M.E.S. Steam up at track. County Showground, Stafford. 7.30 p.m. (if wet meeting at New Inn, Stafford).

July 28 Willesden & West London S.M.E. Brent Show Meeting. Kings Hall Community Centre, Harlesden Road, London NW10. 8 p.m.

July 30 Birmingham S.M.E. Meeting. Illshaw Heath.

July 30 Cannock Chase M.E.S. Track Safety. Lea Hall Social Club, Sandy Lane, Rugeley.

July 30 Sutton Coldfield Railway Society. Members' Records and Recordings. Wylde Green Library, Emscote Drive, Little Green Lanes, off Birmingham Road, Sutton Coldfield, 7.30 for 8.15 p.m.

July 30 Romney Marsh M.E.S. Portable Track at Camber Fete. 6 p.m.

July 31 Hull S.M.E. Talk on "Royal Sovereign" locomotive and difficulties in construction, by John Speak.

July 31 Leyland, Preston & District S.M.E. Meeting. Roebuck Hotel, Leyland Cross, Leyland, Lancs. 8 p.m.

August 1 East Sussex Model Engineers. Pond Night. Alexandra Park Boating Lake, Hastings. 7.30 p.m.

August 1 Stockport & District S.M.E. Bits and Pieces. Wellington House, Wellington Road North, Stockport. 8 p.m.

Continued from page 727

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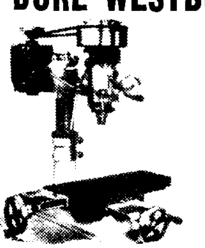

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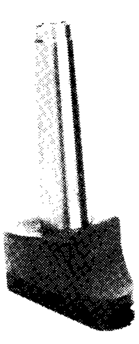

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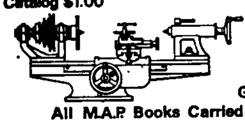

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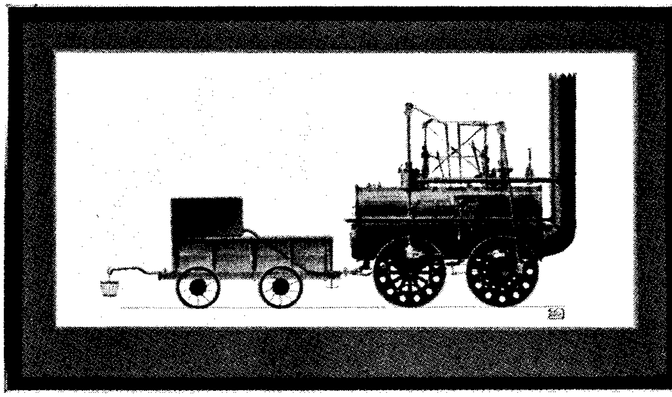

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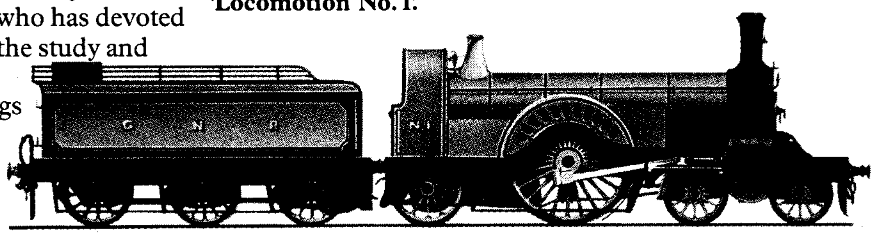

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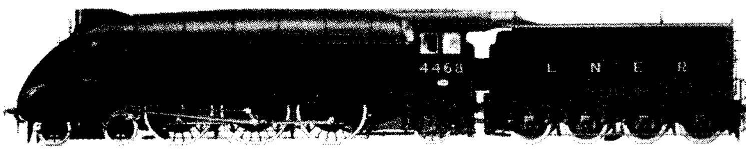

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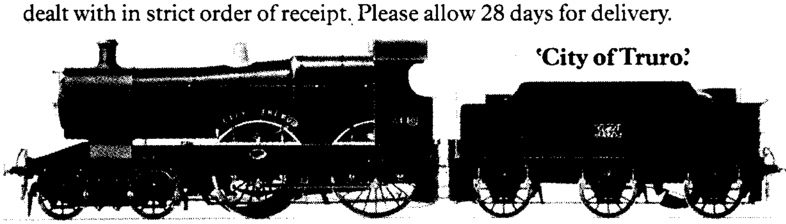

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