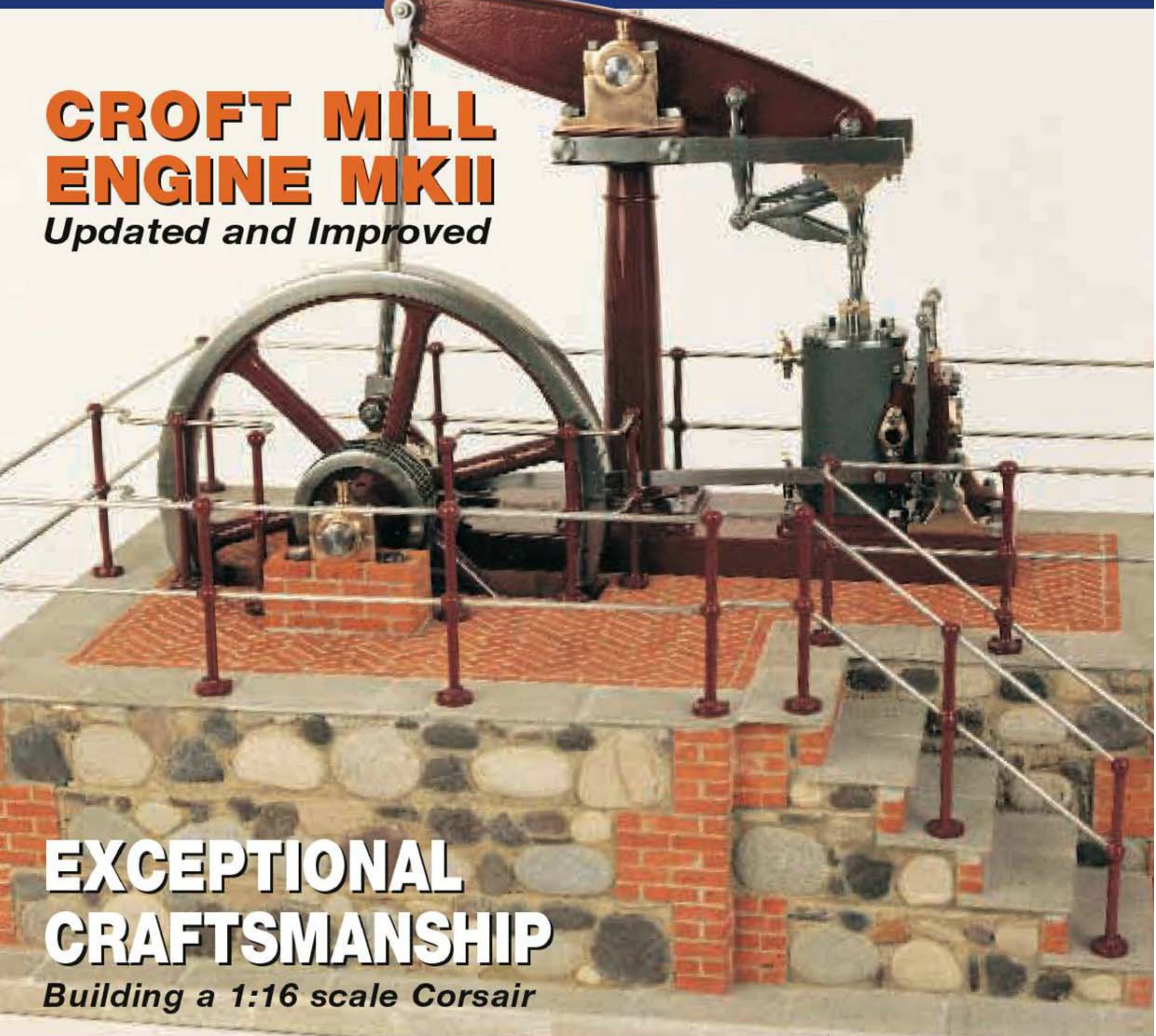
MODEL ENGINEER

Vol. 188 No. 4171

14 - 27 June 2002 £2.10

LEEDS SMEE hosts IMLEC 2002 6 - 7 JULY at EGGBOROUGH NORTH YORKSHIRE

FULL DETAILS INSIDE



CROFT MILL ENGINE MKII
Updated and Improved

EXCEPTIONAL CRAFTSMANSHIP
Building a 1:16 scale Corsair

WEIGHT DRIVEN CLOCK
For the Novice Horologist

71 >
770026 732094
FOR ENTHUSIASTS BY ENTHUSIASTS
HIGHBURY NEXUS

Model Engineer is published by
Highbury Nexus Special Interests Limited
Nexus House, Azalea Drive, Swanley, Kent BR8 8HU
Tel: 01322 660070 Fax: 01322 616319
www.nexusonline.com
Highbury Nexus Special Interests is a wholly owned subsidiary of Highbury House Communications plc.

SUBSCRIPTIONS & BACK ISSUES

Direct Subscriptions and Back Issues are available from Nexus Subscription Services, Link House, 8 Bartholomew's Walk, Ely, Cambs CB7 4ZD Phone: 01353 654422; Fax: 01353 654400
Email: wss@wyverncrest.co.uk
Rates for 26 issues (annual), 13 issues (six months):
UK: £54.60 (annual) £27.30 (six months);
Europe: £69.00 (annual), £34.50 (six months);
RoW Surface: £70.00 (annual), £35.00 (six months);
RoW Airmail: £74.50 (annual), £37.25 (six months);
US Surface: $98.00 (annual), $49.00 (six months);
US Airmail: $113.50 (annual), $56.75 (six months).
Cheques payable to Nexus Special Interests Ltd.
Second class postage paid at Rahway NJ USA.
Postmaster, please send address corrections to
Model Engineer c/o Mercury Airfreight International Inc,
2323 Randolph Avenue, Avenue 1, NJ 07001. Usps 0011099.
US Subscription Agent: Wise Owl Worldwide Services,
1926 S. Pacific Coast Highway, Suite 204,
Redondo Beach, CA90277-6145, USA.
Phone: (310) 944-5033; Fax: (310) 944-9963.
Email: wiseowl@sprintmail.com
Website: www.wiseowlmagazines.com
Visa/MC/Discover accepted.
Canadian Distribution by Gordon & Gotch Periodicals
(Toll free 1-800-438-5005).
Model Engineer is published fortnightly.

HIGHBURY NEXUS

ISSN 0026-7325

IN THIS ISSUE

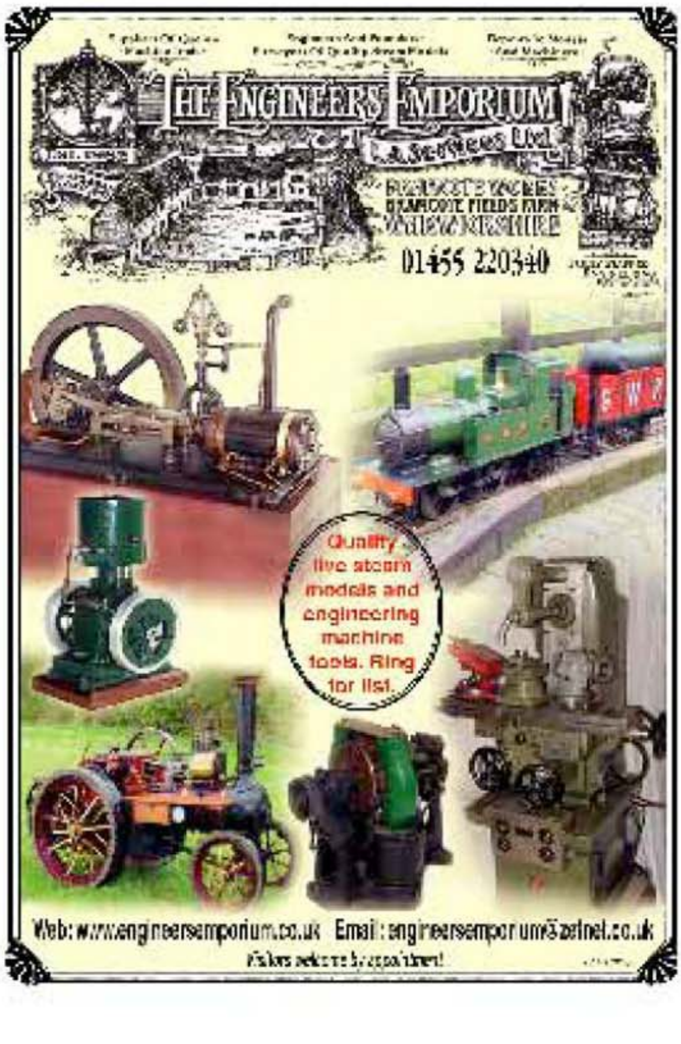
Vol. 188 No. 4171 14 June 2002

On the cover ...

Justifiably proud of his Stuart Beam Engine, depicted on our cover, when he moved to the Isle of Wight, William Godfrey was inspired to build the unusual plinth on which it is presented. Having constructed a number of stationary steam engines and a small locomotive, he now plans to concentrate his energies on building a miniature bungalow using small bricks and stones in the style of such dwellings to be found on the Island.
Mr. Godfrey describes his beam engine and plinth, and his techniques in a letter to our popular Post Bag columns *(see page 440).*

(Photograph by Crispin Verrinder)

M E S
A COMPLETE RANGE OF MATERIALS & FITTINGS FOR THE MODEL ENGINEER
PROMPT MAIL ORDER SERVICE
WARSHIP Class 42
Drawings & castings available for this popular locomotive
CATALOGUE £1.00
SPRING DISCOUNT!
£250 CASH BACK ON A 5"/7 1/4" PEARL
£150 CASH BACK WHEN YOU BUY A 5" DIXIE
£75 CASH BACK ON A 1" SENTINEL or ATKINSON
£50 CASH BACK ON A 5" RUSTON
MAXITRAK
RUSTON
CATALOGUE £3.50
MAXITRAK / M.E.S 5 LARKSTORE PARK, LODGE ROAD, STAPLEHURST, KENT TN12 0QY
info@maxitrak.co.uk www.maxitrak.co.uk
SHOWROOM & SHOP OPEN : MONDAY-FRIDAY 9-5 SATURDAY 9-12
TELEPHONE
MAXITRAK 01580 893030
M. E. S. 01580 890066



THE ENGINEERS EMPORIUM
L.A. Services Ltd
BRAMCOTE FIELDS FARM
WARWICKSHIRE
01455 220340
Quality live steam models and engineering machine tools. Ring for list.
Web: www.engineersemporium.co.uk Email: engineersemporium@zetnet.co.uk
Visitors welcome by appointment

Introducing the
Great Western 4-6-0
"HALL CLASS"
IN KIT FORM
Superb 5" gauge locomotive
Fully detailed
Live steam
Fully machined
Easy to build
Easy payments
Proven design
Coal fired
Bramhurst Mainline Limited
A JOINT MAXITRAK LTD / L.A. SERVICES LTD COMPANY
info@bhml.co.uk • www.bmhl.co.uk
Maxitrak Ltd
10 Larkstore Park Lodge Rd,
Staplehurst, Kent
TN12 0QY
Tel: 01580 893030
Fax: 01580 891505
L.A. Services Ltd
Bramcote Fields Farm,
Bramcote, Warwickshire
CV11 6QL
Tel: 01455 220340
Fax: 01455 221038

SMOKE RINGS
With the Editors

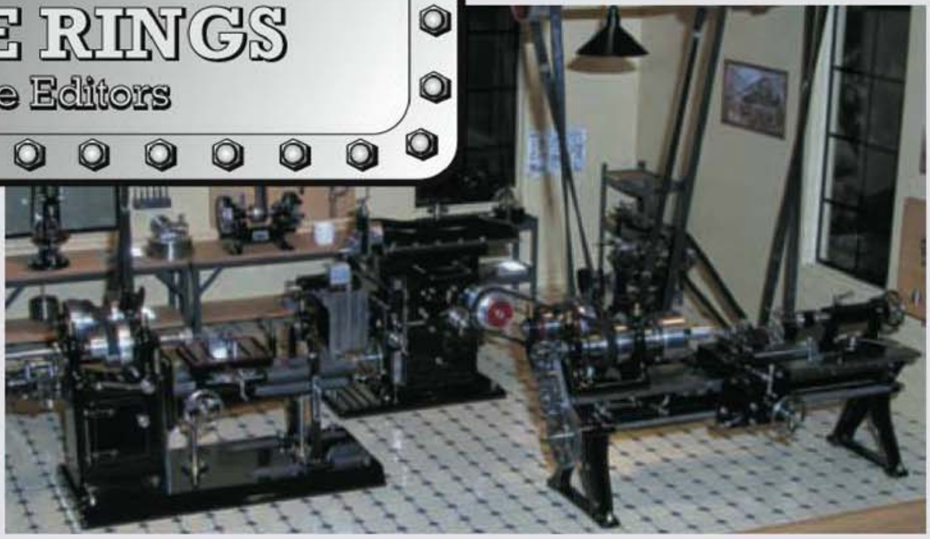
Intolerance

Some years ago Neil was attending a model exhibition and had paused to admire a model of a traction engine in a glass case. The standards of workmanship achieved by the builder was stunning and, to his humble eye, correct in every detail even to the extent of having a full tool kit with a working padlock for the toolbox. He was just craning his neck to look at the tiny padlock key when a loud voice declared *"That's what is wrong with model engineering today!"* It seems the gentleman whose opinion was broadcast to all and sundry nearby had a 'thing' about glass case models and felt that all models should be fully operational and steamed regularly.

We were all surprised by this story. It seems to us that model engineering should be practised as the individual practitioner wishes and the hobby, as a whole, is big enough to accommodate all shades of opinion and different interests. Just because we happen to have no personal interest in a particular branch of the hobby does not mean that those following it are misguided or wrong or that their efforts cannot be admired as examples of craftsmanship in their own right. To us, one of the joys of seeing other peoples' work at exhibitions is to admire things that we ourselves may never make, and to glean ideas. It would be unfortunate if the intolerance which crops up in some other hobbies reared its head in the world of model engineering.

From time to time we catch a glimpse of intolerance in *Post Bag* when individuals hold up a branch of the hobby as the 'one true faith'. These individuals are, of course, entitled to their opinion but it is unfortunate if their views cause offence to others in the model engineering fraternity.

We at *Model Engineer* will continue to try to cover as broad a range of topics as possible. Whether your interests lay with clocks, locomotives, internal combustion engines or any other forms of the hobby, we will try to provide something of interest for you. Who knows, as time goes by your interests may shift and you may wish to build something different and out of character. If you make a good job of it you may even want to put it in a glass case.



A glass case model? Stephan Kastner from Germany created this miniature (1:15 scale) masterpiece and brought it to show at Harrogate 2002. This photograph was taken at the start of the event. By the end of the exhibition the lathe and horizontal boring machine were 'knee deep' in swarf.

Celebrating a genius

The third in the series of annual Seminars and Exhibitions at Kew Bridge Steam Museum covers the achievements of Cornish engineer Richard Trevithick.

The Seminar: *Richard Trevithick - Romantic Adventurer or Unacknowledged Genius* is to be held on Thursday 4 July 2002, 10.30am-5pm. Places are limited and must therefore be pre-booked (020-8568-4757). The fee is £45 (£40 for senior citizens) which includes morning coffee, buffet lunch, afternoon tea and Delegate's Pack. Speakers will include Andrew Guy, formerly of the Beamish Museum, the Rev'd Dr. Richard Hills, and Kingsley Richard of the Trevithick Society.

The Exhibition: *Richard Trevithick - Maverick Genius of Steam* is to be held 5 July-30 September (11am-5pm daily) to mark Trevithick's and Vivian's 1802 patent for the high pressure steam engine. The exhibition will explore Trevithick's life and work which included designing and building the first steam road locomotive (1801), the first locomotive to run on rails, his patented use of iron tanks in ships, his iron floating dock and his 11 years of adventures in South America where he was the first European to cross the sub-continent from coast to coast.

The exhibition will feature models, objects and plans loaned by the Science Museum, the National Railway Museum and the Trevithick Society. The exhibits will include a model of Trevithick's first Cornish steam engine (for the Wheal Prosper Mine, c1812), and a model of the wrought iron boiler of his thrashing machine which he built for Tehidy, home of a wealthy Cornish family headed by Lord de Dunstanville.

Two Special Events will take place during the Exhibition: on 6/7 July, the replica of Trevithick's Camborne road locomotive will be on display and, subject to confirmation, will be demonstrated by members of the Trevithick Society. On Friday 23 August at 7.30pm, the Mikron Theatre Company will be performing their show *All Steamed Up - The Adventures of Richard Trevithick, the Cornish Giant of Steam.* Tickets will be available from the museum (020-8568-4757).

Kew Bridge Steam Museum is in Green Dragon Lane, Brentford, Middlesex, about 200 yards from the north side of Kew Bridge under the tall Victorian tower and may be reached by bus, main line rail or London Underground. The nearest motorway is the M4; leave at junction 2 and follow the signs to Kew Gardens, Brentford and Hounslow.

Admission at weekends when the engines are in steam is adults: £4.50; OAPs and students £3.50; children (5-15 years) £2; family ticket: £11.50. Please note that children under the age of 13 years must be accompanied by an adult.

For more information about this event and the Kew Bridge Steam Museum, telephone Lesley Bossine, museum manager on 020-8568-4757 or visit **www.kbsm.org**

Learn to drive a locomotive in Hungary

If you have ever wanted to learn to drive a full size steam locomotive then this is your opportunity to do so thanks to the fact that the East Europe Travel Centre has signed an exclusive deal with the Hungarian Railway Museum in Budapest to provide 6-day training courses.

Starting every Monday, the course covers everything from cleaning and preparation to full hands-on driving practice with all the tuition in English. The course culminates on the Saturday when the trainees take control of a Hungarian Type 424 locomotive travelling the 40-odd kilometres between Budapest and Vac.

Successful trainees will be awarded an 'Honorary Hungarian State Railways Driving Certificate'.

Launching the programme, Klara Sido, EETC's General Manager explained *"This is not only the perfect holiday for steam enthusiasts but, because it is based in Budapest, other members of the family can enjoy a traditional break at the same time. For example, we can arrange a 3-day beauty package including saunas, steam baths and manicures; we also offer a 1-day cookery course including shopping at a local market, and there is always the sight-seeing."*

Your hotel is in a central location making it an ideal base from which to enjoy Budapest's nightlife, including the dozens of local restaurants, nightclubs and theatres. You can also try one of the many casinos and who knows, you may even win back the cost of your holiday. Prices are low by UK standards and, for example dinner in a local restaurant is about £5 per person with beer at around £1 a pint.

The EETC's unique approach also enables you to make your own travel arrangements between London and Budapest so you can travel by train or car; alternatively, the company can book you a low cost flight.

The locomotive driving course involves 7 nights accommodation in rooms with private facilities at the 3-Star hotel Ring including breakfast, daily train between the Nyugati Railway Station (5 minutes from the hotel) and the Railway Museum. From £265, the 6-day course includes refreshments, driving test, and all local taxes.

An accompanying person, can enjoy the above without the driving but with optional programmes as required including 3-day beauty package and a private half-day cookery course.

Flights London-Budapest-London are booked separately and vary according to the season. Groups can be accommodated to a maximum of 10 participants for the driver training with programmes for accompanying persons.

Contact: Klara Sido (020-7851-4370) for further information. General information on Hungary and photos are available from the Hungarian Tourist Office (020-7823-1032).

POST BAG

Workshop (h)eating

SIRS, - I was interested to read the comment in a recent *Smoke Rings* (*M.E.* 4167, 19 April 2002) concerning the use of industrial ovens for heating food. I am sure this must have been (and probably still is!) a common occurrence, but it did remind me of a couple of examples from the world of craft education.

At the school where I am employed as a Design Technology teacher, I run a miniature railway club. One of the club's traditions is that we have a video night at our last meeting before the Christmas holiday starts The video is usually a feature film with a railway theme, such as *Oh! Mr. Porter*. We also have a mince pie break about half way through. The mince pies are usually heated in a workshop oven normally used for plastic bending and dip coating at other times. The mince pies are put on a proper baking tray and covered with cooking foil to keep them from contacting the remains of the oven's more usual occupants. One year; one of the lads became quite concerned for me. He thought that I would receive a severe 'telling off' if the Head of Department found out, and was amazed when he saw that gentleman eating one of the mince pies.

The second incident which came to mind happened during my period of teacher training as a metalwork teacher. We used to attend an extra workshop session on Tuesday evenings to give extra time to complete coursework projects. There was usually insufficient time after lectures to have a meal at the 'digs' or Hall of Residence, so my custom was to go to the 'chippy' across the road. On this occasion, the Lecturer who was to be present for the evering asked me to bring some fish and chips back for him. When I arrived back with the two paper bundles, there was no sign of the Lecturer. Not wanting him to have a cold meal, I built up a kind of kiln using the fire bricks on the brazing hearth. I then put the unopened fish and chips in the top section and directed a brazing torch with a very low flame into the bottom section.

Pleased at my resourcefulness, I settled down to enjoy my own meal. I finished this and the Lecturer had still not arrived, so I started work, together with some other students. After a while, I smelt burning. Surprise, surprise, the paper wrapping had caught fire. Fortunately, the contents were unharmed, but I could hardly give the Lecturer his fish and chips in burned paper.

Luckily, nothing else had been put in the bin on top of the wrapping paper from my own meal, so I retrieved this and re-wrapped the Lecturer's one in it. More bricks were added to my kiln and the torch flame turned lower. A very close watch was now kept on the arrangement and soon the Lecturer arrived. He was full of praise for the meal and thanked me for keeping it warm. Little did he know ... or did he?

Roger Wakeford, Surrey.

Cover picture

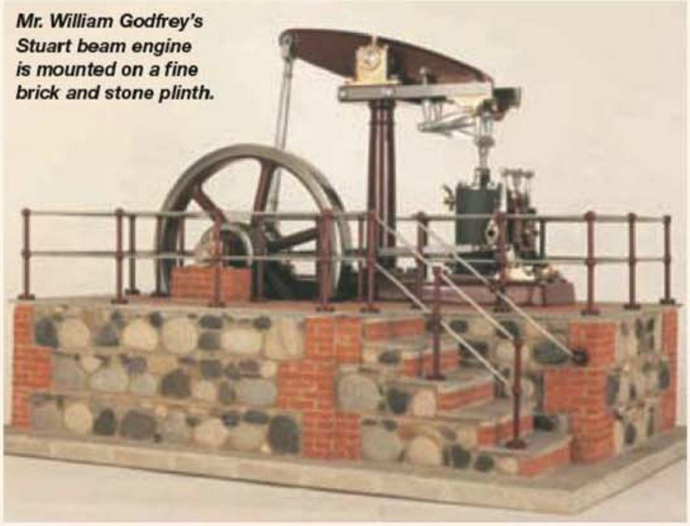
SIRS, - Over the last 30-35 years I have machined up 18 Stuart Turner stationary steam engines and have also buit a *Rob Roy*. Three years ago I moved to the Isle of Wight and helped a friend to restore an old building which had been converted to a bungalow; there seem to be a good many buildings on the Island which have been built in this style.

Over the months during which I helped on site, the idea of doing the same work on a miniature scale began to appeal to me. I fancied that the technique would suit my Stuart Turner beam engine, so I decided to build a plinth for it. Having seen herringbone brickwork in walls on the Island I decided to have a go at using this style for the floor on the plinth. There are over 500 bricks in the floor alone.

On walking my dog in the afternoons on the local beach, I often stop to select and collect small stones which are suitable for this type of work. The stanchions were machined from 1/2in. square steel bar. The base was made using miniature stone slabs bonded with a strong mix of cement with added PVA adhesive.

Having derived a great deal of pleasure from making this plinth I have decided that my next project is to be a miniature bungalow in the same style.

William Godfrey, Isle of Wight.



Mr. William Godfrey's Stuart beam engine is mounted on a fine brick and stone plinth.

Locomotive drawings

SIRS, - I know that there has been some criticism of model locomotive drawings supplied by MAP, Nexus and others. Some of this has undoubtedly been justified, but in his letter (*Post Bag, M.E* 4167, 19 April 2002) Mr. J. D. C. Brown has gone badly off the rails. He mentions *Simplex* as one example, the drawings of which he maintains are so poor as to make the model almost unbuildable! Mr. Brown evidently does not know that *Simplex* is the most popular 5in. gauge model locomotive ever, with examples built and running all over the world.

Mr. Brown would be well advised to join his nearest model engineering society or to attend one of the courses in model engineering available around the UK.

Martin Evans, West Sussex.

Drawings and dimensions

SIRS, - May I add to the recent correspondence on drawings and related topics?

Drawings for models seldom show all the information needed to make a component, much is implied but unspecified. Often there is no mention of features such as circularity, concentricity, parallelism, or smoothness, and with lack of detail regarding fitting when components have to be combined.

Industrial manufacturing drawings are, or were, made by detail draughtsmen, having experience of the product. A good draughtsman produces simple unambiguous drawings, placing dimensions sensibly, limiting the number of decimal places, and not mixing units without justification.

Dimensions on a drawing should be relative to the most appropriate manufacturing method. In other words, only the measurements that are needed when using the best tool for the job; of course not all modellers have 'the best tool for the job'.

Drawings of models, produced by the prototype builder, where the modeller takes on the role of designer and draughtsman are unlikely to be of this standard. This is not a criticism of these modellers, but a warning to prospective constructors to proceed with care.

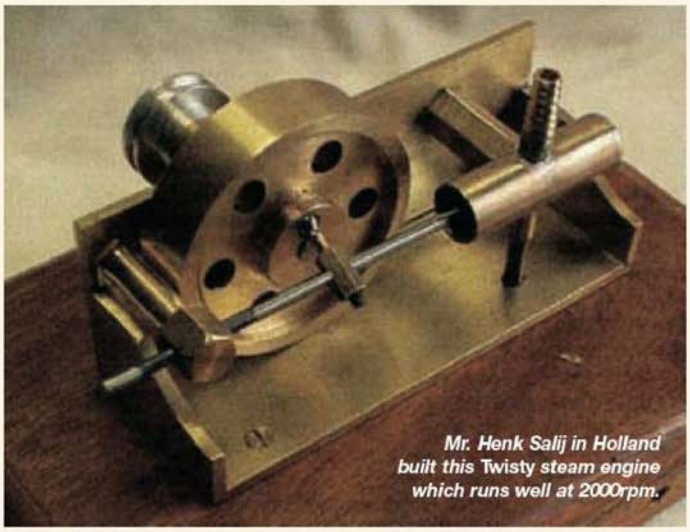
Experienced craftsmen frequently interpret such drawings satisfactorily despite the shortcomings, but modellers from a diverse range of backgrounds who do not have such experience may encounter problems.

Components to be assembled should be the right size, but specifying these sizes to the accepted industrial standards may not make easy work for some hobbyist engineers. British Standards Institute recognised the problem long ago, *"Unless a draughtsman has had some tool room experience ... he may not realise what a ten-thousandth of an inch amounts to."* ... and continues to list over 20 classes of fit with descriptions including light drive, slide or easy push, coarse clearance, etc. There seems little amiss with modellers using such terms, especially when handling the components and thinking about what their fingers are telling them.

It may be different when producing drawings for global manufacturing, that is another story, but even then it is likely that at the time, the design draughtsman was thinking *"that needs to be a light drive fit"* before specifying 'UE' designation (to BS not ISO standards).

Much is claimed for CAD regarding the quality of drawings, but it is important to remember what CAD means, 'Computer ***Aided*** Drafting'. CAD is a very powerful ***aid***, but it depends essentially on the quality of information entered by the person driving the machine. Some CAD packages are so complex that the operator is possibly more of a system driver than an engineering draughtsman. CAD drawings can be bad drawings if the operator does not understand the objects to be drawn.

Not only is the quality of the input information important but also the system settings. As a simple example consider the precision of dimensions. Set to whole units a reading of, say 6 would indicate a value of 6 or more but less than 7. Increasing the precision to tenths, 6.7 would indicate a value of 6.7 or more but less than 6.8, and so on to very high degrees of precision beyond the needs of most modellers. There are other features which if incorrectly set can produce unexpected results. A draughtsman may produce drawings by either pencil or CAD, but a CAD operator may not be a draughtsman.


Mr. Henk Salij in Holland built this Twisty steam engine which runs well at 2000rpm.

Modellers have accepted new developments including electronic digital calipers, and read-outs, tipped tooling, laser cutting and more, but have shunned the simplicity of the metric system. It is over twenty years since the BSI recommended that industry should adopt the metric screw thread system because 75% of world trade was metric and 60% of British exports was to metric countries. New modellers could consider a range of metric drills from 1 to 10mm dia. in uniform steps of 0.1mm (about 0.004in.) rather than buying number, letter, and fractional sizes.

Eventually the millimetre will become the norm, but the inch will persist while ever there is an old flat belt lathe turning away in a garden shed with the operator taking pride and pleasure in reading stiff joint calipers with steel rule to $^1/_{64}$ inch.

And why not?

Ivan Turner, South Yorkshire.

16 annas to the rupee

SIRS, - I refer to my letter published in *M.E.* 4168, 3 May 2002 concerning a special micrometer made for use in the East India Railway workshops. I regret to have to correct your typographical error: there are not 6 but 16 annas to the rupee. With 4 pice to the anna and 16 annas to the rupee, the analogy with imperial fractions of an inch is a fair one.

Dr. C. L. Forbes, Cambridgeshire.

(We apologise for this misprint which rather spoiled the appropriateness of the analogy — Ed.)

A Dutch *Twisty*

SIRS, - When I saw the simple steam engine *Twisty* described in *M.E.* 4163, 22 February 2002, I immediately decided to make one for myself. Currently building a steam locomotive, I thought that this project would make an ideal short break away from all the work involved in the locomotive.

I am a member of the Rotterdam Model Association in Holland and until June of last year was Chairman of this group for 18 years. Please find herewith a photograph of my *Twisty* engine which will demonstrate to other readers that *Model Engineer* is read in Holland, and the models described are built here as well.

My engine runs at 2000rpm and other members of my Association have plans to build it — perhaps somewhat bigger.

Henk Salij, Ridderkerk, Holland.

Drive shafts

SIRS, - Recent correspondence concerning automotive drive shafts has raised memories of my early days as an engineering apprentice with Marcus Hodges of Exeter.

At a time when not all that many people rode around in cars (1951), it appeared to the first year apprentice to be a 'perk' to accompany Foreman Sid Frost in the company Austin A40 Devon pick-up truck for a ride out to the car breakers yard, a bi-monthly event.

There, after tare weighing, the vehicle was backed up to a pile of half shafts and after pitching one or two on board, Sid would go off to 'discuss the price'. *"I'll be back in half a minute."* I would happily chuck on half shafts until the vehicle would begin to wilt whereupon Sid would re-appear and get the 'gross' over the weighbridge, get the ticket and back to work we would go. The shafts would be unloaded into a rack in the yard. It took some time to realise that the junior apprentice was taken as the loader because at that stage he wasn't much use for anything else!

As General Engineers, Hodges could make anything. In my first week I helped with W. J. Glossop's Wallis & Steevens *Simplicity* roller in for a boiler overhaul, and passed nuts and bolts to the fitters who were assembling the jig for building the wings for Hawker Hunter jet aircraft. I was also sent to the stores for a 'long weight' and later for a bucket of steam; I managed the latter but suffered the more for being clever!

The half shafts were used for any purpose where good quality steel shaft was needed, and the turner would go out to the yard to select a shaft which would do for the job. This was then struck with the spanner from the overall pocket and if it rang true, having passed the 'crack test', it was taken inside, cut off and turned for the job.

Later, when in the scrap trade with R. J. Coley, sorting gas turbine blades, I learned that one can develop a tactile sense for the 'rightness' or grade of metal, and I am sure these skilled fitters and turners also had it.

John Hill, Devon.

Kick back

SIRS, - In one of your photographs of the Model Steam Weekend at Amberley (*M.E.* 4167, 19 April 2002), a young lady 'bus driver is shown at the starting handle of the Leyland 'bus. I do hope that she remembered to retard the ignition, as a kick back could do her damage! To start the engine, a pull up on the handle is much safer, with the thumb and fingers on the same side of the handle. By using this grip, if the engine kicks back the handle is snatched from the hand with much less chance of injury.

Having owned several cars with a proper starting handle attached, i.e. vintage cars, I have always used this grip. The worst to cause injury were those made from the thirties until starting handles were no longer issued. Flimsy bent wire affairs, these had to be threaded through various holes in the body 'tinwork', usually with a bumper support bracket at each side, set at a distance only slightly greater than the radius of the starting handle. These bracket were most effective in removing the skin from one's knuckles!

J. A. H. Wallace, Worcestershire.

Gunmetal

SIRS, - Your letters column has recently contained comments on the machineability or otherwise of gunmetal. The following information may be of use to other readers.

The gunmetals are a family of copper-based casting alloys and were widely used for valve and pump bodies on steam engines. They contain about 85% copper with additions of tin and zinc, and some contain significant amounts of lead. The lead weakens the material but it improves the pressure tightness of the castings and so is a valuable addition to a material used for steam fittings. The leaded gunmetals are much easier to machine to a good finish than their unleaded counterparts and this may be where the differing opinions concerning the machineability of gunmetal arise.

It is now some ten years since I left the copper industry, but at that time the gunmetal specifications were to be found in British Standard Specification 1400. The nominal compositions of some are shown in the following table.

Nominal compositions of some BSS 1400 gunmetals

Grade	Copper %	Tin %	Zinc %	Lead %
G1	88	10	2	-
G2	88	8	4	-
LG1	83	3	9	5
LG2	85	5	5	5
LG3	86	7	5	2
LG4	86	7	2	3

In addition to the copper/tin/zinc/lead content, LG4 contains 2% nickel to improve its strength. I believe that Novocast of Melksham produced castings for the Crofton beam engine cylinder and valves in LG4, and the set which I had from them machined beautifully on my old ML7 lathe.

D. M. Hughes, West Yorkshire.

Motor control

SIRS, - I write in response to Mr. J. B. Shaw's letter (*M.E.* 4168, 3 May 2002).

There was of course *no* reference in my letter to suggest that the fuse protects the motor, I was merely highlighting the known facts regarding the starting currents of motors.

I have no argument with any of the statements made by Mr. Shaw other than on a split phase motor, the peak can be 11 times, which for a 0.5hp motor would be around 41 amps! I would be surprised see such heavy cable ($4mm^2$) used in many amateur workshops.

With the exception of my ML7, I use electronic inverters on 3-phase motors so my motors are soft started and ramped up to speed, which of course controls the start current.

On another subject, the list of on-line suppliers of metals could be extended to include Mike Stone of W. L. Cooke Ltd., who I believe are suppliers to education and from whom I have obtained very satisfactory service and prices. (usual disclaimer). Addresses: Cookes Corner, Wangey Road, Chadwell Heath, Romford, Essex. RM6 4BW; tel: 020-8590-3277; fax: 020-8599-5030; www.wlcooke.co.uk

Ken Willson, Hampshire.

Young C. Park of Honolulu, Hawaii was presented with the Martin Foundation award at the North American Model Engineering Society show.

Mr. Park's magnificent all-aluminum model Corsair in big 1:16 scale. The total skeletal appearance means that no internal detail has been omitted. The aircraft was displayed at the NAMES show in Southgate, Michigan, 27/28 April 2002. (Photo: Augie Salbosa).

METALWORKING CRAFTSMAN OF THE YEAR 2002

Young C. Park in Hawaii has been named Metalworking Craftsman of the Year by the Joe Martin Foundation for Exceptional Craftsmanship, and here provides us with a glimpse at the work which led to this award.

I was born in Kona on the island of Hawaii on March 15, 1932 to immigrant parents who came from Korea in 1910. I grew up on the opposite side of the island in Hilo. World War Two left a lasting impression on me, especially the fighter aircraft with their speed and loud noise. After the war, I became interested in a new product; the Olson 23, an ignition, gas-powered model aircraft engine. I delivered newspapers and saved enough to buy my first engine, a Vivall 35. Now I could build an aircraft with speed that made lots of noise.

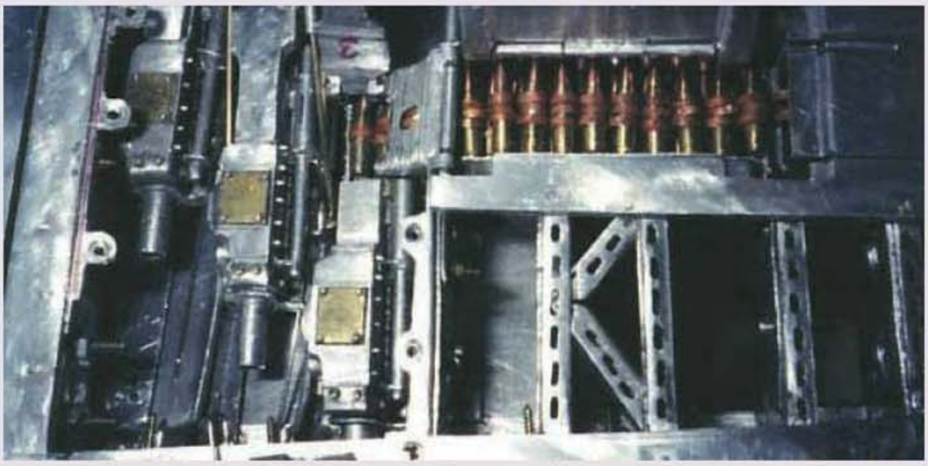
I was fortunate to have an older friend, Louie Carvalho, who was a modeller and taught me all he knew. He was patient, meticulous and understanding. My first U-control model was a failure. Like all beginners, I rushed the model to see how it would fly. He taught me to be patient and to do the best I could at each step. I remember Louie teaching me in detail, saying, *"Wait for the solder to turn dull"* or stopping me and saying *"Flat washers and nuts have a 'face'."*

Louie took me to a graveyard of World War Two aircraft being processed for scrap. I remember seeing 50 calibre machine guns rusting on wings and being amazed to see that many parts of the fighters were made like a U-control model: cloth painted with dope. I took pieces of aluminium, which was a novelty at the time, and made jewellery and bellcranks, control horns and switch plates for my U-control planes. One day I said to Louie, *"Wouldn't it be neat to build an all aluminium scale aircraft?"* I became excited about the idea but soon became discouraged when I took a mental inventory of my tools. I had an X-Acto knife, a file and a hand drill. Louie passed away at the early age of 25, but I always think of him while modelling, to get his silent approval, as he was my mentor.

I was inducted into the army in 1952 and again saw the beautiful Corsairs in Korea. During the next 40 years I continued to build models. I built radio control planes in the era of single channel escapement radios, enjoyed rubber powered planes and was intrigued with plastic kits when they came out, but I could never seem to finish them. Nothing I did in the hobby seemed to bring me total satisfaction.

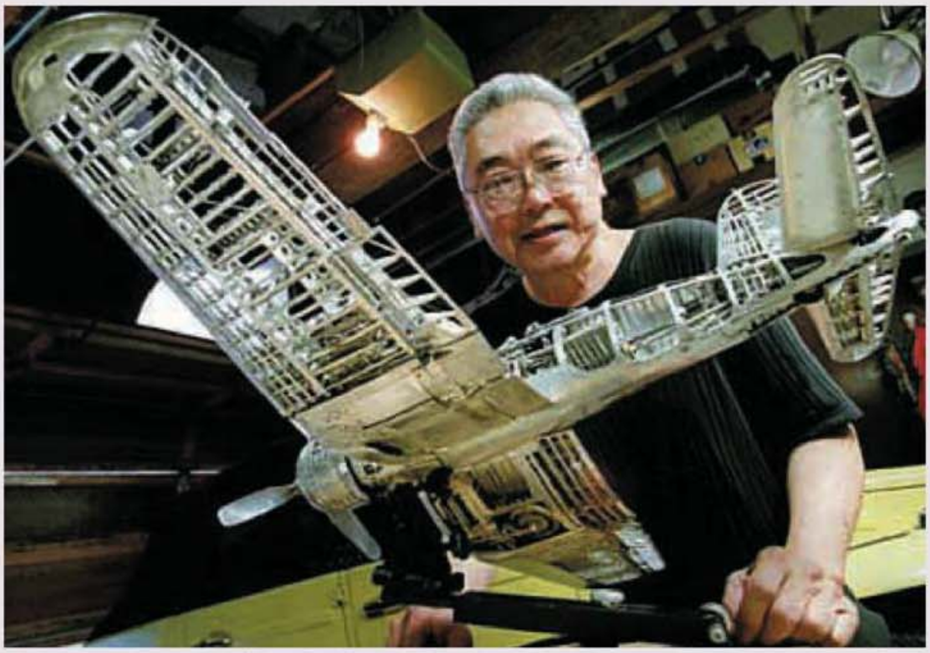
In 1996 I got the urge to build again and ordered a Lockheed Vega kit with a 9ft. wingspan and a 5-cylinder Sidel engine. I built most of the framework and decided to use aluminium for the dash, windshield and window frames. The aluminium parts looked good, so I looked for more parts to convert. I suddenly remembered my long-forgotten dream of an all-aluminium aircraft. This was what I had been searching for all these years. I now had the tools and space necessary for my new hobby. I knew I would never work on the Vega again, so I hung the unfinished model in the garage where it remains to this day. Working in aluminium was to bring me the satisfaction I had been seeking.

The Corsair had always been a favourite of mine, so I decided to build its tail fin and rudder to see what it would look like in aluminium. I also decided on moveable trim tabs and rudder and planned to use it as a decorative piece if I could complete it. At this point the tail was my



Inside the wing can be found the 50 calibre machine guns and boxes containing scale rounds of ammunition ready to be fed into the breech.

Young C. Park (centre) at age 15 flanked by friend and mentor Louie Carvalho (left) and another friend on the right.



Retired from his practice of dentistry, Young C. Park looks forward to completing his second model Corsair and maybe commencing construction of a P-51 Mustang. (Photo: George F. Lee, Honolulu Star Bulletin)

only objective. Had I considered building an entire plane at this point I would have surely become discouraged and never started.

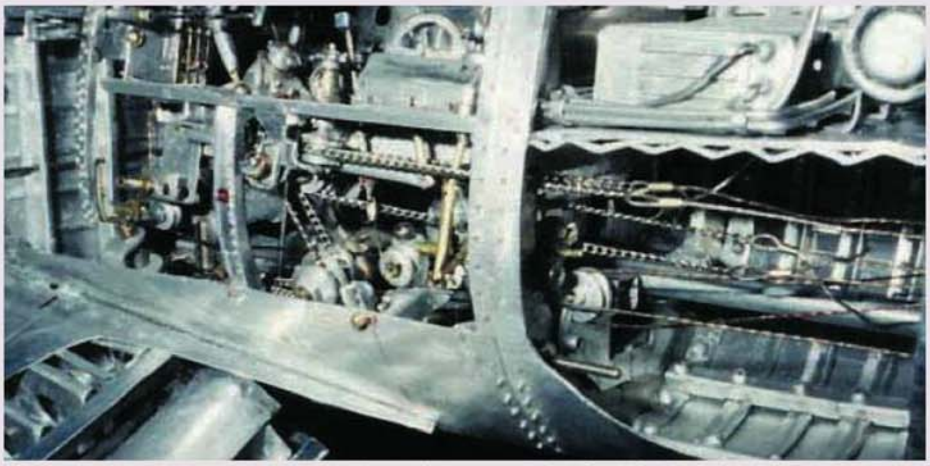
For reference material I used the plans from the $^3/_4$in. to 1ft. scale Guillow kit and the cutaway and other illustrations by Rikyu Watanabe from *The Great Book of World War II Airplanes.* I began with these references and later added more detail with better resources. After a month, the horizontal tail was complete and looked pretty good for a first project. I next added the vertical stabiliser and rudder after doing more research on the structure. I was getting better and really enjoyed working with the aluminium, so I decided to continue with the fuselage. Three years later, a cutaway model was virtually complete, although I continue to add detail to this day, so it will probably never be 'done'.

In making the first Corsair, I ran into some jobs that I could not complete to my satisfaction with hand tools and knew I would need to learn to use small machine tools to make better parts. I purchased a Sherline milling machine and started on a second model. This one would be built in sections that could be assembled like the real plane and would be built to a higher level of quality. I added a Sherline lathe to my shop as well and am now in the process of finishing the second model.

Up until 2000, the first model had only been seen by a few friends. The president of a model club in Honolulu asked me to display the model in a show at a local mall. I had not really planned to attend, but an article about the model in the Honolulu Star Bulletin announced that the plane would be at the show, so I felt I had to attend. It attracted a fair amount of attention, but there was really nothing to compare it to, as no one else was making all-metal models. That article, however, was also published on the Internet, and it led to a photo feature article in the November 2000 issue of *Fine Scale Modeler* magazine. In the meantime, I had been in contact with the people at Sherline after they found out about the model. I kept them up to date on my progress by sending photos now and then.

I retired from my dental practice in December, 2001 to spend all of my time modelling. In January, 2002 I received a call informing me that I had been selected as the 'Metalworking Craftsman of the Year' by the Joe Martin Foundation. I was speechless. After seeing the accomplishments of the five former winners and looking at the projects in Joe Martin's book, *Tabletop Machining,* I felt like a dwarf among giants. I always thought of my model as being unique and unusual, but not from the machinist's point of view. When I see the beautiful precision machining that some of the other modellers do, I feel that I will never be able to achieve that level of perfection, but I do agree that my model has a unique character. I am not so concerned with technical accuracy as I am with the way it looks and how all the parts fit together. In fact, I have been asked many times what motivated me to build this unusual model, and I had no good answer until I talked it over with Craig Libuse when he notified me of the award. He pointed out that it was not the individual details of the model that were unique, but the interaction of so many parts and how they all fit together. I now realise that it is the pleasure that I get from the aluminium material and the interaction of these parts that has kept me motivated day and night for the last five years, and I hope it will keep me going for another five years at least.

As a dentist, I have worked with gold casting, and I find aluminium to have very similar properties. It can be annealed, work hardened, burnished and made malleable. Living in Hawaii I appreciate most its non-rusting properties, particularly as I see all of my tools slowly rusting in our salt air. I plan to keep honing my skills and continuing to work with aluminium. If all goes well, my next project may be a P-51 Mustang. I hope Louie approves.

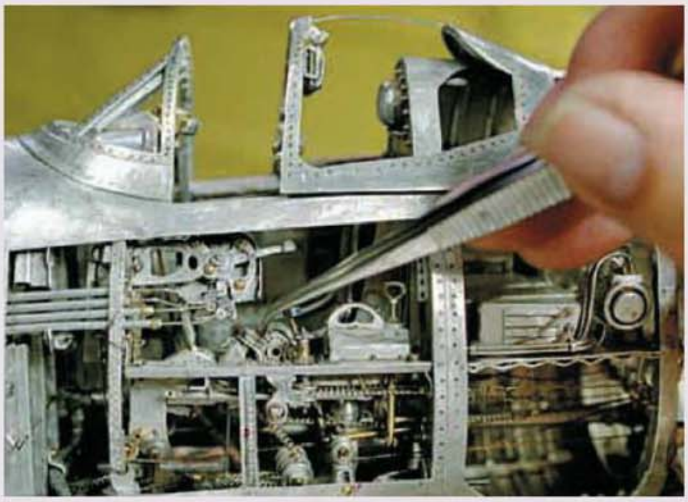


A close-up view of the controls reveals the total attention to detail paid by Young C, Park throughout the construction of the entire aircraft.

Building the Corsair

When I first started work on building just the tail of the Corsair, my first attempts were disheartening. It was difficult trying to hold two pieces at different angles and expecting them to stay in place. I used 'rivets' by drilling holes, inserting pieces of wire and squeezing them together. It became so flimsy that I wanted to stop. I knew if I did, I would never go back to it, so I continued and slowly the tail became more stable as pieces were added. It took over a month, but the tail looked good for a first project.

I next decided to build the stabiliser and elevator using the same method and reference material. It again looked good, so I decided to connect the fin and stabiliser. I needed more reference material to see how this was done. I collected all the literature,



Cockpit details inside the cutaway fuselage — the controls actually work! (Photo: George F. Lee, Honolulu Star-Bulletin.)

In the comfort of his workshop, Young C. Park gets to grips with his 1:16 scale all-aluminium model Corsair aircraft.

photos and drawings I could find on the Corsair. Most helpful were the copies of the original government manuals dealing with the complete illustrated parts list and the detailed repair and maintenance sections from AeroTec Data. I also received photos and scale drawings from Bob Banka's *Scale Aircraft Documentation and Resource Guide* catalogue. I needed a three-dimensional view and used the $^1/48$ and $^1/32$ scale plastic and resin kits to learn more about the plane, particularly the engine and cockpit.

Fuselage

I now had visions of making a complete aircraft. I decided to build a cutaway model with internal moving parts. I now knew that I must always use a jig or support made from wood — balsa or hardwood — for stability. I began the fuselage at the tail section using a $^3/4$ x $^3/4$ x 30in. straight wooden stick as a guide and temporary central brace. The stick was shaped to accept the tail pieces. Skin and carved aluminium pieces were mounted at the tail end. The fin and stabiliser were aligned and screwed to the skin using round head sheet metal screws for easy removal. Main bulkheads were added and Superglued to the stick. All construction was started at the rear and moved forward. Pre-shaped aluminium skin was added to the bulkheads. I used the ball of my foot to shape the large area of the skin behind the cockpit. I used a folded towel for padding. The raised hump directly behind the cockpit (the turtle deck) was annealed and slowly hammered to shape before installation.

I try not to anneal skin with single curves because of the 'oil can' effect. I annealed only areas with multiple curves and areas that can be work hardened. I used the largest piece that could wrap around this area, which gave an even flow and contour to the skin. Panels were cut out after the skin was installed. The skin was fitted around the bulkheads which were, in turn, pressed against the stick. The initial fit was not good. Tape and rubber bands were used to hold the pieces in place. I wrapped my hands around the skin and slowly squeezed. I cannot describe the sensation of an aluminium fuselage held in my hands. I sometimes think of it as an aluminium sculpture as it takes shape.

I used the flat side of a 2 x 4, applied pressure and slowly rolled the wood around the fuselage. The fit slowly gets better. I always kept the ends of the skin pulled tight. I removed the skin to straighten out dents or to move more metal by the previous methods. This was repeated many times until I had a fairly good fit. This procedure took a few days. The end result is a part of Corsair model no one had made before. The skin was held to the bulkhead with round head sheet metal screws, size 0 rivets were added and finally the screws were replaced with more rivets. The screws act as 'Cleco clips'. Flat head sheet metal screws were used on the removable panels. I removed the stick after all of the skin was attached. I now had a half exposed, hollow tube with tail and good internal access.

I used common aluminium roof flashing for most of the covering and internal parts. The flashing is found in all hardware stores. There are two types: the old stock, which I use, and a new stock with lower aluminium content. It is shiny and cannot be annealed because it turns brown before annealing temperature is reached. Both come in different width and roll lengths. I must have used over 50ft. on my first model. There was a lot of waste due to trial and error and finding the correct method of annealing.

Annealing techniques

After much experimentation I found that using a red 'Sharpie' permanent marker pen made by Sanford works well as a heat indicator. I drew lines on both sides of the aluminium, used a brush flame butane torch and slowly heated both sides. When the lines turn brown and disappear completely, it is properly annealed. I sometimes see a dark orange glow. The aluminium returns to its original colour after it is correctly annealed. If I over-anneal a part it is discarded. When correctly done, the soft metal is easier to form, drill or carve. Carving was done with a Dremel motor tool with straight and angled drives. I burned out two before finishing the first model. I have since learned to use my dental hand pieces and a small lathe and mill for the bulk of precision removal.

After three years and 6,000 hours of work on the model, the exterior was completed and the major internal controls were installed. There were many on-going improvements and additions. There were many minor controls yet to be installed. I saw no end to the project, so I declared the cutaway model temporarily 'completed' so that I could start another project.

I decided to build a better model with what I had learned. I needed more accurate tools and bought a Sherline milling machine with a tilting table and rotary table. I milled the wheels and brake drums and made the gun breech hinges and other parts. They were not very good by machinist's standards but ideal for a scratch scale aircraft hobbyist. I later added a Sherline lathe to complement the milling machine.

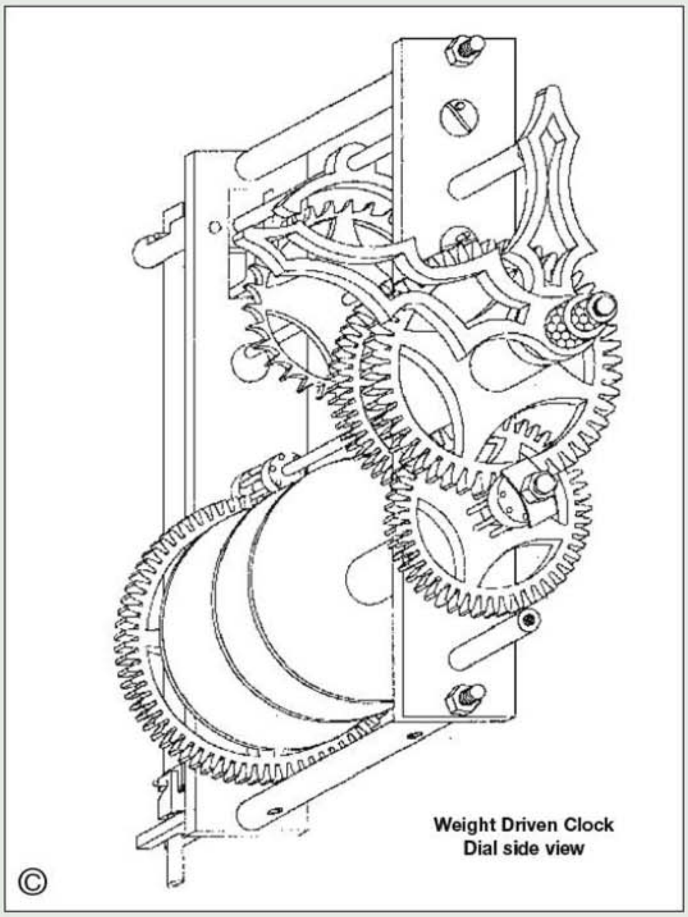
I decided to do another Corsair as I felt I did not have enough time to do all the research on a new aircraft as I was 68 going on 70. On the first cut-away model, the front curved cowling and wing root intakes were made by stacking solid pieces of metal together and carving out their anatomy. I now felt I had the skill to hammer out these parts. I decided on a model with a full aluminium covering and a fuselage that could be put together and removed in four sections like the original. I planned to deviate from the original by installing many of the removable panels for future access. The Corsair fuselage is a hollow tube mainly supported by its outer shell or skin.

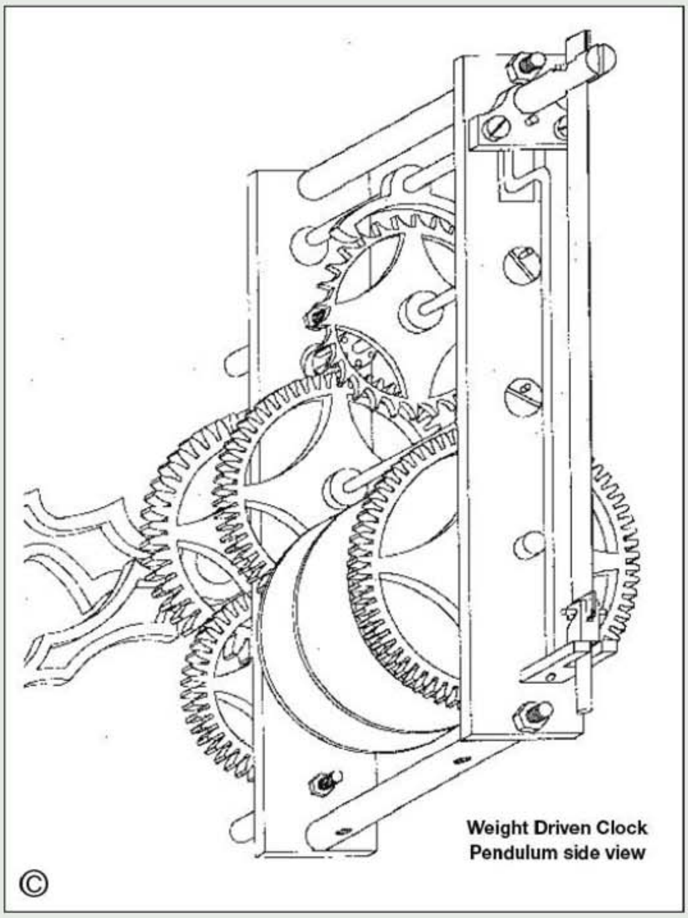
Many of the Corsair's minor joints were originally spot welded. I inquired about buying an aluminium spot welder and was politely informed that our household electrical wiring was not compatible with the requirements of spot welding. Instead I would use 24 gauge wire 'rivets'. I could not find that gauge in aluminium so settled for sterling silver wire until the craft store supply ran out. I next used copper and brass. Copper gives a good contrast and is a lot cheaper. The wires are Superglued in place The large wires are hammered or squeezed in place when possible. Otherwise, they are glued. The major joints on the real aircraft: the section-to-section or skin-to-bulkhead connections, were flush riveted and the minor joints: the skin-to-formers and longerons were spot welded.

Special tools

When I retired from the practice of dentistry I did remember to transfer four dental hand pieces to my workshop at home. Cutting aluminium for the first time with a dental high speed carbide drill was a unique experience. It cuts like butter until it digs in and binds or grabs the metal. The use of cutting oil and very light pressures reduces this problem. Diamond drills are slower but behaviour is better. The first chance I get, I will mount the dental drill on the Sherline lathe and see how it cuts.

I look forward to completing this second model, although I see both as on-going projects. I will continue to add details and fine tune parts to make them better. The satisfaction I have received from making them has inspired me to begin to think about future projects such as a P-51 Mustang.





A WEIGHT DRIVEN CLOCK

Robert Graham Boyes in Zimbabwe, admits to being a little unfamiliar with horological terminology and techniques but has designed and made an attractive timepiece which he is pleased to share with other readers.

●*Part I*

I do not intend to give a blow by blow account of the way that I constructed this clock. I feel that builders will have their own ideas on how to tackle all the various bits and pieces, according to their skills and workshop equipment available. I shall merely give a brief account of the way that mine was done. It may be that some would-be builders might be put off construction because I have prepared the drawings using the metric system. Such folk can be assured that none of the dimensions are critical. As long as the wheels all have the right number of teeth, the metric dimensions can be converted to the nearest 1/16in. or so.

Where I have specified Loctite or its equivalent, some might prefer to use soft-solder, or rivet the assembly. This is probably more in keeping with traditional clock making methods but in my opinion, metal glue is just right for this sort of application. It also occurred to me that some builders will not like the idea of cutting the teeth with a form tool 'that looks about right'. But as I have used lantern pinions which, in my experience will mesh with just about any form of tooth, the clock works and keeps time. If one has proper gear cutting hobs of the correct diametral pitch (DP) etc., then obviously they should be used.

As to why I have used pulleys on the weight cord, the great wheel and spool revolve once every two hours. This means that without reduction pulleys, the drop of the weight in 24 hours will be about 1.5 metres; to get the clock running for 36 hours a drop of at least 2 metres would be needed. If we add the height of the clock dial and the length of the weight, a very long or tall case is required, or the clock would have to be mounted high up on a wall. The pulleys reduce the drop by about two thirds, but their presence means that a heavier weight is required. If you prefer a long, tall case, or don't mind the clock being high up, then no pulleys are needed but I don't think that such a tall case, or having the clock mounted so high on a wall is very practical.

Wheels

I started with the wheels, simply because I wanted to give my dividing head a good try out. The wheel blanks were cut from 3mm brass plate. Rough octagons, about the size of each wheel, were cut with the hacksaw and the centre holes drilled. A blank was then mounted on one of the stub mandrels, but being octagonal in shape, when I tried to turn it down to size I found that it slipped on the mandrel as soon as the lathe tool was brought up to it, no matter how tight I tried to tighten the nut.

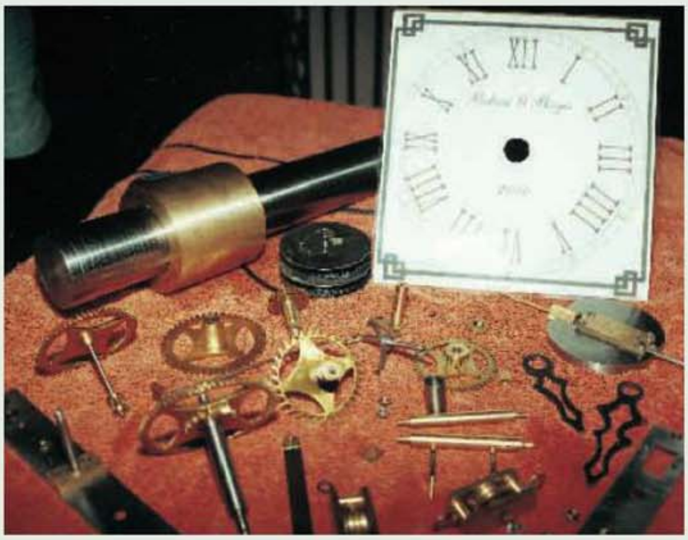
The answer was to put cardboard washers between the steel washers, as per grinding wheel practice; this cured the slipping. The blank was then reduced to the diameter of the intended wheel. Still mounted on the mandrel, the wheel blank was then transferred to the dividing head. The form tool was ground freehand to the shape described in the drawing, not forgetting to give some top and side rake. This was now mounted in a fly-cutter, and the teeth cut on the wheel blank. When using a fly-cutter, only very small cuts can be taken at a time, making sure that each tooth is cut to the correct depth. The spokes were cut out using a piercing saw, following templates taken from computer print-outs Without computer templates, the outline of the spokes can be scribed onto the wheels in the traditional manner. Of course, you can use any style for the spokes that you choose. Including the ratchet wheel, all seven wheels were dealt with at this time. Constructors should note that the escape wheel is made from a thinner brass plate (2mm) than all the other wheels.

Centre bushes

These are a simple turning and reaming job, and are secured in the wheels with Loctite. The tubes for the cannon pinion and hour wheel are likewise simple to make, and are also secured with Loctite.

Shafts or staffs

These are turned from silver-steel rod of the correct diameter. Care must be taken to get them to the exact length, otherwise they might have too much end shake, or they might be tight between the plates. The pivots must also be turned down to a fine tolerance and burnished to a bright finish.



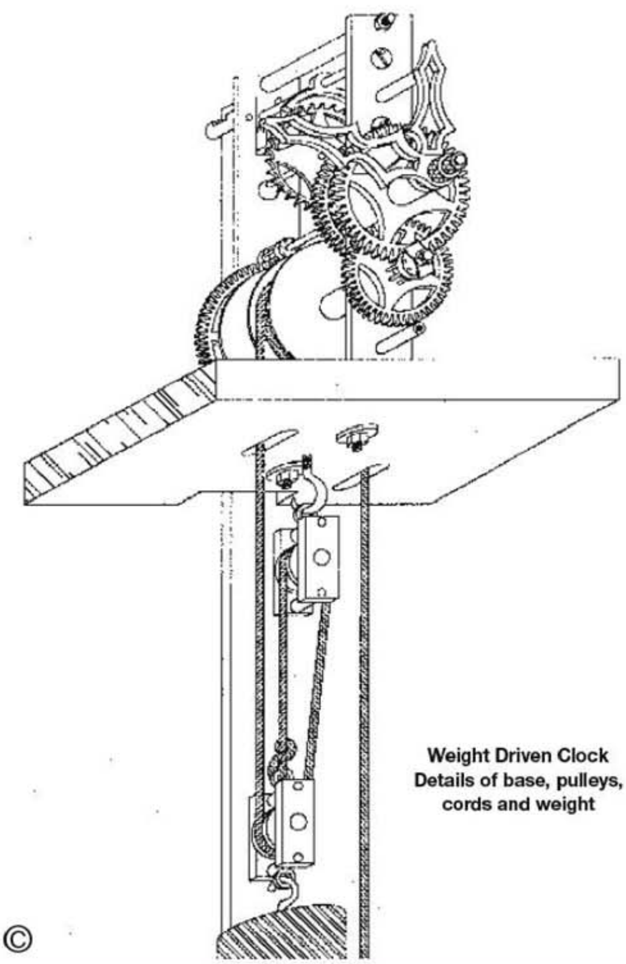
Components for the clock. The dial is a laminated computer-generated print and the hands have been cut from computer-generated templates.

The pivot on the dial side of the first wheel shaft is cut 2.90mm long, as the cannon pinion stud brass block is flush against this bush and the pivot can't protrude. The lengths of the other pivots are not at all critical. The pallet staff is also made at this time, remembering that it is 3mm longer than those for the wheels, and is 4mm diameter. The wheels are then fixed to the shafts, again with Loctite, making sure that they are in the correct position. These positions must be checked against the drawings.

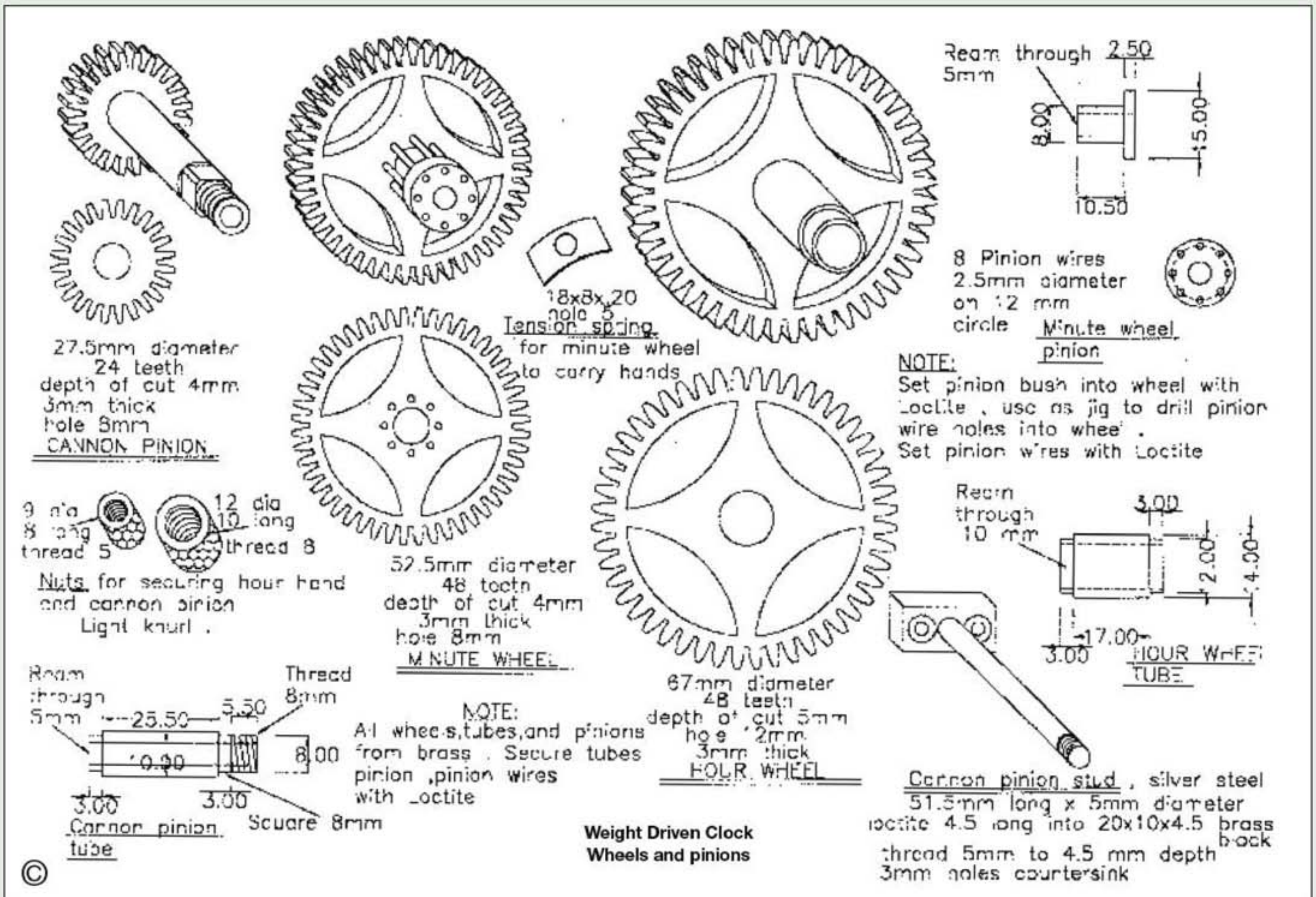
I decided to make the cannon pinion stud at this time. This is likewise set in the brass block with Loctite. The threads on the great wheel shaft and the cannon pinion stud were cut with the help of a tailstock die holder.

Pinions

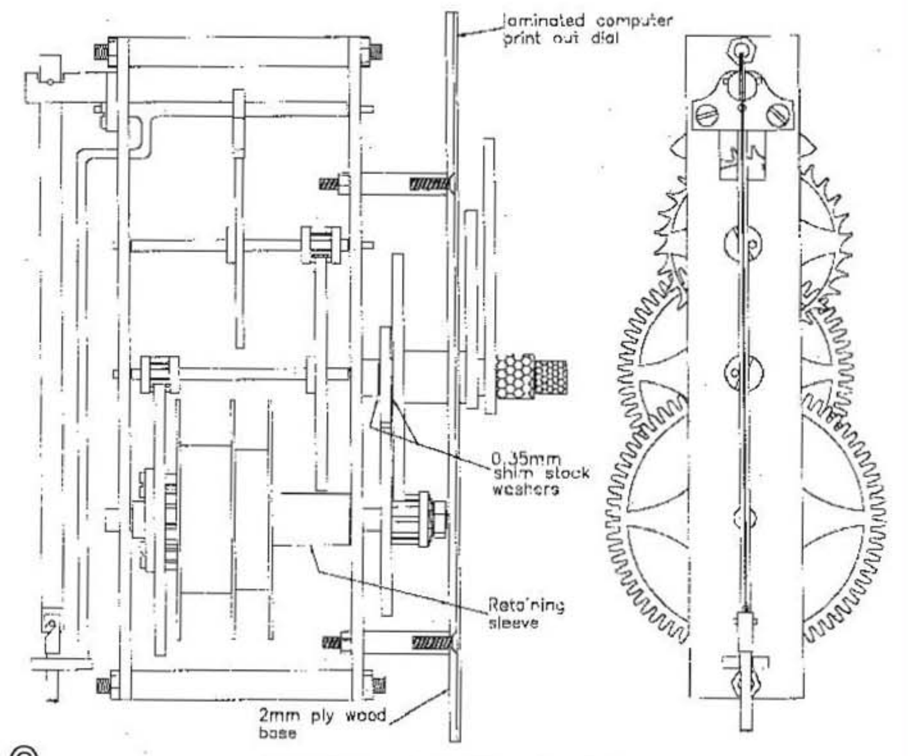
I have used lantern type pinions, because I was not very sure about the tooth form that I was using, but I knew that lantern pinions are not too particular about the teeth with which they mesh. When I eventually got to the stage of meshing the wheels and pinions, I was relieved to find



Weight Driven Clock
Details of base, pulleys, cords and weight



Weight Driven Clock
Wheels and pinions



Weight Driven Clock - Side and front views

that all the wheels and pinions meshed beautifully together.

The minute wheel pinion was the first to be tackled. The core of this pinion was a simple turning and reaming job. The locations for the pinion wires holes were found by cutting out a template from the drawings and very carefully gluing this to the core using a contact adhesive. The centres of the pinion wires were then very carefully centre popped through the template, and drilled 1.5mm diameter. This core was then used as a jig to drill the holes in the wheel.

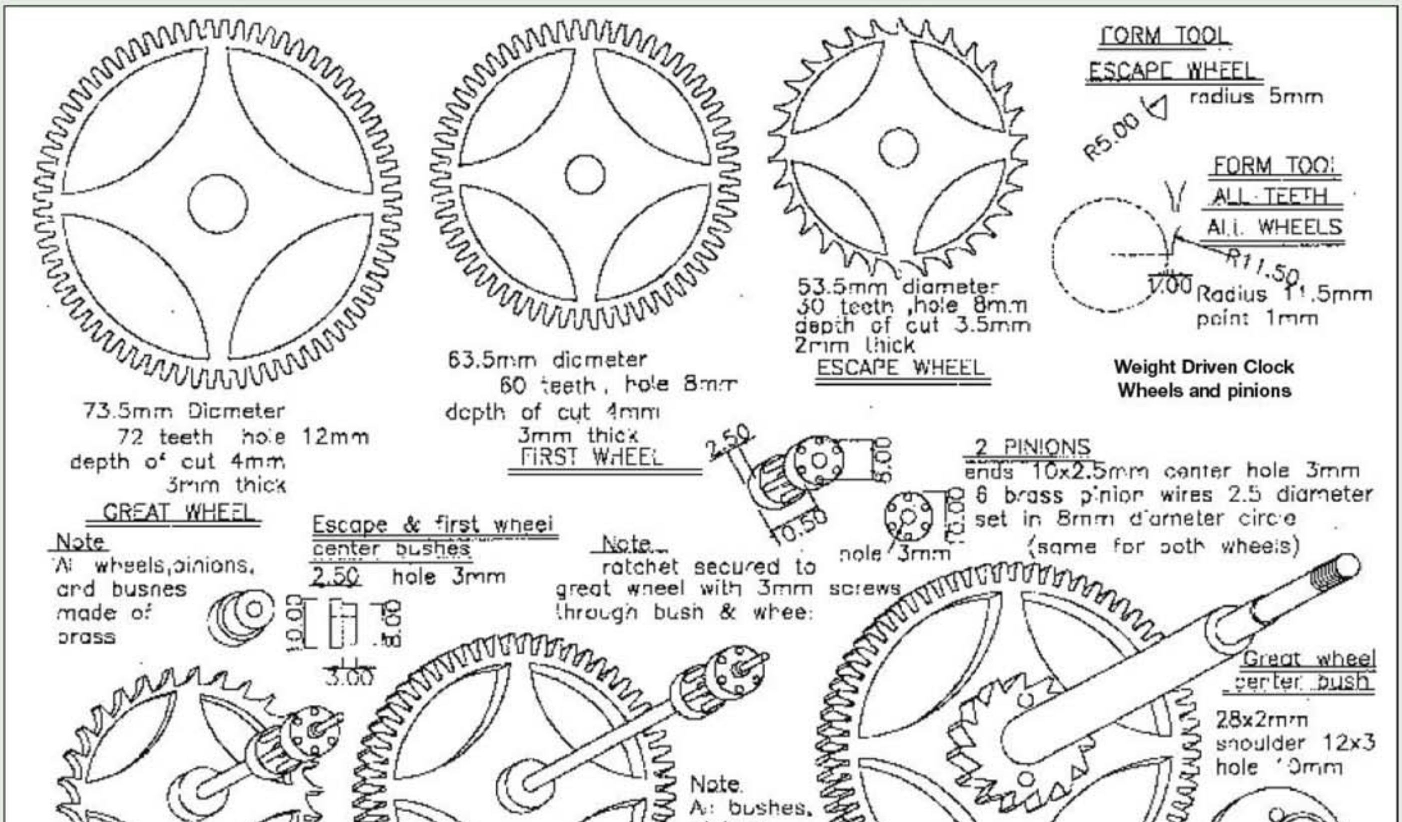
The core was then set in the wheel and 1.5mm dia. brass wire was pushed through. Again all was secured with Loctite. The protruding wire was filed flush on the back of the wheel and also from the pinion. I realise that builders will not be able to cut a template from my drawings but knowing the ingenuity of model engineers, I am sure there must be many ways to carry out this job.

The other two smaller pinions were made in a similar manner, except that on these two pinions there are no cores, only two end discs. These too are held together and located on the shafts with Loctite. I advise builders to make sure that the pinions are located at the correct positions on the shafts; the drawings show these measurements.

Also be sure that the pinion on the escape wheel is fitted on the correct side of the wheel so that the teeth rotate in the right direction — see the drawing for details. I made the mistake of putting the pinion on the wrong side and had great difficulty in removing it. The note on the bottle of Loctite said *"special tools needed to remove"*. To get it off the shaft, I ended up having to destroy the pinion and had to make a new one. This has given me great confidence in the strength of joints secured using Loctite (usual disclaimer).

So now I had all the wheels completed, and the next job to be tackled was the plates and pillars.

●*To be continued.*



Weight Driven Clock
Wheels and pinions

A MANDREL HANDLE FOR A SMALL LATHE

The Author's finished item looks smart with its polished mahogany handle and 'house grey' paint.

Len Walker

describes a handy accessory for the Myford ML10 which can easily be adapted to suit other lathes.

This must be one of the most useful attachments I have ever made for my lathe. It has repaid many times over the modest effort involved in making it. Most threads in model engineering are relatively short in length but often require threading accurately to a shoulder, or at least to a tiny undercut, necessitating very fine control. For years, I pulled the belt around to achieve this while often looking at the Myford catalogue and its illustration of a lovely, but expensive handle! Eventually, I sat down and sketched my own version, using odd bits from the scrap box. This led to using a 'built-up' type of construction i.e. the body, Detail 1, has a collar, Detail 2, pressed on to give a decent diameter to carry the arm.

Incidentally, with hindsight, this gave a bonus, because Detail 1 could be pushed right into the 3-jaw chuck, allowing the 30deg. inclusive taper and the 'fitting diameter' to be machined at one setting. Of course, the body can be turned from the solid, but that would involve using a fixed steady to support the outer end while boring the taper. On a small lathe, the chuck body would not accept the 1³/8in. diameter. Anyway, you pay your money and take your choice!

In use, the attachment gives really accurate control whether screw cutting with a gear train setup, or running a die in the tailstock down work held in the lathe chuck. By merely turning the handle to the same angular position each time, threads can literally be cut up to a shoulder without effort. With the lathe drive belt slipped off, the attachment, spindle and chuck become a sensitive unit. Construction is straightforward. Assuming the built-up type is desired, the odd note covering a few details may be of help.

First make a plug gauge of bright mild steel to check the mandrel bore of your lathe. Mine was 0.625in. diameter. Make sure that the bore is smooth and free from burrs.

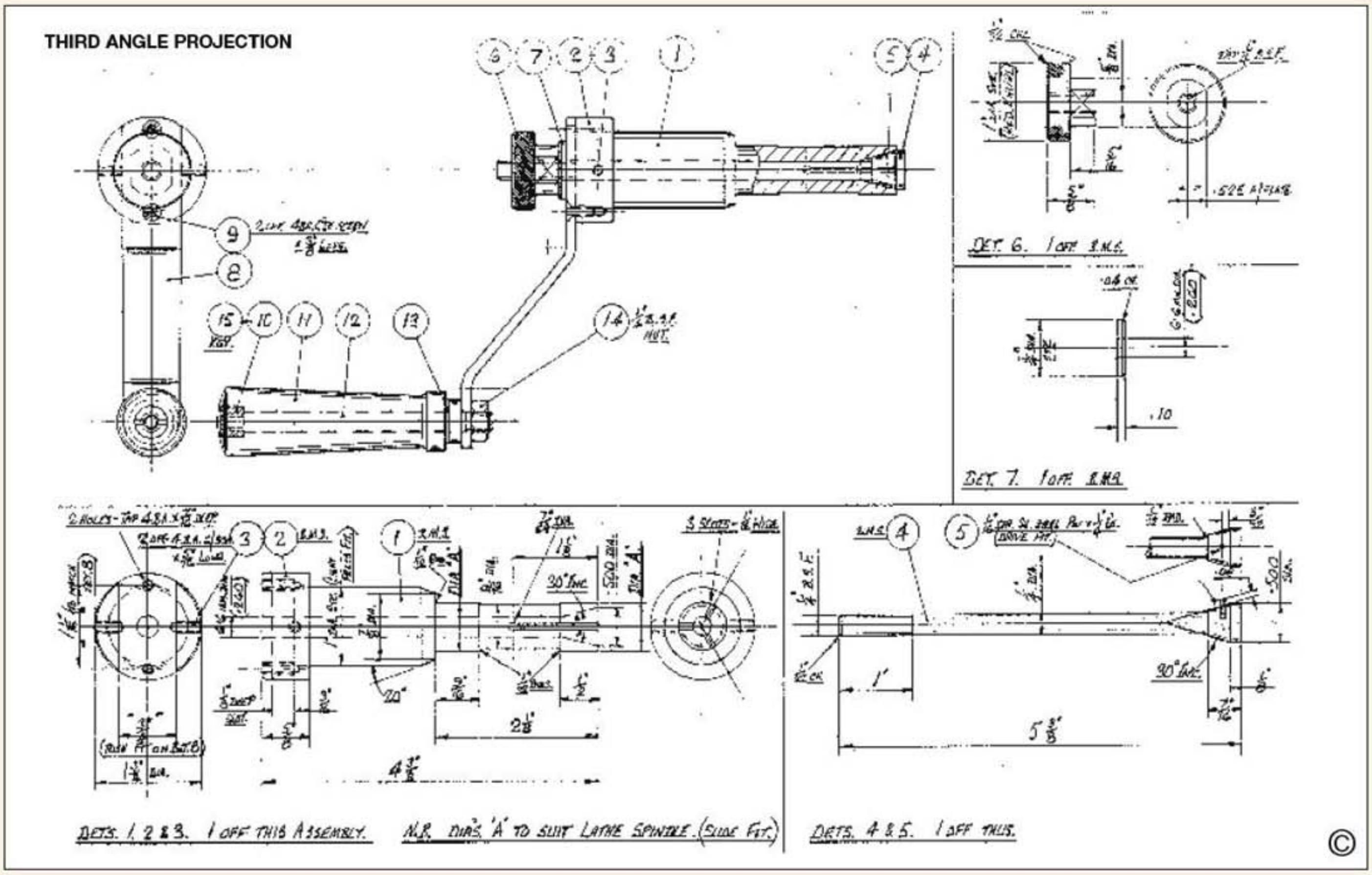
Main body (Detail 1)

Using 1in. dia. bright mild steel held in the 3-jaw chuck, face to length and centre both ends. Drill 6.6mm dia. right through the workpiece (drill from both ends). With the 1in. dia. pushed right into the chuck body, grip and turn the 'fitting diameter' to match your plug gauge. Turn the 9/16in. dia. relief and also the 20deg. chamfer.

Next, using a small boring tool set accurately on centre height, carefully bore the 30deg. inclusive taper with the top slide set at 15 degrees. Leave it set at this angle, as it will do for the matching taper on Detail 4. Drill the 3 equi-spaced holes 7/64in. dia. as shown, then mill, or neatly hacksaw the 3 slots 1/16in. wide.

Collar (Detail 2)

Using 1in. dia. bright mild steel in the 3-jaw chuck, face both ends to length. With the work securely gripped, rough out the bore to approximately 15/16in. diameter. With approximately 5/16in. protruding from the jaws, finish bore to 1in. dia., a light press fit on Detail 1, and turn the outside diameter to 1³/8in. as far as the chuck jaws. Reverse in the chuck and turn the remaining outer diameter to a matching 1³/8in. diameter. Press Detail 2 onto Detail 1 flush with the end. Use the 7/8in. dia. as a shoulder, to avoid damage to the finished taper.



Drill and tap for 4BA socket grub screws as shown. Fit the grub screws and lock them up tight. A skim can now be taken across the 1 3/8in. dia. end. Mill, or file, the slot for the arm to a nice push fit and then transfer the position of the two arm fixing holes. A short piece of 1/4in. dia. bright mild steel will align the arm and the body. Tap 4BA as shown, and fit the countersunk screws.

Draw bar (Detail 4)

Face a piece of 1/2in. dia. bright mild steel to length and centre both ends. With care, the job can be finish turned between centres. An alternative, perhaps easier method that will minimise deflection problems, is as follows.

Having faced to length and centered both ends, with, say 2 3/4in. protruding from the 3-jaw chuck and the tailstock centre engaged, turn the 1/4in. dia. as far as the jaws allow. Thread 1/4in. BSF as shown, using a tailstock die-holder. Now reverse in the chuck, gripping on the 1/4in. diameter. With the tailstock centre engaged, turn the taper and the remaining 1/4in. diameter. This will produce a drawbar quite accurate enough for the purpose.

Arm (Detail 8)

This can easily be bent cold, as the bend radii are fairly generous (2 x thickness). A profile can be formed into an odd piece of wood to act as a gauge for bending, or the shape can simply be marked out with a pen on a piece of plywood. If you get the centre portion right, the ends can then be cut off to length. A scrap piece of 1 x 1/2in. bright mild steel, with a 1/4in. radius along one edge and held in the bench vice, makes a handy bending bar.

Note, before bending, the arm should be set at 90deg. to the vice jaws, using a square. A few blows with a hide mallet should do the rest. Keep the bending bar for future use.

Mark off, drill and countersink two holes for 4BA fixing screws. These should be equally positioned about the centre 1/4in. dia. hole.

Handle (Detail 11)

I cut a blank out of a piece of mahogany, which is lovely stuff to work after the usual cheese! If you allow an extra 2in. to hold in the chuck (4-jaw, if you have a square blank), the job can be completed in a single setting. Remember to work with the recess outwards. With *really* sharp tools, this is a real treat. Centre the end, drill as deep as required and bore the recess. The outside profile can now be finely finished and parted off to the 2 5/8in. dimension given on the drawing.

Two or three coats of polyurethane varnish allowed to dry hard between coats will give many years of service and you can enjoy the lovely golden grain each time you use it!

Handle spindle (Detail 12)

This can be completely machined between centres. However, an alternative method is suggested which gives immediate access to the threaded portions and enables us to test them for fit.

Using 5/8in. dia. bright mild steel in the 3-jaw chuck, part off a blank 3.650in. long. Make a small centre at one end. With 3 1/8in. protruding from the chuck, engage the tailstock centre and turn the 0.250in. and the 0.185in. diameters, the latter for 2BA.

Note, the shoulder length of 2.690in. may be adjusted to suit your wooden handle plus the 0.048 thick brass washer (Detail 13).

Using a tailstock die-holder, cut the 2BA thread. Reverse in the chuck and, holding on the 0.250in. dia., turn the 9/16in. dia. flange and the 1/4in. diameter. From the tailstock, cut the 1/4in. BSF thread to a snug fit in its nut.

Key (Detail 15)

This is simply a purpose-made key to enable the brass nut (Detail 10) to be properly tightened in a civilised manner without bruising or bad language!

Finishing

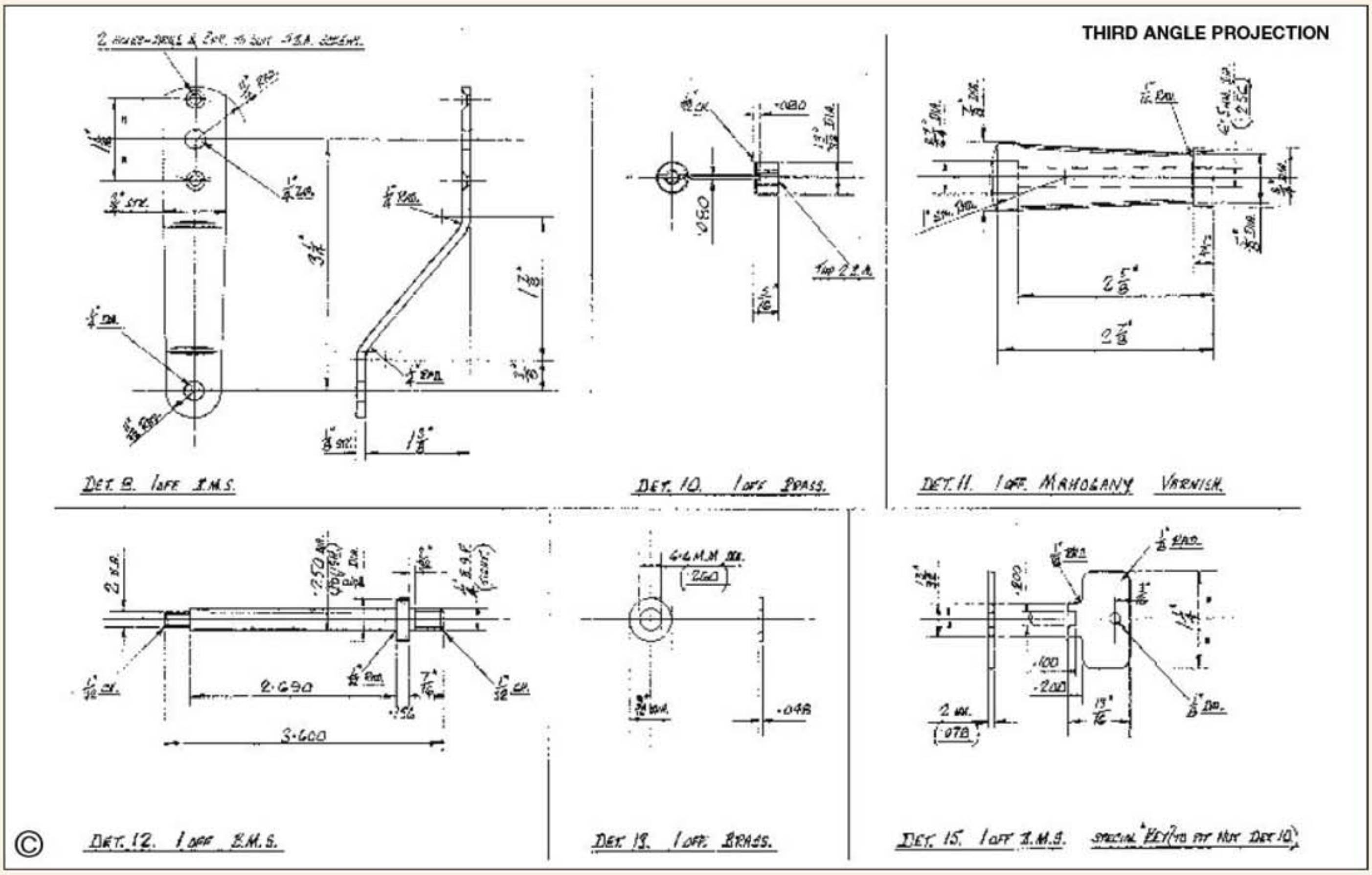
Two coats of Humbrol grey enamel (my workshop 'house colour') on the body and arm, will give a nice finish, and also protect against rust.

Speaking of rust, our old enemy. I find that keeping attachments in sealed strong plastic bags, well oiled and with a piece of anti-rust paper, really does protect against rust. If the bags are stored in a wooden box (with a lid) or a strong carton with closing flaps, this again adds to the protection. Living within sight of the sea, with humidity levels often in the region of 90%, I have been surprised how effective this treatment has proved to be.

Finally, assemble the well oiled drawbar to the body. Engage the 1/16in. dia. pin in a collet slot to prevent rotation. Grease the bore of the wooden handle before tightening the retaining brass nut.

In use, just a firm handgrip should be enough to expand the collet into the lathe mandrel. There is no need to use beef on the spanner flats which are really provided to easily release the grip, if required.

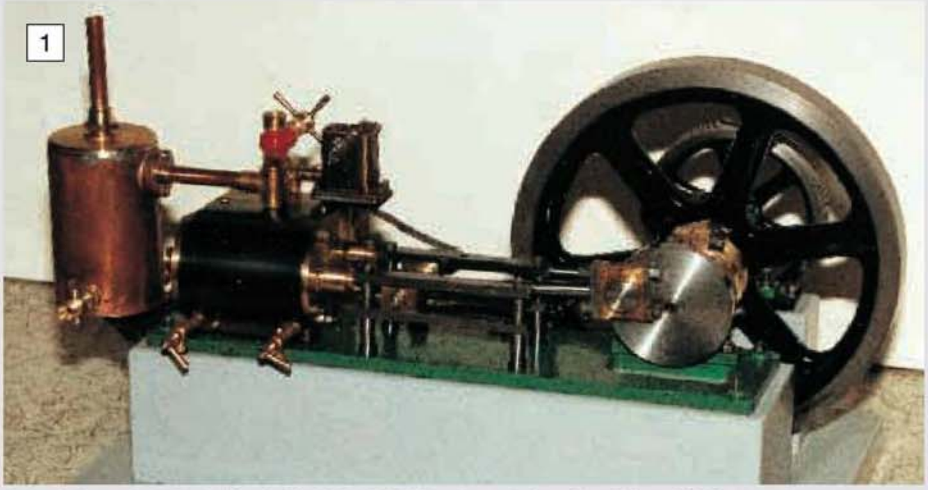
Best of luck, and work safely!



THE CROFT MILL ENGINE
Mk II VERSION

John Bertinat
begins work on the construction of a more detailed version of his horizontal mill engine.

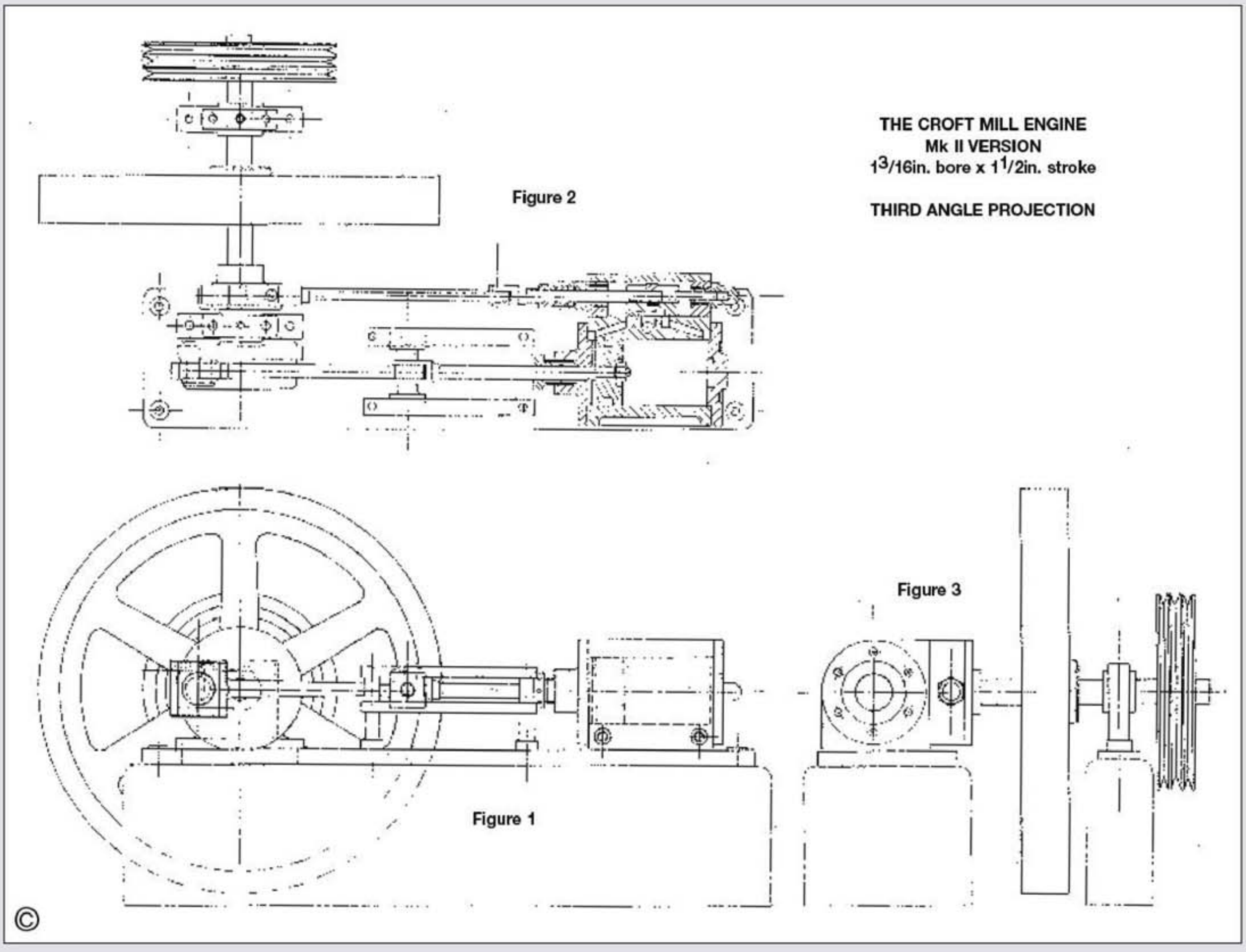
●Part IV continued from page 351 (M.E. 4169, 17 May 2002)

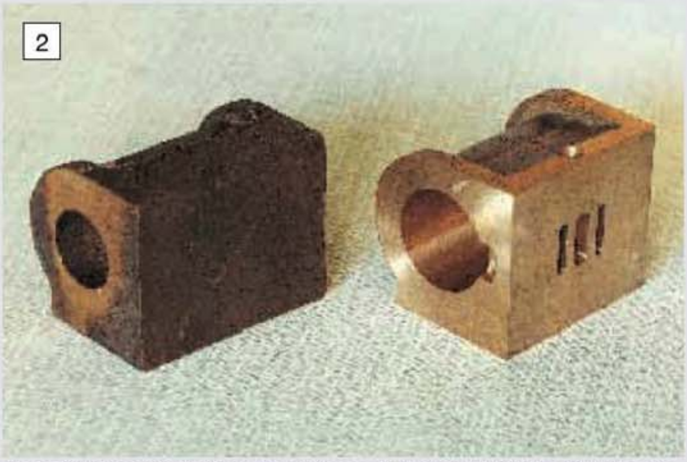


One of the pair of the Author's Mk. II Croft Mill Engines designed to follow full-size practice more assiduously than the simplified Mk. I version intended for construction in the school workshop.

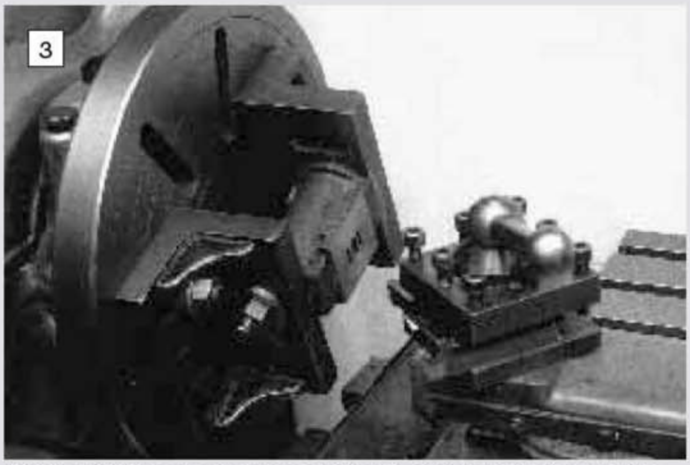
Concurrently with scheming out the relatively simple Mk. I engine, a more elaborate design was developed, incorporating many features from full-size practice. A larger number of smaller fixings was used for the cylinder covers, etc., the cylinder was fitted with lagging and strategically placed drain cocks were added; a steam stop valve and a mechanical cylinder lubricator were also fitted. Although in the first Mk. II engine made, the crosshead and guide were of similar design to those employed on the Mk. I engine, work is in progress on a second Mk. II engine fitted with a trunk guide and details of this will be given in due course. Both big end and main bearings are split as in full-size practice. The flywheel is mounted between the bearings, thus requiring a more elaborate engine base and an overhung grooved drive pulley is provided; both flywheel and pulley are keyed to the crankshaft. The engine is also provided with an eccentric driven boiler feed pump, delivering to the boiler via a combined exhaust steam feed water heater and an oil trap.

Photograph 1 shows the finished engine and **figs 1, 2** and **3** show respectively the elevation, plan and end view of the basic model. Comparison of the photograph with the drawings will reveal that the photograph shows an engine of 'opposite hand' to that indicated by the





The cylinder casting (letf) is one of those available for LBSC's **Heilan' Lassie** *locomotive. The gunmetal should machine to a good finish (right)*



A rigid and balanced set-up for machining the cylinder valve face involves mounting the block between a pair of angle plates bolted to the faceplate.

drawings; the reason for this apparent discrepancy is that the cylinders were initially machined as a pair with the possible construction of a twin cylinder engine in mind; this idea was subsequently abandoned and two separate Mk. II engines were built. All drawings relate to the second engine.

Cylinder components (Details 1)

As mentioned when dealing with the Mk. II engine, an LBSC *Hielan' Lassie* locomotive cylinder formed the basis of the present model and **photo 2** shows the cylinder casting before and after the basic machining operations have been carried out. Note from the drawing that 3/16in. x 40tpi tapped holes have been provided for the later fitting of drain cocks, the holes being so positioned that they drain from the lowest point of the cylinder. This positioning calls for some 'drill and plug' operations and I also like to mill or chisel a narrow groove between the point of entry of the drilling into the cylinder wall and the adjacent end of the cylinder block, to avoid the risk of the piston over-running the drilled hole and thus creating a hydraulic lock between the piston and the cylinder cover.

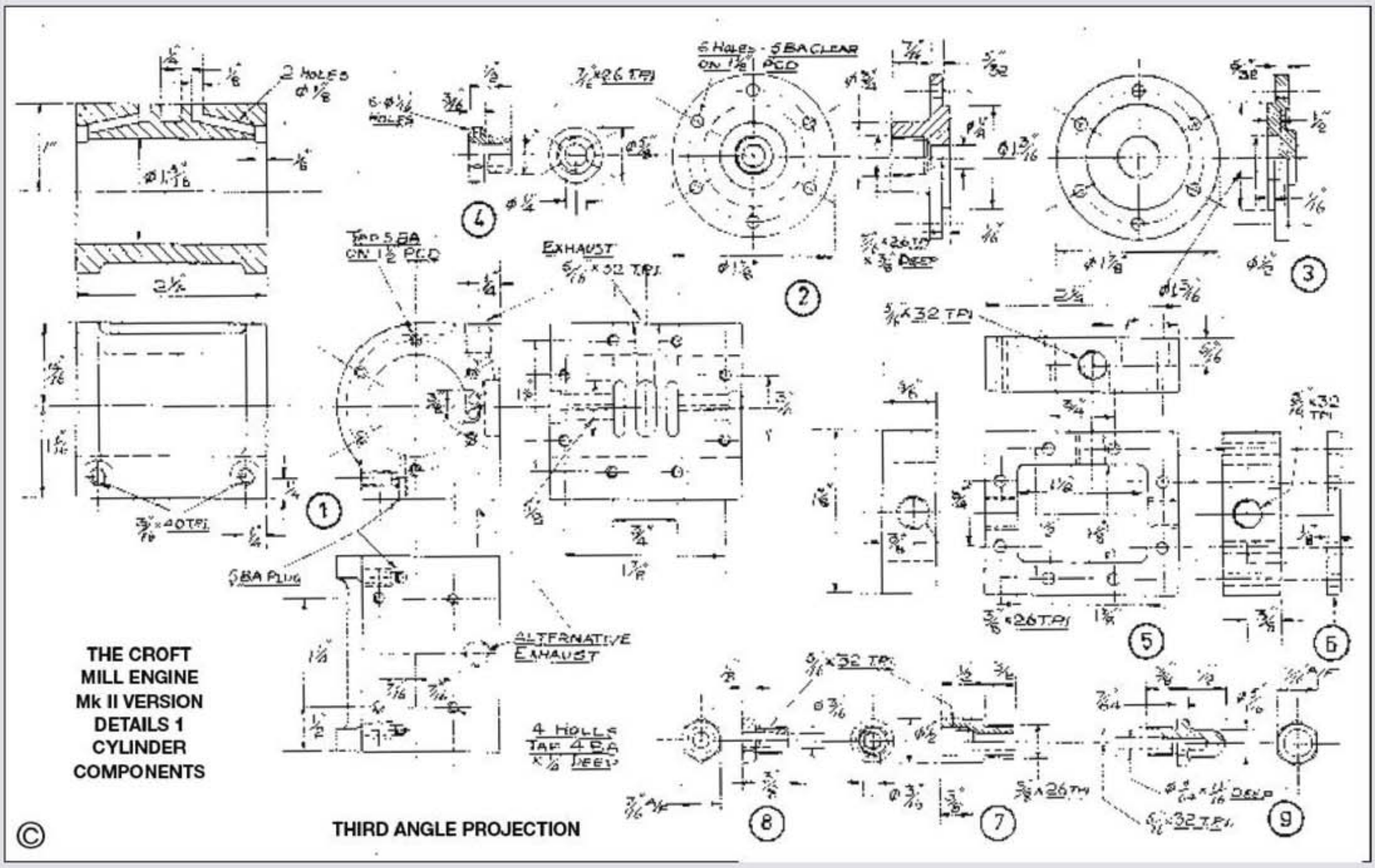
Machining of cylinders has been described so often in these pages that detailed discussion seems unnecessary, but I will point out one change which I often make, viz. when machining the valve and mounting faces of the block, I usually employ two angle plates as shown in **photo 3** which shows the machining of the valve face of a Stuart beam engine. In addition, to greatly increasing the rigidity of the set up, the second angle plate serves the purpose of a balance weight which would otherwise be necessary.

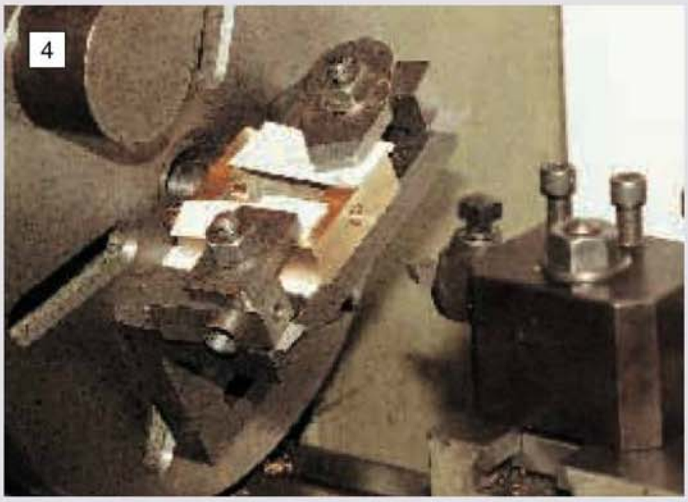
Any builders who may be contemplating the trunk guide version of the engine will need to incorporate in the inner cylinder cover (Part 2), a locating spigot 1/16in. high and 15/16in. dia. to provide a location for the trunk guide; this feature will be shown on Detail Sheet 3A to follow. As mentioned in connection with the Mk. I project, any offset bosses on the loco valve chest castings will need to be removed and the central drillings for the valve rod gland and tail rod guide will need to be provided and the separate parts fitted as detailed.

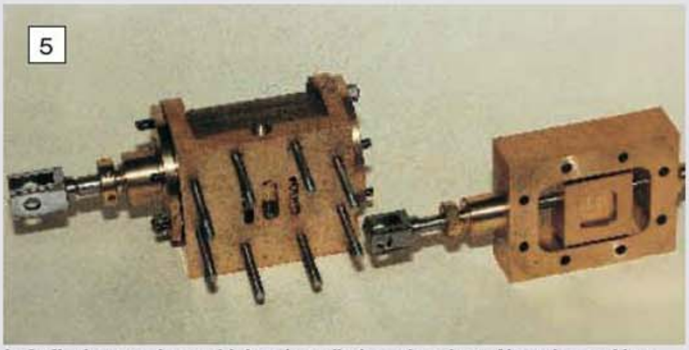
Photograph 4 shows the machining of the valve chest in its final stages. The cylinder lagging, which is made from thin (0.015in.) sheet steel, blued by heating and 'dunking' in oil, is held in position by 7BA brass roundhead screws.

Piston, crosshead and valve components (Detail Sheet 2)

Unlike the Mk. I engine, the piston rod-crosshead threaded attachment is intended to be permanent, dismantling and subsequent assembly being carried out by removal of the piston. This construction was often applied to full-size practice (particularly in marine engines) where the piston rod and crosshead were a one-piece item; this practice was continued in the model world by Stuart Turner with their Nos. 1, 4 and 5A engines, a feature which generally precluded the use of stainless steel for the piston rods!







Left: final stages in machining the cylinder valve chest. Note the packing to prevent damage to the clamped surfaces.

Above: partly 'exploded' view of the cylinder block assembly.

Below: the assembled cylinder unit.

The piston (Part 10) is conveniently turned on the end of a section of brass or gunmetal bar (or from a casting), leaving the outside diameter about 10 thou. oversize for subsequent finishing on the piston rod or on a turned-in-situ mandrel. The 3/16in. central hole is then drilled and reamed and the underside of the piston faced so as to be square with the hole. When reversing the work in the chuck to machine the top or outer end, careful setting up is essential to ensure that the recess into which the securing nut fits is also square with the piston bore to ensure that the piston is not pulled out of line when tightening the securing nut.

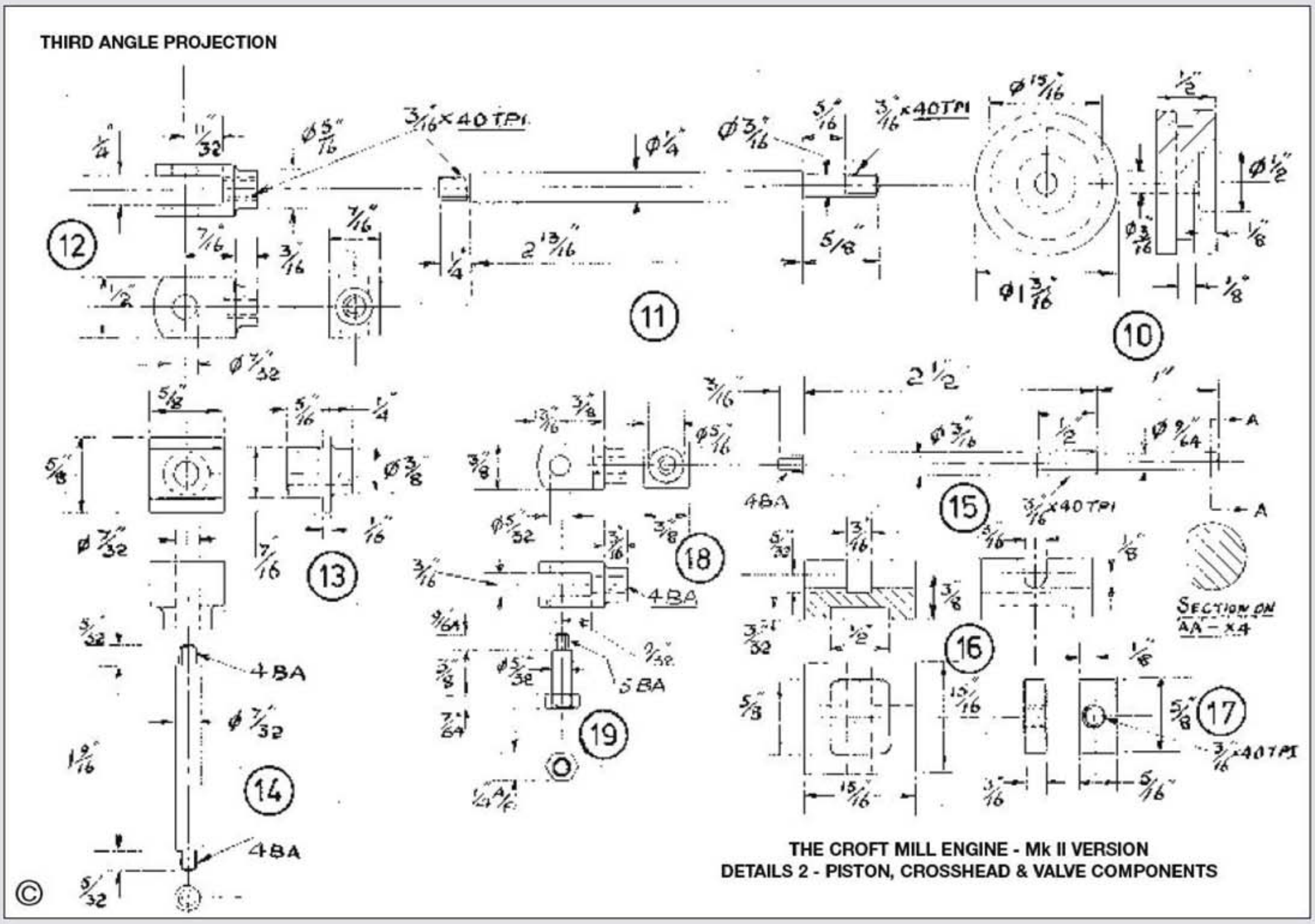
The piston rod (Part 11) is machined from 1/4in. dia. ground rustless steel rod, a length of which is set up in a 4-jaw chuck (the latter being in good condition) to run true to a dial test indicator. The end of the rod is then reduced to 3/16in dia. for a length of 5/8in. to be a tight push fit in the hole in the piston, care being taken to obtain a clean shoulder against which the lower end of the piston can locate. If your tailstock dieholder can be trusted to produce a truly axial thread on the end of the piston rod, then fire away; otherwise screwcutting is recommended!

The piston is now mounted on the rod and turned to a close fit in the cylinder; all parts should now be truly co-axial. The other end of the piston rod is given similar treatment and its permanent attachment to the crosshead fork (Part 12) is assured by a spot of Loctite on the threads.

The remaining components on Sheet 2 complete the working parts of the cylinder unit which is shown in a partly exploded form in **photo 5**, and assembled in **photo 6**.

My final operation on the cylinder unit was the making of numerous 5BA studs and the corresponding number of 5BA nuts from 6BA hexagon steel.

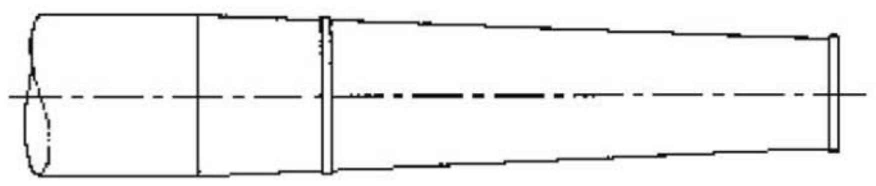
● *To be continued.*



LETTERS TO A GRANDSON

M. J. H. Ellis
issues a timely warning regarding swarf and offers advice concerning the identification and cutting of screw threads and a technique for setting up to turn a taper.

●*Part XXXIX continued from page (M.E. 4169, 17 May 2002)*



Setting up to turn a taper
A piece of stock is selected and turned to an approximate taper to suit the workpiece to be produced. The centre portion is relieved by some 0.020in. to leave registers 1/16in. wide at each end of the working taper. These registers are adjusted to fit the taper socket and can then be used with a dial gauge to set the lathe for turning a taper plug to a snug fit in the taper socket.

Dear Adrian, I have thought of yet another warning to add to those contained in my last letter. When you turn some metals, such as cast iron or gunmetal, the chips come off almost like a coarse meal, but others are not so accommodating. Alloy steels, for example, give rise to long, tenacious and springy swarf, which not only has sharp edges capable of inflicting unpleasant cuts, but also, because of work-hardening, is turned blue by the heat generated by cutting it, and is therefore able to burn unwary fingers as well. Particularly when you are boring a hole of comparatively large diameter, but also sometimes in the course of other operations, this stuff forms sizeable balls. If one of these gets caught up by the work, it will fly round without warning, and can then inflict an unpleasant injury, in an extreme case, to one's face. *"Verb. sap."*, as LBSC used to say. I am not sure of the Latin any longer, but the English meaning is something like *"A word to the wise should be sufficient"*. The best advice is to clear it out of the way before enough of it accumulates to do any harm.

Screw threads

I now come to a couple of points which occur to me in connection with cutting screw threads. Mistakes are like accidents, in that the time to deal with them is before they happen, not after. There is no point in cutting a thread in the lathe, if you then find that you made a mistake over the changewheels, and that the pitch of your thread is incorrect. Before starting work, I always make a point of checking the set-up in the following way. It is quite easy; I engage the lead-screw and clasp-nut, and pull the lathe round by hand until the saddle begins to move. This ensures that all backlash is taken up. Then, assuming it to be a right-handed thread that is to be cut, I place a magnet, which in my case is the round base of an adjustable magnifier, against the right-hand edge of the saddle. Now I go on pulling the lathe round for as many turns as I intend to cut TPI.

If all is in order, the saddle should have moved by 1in. which can be checked with the rule, or an old halfpenny coin, if you happen to have one, although I hardly think that is likely so far as you are concerned. Naturally, if it were a left-hand thread, you would do it the other way about, or pull the lathe backwards.

I undertook a little job for someone recently, making a replacement silencer (or muffler as you say in the US) for a small petrol engine. The inlet pipe screwed into a hole which I thought was most likely threaded 1/2in. Gas, which is 0.825in. x 14TPI, but I needed to make sure, and although a 14TPI thread gauge appeared to fit it, I still needed reassurance and so I used one of my little dodges. I snipped off a short piece — about 1in. — of the resin-core solder used by radio and television repairers. Soft and no more than 1/16in. dia., this was just the thing for the purpose, but lots of other materials would have done as well. I bent it into an L-shape, put one leg into the hole as far as it would go, parallel to the axis of the thread, and pressed it down to take the imprint of the thread. It was now a simple matter to check the impression against the thread-gauge, and if I had not had one, I could have used the micrometer to measure four or five threads. As a matter of fact, it proved to be 14TPI.

Tapers

A little while ago, my eye lit upon two more of Grandpa's Useful Gadgets. Both of them were tailstock chucks for holding the tiny drills which I used for drilling the cones for injectors. The largest of these drills is only 0.037in. dia., while the smallest is 0.020 inch. It would be useless to try to hold these drills in an ordinary drill-chuck, since the jaws would not close far enough to grip it, and so you have to use a little pin chuck such as those produced in the UK by Neill Tools Ltd. under the brand name 'Eclipse'.

These chucks have a 1/4in. dia. parallel shank, which can be held in the normal type of tailstock chuck, but this is rather too clumsy an arrangement when using these comparatively fragile little drills, and so I produced something more delicate in operation. Both devices are similar in providing a lever feed, but whereas the simpler version holds the drill so that it merely slides to and fro, the other also provides for it to counter-rotate against the work and so greatly increase the effective speed of drilling, highly desirable with very small drills. Both types fit into the barrel of the tailstock on a No. 2 Morse taper, which is extended sideways to provide an anchorage for the lever.

Turning an accurate Morse taper is a perennial problem, and it has just occurred to me that the scheme which I mentioned in an earlier letter could be extended to solve it. You will recall that on one occasion I suggested that when you made a plug-cock you should make a 'skew square', not at right angles at all, but at an angle to suit yourself, by which you could always set the top-slide to the same angle. By this means, once you had produced a taper reamer to the angle set by the skew square, you would always be able to turn a plug for any other cock, the bore of which had been finished with your reamer. In use, one arm of the skew square fitted against the edge of your table, and the top-slide was adjusted to fit against the other.

In the same way, but in reverse order, once you had managed to turn a true Morse taper, the skew square could be made to fit the angle, and would then be available to set the top-slide whenever the need arose to turn that particular taper in future. But how to produce a true taper in the first place?

Well, here's Grandpa's system, and it works. You start by measuring the smallest diameter of the female taper which is going to be your guide: it can conveniently be that in the tailstock barrel. This is so that the turning operations may be on a male taper big enough not to go all the way through. Next, you cut off a piece of round mild steel bar long enough to turn the taper when held in the 3-jaw chuck. It can be something like 3/4 dia. x 5in. long; but it really depends on what you intend to do with it. For example, if you were making a tailstock die-holder, there would have to be a parallel extension for the die-holder part to slide along. Now you would set over the top-slide and reduce an inch or so to a taper which looked somewhere about right, and try it for fit in the socket. You will be able to see which way your taper is out, too much or too little, and adjust the top-slide accordingly. You continue in this way until you have a taper about 2in. long, and with its smaller end around 0.050-0.060in. bigger than the minimum diameter of the socket.

Now comes the artful bit. You reduce the middle part of the taper by about 0.020in. all along, apart from two narrow ridges 1/16in. or so wide, one at the very end, and the other at the larger end, where, if it were inserted in the socket, it would be just inside. When tried in the socket, the work will now bear on one or other of these ridges, and if you are in doubt as to which, you can test them with marking blue. This ridge must now be carefully reduced in size (using the top slide) until all shake disappears.

All that now remains to be done is to mount a DTI at centre-height in the tool-holder and adjust the top-slide until it reads the same on both the ridges. Finally, the ridges can be turned away and the size of the taper reduced to whatever you want.

I will finish telling you about the drill-chucks in my next letter.

Your affectionate and vainglorious Grandpa.

●*To be continued.*


The jigs and fixtures used to produce the ON/OFF valves in quantity to a consistent standard with interchangeable fits. Simple tooling like this is often useful when more than one component of a type has to made.


Using fixture 1 to drill the valve bodies. Note that the fixture is held in a vice which is rigidly clamped to the table of the drilling machine - a wise precaution when drilling brass


After drilling has been completed fixture 1 can be used as a tapping aid thus ensuring that the threads are automatically cut perpendicular to the surface of the valve body.

VACUUM BRAKES
THE FRIMLEY LODGE MINIATURE RAILWAY VACUUM GENERATOR

John Jones
finishes work on this important contribution to the safe operation of a miniature railway by completing the manufacture and assembly of the ON/OFF valves.

●*Part III continued from page 343 (M.E. 4169, 17 May 2002)*

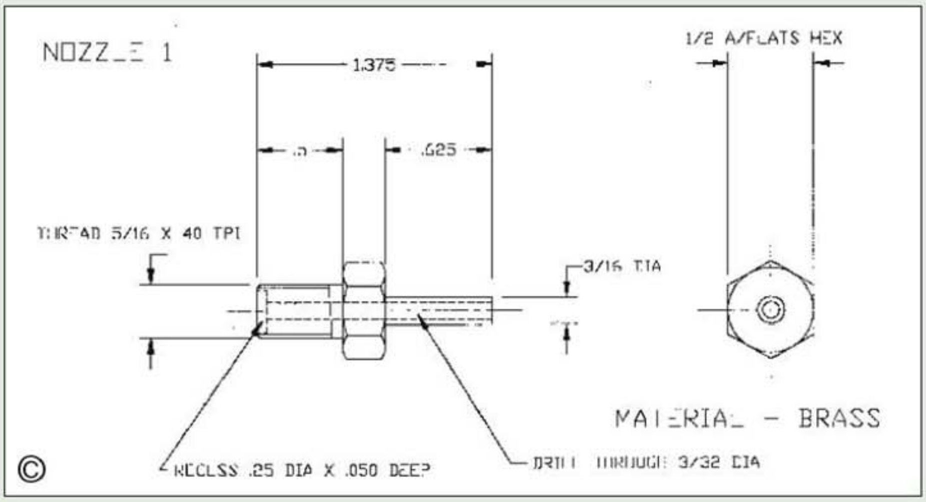
We can now commence further machining on the embryo valve bodies. First, I must issue a word of warning to the less experienced among us. Drilling brass or bronze can be a very hazardous procedure. During my teaching career one of the worst accidents I saw was a young lad who had decided to open out to 12mm a 10mm hole in a piece of brass without clamping the job to the drilling machine table although the work was being held in a large vice.

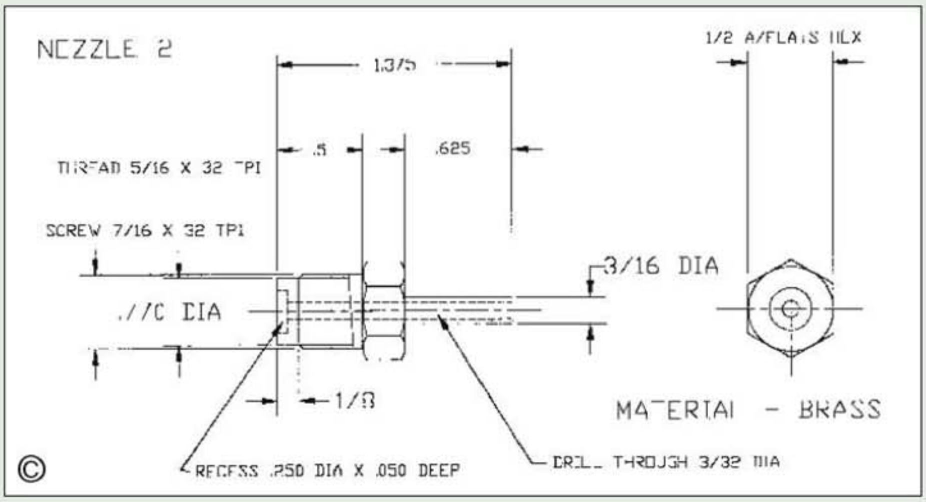
As the drill broke through, the whole thing swung round and the vice hit the lad in the tummy causing him some considerable discomfort, to say the least. Luckily the drill broke which at least stopped the vice from going round and round. Our fixture block is particularly handy because it will hold the workpiece securely for drilling. It also means that all the holes in all the bodies are consistently in the right place.

Put the first valve body in the fixture block, aligning the dot marked holes. Secure using 4 BA screws. Now hold the block in a machine vice and clamp the vice down firmly on the drill table as shown in the photograph. Fit the 7.2 mm dia. drill bush and drill 7.2mm dia. through to the 3/8in. dia. bore. Watch out as the drill breaks through. Now drill the 3/32in. dia. hole. Remove the block from the machine vice, place it in the bench vice, replace the drill bush with that with the 5/16in. dia. bore and tap the 5/16in. x 32TPI hole. Repeat for all the other valve bodies.

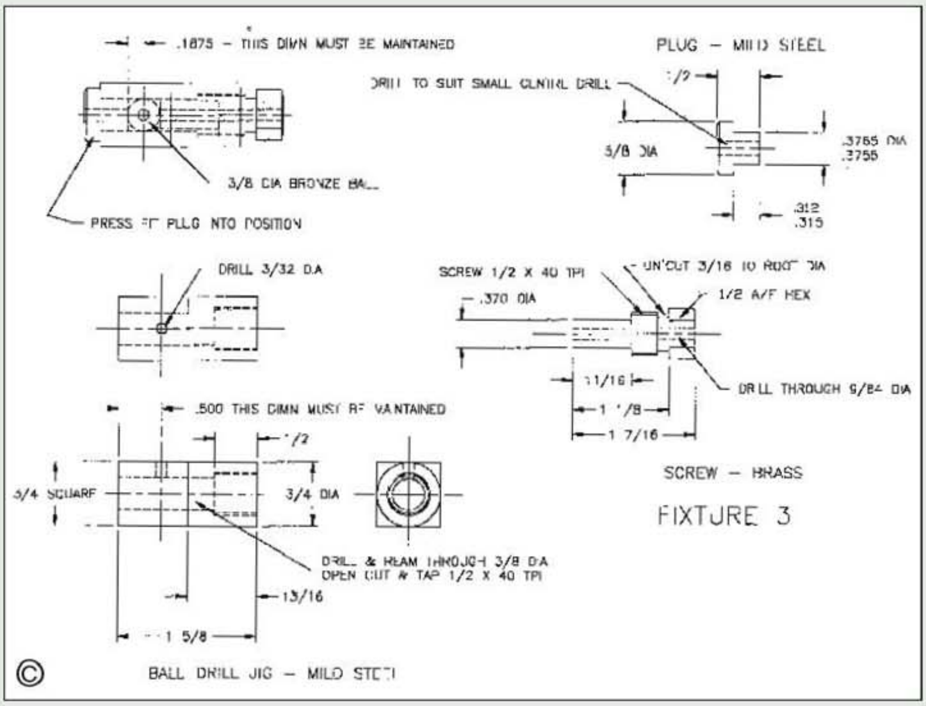
The same holding block can be used with effect for the machining of the top quadrant. Each side of the quadrant acts as a stop for the operating lever, so again a bit of careful machining is needed. Finish off each valve body by de-burring all the sharp edges with a very fine needle file.

The two nozzles are machined from 1/2in. A/F hexagon brass stock. These are fairly straightforward turning exercises but take care to machine the O-ring recesses to the correct dimensions.





Fixture 1 is also used to hold the valve bodies during milling of the top quadrant which forms the stops for the operating lever. The fixture fits conveniently into the machine vice.

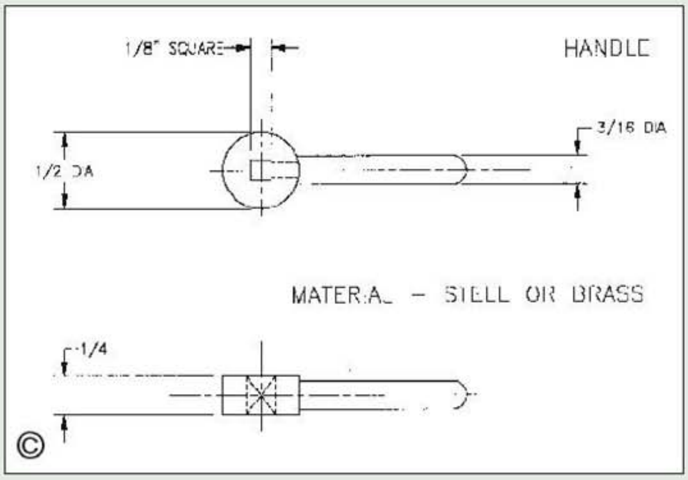


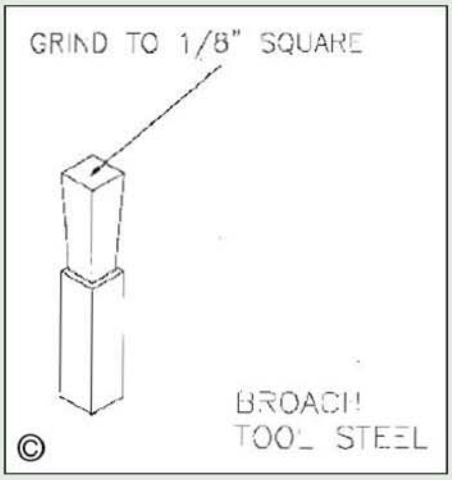
The valve spindle consists of two parts silver-soldered together. Dealing with the balls first, these are made from standard 3/8in. dia. phosphor bronze balls sold for clack valves, etc. Experience has taught that it is wise to buy a couple more balls than the number of valves being made. I had to modify the drill jig a few thousands of an inch here or there before getting it right. In the meantime, a couple of balls were used as sacrificial lambs. Again, I decided that a drill/holding jig was required so that the through hole and the cross hole ended up in their rightful places as shown in the drawing.

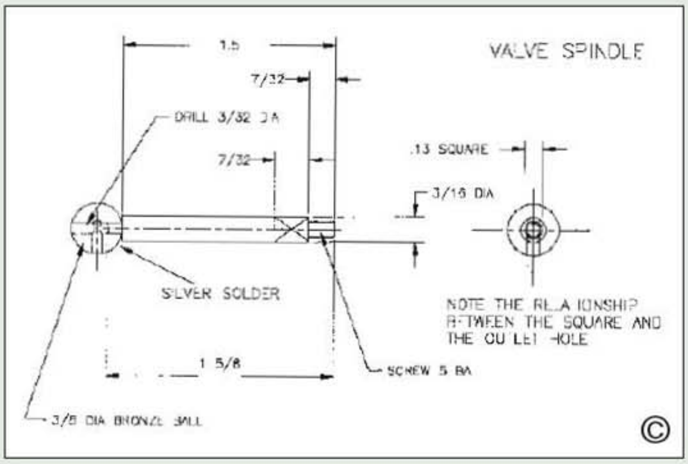
The main body of the fixture is made from 3/4in. square mild steel, so my self-centring 4-jaw was put to use once again. Just chuck, face off one end, centre drill, drill and ream 3/8in. dia. right through and open out and tap 1/2in. x 40TPI for about 1/2in. depth. Reverse and face off to 1 5/8in. long. Carefully mark off and drill the 3/32in. dia. cross-hole. At this point just check that the balls are a slide fit in the 3/8in. hole. The plug is a press fit in the left hand end of the fixture, check that the 0.1875in. dimension will be maintained after assembly, this being half the diameter of the bronze balls.

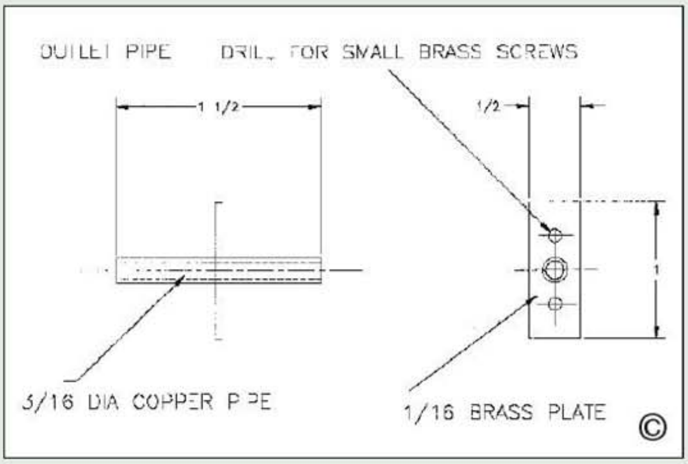
The screw is a simple brass turning; it could well be made of aluminium alloy to prevent damage to the ball. In use, just drop a ball down the hole and secure it with the screw. Hold the fixture in the lathe and first use a small centre drill to spot the ball, change to a 3/32in. dia. drill and drill through. Remove the fixture from the lathe, transfer to the drilling machine and drill the cross hole, again with a 3/32in. dia. drill but this time only half way across the ball. Repeat for all the other balls; as I said, a few spares would not come amiss!

I would make the handles next. The centre boss of the handle is best made from brass; mine have stainless steel handles. I also made up a tool-steel broach to produce the square holes in the boss. It's easier to produce the squared spindle using the square hole as a gauge than the other way round. In commercial engineering this would be known as a 'hole based' approach. The handle itself is a piece of 3/16in. dia. brass or stainless steel 1in. or so long rounded off at one end and reduced to 3/32in. dia. at the other. Drill the boss to take the handle and silver-solder them together.









The valve spindle itself is made up from a $1^1/2$in. length of $^3/16$in. dia. stainless steel. Turn one end to a touch smaller than $^3/32$in. dia. so that it just fits the through hole in the balls. Don't turn this too long or the cross-hole will be blocked off as well. The other end can be machined to $^1/8$in. square to fit the square holes in the bosses, and then reduced and threaded 5BA for the fixing nuts.

The spindles and balls can now be assembled. Once the handle has been placed in position it is important to turn the ball so that the side hole is in the correct relationship with respect to the handle. Now, very carefully silver-solder the two together. Take care to prevent excess silver-solder running down the spindle which will prevent the spindle running smoothly in the valve body. One of Murphy's Laws of Model Engineering is that if a dozen parts all the same are required and a dozen are made, one is sure to be scrapped; if 13 are made, the probability is that they will all be perfect. These spindles are a case in point.

The ON/OFF valves can now be completely assembled. I repeat: de-burr all the parts to remove any sharp edges. To fit the side and bottom nozzles, set the O-rings into their grooves giving them a helping smear of Vaseline to assist in the smooth operation of the valve. Apply a touch of sealing grade Loctite to the threads of each of the nozzles, screw them in until you can just feel metal to metal and then turn back a quarter of a turn. That should be enough to give the O-rings a nice seal.

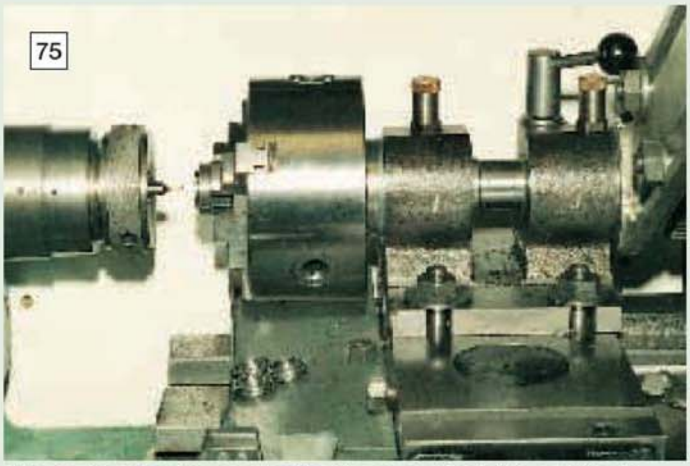
The last part to be made before the box can be finally assembled is the outlet pipe which is just a bit of $^3/16$in. dia. copper tube silver-soldered to a scrap of brass bezel plate.

So, there you have it. Obviously a fair degree of 'licence' can be used in adapting this idea to your own situation, but those of us who have taken the trouble to construct the generators have found the work to be well worthwhile.

My thanks to Peter Gardner and colleagues of Frimley Lodge Miniature Railway for sharing their expertise with the rest of us.

BUILDING A 1:5 SCALE GNOME ROTARY ENGINE

The lathe set up for machining the valve cage locking rings. The bush steady is used together with both the front and rear tool posts.



After turning, the valve cage locking rings were chucked in a split bush in the dividing head to machine the spanner slots.

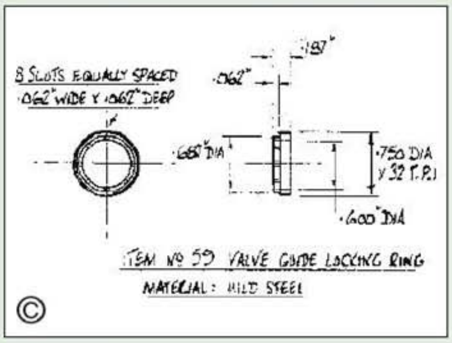
Rowland Lowe
continues with the valve cage locking rings and pistons.

●*Part VI continued from page 347 (M.E. 4169, 17 May 2002)*

The making of the locking rings is shown in **photos 74** and **75**. The bush steady and bar stock are set up as before. The sequence of operations is:

1: Face end.
2: Drill and bore to inside diameter.
3: Turn both outside diameters.
4: Screw cut.
5: Part off.

When this stage is complete, each workpiece in turn is gripped in a split bush in the 3-jaw chuck as in **photo 75**. The chuck is mounted on the dividing head and the work traversed across the cutter using the cross-slide feed.



Pistons

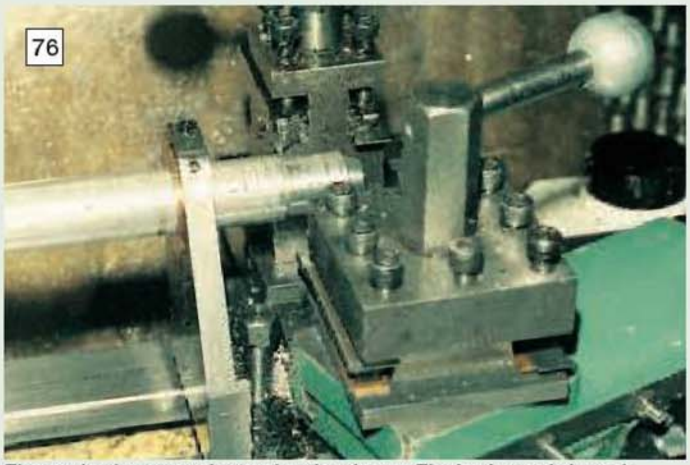
Making the pistons involves repetition work from bar stock again. **Photograph 76** shows the first stage. The top slide is set over 20deg. and the tool set for facing and turning. Now:

1: Face the end using the cross-slide feed screw.
2: Turn the major and minor (root of taper) diameters using the leadscrew hand wheel to feed the tool.
3: Turn the taper using the top-slide feed screw.
4: Machine piston ring grooves with the rear mounted parting tool.
5: Part off over length.

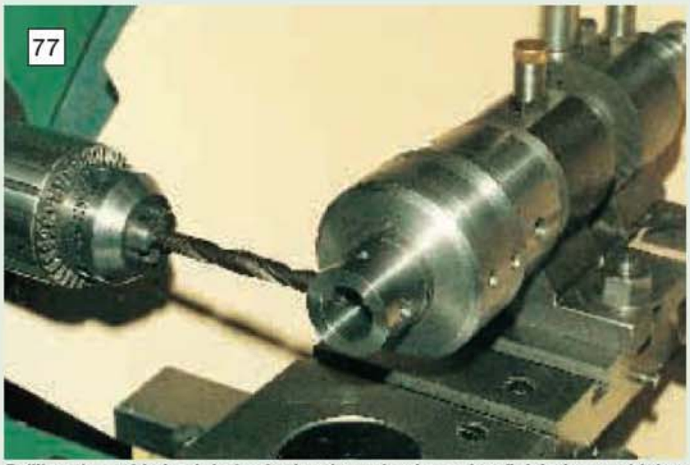
The internal machining of the pistons is more complex, and the slave chuck shown in **fig 9** is required. Note that the distances from the face to the gudgeon pin hole centre and the length stop at the taper base are 0.005in. less than the piston lengths to allow tool clearance. **Photograph 77** shows the set up for drilling the guide bush holes. Remember to counter the drilling pressure from the tailstock.

To finish the interior of the pistons, push a piston blank into the slave chuck until it is against the stop and lock it with a soft alloy screw so as not to mark the piston. Face off to length and note the index reading. Repeat with the remaining pistons. **Photograph 78** shows this and the preparation for initial drilling.

After this, the circular portions are bored out



The production set up for turning the pistons. The bush steady is again in use. The top slide is set to 20deg. for turning the tapered crown.

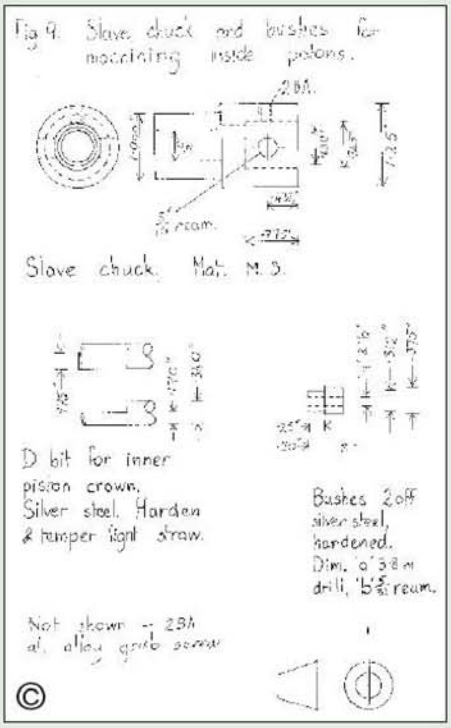


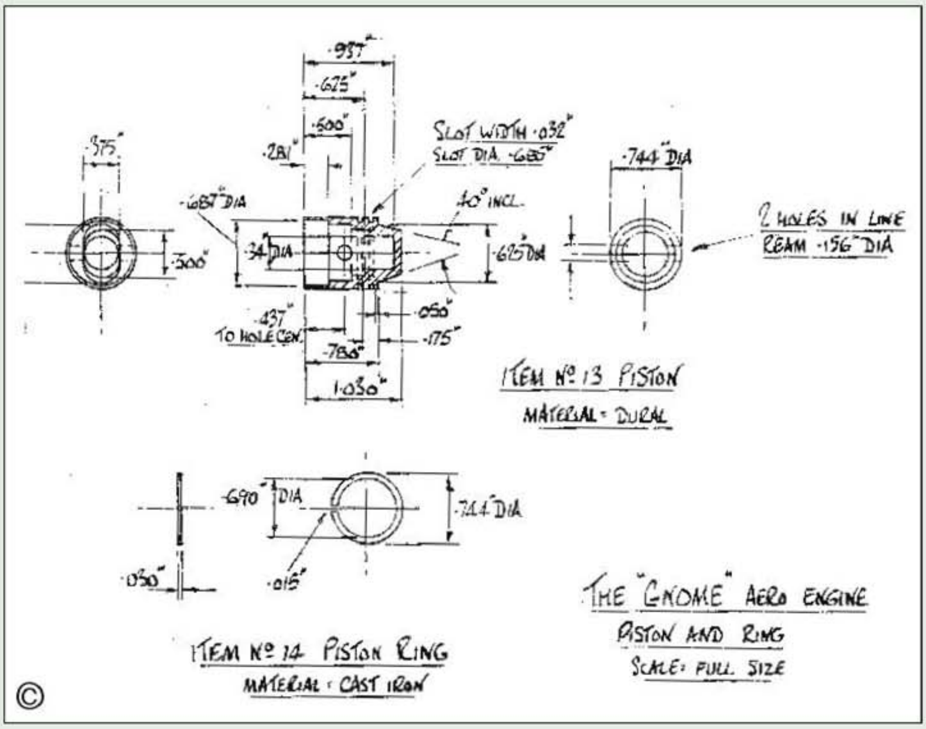
Drilling the guide bush holes in the slave chuck used to finish the machining of the pistons. The tailstock was used to counter drilling pressure.

and the crown flat-bottomed with the D-bit drawn in fig 9. **Photograph 79** shows this operation.

The dividing head is set up on the cross-slide to drill the gudgeon pin holes. The chuck mounting shown in photo 77 lacks rigidity for the milling operations and a solution is shown in **photo 80**. The master chuck and dividing head bores are both 1in. diameter. The mandrel and one oiler are removed from the dividing head and the slave chuck inserted into the bore. A clamp screw with a soft copper pad replaces the oiler.

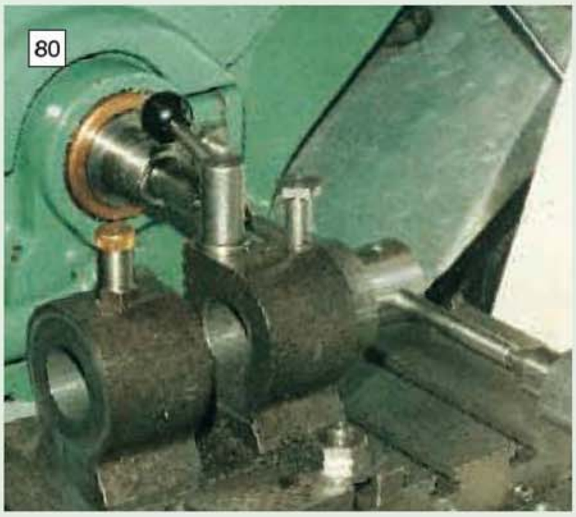
Continuing with photo 80, a 5/16in. dia. bar, centred both ends, is passed through the reamed holes and set up between centres. The dividing head is secured to the cross-slide, which is then locked. This securely fixes the drilling position for the gudgeon pins.





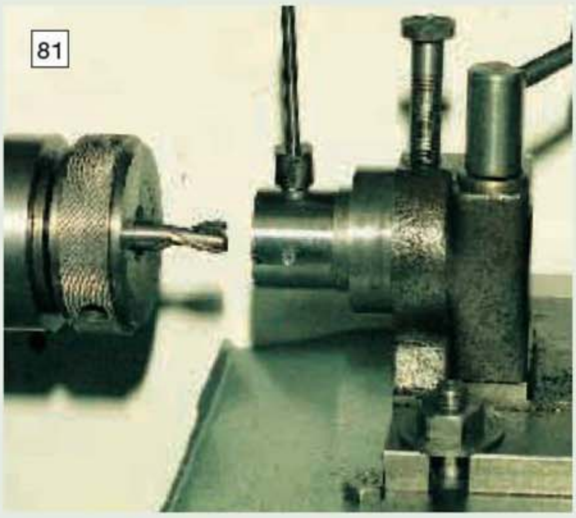
Here a piston blank has been mounted in the slave chuck and a start is being made on machining out its interior using a twist drill.

The circular cavity in the pistons then requires to be bored to size and flat-bottomed using a specially made D-bit.



Left: setting up the dividing head and master and slave chuck for drilling the gudgeon pin holes in the pistons.

Right: milling out the piston interiors using a slot drill. The vertical rod is located in the gudgeon pin hole to ensure correct alignment of the piston.

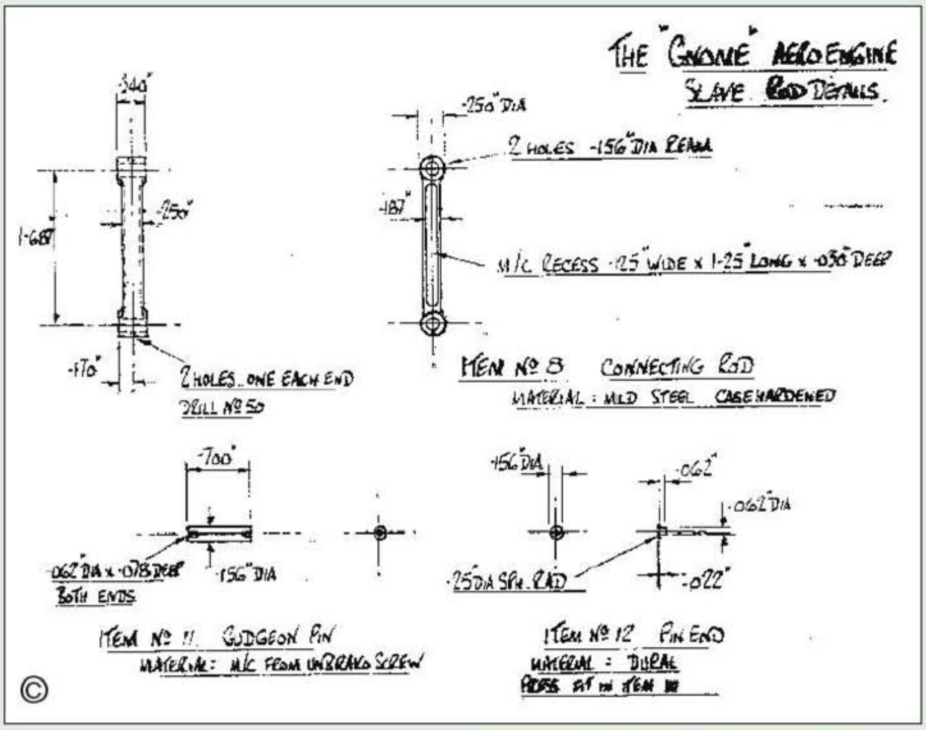


Remove the centres and rod, and proceed as follows:

1: Push each piston fully into the slave chuck, and lock with the alloy grub screw.
2: Mount the drill chuck with a 3.8mm drill in the lathe mandrel, and a 3.8mm hardened bush on the mandrel side of the slave chuck.
3: Insert a 5/32in. dia bush in the tailstock side of slave chuck to give a visual check on the truth of drilling.
4: Drill through 3.8mm dia. with tailstock support.
5: Hand ream 5/32in. dia. from tailstock side, having removed the 3.8mm dia. bush.

Repeat for all the pistons before unlocking any secured movement. Now unlock the cross-slide and release the dividing head body.

Now see **photo 81**. Set up the dividing head along the lathe axis. Release the screw holding the chuck and rotate the chuck through 90 degrees. Place a 5/32in. bush in the top hole and pass a 5/32in. dia. rod through the bush and piston. Set this rod vertical and lock the chuck in position. Mount a 3/8in. dia. slot drill in the lathe chuck. Some careful work with the feed screws is needed to establish readings for start and finish points. This done, complete the machining of all the pistons to the same measurements.



Piston rings

The making of piston rings has been described several times in *Model Engineer*. The series of articles by *Tubal Cain* in 1994 is recommended, especially those in *M.E.* 3975, 19 August 1994, p. 236 and *M.E.* 3977, 16 September 1994 p. 345.

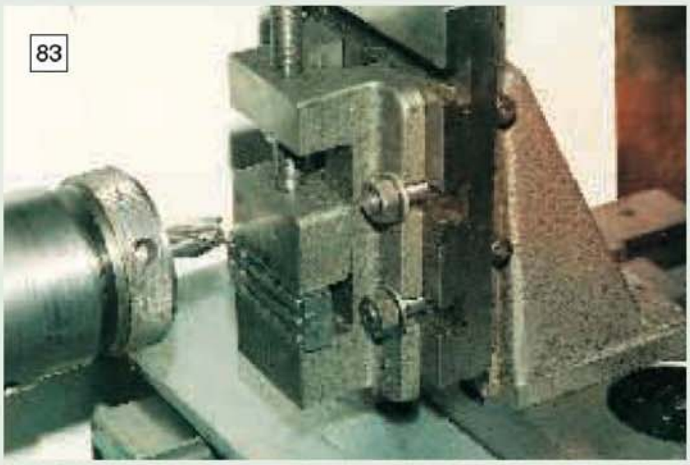
I used the 'high anneal' method from p. 236. An excellent later article is found in *M.E.* 4005, 17 November 1995, p. 616.

Photograph 82 shows completed pistons and rings, and the holder for dressing rings to width using a surface plate and abrasive paper and oil.

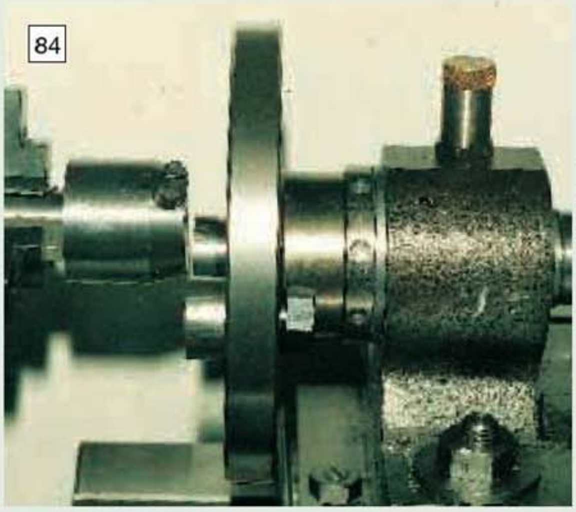
Connecting rods and wrist pins

First cut 1 3/4in. lengths of 3/8 x 1/4in. mild steel. It would be prudent, bearing in mind the amount of machining to be done, to normalise these by heating to red and allowing to cool in still air. Two holes are now to be drilled and reamed in

Some pistons and their rings. The rings are being dressed on abrasive paper to bring them to width using the special holder shown.

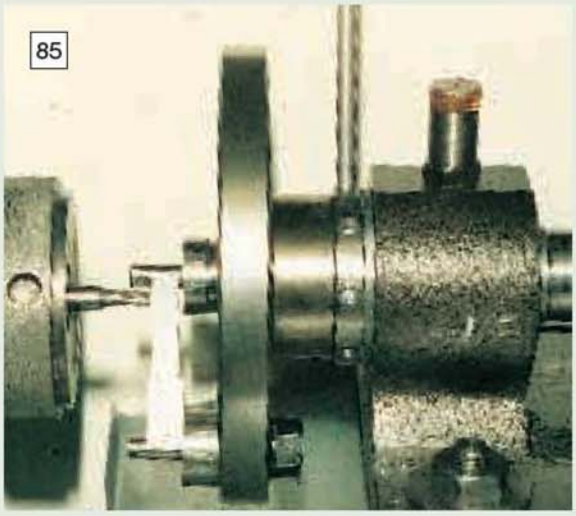


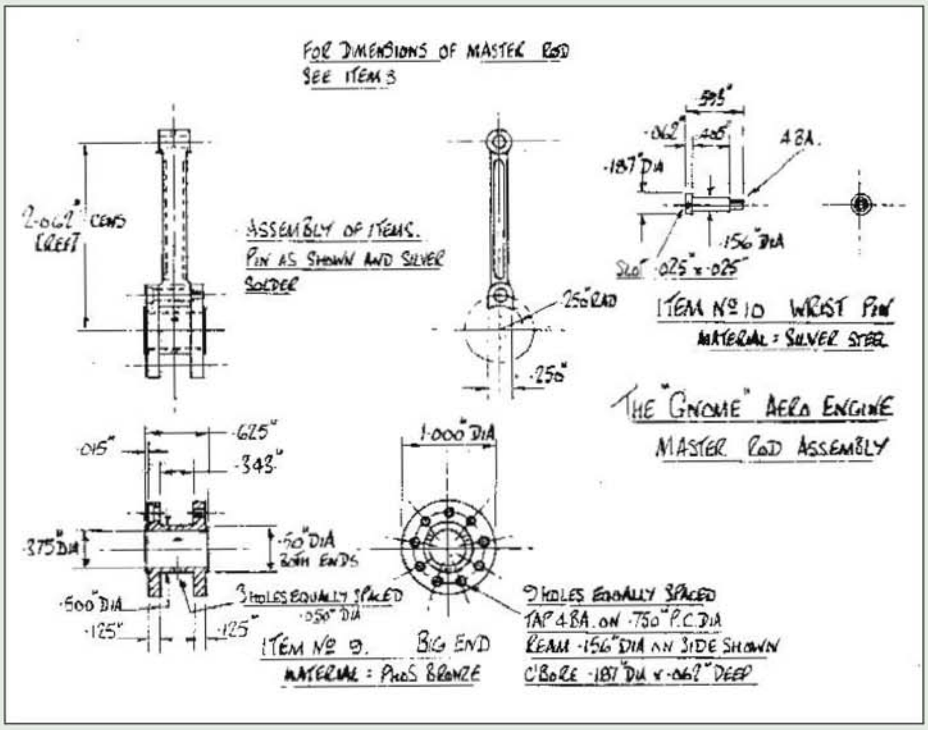
Jig drilling and milling the con-rods. The vertical slide and cross-slide index scales are used give the correct hole spacing during drilling operations.



Left: fly-cutting the two plugs used for rounding the ends and milling the flutes in the connecting rods. The plugs are mounted on the lathe catch plate.

Right: rounding the ends of one of the con-rods. Note the use of a tommy bar located in one of the holes in the dividing head spindle to control rotation.





each blank 5/32in. dia. and 1.687in. apart. Clamp the blanks in a machine vice as shown in **photo 83** and drill and ream using the vertical and cross-slide index scales for correct location. The 1/8in. recesses can also be milled and the shaped end of No. 1 master rod milled with a 1/2in. dia. end mill. Complete the milling on the reverse side of the rods.

Next, the ends of the rods are to be rounded, and the recessed faces reduced to correct size. My method is shown in **photos 84** and **85**. First prepare two plugs of about 1/2in. dia., one shaped to plug into the dividing head mandrel and the other secured in the catch plate slot. The mandrel is locked, and the plugs fly-cut to the same height as in photo 84. Make two bolts threaded 4BA with a 5/32in. dia. shank to secure the con rod as in photo 85. The heads of these bolts also act as a diameter gauge. Now slacken the plug secured in the catch plate slot, and secure the con rod. Re-tighten the slackened plug. The recessed faces of the con rod can now be milled as shown, and the ends of the rods rounded. Take care when rounding the ends not to go too far so that the tool catches up on the rod. The tommy bar holes in the mandrel are used to give better control.

Wrist pins

A repetition set up similar to previous examples is used. The sequence is:

1: Turn and thread the 4BA portion with the tailstock die holder.
2: Turn 0.156in. diameter.
3: Turn to 0.187in. dia. if the stock is not already to size.
4: Part off and put aside for slotting of heads.

For slotting the screws or wrist pins, I use brackets as in **photo 86**, two of which are shown in more detail in **photo 87**. The brackets are made as follows:

1: Mount bracket on the cross-slide across the lathe axis.
2: Use the cross-slide index to drill (and tap if required) appropriate holes at 0.250in. intervals.
3: To hold the wrist pins, saw along the centre line of the holes and fit clamping screws as seen.

When these brackets are used for slitting, two turns of the leadscrew hand wheel will position the cutter for each screw after the first has been set.

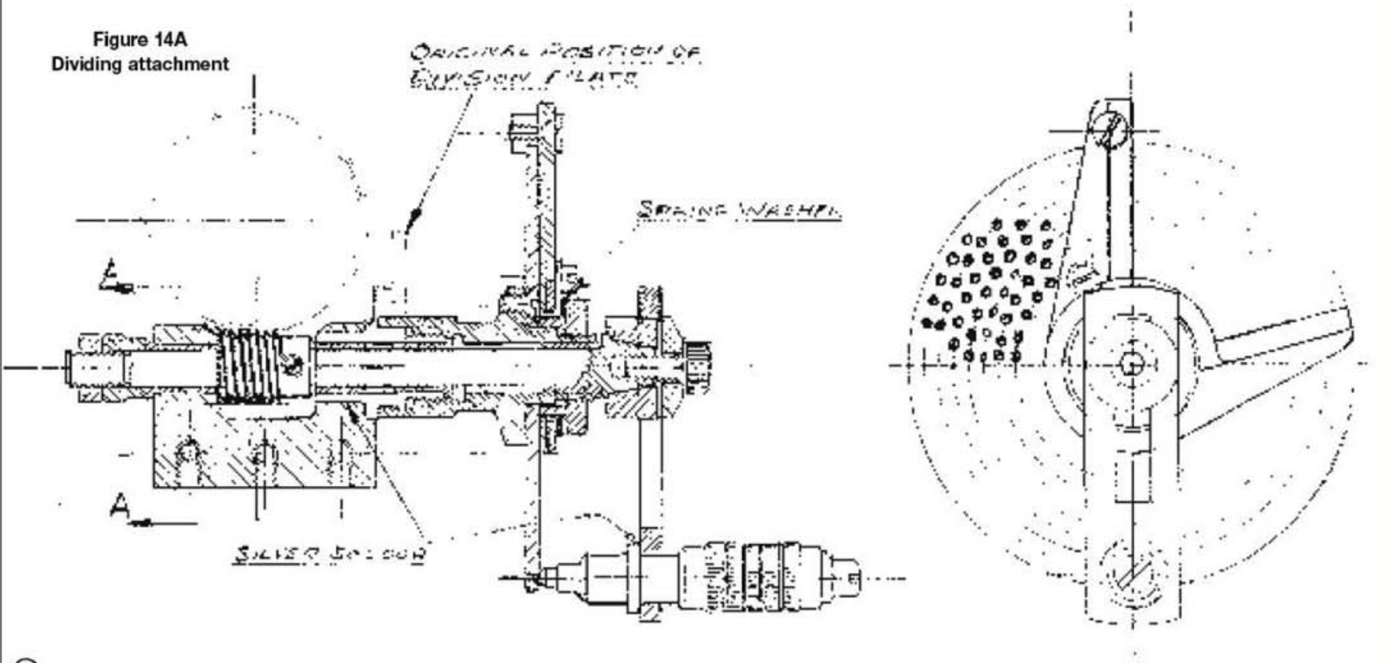
●*To be continued.*

Above: two of the special angle plates used by the author for slotting screw heads and similar work.

Left: the special angle bracket used to machine the screw slots in the wrist pins. It was made from a piece of angle iron machined on the outer faces.

BUILDING A MINIATURE UNIVERSAL LATHE

Figure 14A
Dividing attachment



Colin Barter

continues his description of the construction of a dividing head for his versatile little machine tool.

●*Part VII continued from page 349 (M.E. 4169, 2001)*

The dividing head mandrel incorporates opposed tapered bearings and the rear face of the mandrel nose serves as a thrust face to take axial loads. The front bearing is integral with the mandrel and the rear bearing is a close fitting sleeve fitting the tail of the mandrel. One end of the sleeve is tapered to serve as the rear bearing, the other end is also tapered and fitted with a taper bored bush and a ring nut. Four slots are cut in this tapered extension so that when the bush is forced up the taper by the ring nut, the sleeve grips the shaft tightly. This arrangement allows close adjustment of bearing clearance. The bearing housing or body of the dividing head would be made in cast iron.

I schemed out a compact arrangement of the worm shaft and division plate assembly that would also allow the worm wheel and the assembly to be mounted in the little lathe headstock. I did consider an overhung worm assembly but it did not look very practical so an arrangement with a bearing on either side of the worm was made. A late change in design made me realise that an overhung worm design could have been achieved.

Drawings **fig 13A** and **14A** show the arrangement of the dividing head and the dividing mechanism.

Making the dividing head

The mandrel and the bearing sleeve were turned from 3/4in. dia. silver-steel. The mandrel was turned between centres then set up in the 4-jaw chuck and a fixed steady for boring the central hole and the seating for the collets. Setting up was done as carefully as possible using a dial indicator reading to 0.0001in. to ensure the central hole and collet seating were truly concentric with the outside diameter.

The loose bearing sleeve was bored through and the tapered bearing surfaces were both machined at the same setting to ensure concentricity. The tapered extension and the thread for the ring nut were machined with the sleeve mounted on a close fitting mandrel turned in the lathe. The mandrel was tapered very slightly, about 0.001 to 0.0015in. over its length, so that the sleeve would be a tight fit over the last 1/2in. or so. This was to prevent any movement when cutting the thread.

The mandrel housing or head was machined from a piece of cast iron railing. I was doubtful of its quality but it machined well and seemed to have no blowholes, hard spots or inclusions. It was machined all over in the shaper then mounted in the 4-jaw chuck for through boring and finishing the front tapered bearing, using the mandrel as a gauge until the flat face of the mandrel nose just touched the mating face on the housing.

The rear tapered bearing surface was machined by mounting the housing by the front taper on a matching tapered mandrel. The tapers had to match exactly for this was all that held the housing during machining. It was a case of light cuts and always towards the headstock using the tapered sleeve as a gauge. This method of work holding was successful because the shallow taper angle, approximately 7deg. included angle, served as a driving taper.

I was confident that the tapers were all in alignment and concentric with one another, and a trial assembly of the mandrel and sleeve in the housing revealed that there were no tight spots and the sleeve could be placed in any angular position on the mandrel without changing this situation. Turning the taper bored bush, the ring nut and cutting the four slots in the sleeve extension completed the major work on the dividing head.

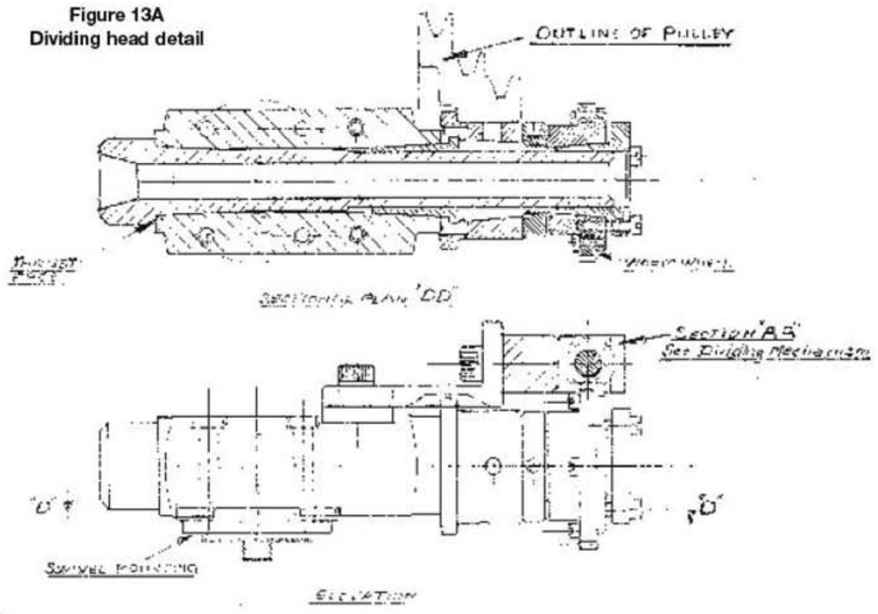
Since I proposed to use this assembly as a light milling and drilling spindle, a pulley was turned up in aluminium alloy for mounting on the rear bearing sleeve locking bush. Instead of securing this with a key and grub screw, I decided to try a shrink fit. As the coefficient of expansion of aluminium alloy is approximately twice that of mild steel I assumed that quite a moderate heating of the pulley would achieve sufficient expansion. An interference fit of 0.0015in. was provided on the 1in. dia. and with moderate heating the pulley slipped onto the bush. When cold it was secured tightly in place.

Removal of the pulley required heating slightly more, but it dropped off without any problems. Apart from drilling and tapping various holes for securing other parts to it, the head was now complete.

Dividing mechanism

Work commenced with the machining of a worm in mild steel taking care to get the flanks of the thread very smooth. A flank angle of 20deg. was used and the wheel was tried against the worm to

Figure 13A
Dividing head detail



©

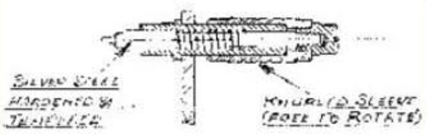


Figure 14B
Section through
indexing pin

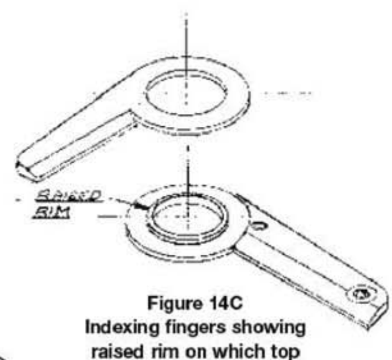


Figure 14C
Indexing fingers showing
raised rim on which top
finger is located

©

ensure that it did not bottom in the worm thread. It was then bored to a light press fit on a piece of 1/4in. dia. silver-steel. After drilling and tapping for a grub screw the worm was case hardened and polished.

The worm support frame was cut from 1/2in. mild steel bar and bored for the flanged bush on which the division plates and indexing fingers would be mounted. With this silver-soldered in place, final machining for the worm spindle bushes and the seat for the division plate, etc. was completed. The worm spindle was turned from silver-steel and finished so that the worm seat was a light press fit in the worm. At this diameter the spindle was too tight a fit in the bearing bushes. It was reduced very slightly in diameter where it located in the bearings until it rotated smoothly with negligible clearance.

The remaining items, including the spindle nuts, index fingers, grub screws, spring washers etc. were now made to complete the dividing mechanism. The items requiring careful machining and fitting were the spring-loaded index pin that fits the holes in the index plates, and the slotted arm that secures the index pin to the worm spindle. **Figures 14B** and **14C** show the indexing pin assembly and the indexing fingers.

Worm wheel

The mounting of the worm wheel required care as its original bore was 3/16in. and this had to be opened out to 1in. diameter for mounting on a taper bored bush which, with a matching sleeve, would enable the wheel to be fitted either to the dividing head or the little lathe headstock.

To ensure that the wheel is mounted truly concentric with the dividing head mandrel, it is not mounted on a close fitting seat but with a small clearance. Four clamp screws secure it to the mounting bush. With the wheel secured to its bush and mounted on the mandrel, a dial indicator was used to check that the wheel teeth were concentric, any necessary adjustment being achieved by first slackening the four clamp screws.

After mounting the dividing mechanism on the head housing by way of a bracket and securing screws, rotation of the worm wheel by the worm was possible. Final adjustment of the wheel mounting to achieve close engagement without backlash was made. Several complete rotations of the worm wheel and dividing head mandrel had to be made to ensure that engagement without backlash or tight spots was obtained throughout 360 degrees.

Drilling the division plates

For drilling the division plates I used what I believe is a very old method. It employs a long strip of steel in which the required number of holes has been accurately punched. The strip is wound round the periphery of a wooden disc to the exact centre of which the division plate is fixed. By means of an index arm and pin the disc is advanced one hole at a time. A rigidly mounted drilling spindle is used to drill the holes in the division plate. When the row of holes is complete the strip is removed and cut to the next lower number of holes. The wooden disc is turned down and the strip refitted and the next row of holes drilled.

My steel strip was some nice clean steel banding as used for packing cases. I made up a jig out of an old file with two holes at a predetermined pitch. In one hole a hardened steel punch was fitted and, in the other, an index pin. The steel strip was fed through a slot in the jig and a hole punched. The strip was advanced until the index pin entered the hole; the next hole was then punched and so on until the required number of holes had been punched. By using a close fitting punch and index pin the pitch error was very small.

Two division plate blanks were machined all over and bored to a close fit on the register seating on the worm spindle frame. These are nickel brass and are 27/8in. diameter. My old Milnes lathe allowed me to start with a wooden disc turned to just under 12in. diameter. A stub mandrel fitted in the mandrel nose was turned to form a close fitting seat for a division plate which was secured to the wooden disc by three wood screws spaced around its periphery.

I had decided to drill one plate with seven rows of holes as follows: 54, 50, 48, 45, 42, 36, 33 respectively and the second plate with six rows of 56, 52, 49, 44, 38, 34 holes respectively. To do this I required two wooden discs and two steel strips. The steel strip was wrapped round the disc with the required number of holes plus a few to give an overlap. The diameter of the disc was carefully turned to the required calculated diameter and the strip was fitted. Fitting the strip to get it tight with the right number of holes sounds easy but it is not. I solved the problem by making a special clamp that fitted notches cut in the sides of the strip near each end and then pulling the ends together by screws incorporated in the clamp. To get the right number of holes, the strip was cut and filed until a half hole remained. The other end of the strip was then cut at the correct hole and filed until, with the ends butting, a close fitting pin would just fit the half holes. The strip was fitted around the wooden disc and the ends pulled together by the clamp until they butted together and the pin just entered the half holes. If it was too tight a little wood was turned off. If loose, then a strip of paper was glued around the disc. The advantage of the clamp system is that the index pin has all holes clear whereas if screws or other methods of securing the strip is used these would have to be removed before the drilling could be completed which is a possible source of error.

With the first strip in place and an index pin mounted on a flat spring, the drilling of all 581 holes could commence. The dividing head with pulley fitted (for use as a drilling spindle) was mounted on a bracket on the top-slide of the Milnes lathe. On the bracket was mounted a 1/10HP electric motor with a round leather belt to drive the spindle. A 1/8in. dia. centre drill held in a collet completed the drilling set up. A clamp fixed to the lathe bed determined the depth of the drilled holes.

Drilling of all the holes went slowly as the motor was barely powerful enough and had to be allowed to cool off occasionally. After each row was completed the strip was removed and cut, the wood disc turned down and the strip refitted.

When one plate had been competed, the burrs were removed from the drilled holes and it was fitted to the dividing mechanism and the index pin traversed round a row of holes. It dropped into all the holes without any off-centre tightness being apparent. At least it proved that the holes were drilled in a true circle.

●*To be continued.*

KEITH'S COLUMN

Keith Wilson

discusses the value of jig-boring for valve gear components before describing the expansion links and crosshead pins.

●*Part V continued from page 362 (M.E. 4169, 17 May 2002)*

LOGGER

AN AMERICAN TYPE 2-8-2 LOCOMOTIVE

for 5in. and 7^1/4in. gauges

A couple days ago I had a telephone conversation with a friend who was mystified with some parts of my write-up on crankpin jigs. It seems that I did not actually show a drawing of the part I called 'mandrel', and he said he would think of it as 'bush'. 'Tis a moot point about the nomenclature (name) but I always think of a bush as being hollow. As a matter of fact, this 'mandrel' appears on page 259, admittedly not fully labelled, but dimensioned. The 'mandrel' for the *Logger* jig is similar, the slot to guide the broach will be identical, but of a diameter to match the *Logger* driving wheel bore, to wit 18mm (0.7086in.) if you are using my bearing sizes. Our good friend also pointed out that the centre distances on the jig were wrong; he was perfectly correct and I thank him for this. I originally did the drawing for *Logger*, the 5in. version, and I missed this when converting it to 7^1/4in. for *Slogger*.

It may be helpful at this point to re-mention a helpful hint that I gave some considerable time ago — it's a good idea to draw out an item for yourself, even if only as a rough sketch. It protects the original drawing and if you do this and find there is something wrong, I would appreciate being told. A clanger will often become obvious, and you can mutter (under your breath, of course) the hope that apes will void upon my ancestral tablets.

At the time of writing, a General Arrangement or good outline drawing has been traced but is not yet arrived, so the best that I can offer are those bits for which I have definite measurements, at present the valve gear. I have lots of other dimensions but it seems best to keep on the chassis for the present.

Now, valve gear can make or mar a locomotive as of course can some other parts, as well, but valve gear is all-important. Strange as it may seem, I have yet to see a published design where the greater accuracy of jig-boring is recommended as I did for Saint and 47xx expansion links. This method has certain advantages, the first of which is the extreme accuracy available. I can hear the frantic cry from builders: *"Does the old fool think we all have such things as jig-borers*?" Well, you have, although you may not realise it.

I very much doubt if any builder does not possess a lathe and milling machine, even if a lathe does in fact serve both purposes. I made my first 3^1/2in. locomotive, a GWR prairie, on my first Myford, using a vertical slide. Later I built the first *King John,* a somewhat heftier job, by the same method. Later, I bought a set of castings from Centec and made up my own milling machine, milling the big bits at work (with the firm's permission!) I made almost all the lathe parts on the Myford, and I used several Myford change-wheels to get a geared machine. With carefully selected pulleys for the motor and input drives, I got a total of 12 spindle speeds, ranging from about 50 to over 1000rpm as far as I recall, in near geometric progression.

Geometric progression only means that the speeds were in fairly constant ratio, i.e. any given speed bore the same ratio to the speed below as to the speed above (you know what I mean). This gives the best series of available speeds. The shafts were of mild steel running in Glacier bearings, giving heavy loads at high speeds. The casting for the main body held a good load of oil, and with the sole exception of the slowest drive gears giving up under load (eventually, and perhaps not unexpectedly!) They were replaced by mild steel gears ^{1}/2in. thick and, as far as I am aware, that mill is still giving good service today.

Using it together with a 'hotted-up' Myford ML7 I built two 47xxs, two Saints, three '1366s', a Dean Goods, a Wainwright Class 'C', a 43xx, three Castles and a *Great Bear,* as well as some development work on a gearless car drive. So take heart, those with limited machinery, for where there's a will there's a way (or lots of expectant relatives!) Nowadays, with a long-bed Myford, a Colchester student, a big vertical drilling machine and a Cincinnati No. 2 ML milling machine, life is somewhat easier. A big bandsaw helps a lot too.

Back to jig-boring

A jig borer, more or less, is a machine with a strongly-made headstock, either horizontal or vertical, and movable slides controlled by lead-screws in turn fitted with dials reading to the nearest 'thou'. But there can be few lathes, or milling machines, that do not match these criteria in a general way at least. Also, for not overmuch outlay, a two-axis table may be purchased; fitted to a drilling machine, this suits our purpose splendidly.

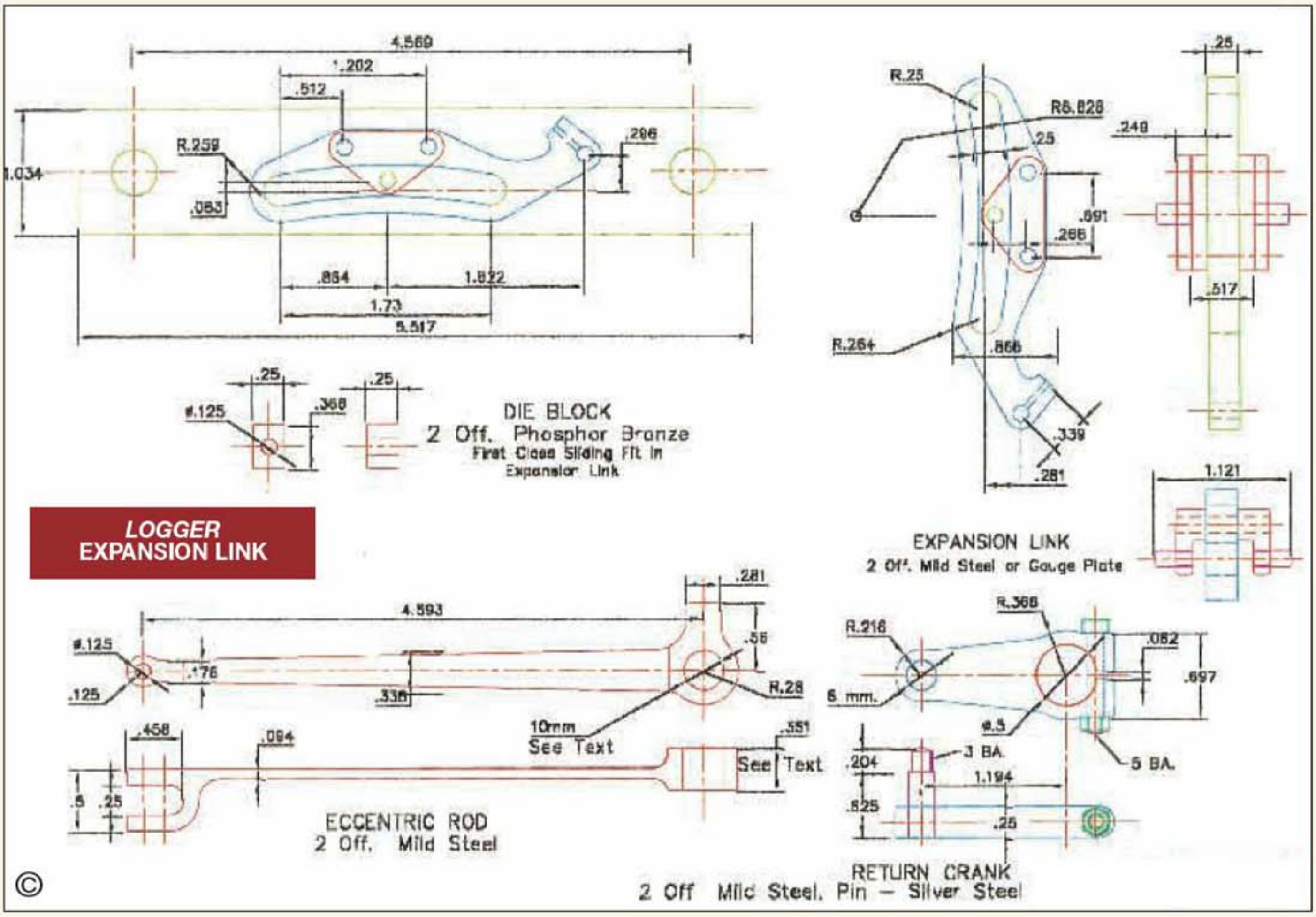
With this in mind, I have carefully left all valve gear dimensions as near 'to scale' as possible, without any tendency to make nice neat nearest-fraction-of-an-inch measurements. For, using jig-boring, is it so much harder to make the centre distance 6.666 rather than 6^{11}/16in.? The results will be an easier-to-assemble gear, and one much easier to set when the time comes.

A brief explanation as to how this valve gear works might be of interest. A valve gear of the 'radial' type needs two Simple Harmonic Motions (SHMs). An SHM can be represented by a sine curve, that is the curve produced by plotting the sine of an angle against the angle. An example is an alternating current electrical supply. (The cosine curve produces exactly the same curve but is 90deg. out of phase).

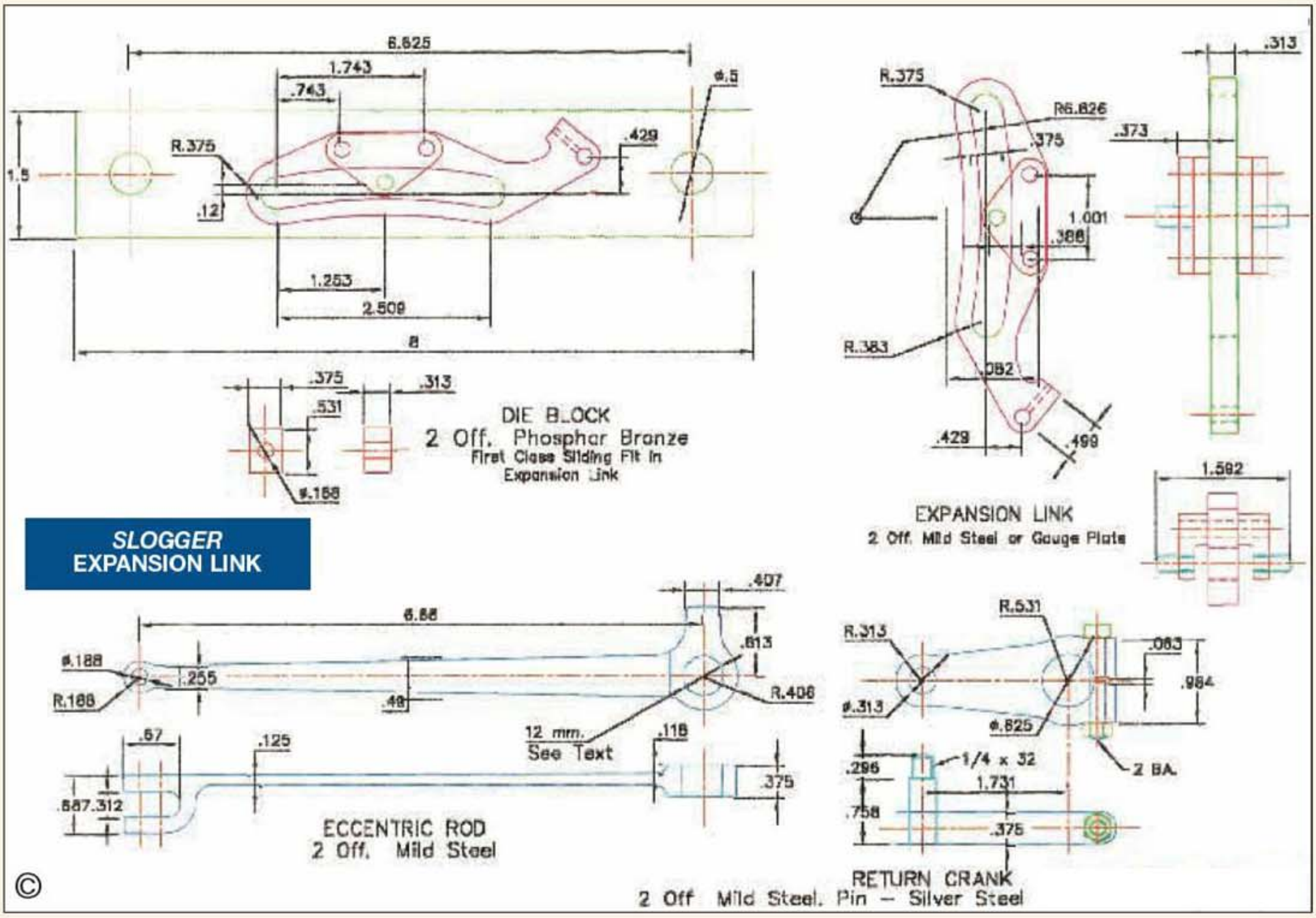
The first SHM is needed to ensure that the valve just opens the port at each and of the piston stroke, and is provided by the combination of the Combination Lever and the Anchor Link; it is the least amplitude SHM (in full gear) and will always be exactly in phase with piston, for the motion is totally derived from the crosshead. The second SHM comes from the Return Crank, Eccentric Rod and Expansion Link combination. This SHM is out-of-phase by exactly 90deg. with the first one.

Now, an interesting thing about SHMs is that they can be added together without distortion, and if not exactly in phase, can also be subtracted (or 'decoded') and the original SHMs recovered, this is easiest if in 90deg. phase. If SHMs are of the same frequency, the result of the addition is a new SHM. Incidentally, and not concerning us directly, *all* motions can be built up from a sufficient number of SHMs, of varying amplitudes, frequencies, and phases.

So the valve motion (except in mid-gear) consists of two added SHMs, the small one taking care of the initial port opening and the larger one, either 90deg. in *advance* or 90deg. *behind*, but always in step. This latter SHM biases the valve according to the required direction of travel of the locomotive,



LOGGER
EXPANSION LINK
DIE BLOCK
2 Off. Phosphor Bronze
First Class Sliding Fit in Expansion Link
EXPANSION LINK
2 Off. Mild Steel or Gauge Plate
ECCENTRIC ROD
2 Off. Mild Steel
10mm See Text
See Text
RETURN CRANK
2 Off Mild Steel. Pin – Silver Steel
3 BA.
5 BA.
6 mm.
©



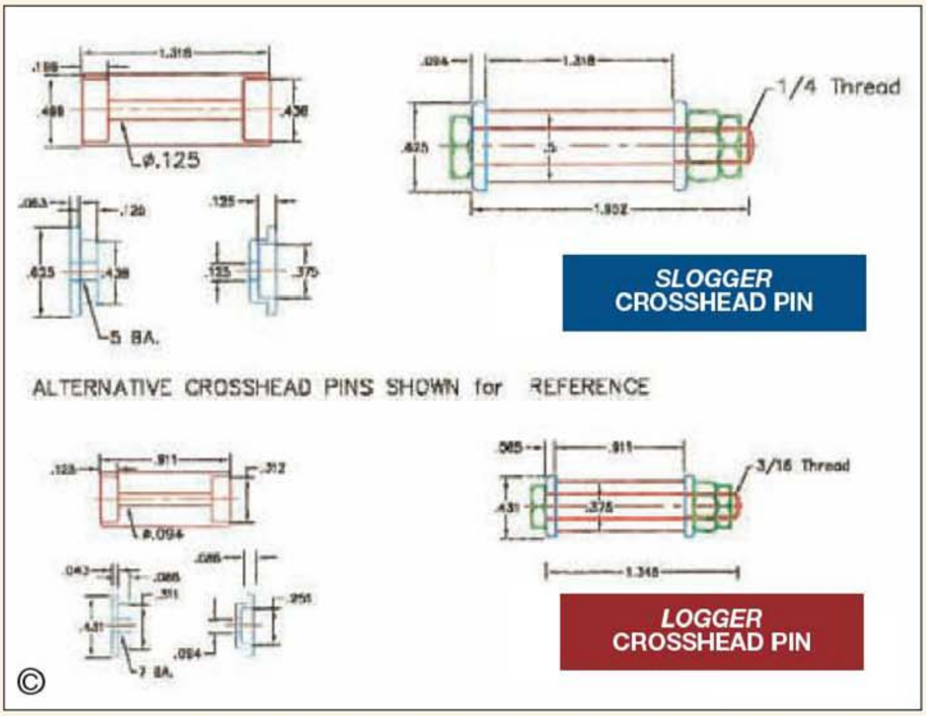
SLOGGER
EXPANSION LINK
DIE BLOCK
2 Off. Phosphor Bronze
First Class Sliding Fit in Expansion Link
EXPANSION LINK
2 Off. Mild Steel or Gauge Plate
ECCENTRIC ROD
2 Off. Mild Steel
12 mm. See Text
RETURN CRANK
2 Off Mild Steel. Pin – Silver Steel
1/4 x 32
2 BA.
©

and if reduced in amplitude results in 'notching-up', that is, reducing the time for which the port is open and therefore reducing the amount of steam used whilst the tractive effort is reduced, but *not* in proportion. Thus efficiency is greatly increased.

The expansion link serves two purposes, one being to alter the amplitude of the larger SHM, and the other to change its phase by 180deg., thus reversing the action of the valve relative to the motion of the piston, therefore the direction of the locomotive is reversed. Quite simple really. As a minor detail, due to angularity of rods at positions other than dead centres for each rod, these motions are not strictly SHMs.

In the case of Stephenson gear, the SHMs come from the eccentrics, due to the advance of these the two SHMs are already incorporated. The expansion link in this case alters the relative amplitudes plus a small phase change, this latter accounting for the better power output at slow speeds compared to Walschaerts, the latter being generally freer at higher speeds.

In the case of the similar locomotives Stars and Saints, the change-over seems to have been about the 48mph mark. They had the same boiler and wheel diameter, Saints with Stephenson gear and Stars with Walschaerts. I would mention that some GWR drivers are of the opinion that there was no difference, so the matter is unsettled.



Get on and make it

I give two drawings for the expansion link, as it is easiest to chew this out of a biggish slab rather than one just big enough. Take my tip, deal with the slot and the drive position, forget the outside shape until these two are as accurate as you can get them. For, finishing the outside first, and then making a duff job of the inside leads to *"Oh dears!"* and *"Tut, tuts!"* I suggest a 1/4in. slot drill for the slot, taking it out until a piece of 3/8in. dia. silver-steel will just slide smoothly all along it. If you can keep a brand-new slot drill for the final cut, it will pay off. If you haven't got a big enough rotary milling table, then a suitable substitute device can be made, drawings (WE12) available from Highbury-Nexus Customer Services (01322-616300).

It is a matter for discussion whether or not this link should be case-hardened, for distortion could rear its ugly head. I did once get a similar-sized Stephenson link nitride hardened, but a: it was cross-braced by the suspension bracket, and b: it was done by a professional who dealt with its copper-brazing at the same time. Even so, a tiny bit of distortion took place for the die-block, done at the same time, did get a bit stiff here and there; however a slip-stone in the link taught it manners.

It is as well to make the two die-blocks at the same time and setting. There is a crafty alternative to a bronze block, it is to make the block out of PTFE a good bit larger than size and to force it into the slot. If this is done with a same-sized pin in the hole all should be well, replacing the pin with the real one when assembling the valve gear on the locomotive. For those who have witnessed Bob Shaw's splendid 7 1/4in. Britannia *Coeur de Lion* in operation, his die-blocks are made just like this — in fact it was he who told me about it.

Digressing slightly, this particular puffer works so well that there is no blast cap in the smokebox, just a plain pipe pointing up the chimmock! Examination of his expansion link and die block reveals that there is no flange on the die-block which will be held in place by the rear end of the radius rod.

The two brackets on each link to hold the pivot pins must be riveted tightly to the link; it is best to use silver-steel in reamed holes, bashing the ends rivet-wise into countersinks. If you feel able to risk silver-brazing these bits on, then I suggest mild steel pins treated the same way. If you do it this way then it is best not to quench the job, let it cool naturally, this should reduce the risk of distortion. Incidentally, I have always made these links out of ordinary bright mild steel, never having bothered with gauge plate. I have yet to regret this, but it is always possible that gauge plate might be worth the trouble. Full-size, at Swindon at least, the links were case-hardened and precision ground to exact sizes, but it's the old story of having a machine specially for this task. There is also a slight difference betwixt a full-size locomotive doing over 200 miles per day and a 'model' that probably does five miles per month! If you rely on non-silver-brazing, then Loctite 601 will add to the strength of these important joints.

I don't think the anchor link and eccentric rod need any extra write-up, but the return crank is another matter. Ideally, this would be best with a square hole for mounting on the crankpin, this in turn being set accurately at the correct angle. But I cannot think of a way in which this could reasonably be done in our size; if there are those among us who know better then please point out the error of my ways, to the greater benefit of us all.

So, at this stage of manufacture, do *not* drill the hole for the adjusting bolts yet, although it may of course be marked out. When the valve gear is set (much more of this later!) the crank will be clamped with a toolmaker's clamp and the hole drilled and reamed through crank and crankpin at one fell swoop. I would like to see the crankpin located absolutely in the wheel, but it is a bit difficult to see how this could reasonably be done in view of the fact that the wheels are finally machined on their axles; the overhang enforced by the previous insertion of the crankpins would make this difficult. However, it might well be possible to bond in a pin by drilling through from the opposite wheel using a 'long drill'. These are made by silver-brazing an ordinary drill into a long piece of mild steel a bit larger than the drill diameter. I have a selection of these which has built up over the years. They pay for themselves in all sorts of ways.

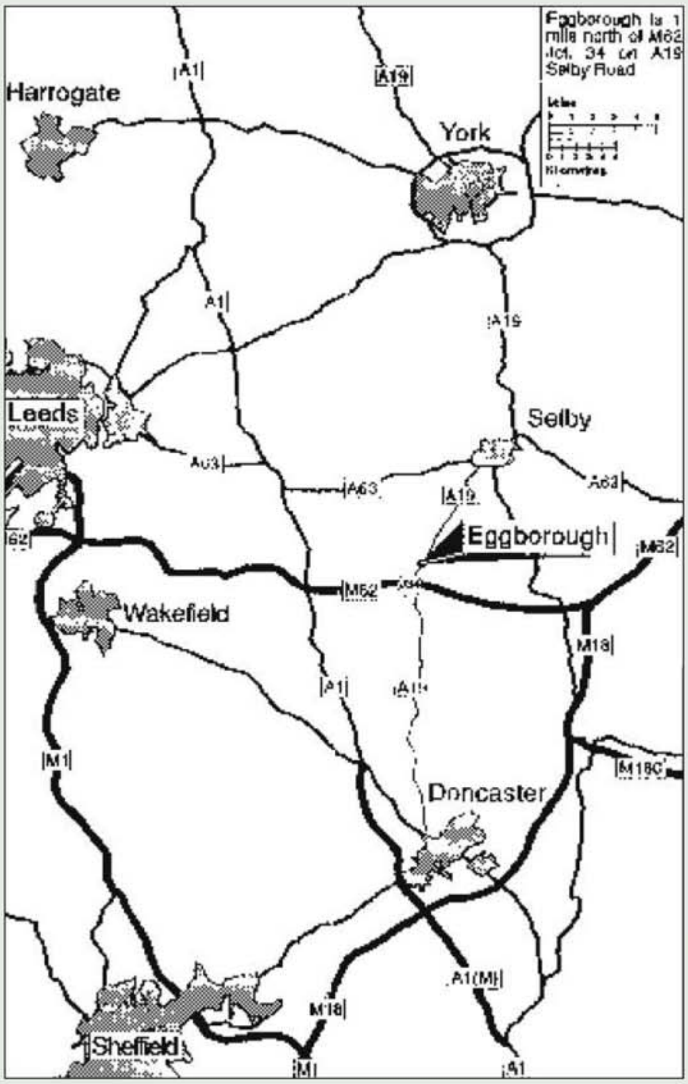
I show needle roller bearings for the big-end of the eccentric rod, this I believe to be common modern practice, although ball races are more likely in full-size. But we don't have too much room to spare. In the case of the 5in. version (*Logger*) I show the eccentric rod big-end much thicker than scale to allow for this bearing. If you want to use ordinary bronze bearings, then the metric measurements may be reduced to imperial and the thickness reduced to 1/4 inch. It's your choice.

Readers might well have noticed that the crosshead pin which I showed on the Crosshead drawing is not the same type as appears in the *Logger* photograph(s). This was mainly from force of habit, for the type shown was Great Western and has some advantages, one being clearance behind the crosshead, very important on engines with connecting rods of the same length as the front portion of the coupling rods. GWR Prairies, Moguls and 47s come immediately to mind. Another advantage is that when the pins wears a bit oval, the replacement part is very easily and quickly made. However, for those who want the more authentic type for *Logger*, they are made just about as easily. Both types can be hardened right through.

I think it is clear that there are several ways of making these items. The choice is yours between a length of studding with three nuts, or a turned bolt with two nuts.

Now, I have mentioned zone-hardening elsewhere; it is quite simple and very useful. Use an intense heat source (oxy-acetylene ideal) cook up the job to bright red as quickly as may be, but do *not* allow it to soak at this temperature, quench right out immediately. The theory is that the outside gets hot enough to harden, but the core does not, therefore it does not become brittle, and therefore tempering is not required. Theory right or wrong, it works. Not too well on thin bits, but should be okay with 1/4in. upwards. I have not personally used it with bits below 1/2in. diameter.

●*To be continued.*



The Deep: a Submarium in Hull, seen from the Pier.

A very early Priestman excavator at Hull Museum of Transport.

The replica Hurricane displayed as if in flight at Eden Camp.

IMLEC 2002 AT EGGBOROUGH

Arthur Bellamy

describes some of the nearby places in north Yorkshire well worth a visit during the IMLEC weekend.

In 1988 and again in 1992, Mavis took Bob to Yorkshire on the pretext of visiting the Leeds club track for IMLEC, which they did of course, but there was much more that interested her and she wants to go again to see what is new, and how others have developed.

The nearest place to visit is **Selby** with its **Abbey Church**. Work on the present structure began in 1089. William the Conqueror built Battle Abbey to celebrate his victory at Hastings and Selby Abbey for his battles in the North. Many American tourists visit Selby Abbey because of the 'Stars and Stripes' in one of the windows.

The latest thing is **The Deep** in Hull. A deep-sea experience of the world's oceans, it opened at Easter this year. More correctly called a Submarium and resembling the bows of a ship, the building is most unusual and is as revolutionary in style as the Sydney Opera House or the Eiffel tower. You go up to the Deep in a lift (work that one out!) and then walk down, past interactive displays, a fossil wall and tanks of neon lit jellyfish, etc., to the major display: a 10m deep shark tank claimed to be the largest in Europe and containing zebra sharks, groupers and other fish from the tropics. Elsewhere we move to the Arctic and to an underwater sea station representing somewhere we may supposedly spend some of our recreation time in the future. The whole outfit is one of the Millennium projects and this one has set the taxpayer back a cool £45 million.

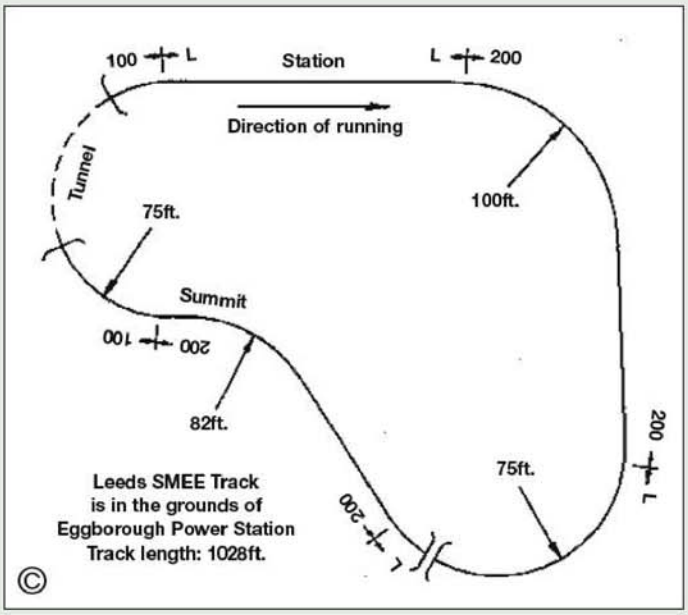
The Deep is on the waterfront at a place called Sammy's Point close to the city centre and the Old Town. Other places of general interest in Hull include the **Town Docks Museum**, covering the fishing industry, and hence many good model boats, and the whaling industry of days gone by.

In High Street there is **Wilberforce House**, a typical merchant's home, also significant for the displays about the abolition of the slave trade. A few doors away is the **Streetlife, Hull Museum of Transport** with period streets and shops, a railway signal box and an early Priestman diesel engine. Priestman, who later was known for cranes and grabs, was a pioneer in this field. These museums back onto the river Hull which gives access to a trawler which can be boarded at various times. Also in High Street is the **Hull & East Riding Museum**, mainly of archaeological pieces, but it also houses the Hasholme Boat, a 3000 year old boat recovered a few years ago and still in the process of being 'stabilised'. It is in a glass tank and is constantly sprayed with a preservative.

Close to Holy Trinity Church is the **Old Grammar School**, the school were William Wilberforce and Andrew Marvell were educated. Among other things there now is a collection of replica Tutenkamun treasures. The mask is breathtaking. After being on display at the Wembley Empire Exhibition in the 1930s they were purchased by the founder of Reckitt & Colman who donated them to the City. They were in store and survived the Blitz. Reckitt & Colman are well known as makers of Dettol, Disprin and the Blue Bag which mother once used to make your shirts look whiter. They also make mustard and all model engineers are familiar with Brasso!

A trip to **York** is a must! With all the Roman remains, I can recommend a couple of hours at the **Yorvik Centre** where in groups of four, visitors board a time car which travels back into history, and then forward through the ages to Viking villages complete with their notable smells. This museum has no barriers, windows or fences; there's nothing between you and the exhibits.

Take a look at the Minster and think of the engineering required to build it. Bob, of course, will want to visit the **National Railway Museum**; entry to which is now free. There are many exhibits in 'our' scales. Someone told them that if they wanted government money, they ▶



The approach to the Station showing the hydraulically operated section leading to the passing loop. The steaming bays are beyond the station.

should put out more of the items then stored in a dusty storeroom; so they did! Suitably labelled, many 31/2 and 5in. gauge locomotives are stored on stillages. Also in this room there are three showcases of 7mm to the foot, fine-scale models of locomotives, coaches and wagons, all made and donated by Mr. J. P. Richards. They are close to but more accurate than 0-gauge but will not run on 0-gauge tracks. In fact, they are considering building another layout to show them off to greater advantage. In the foyer, in the new acquisitions showcase is an unfinished 3^1/2in. gauge Czechoslovakian engine donated by the widow of a York model engineer. This is really beautiful and worth looking out for. Then of course there are the full size exhibits: *Mallard, Green Arrow, Duchess of Hamilton, Lode Star,* the Chinese engine, all made in the UK, and the Japanese Siskatan, their High Speed Train.

Take a stroll through, or should I say over the workshop and see which locomotive Rod is working on this week. Rod used to be a member of the Leeds Club but now he works at 12in. to the foot, helping to keep the locomotives in the National Collection in pristine condition. And he gets paid as well! On his days off he is restoring his Fowler Traction Engine. Rod thinks he is in Heaven. Mavis will enjoy looking at several royal coaches while she has lunch in the *Brief Encounter* Restaurant.

North of York and close to Malton is **Eden Camp**, at one time a prisoner of war camp housing both German and Italian POWs, at different times, during the last war. Of the 24 or so sheds, some are left in original condition, while others are themed as a result of the blitz. Hull got a real pasting, some say worse than Coventry, but equal to Portsmouth on a tonnage per population basis. I remember — I was there. Have a meal there but think about the menu. Dambuster's stew is good, it includes a dumpling, and Submariner's Surprise of course, is fish. Look closely and see if you can spot a 7^1/4in. gauge Hunslet quarry engine. Eden camp has a fibreglass Hurricane mounted in a banking position but for Aircraft you must visit **The Yorkshire Aero Museum,** a private Museum run by a club at Elvington to the East of York. This airfield has a very long runway built late in the war for the large American bombers, but was barely used. This is where you can see the *only* Halifax bomber in the world. It has been restored from the remains of a chicken shed, and stands with many other wonderful aircraft: *Canberra, Mosquito, Hunter, Buccaneer* and a privately owned Victor tanker aircraft is prominently displayed. It is not allowed to fly but at air shows it gets very close to it during high speed taxiing. Elvington is also the custodian of the Barnes Wallace Collection. Yes, there is a bouncing bomb, and details of his supersonic ideas years ahead of his time. Photographs of the Airship R100 to Barnes Wallis design, which was built close to Howden just down the road, Neville Shute Norway was also on this project. The only thing on the site now is a large anchor ring!.

Now for the kids, it's a pity school will still be open: **Flamingo Land**, close to Pickering, is one of the UK's leading amusement parks with several white-knuckle rides. The *Terroriser,* the *Bullet, Wild Mouse* and *Magnum Force* are all there. The latter is Europe's only triple loop roller coaster; it would be a pity if they missed it, wouldn't it? When I am taken to such places I look at the engineering, including the huge hydraulic rams required, and think of the electronics for the control circuit. Chips with everything!

Pickering is the southern terminus of the **North Yorkshire Moors Railway,** but the engine sheds are a little further north at Grosmont. The next village is Goathland where the TV series *Heartbeat* is filmed. On the Pickering to Whitby road you pass **Fylingdales,** one of the early warning stations set up in the cold war period; the others are in Spain and Greenland!

Beverley, between York and Hull has the **Army Transport Museum** housed in an old tannery; it's okay, the smell has gone! Several locomotives and the Hook is there. The Hook was used by the enemy to break railway sleepers when towed behind a retreating train. Outside they have the last Blackburn Beverley transport aircraft. These were built at Brough on the north bank of the Humber and were used for dropping supplies to troops in the jungle, etc. They could also take off and land on little more than a football field. Leave the car at the museum, turn left and take a short stroll to **Time & Motion,** a shop selling longcase clocks and other timepieces, as well as barometers. It's certainly worth a look in the window; by all means go inside if you have cash to spare.

Beverley has two fine churches: the Minster, with its treadmill in the roof to get materials up there. The boss in the centre of the church is about 5ft. dia. and when removed by the treadmill, a rope can be dropped to the nave and the hard work can begin. The other church, St Mary's, at the corner of Hengate, (now, there's a quaint address) is where Lewis Carroll saw the White Rabbit in the Stonework. The Vicar here is a model engineer hoping he can get the day off to come to IMLEC; he did last time!

We haven't yet been to the west, to **Leeds** in fact where there's an excellent Industrial Museum in Canal Road, off Kirkstall Road where the ruins of the Abbey are. The museum has examples from the various engine builders of Leeds: Yorkshire Engine Co., Fowler, McLaren and others, I was impressed with the Burton tailoring exhibit; all of a sudden you find yourself in a 1940s shop and next into the cutting and sewing room. Mavis will enjoy Leeds, the shops are said to be second only to London. Harvey Nichols are in Briggate.

At **Elsecar near Barnsley** is the Heritage Centre, which includes a Science Centre, craft workshops, steam railway and the only Newcomen beam engine still on its original site, erected in 1795.

I have kept the best until last: **Markham Grange.** Some think of it as a nursery selling plants. Markham Grange is a steam engine enthusiast's paradise. Open every day but best of all on Wednesdays when the engines are in steam. They are full-size steam engines rescued from the scrap man. Some are up-and-down marine engines, a set of triple-expansion engines that once powered generators in a power station, engines from a colliery, etc., and a Corliss valve mill engine from a textile mill over the border in Lancashire. The owner needed low-pressure steam for the nursery and being a steam man decided to have a little fun and run steam engines with it first. He also has modern plant to generate his own electricity — by steam of course!

Bob and Mavis could easily call in here on the way south. It is just off junction 38 on the A1 at Brodsworth on the A638 back towards Doncaster.

Further details of many of the attractions described can be found on the Internet.

Visitors with caravans can stay at Eggborough for the event and there are Caravan Club sites relatively close. York has a full Caravan Club site with all amenities and for those without caravans I have listed suitable Hotels and B&Bs. The site at Eggborough can cater for about 40 caravans and tents, but we will be taking bookings. The track is part of the Sports and Social Club which can provide bar meals. On Sunday lunchtime they run a carvery which is good value but can get quite busy.

Locomotive handling is facilitated by the club's hydraulic lifting traverser.

Many of us IMLEC stalwarts go out for a meal on the Saturday evening, so this year I will ask the steward if he can arrange bar meals or a carvery on Saturday evening for us. Give me a ring on 01757-702863.

Local accommodation

Old Vicarage, Main Street, Kellington, Selby DN14 0NE (01977-661119). Closest to the track but is still a couple of miles away.

Berewick House, Park Lane, Barlow, Selby, YO8 8EW (01757-617051). Very nice but seven miles away on back roads.

Barff Lodge, Mill Lane, Brayton, Selby YO8 9LB (01757-213030). A private house on the ETB list next door to *West Cottage* (below).

West Cottage, Mill Lane, Brayton, Selby YO8 9LD (01757-213138). A private house on the ETB list, next door to *Barff Lodge* (above).

Chester Court Lodge, Chester Court, Camblesforth, Selby YO8 8JD (01757-618634). On the A1041 Selby to Snaith road.

Forresters Arms, High Street, Carlton, Goole DN14 9LY (01405-860315). On the A1041 Selby to Snaith road.

Hazeldene, 32-34 Brook Street, Selby YO8 4AR (01757-704809). In Selby on the A19.

Park View Hotel, 20 Main Street, Riccall, York (01757-248458). On the A19 north of Selby.

South Newlands Farm, Selby Road, Riccall, York YO16 6QR (01757-248203). On the A19 north of Selby.

Royal Oak, Hirst Courtney, Selby YO8 8QT (01757-270633) In a village three miles away to the north east.

Axle weights are determined by the club's mechanical system.

Visit **www.selbynet.co.uk/acommodir.html** or **www.s-h-systems.co.uk/selby.html**

We have room for about 40 caravans on site. To reserve a space, please call Arthur on 01757-702863.

CLUB CHAT
With Stan Bray

UK News

A good turnout of around 50 members attended the **Romney Marsh MES** AGM when a motion was carried authorising a modest increase in subscriptions from January 2003. Although they have received a small grant from Community Action for Kent towards the cost of an extension to their clubhouse, the society has already had some very heavy expenditure and additional funds are required to meet the cost of the installation of mains drainage. In the interests of security, there was also some discussion concerning the display of photographs of models on the society website and whether those members whose models were shown should be identified by name. Opinion on the matter was divided and it was therefore agreed to leave it to the individual concerned as to whether they were prepared to be named. A new track cleaning wagon is under construction and when completed should save a great deal of hard work; it is expected to be finished soon.

As a result of their erstwhile Secretary moving away from the district, Mick Funnell, Chairman of **Brighton & Hove SMLE** is now also acting as Secretary until some other arrangement can be made. Anyone wishing to contact the club should therefore get in touch with Mick at 77 Sherwood Avenue, Seaford, East Sussex BN25 3ED; (01323-892042) or by e-mail: mick@seafordworks.freeserve.co.uk

Welling DMES opened the season with a family day on Easter Sunday, which turned out to be the coldest day of the Easter Holiday. Members seem not to have been deterred, about 12 of whom dusted the cobwebs from their locomotives which had been tucked away for the winter, and set about demonstrating that the rest had done them no harm. During the winter one of the club members had loaned the society a laser level which had been used to re-align the track and reset some of the gradients, thus ensuring that drivers had a superb run. Some thirty or so people enjoyed the buffet lunch and the running season started with a real swing. An Open Day was held in early April and the running log records 27 visiting locomotives for the event, so perhaps news of the re-aligned track had spread. Everyone had plenty of opportunity for a run and, with yet another buffet lunch to be consumed, the club's season has really started in the best possible fashion.

Stafford MES will be running their portable track at a unique event at the Amerton Railway, which is run by **Staffordshire Narrow Gauge Railway Ltd.** The event is unique because amongst the many locomotives in steam will be no fewer than 3 examples of the Kerr Stuart Wren Class. The railway is at Amerton Farm, Stowe-by-Chartley, in Staffordshire and further information can be obtained from the web site at www.amerton railway.co.uk or by contacting Mr. J. P. Bell (01785-850965) or e-mail jpeterbell@AOL.com. Additional interest will be in the form of several sales stands and displays of 16mm scale live steam models.

Wishing to include a Meccano display in their normal annual Exhibition, **St Albans DMES** have been obliged to change both the date and venue. The exhibition is normally held at Marlborough School in St. Albans, but this year's event will be at the Francis Bacon School, also in St. Albans, on 28/29 September. No doubt we will be able to pass on further information a little nearer the time. Good use is being made of the track site obtained by the club last year and as some time had passed since there had been any running of live steam locomotives, a special meeting was devoted to the mysteries of driving one prior to organising a meeting for the whole society at their track.

Not long ago **Woking MRS** took the opportunity to purchase their own track site and work started on building a railway in September 2000. It has taken an enormous amount of effort to rebuild their railway and the associated facilities at the new site. Although far from complete, sufficient had been done by last summer to enable them to start public running which, together with some particularly well patronised Santa Specials when over 3000 passengers were carried, helped towards the substantial costs which have been incurred. The official opening of the site and the railway was held at the end of May when a display of photographs was presented to show visitors what had been involved in the move and rebuilding.

After many months of uncertainty, members of **Kings Lynn DSME** have at last heard that they have been granted a further 10 years tenure of their track site. Public running will start a month later than originally intended since, being unsure as to whether they would have to vacate the site, less work than normal had been done to keep the track to the standard required in order to conform to the necessary health and safety requirements. The good news has brought about a resurgence of effort and everyone is able to look forward to being secure at their current site for at least the next decade. The well attended AGM took place before the news broke and at the time there was considerable uncertainty about the society's future. Although he would have preferred a change, the prevailing circumstances encouraged Bill Morris to remain as Chairman for another year, although he will definitely want to stand down next time. Likewise, Mike Coote who had stepped into the vacant position of Secretary earlier in the year, agreed to carry on for a further 12 months.

The threat of vandalism and theft from parked cars means that members of **Wigan DMES** are still having to organise a rota of people to keep watch during meetings; a chore which may not be quite so bad at this time of year but which will become an unwelcome task as winter arrives. During the society's March meeting, the annual presentation of the *Horace Hall Memorial Cup* was made to Brian Woodward, in recognition of his 5 years of service as Chairman of the society.

After anticipating that their railway would have to be relocated to another area this year, and their programme having been curtailed in preparation for the move, it now seems probable that the move by **Ascot LS** will not take place until the end of the year. In particular, this mean the society can proceed with a $7^1/4$in. gauge rally on 17 August without fear of having to cancel it at the last minute. Owing to the uncertainty of relocation, it has been decided that this is not the right time for the club to apply to become a limited liability company, and no further steps will be taken towards this until the new terms of agreement with the racecourse authorities have been agreed.

Members of **Bedford MES** have enhanced their workshop facilities with the acquisition of a fully equipped Harrison lathe and, looking ahead, anticipate the building of a new workshop in the not to distant future. Although quite heavily committed to public passenger hauling, the society still manages to find time for a number of social events. One of the most popular of these is the annual Treasure Hunt which covers a distance of some 25 miles around the immediate area of the track site. A couple of years ago an attempt was made to organise an in-house locomotive efficiency trial, but it failed through lack of support. It is to be resurrected this year in the form of a driver efficiency trial with all participants using the club locomotive.

There was some concern at **Frimley & Ascot LC** when it was discovered that newly fitted plastic sleepers were prone to catching fire, particularly when larger steam locomotives were operating. Tests showed that they were entirely different to the sample which had been supplied, prior to the club placing an order. The sample had been made of a self-extinguishing plastic, while tests on the ones in use demonstrated them to be highly flammable. The club has now gone back to using softwood sleepers soaked in creosote. They have been unable to seek redress for the plastic sleepers as the supplier has ceased trading and efforts to trace the company or its principals have been unsuccessful. No such problems have been experienced with the newly acquired wheels for rolling stock which have been CNC machined and are proving to be just about perfect.

Many model engineers have tried, or are still trying their hand at restoration of motor vehicles. It therefore comes as no surprise to read that a small contingent from the MG Car Club visited **Reading SME** in May. It appears that this is not such an unusual event for the car club which regularly arranges visits to various steam centres throughout the country. The model engineering society is still, regrettably, suffering the attention of vandals and a determined attack on a concrete garage means that a new roof is required. Plenty of early season work has been going on including reparations to the track and repainting the bridge.

It is 10 years since the **Northern Mill Engine Society** were given the opportunity to move into their present building, since when it has been a long hard slog for those members able to take part in the rebuilding of all the steam engines. The museum is still not complete, perhaps like most museums it never really will be, but sufficient engines have now been erected for the society to consider it worthwhile opening to the general public. Although they do not have facilities to run them on steam, some will be powered by electric motors. The first Open Days were scheduled for 3/4 June, fortunately coinciding with an Austin Seven Owners Club Rally in the car park, just outside the museum. Regrettably, we received notification of the event too late to give readers advance notice. We hope this is only the start and that this unique collection of preserved engines will soon be available for viewing on a regular basis and that the aim of the society to introduce an educational programme can be realised.

World News

South Africa

The official opening ceremony of the new **Pietermaritzburg MES** track extension took place on the same day as the official naming ceremony of a Hunslet built by Rob Steiger and now officially called *Tammy S.* The ceremony was performed by the builder's granddaughter whose name is Tammy Steiger and who made a short but pleasing speech. It was also the day for the inaugural run of one of a batch of locomotives, dubbed *Highwaymen*, a number of which have been built as part of joint project by members of several societies. It is only a year until the society is due to host the National Steam Meet, and considerable effort is to be put in between now and then to make sure everything is as near perfect as possible.

Members of **Centurion SME** were able to listen to an interesting talk on boilers and in particular, model steam boilers, by Larry Kloppenburg, an expert on the subject who is employed by the Department of Labour. It was even more interesting and useful because the club is at present drafting rules and regulations on the subject. The club has devised a most interesting arrangement for visits to members' workshops. Arrangements are made to visit three members' workshops on a scheduled day and the wives of all three meet at the house of the one due to be visited last, each taking along some form of refreshment so that at the end of the workshop tour the party assembles and enjoys the food and drink.

The National Steam Meet of South Africa will be hosted this year by **Bloemfontein SME** 21-24 September and anyone interested in obtaining more information should contact Fred Bishop at PO Box 1049, Bloemfontein 9300; tel: 051-447-6556.

Australia

The **Steam LS of Victoria** AGM witnessed several changes to the make up of the committee with Graham Fedley taking on the position of President. During the meeting Ron Baneth was voted to life membership of the society. For many years Ron has acted as club auditor free of charge, but now he has retired he is no longer able to do so for reasons of lack of indemnity. The honour is in recognition of the valuable service he has given. Members were entertained to an unusual evening in March when they were visited by members of the **Surrey Park Model Boat Club,** who came along to talk about making model steam boats and brought along a number of very fine examples to add to the interest.

New Zealand

Negotiations regarding the relocation of the **Canterbury SMEE** track are making slow progress. The delay is being caused by the constant need to refer every detail of the proposed new track layout and its facilities to the local authority. The site is not quite what the club had hoped for, but it will give them the opportunity to build a track over 1km in length. An additional bonus is that there is every reason to believe that an extension of the railway will be possible at a later date. It should also be possible to build a model boating pond. The Canterbury Community Trust has given the club a handsome donation towards the cost of relocation. The club exhibition in late February was successful, attracting a good attendance, and a number of people have since applied to become members.

A new locomotive has appeared on the $7^1/4$in. gauge track at **Hutt Valley MES.** A diesel outline model based on an English Electric type supplied by them to New Zealand it is powered by an i/c engine. The model is a real monster, dwarfing the ample proportions of its builder Mike Hartle. It is numbered 760 and named *The Mistress,* the name having been selected by Mike's wife and painted very discretely on the bottom front corner of the cab side.

When we last heard from **Maidstone MES,** the AGM was fast approaching and at that stage no nominations had been received for the positions of President and Treasurer. No doubt somebody's arm will be twisted in good time. A photograph of the new club storage facilities for locomotives and passenger stock has been published,

In Memoriam

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

Eddie Barry	*Romney Marsh MES*
Alan Croot	*National $2^1/2$in. Gauge Association*
Geoff Down	*Reading SME*
John Gilbert	*St Albans DMES*
Dr. K. Heap	*Old Locomotive Committee*
Arthur Morris	*Woking MRS*
Roddy Rodwell	*High Wycombe MES*
Les Taylor	*Centurion SME*

and very nice it looks too. Large enough to accommodate plenty of people as well as rolling stock, it will doubtless prove to be a great asset during inclement weather, in addition to providing plenty of storage space and ensuring that the there is no longer any need to lift heavy locomotives on and off the track at the beginning and end of proceedings.

If anyone is going to Invercargill to visit the track of **Southland SME,** beware! The local council have moved it. Well, actually they haven't physically moved the club site, but have re-named the roads in the area so, while the official address of the club has always been Tay Street, without their knowledge it suddenly became 23 Surrey Park Road; they only found out they had moved by accident. In itself, this is probably not too bad, but as there are no street signs bearing the name Surrey Park Road, it all becomes somewhat confusing. Of course, the members know where the club is — they could find their way there blindfolded (well, some could anyway). But it's going to be a bit hard on visitors though, looking for a street that seems not to exist. After a long period of being without a pond for the boating enthusiasts, repairs to it have finally been completed, due in a large part to the generosity of members Tom and Donna Frew who made a handsome donation towards the cost, thus saving club funds from becoming completely exhausted. The completion of the repairs has brought about a surge in activity with a number of members hastily making new model boats now they have the facilities for their use.

Canada

When members of **British Columbia SME** were building their track, they gave some thought to the future. Because one of the bridges was to be built on ground that had only settled for about 3 years, the abutments were designed in such a way that, should there be any more settling, they could be adjusted. Sure enough, when the track was checked prior to the commencement of running this year, one had done just that and needed to be raised by $1^3/4$ inches. During the process, for every $^1/2$in. of lift, the jack being used sank 6in. into the foundation material, so it may have to be lifted again in a year or two as the ground settles even more. A new safety system has been inaugurated and, having in mind the present day climate of everyone wanting compensation for everything, the new rules will be enforceable whereas the previous ones were kept to on a voluntary basis.

Ottawa Valley LS propose to complete phase two of their raised track project this summer. The track has proved very popular since the commencement of its building, showing that not everyone wants to drive large models; just as much fun can be had from smaller ones. A group photograph of the members has been arranged and will no doubt raise a great deal of interest and comment in years to come, when somebody goes through the archives.

CLUB DIARY

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

JUNE

To 14 July Talyllyn Railway. *Talyllyn Vintage Train.* Enquiries: 01654-710472.

14-16	**Vale of Aylesbury MES.** *Thomas the Tank Weekend.* Contact Clive Ellam: 01296-623433.
15	**Harlington LS.** *Visiting Clubs Day.* Contact Peter Tarrant: 01895-851168.
15	**Portsmouth MES.** *Families Day.* Contact Bob Aldred: 023-92-523366.
15	**STEAM – Museum of the Great Western Railway.** *King George V: 75th Anniversary Talk.* Information: 01793-466646.
15	**STEAM – Museum of the Great Western Railway.** *Meet the Railway Workers.* Information: 01793-466646.
15/16	**Dockland & E. London MES.** *Track Run, 'Mayhem' Event.* Contact P. M. Jonas: 01708-228510.
15/16	**Erewash Valley MES.** *Steaming Weekend.* Contact Jim Matthews: 01332-705259.
15/16	**Hull DSME.** *Steam Festival.* Contact Brian Rylance: 01482-647032.
15/16	**Nottingham SMEE.** *Thomas the Tank Engine Weekend.* Contact Gerry Chester: 0115-9259096.
15/16	**South Lakeland MES.** *Open Weekend.* Contact Adrian Dixon: 01229-869915.
15/16	**Guild of Model Wheelwrights** at Acton Scott Historic Working Farm, Church Stretton, Shropshire. Contact Biddy Hepper: 01492-623274.
16	**Frimley & Ascot LC.** *Club Run.* Contact Bob Dowman: 01252-835042.
16	**Leighton Buzzard NG Rly.** *Fathers' Day.* Enquiries: 01525-373888.
16	**N. W. Leicester SME.** *Running Sunday & Open Day.* Contact John Elliott: 01455-847040.
16	**Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
16	**Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
16	**Rugeley Power Station SME.** *Open Running Day.* Contact Dereck Moore: 01543-490023.
16	**Saffron Walden DSME.** *Running Day.* Contact Ken Archer: 01763-852911.
16	**West Huntspill MES.** *Open Day.* Contact Owen Jones: 01749-673205.
16	**Wigan DMES.** *Diesel Day.* Contact John Chamberlain: 01744-882255.
16	**Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
16	**York City & DSME.** *Running Day.* Contact Ken Bateman: 01904-421445.
17	**Lancaster and Morecambe MES.** *G. Coles: Tinkering about with Traction Engines.* Contact Harry Carr: 01524-411956.
17	**Peterborough SME.** *Trackside Barbecue.* Contact Tony Meek: 01778-345142.
18	**Chesterfield MES.** *B. Purvis: Original Computer Development.* Contact Mike Rhodes: 01623-648676.
18	**Romney Marsh MES.** *Midsummer Track Meeting and Barbecue.* Contact John Wimble: 01797-362295.
18	**Taunton ME.** *Fun Night at Shute.* Contact Don Martin: 01460-63162.
19	**Bristol SMEE.** *Evening at Ashton.* Contact Trevor Chambers: 01454-415085.
19	**Chingford DMEC.** *Club Evening.* Contact Martin Masterson: 0208-989-5552.
19	**Historical MRS (North West Area).** *Jeremy Suter: Soldering Workshop & Demonstration (Bring your own iron!)* Contact David Goodwin: 01224-880018.
19	**Leeds SMEE.** *Meeting.* Contact Edwin Hughes: 01757-707454.
19	**Maidstone MES.** *Afternoon Playtime Run.* Contact Martin Parham: 01622-630298.
19	**MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
19	**West Riding SLS.** *Visit to Brighouse.* Contact Margery Bradley: 01977-685782.
19	**West Wiltshire SME.** *Steam Up.* Contact R. Nev. Boulton: 01380-828101.
20	**High Wycombe MEC.** *Track Evening.* Contact David Savage: 01494-527402.
20	**Isle of Wight MES.** *Bits & Pieces.* Contact Ken Stratton: 01983-760762.
20	**Leyland SME.** *Project Night.* Contact Alan Wilson: 01942-715072.
20	**The Society of Ornamental Turners.** *Worshipful Company of Turners: Competition.* Contact N. S. Edwards: 01234-359392.
20	**Sutton MEC.** *Busy Night.* Contact Mike Dean: 0208-657-5401.
21	**Canterbury DMES.** *Open Day.* Contact Granville Askham: 01227-463295.
21	**Rochdale SMEE.** *Quiz Night.* Contact Mike Foster: 01706-360849.
21	**Steam LS of Victoria.** *Gathering.* Contact Graham Plaskett: (03) 9750-5022.
22	**Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
22	**Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.
22	**Nottingham SMEE.** *Evening Steam-Up & Barbecue.* Contact Graham Davenport: 0115-8496703.
22	**Romford MEC.** *Trackside Afternoon.* Contact Colin Hunt: 01708-709302.
22	**SM&EE.** *Rummage Sale.* Contact David Boote: 01202-745862.
22	**Steam LS of Victoria.** *Club Run.* Contact Graham Plaskett: (03) 9750-5022.
22	**West Riding SLS.** *Sweet Pea Rally.* Contact Margery Bradley: 01977-685782.
22/23	**Amerton Railway.** *Kerr Stuart Wren Gala.* Information : 01785-850965.
22/23	**Kinver & West Midlands SME.** *40th Anniversary Open Weekend.* Contact John Campbell: 01384-891244.
22/23	**Nottingham SMEE.** *Thomas the Tank Engine Weekend.* Contact Gerry Chester: 0115-9259096.
23	**Amberley Museum.** *Harrington Gathering.* Contact Derek Kilburn: 01798-831370.
23	**Bedford MES.** *Club Running Day.* Contact Ted Jolliffe: 01234-327791.
23	**Bradford MES.** *Open Day at Northcliffe.* Contact Gordon Eddison: 01943-864217.
23	**Leyland SME.** *Scale Running Day.* Contact Alan Wilson: 01942-715072.
23	**MELSA.** *Queensland Day Run.* Contact Graham Chadbone: 07-4121-4341.
23	**National $2^1/2$in. Gauge Ass'n.** *Northern Area Rally* at Stockport DSME. Contact Clive Young: 01233 626455.
23	**Sutton Coldfield MES.** *Midlands Federation Rally.* Contact Roger Timings: 0121-308-5875.
23	**Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
24	**Bedford MES.** *Treasure Hunt.* Contact Ted Jolliffe: 01234-327791.
24	**Canterbury DMES.** *Meeting.* Contact Granville Askham: 01227-463295.
24	**Hornsby ME.** *Meeting.* Contact Ted Gray: 9484-7583.
25	**Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
25	**Chelmsford SME.** *Steam-Up & Barbecue.* Contact D. Blake: 01376-324205.
25	**Historical MRS (E. Lancashire/N. Manchester Group).** *John Brighton: Loco Kit Building, a Professional Approach.* Contact John Sykes: 01706-823989.

25 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
25 **Surrey SME.** *Bits & Pieces.* Contact John Cook: 020-8397-3932.
25 **Sutton Coldfield MES.** *Meeting.* Contact Roger Timings: 0121-308-5875.
26 **Chingford DMEC.** *Barbecue Evening.* Contact Martin Masterson: 0208-989-5552.
26 **Hull DSME.** *Review of Steam Festival.* Contact Brian Rylance: 01482-647032.
27 **Erewash Valley MES.** *Visit by Maidstone MES.* Contact Jim Matthews: 01332-705259.
27 **Sutton MEC.** *Evening Steam-Up.* Contact Mike Dean: 0208-657-5401.
28 **Steam LS of Victoria.** *Working Bee and Barbecue.* Contact Graham Plaskett: (03) 9750-5022.
29 **Chichester DSME.** *Summer Barbecue.* Contact Brian Bird: 01243-542266.
29 **Frimley & Ascot LC.** *Fish & Chip Run.* Contact Bob Dowman: 01252-835042.
29 **National 2½in. Gauge Ass'n.** *Summer Rally* at Worthing DSME. Contact Clive Young: 01233 626455.
29 **Reading SME.** *Open Day.* Contact Graham Bustin: 01189-615450.
29 **STEAM – Museum of the Great Western Railway.** *Meet the Railway Workers.* Information: 01793-466646.
29/30 **Amberley Museum.** *Fire Show.* Contact Derek Kilburn: 01798-831370.
30 **Ascot LS.** *Members' Steam-Up.* Contact Tony Alderman: 01932-854393.
30 **Birmingham SME.** *Heartlands Leukaemia Charity Day.* Contact John Walker: 01789-266065.
30 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
30 **Great Western Soc.** (Didcot Railway Centre) *Steamday.* Contact Jeanette Howse: 01235-817200.
30 **Guildford MES.** *Running Day.* Contact Dave Longhurst: 01428-605424.
30 **Leighton Buzzard NG Rly.** *Vintage Vehicle Rally.* Enquiries: 01525-373888.
30 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
30 **Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
30 **Ryedale SME.** *Passenger Day.* Contact Michael Burch: 01439-788033.
30 **St. Albans DMES.** *Outing to the Bluebell Line.* Contact Roy Verden: 01923-220590.
30 **Urmston DSME.** *Electric/Diesel Outline Day.* Contact Bryan Cantwell: 0161-485-5174.
30 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.

JULY

1 **Peterborough SME.** *Bits & Pieces.* Contact Tony Meek: 01778-345142.
2 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
2 **South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
2 **Taunton ME.** *Barbecue.* Contact Don Martin: 01460-63162.
3 **Bradford MES.** *Steam-Up.* Contact Gordon Eddison: 01943-864217.
3 **Bristol SMEE.** *Bring & Buy.* Contact Trevor Chambers: 01454-415085.
3 **Chingford DMEC.** *Club Evening.* Contact Martin Masterson: 0208-989-5552.
3 **Hutt Valley MES.** *Mark Waterland: Harvesting Sunlight.* Contact Gavin McCabe: 567-4487.
3 **West Wiltshire SME.** *Steam Up.* Contact R. Nev. Boulton: 01380-828101.
4 **Leyland SME.** *Sam Bates Vol. II: Railway Reminiscences.* Contact Alan Wilson: 01942-715072.
4 **South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
4 **Sutton MEC.** *Bits & Pieces.* Contact Mike Dean: 0208-657-5401.
5 **Vale of Aylesbury MES.** *Track Night.* Contact Clive Ellam: 01296-623433.
5 **Maidstone MES.** *Evening Run & Pizzas.* Contact Martin Parham: 01622-630298.
5 **Portsmouth MES.** *Fish & Chips Evening.* Contact Bob Aldred: 023-92-523366.
5 **Rochdale SMEE.** *Annual Models Running Night.* Contact Mike Foster: 01706-360849.
5 **Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.
6 **Dockland & E. London MES.** *Track Meet.* Contact P. M. Jonas: 01708-228510.
6 **Isle of Wight MES.** *Track & Pond.* Contact Ken Stratton: 01983-760762.
6 **Peterborough SME.** *Visit to National Railway Museum.* Contact Tony Meek: 01778-345142.
6 **Romney Marsh MES.** *Visit to Great Wealden Railway.* Contact John Wimble: 01797-362295.
6 **The Society of Ornamental Turners.** *Meeting.* Contact N. S. Edwards: 01234-359392.
6 **York City & DSME.** *Summer Barbecue & Steaming.* Contact Ken Bateman: 01904-421445.
6/7 **Amnerfield Miniature Railway.** *Steam Open Day.* Contact David Jerome: 0118-9700274.
6/7 **Ascot LS.** *GL5MLA Rally.* Contact Tony Alderman: 01932-854393.
6/7 **British Columbia SME.** *Annual Meet.* Contact Sean Laurence: (604) 931-1547.
6/7 **Lancaster and Morecambe MES.** *Open Days and Exhibition at Cinderbarrow Track.* Contact Harry Carr: 01524-411956.
6/7 **Leeds SMEE.** *IMLEC.* Contact Edwin Hughes: 01757-707454.
6/7 **Museum of Power, Langford.** *Little Engine Rally and Model Show.* Contact Janet Hobart: 01245-473359.
6/7 **Stockholes Farm MR.** *Non-Steam Rally Weekend.* Contact Ivan Smith: 01427-872723.
6/7 **Guild of Model Wheelwrights** at *Fire Rail 2002,* St. Peters Collegiate School, Woverhampton. Contact Biddy Hepper: 01492-623274.
7 **Bedford MES.** *Road Vehicles Day.* Contact Ted Jolliffe: 01234-327791.
7 **Cardiff MES.** *Steam-up & Family Day.* Contact Trevor Jenkins: 029-20755568.
7 **Great Western Soc.** (Didcot Railway Centre) *Steam & Railcar Day.* Contact Jeanette Howse: 01235-817200.
7 **Guildford MES.** *Disability Challenge.* Contact Dave Longhurst: 01428-605424.
7 **Kinver & West Midlands SME.** *Kinver Diesel Day.* Contact John Campbell: 01384-891244.
7 **Leighton Buzzard NG Rly.** *Model Railway Mania.* Enquiries: 01525-373888.
7 **Ottawa Valley Live Steamers.** *Steaming Day.* Contact John Bryant: 761-1109.
7 **Oxford (City of) SME.** *Running.* Contact Chris Kelland: 01235-770836.
7 **Reading SME.** *Running.* Contact Graham Bustin: 01189-615450.
7 **South Durham SME.** *Running Day.* Contact B. Owens: 01325-721503.
7 **Surrey SME.** *Families Day.* Contact John Cook: 020-8397-3932.
7 **West Riding SLS.** *Morris Minor Rally.* Contact Margery Bradley: 01977-685782.
7 **Woking MRS.** *Open Day.* Contact Ronald Dewar: 01932-343331.
7 **Worcester DME.** *Club Running Day.* Contact M. Lane: 01905-425972.

THE ESSENTIAL WORKSHOP LIBRARY

from NEXUS SPECIAL INTERESTS BOOKS

MODEL ENGINEERING BOOKS

Building Simple Model Steam Engines
Tubal Cain
[illegible]

Building Simple Model Steam Engines II
Tubal Cain
[illegible]

Model Engineering - A Foundation Course
Peter Wright
[illegible]

Model Engineers Handbook
Tubal Cain
[illegible]

The Model Locomotive from Scratch
B. Terry Aspin
[illegible]

Introducing Model Traction Engine Construction
John Haining
[illegible]

The Countryman's Steam Manual
John Haining
[illegible]

An Introduction to Robotics
Harprit Sandhu
[illegible]

The Amateur's Workshop
Ian Bradley
[illegible]

The Amateur's Lathe
L.H. Sparey
[illegible]

WORKSHOP PRACTICE SERIES

Hardening Tempering & Heat Treatment — WPS 1
Tubal Cain
[illegible]

Vertical Milling in the Home Workshop — WPS 2
Arnold Throp
[illegible]

Screwcutting in the Lathe — WPS 3
Martin Cleeve
[illegible]

Foundrywork for the Amateur — WPS 4
B. Terry Aspin
[illegible]

Milling Operations in the Lathe — WPS 5
Tubal Cain
[illegible]

Measuring & Marking Metals — WPS 6
Ivan Law
[illegible]

The Art of Welding — WPS 7
W.A. Vause
[illegible]

Sheet Metal Work — WPS 8
R.E. Wakeford
[illegible]

Soldering & Brazing — WPS 9
Tubal Cain
[illegible]

Saws & Sawing — WPS 10
Ian Bradley
[illegible]

Electroplating — WPS 11
J. Poyner
[illegible]

Drills, Taps & Dies — WPS 12
Tubal Cain
[illegible]

Making Small Workshop Tools — WPS 14
Stan Bray
[illegible]

Workholding in the Lathe — WPS 15
Tubal Cain
[illegible]

Electric Motors — WPS 16
Jim Cox
[illegible]

Gears & Gear Cutting — WPS 17
Ivan Law
[illegible]

Basic Benchwork — WPS 18
Les Oldridge
[illegible]

Spring Design & Manufacture — WPS 19
Tubal Cain
[illegible]

Metalwork & Machining Hints & Tips — WPS 20
Ian Bradley
[illegible]

Adhesives & Sealants — WPS 21
David Lammas
[illegible]

Workshop Electrics — WPS 22
Alex Weiss
[illegible]

Workshop Construction — WPS 23
Jim Forrest & Peter Jennings
[illegible]

Electric Motors in the Home Workshop — WPS 24
Jim Cox
[illegible]

The Backyard Foundry — WPS 25
B. Terry Aspin
[illegible]

Home Workshop Hints & Tips — WPS 26
Edited by Vic Smeed
[illegible]

Spindles — WPS 27
Harprit Sandhu
[illegible]

Simple Workshop Devices — WPS 28
Tubal Cain
[illegible]

CAD for Model Engineers — WPS 29
D.A.G. Brown
[illegible]

Workshop Materials — WPS 30
Alex Weiss
[illegible]

Useful Workshop Tools — WPS 31
Stan Bray
[illegible]

Unimat III Lathe Accessories — WPS 32
Bob Loader
[illegible]

Making Clocks — WPS 33
Stan Bray
[illegible]

Please add £1 p&p for single book orders and 50p for each additional book ordered.

Send payment with your name, address and telephone number to:
Nexus Customer Services, Nexus House, Azalea Drive, Swanley BR8 8HU.
Cheques made payable to Nexus Media Ltd. or phone 01322 616300.

MODEL ENGINEER

CLASSIFIED
Advertisements

Send to Model Engineer Classified Department, Nexus Special Interests,
Nexus House, Azalea Drive, Swanley, Kent, BR8 8HU. Tel: 01322 660070, Fax: (01322) 616319
All advertisements will be inserted in the first available issue. There are no reimbursements for cancellations.
All advertisements must be pre-paid.
The Business Advertisements (Disclosure) Order 1977 – Requires all advertisements by people who sell goods in the course of business to make that fact clear. Consequently all trade ads in *Model Engineer* carry this 'T' symbol

WORKSHOP EQUIPMENT

EVENSON ENGINEERING

Quality Machines and Tooling

Machine Sales

EX BRADFORD UNIVERSITY MACHINES

Colchester Master 6" x 36" Late fully Tooled £1500
Arboga Maskiner geared Head Pillar Drill 3MT £875
Raglan 5" x 20" Lathe Gear Box P/F Single Phase Fully Tooled £1400
Thommen Chip-Breaker Tool + Cutter Grinder £870
Colchester Chipmaster, taper Turning Rear Tool Post, Bed Stops Fully Tooled £1200
Arboga Geared Head Drill 3MT £850
Edwards 4ft X 16G Guillotine £550
Elliot 00 Mill 27" X 8" Table £1800
J+S 12-12 Hand opp cylindrical Grinder Single Phase £1800
J+S 540 Surface Grinder (Like New Condition) £3500
Elliot 4E Pedestal Drill 4 Morse Power Feeds £850
3 of Harrison L5 Lathes (All Good Condition) .... £1100-£1750
Harrison Vert Mill 30"-8" Table (Superb Conditions) £1800

All machines are of outstanding condition & come completely tooled
Too many machines to list, please phone for details

MILLING MACHINES

A.E. Jones Vert/Hort Swivel Head+Table Power Feed (Tom Senior Size) £1350
Bridgeport 42" 9" Variable Speedhead Digital Readout £2800
A & S horizontal mills .... from £500
Harrison horizontal mills .... from £700

LATHES

Boxford Cud Metric Cab/Stand PCF £875
2 Colchester Masters 6" 36" One with Clutch £1400
Harrison L6 Gearbox PCF Gap Piece Missing (Verty Tidy) £800
Colchester Bantham 2000 6" 30" Gap Bed Dual Dials £1850
Harrison M250 Fully Tooled £2300
Colchester Chipmaster Tooled Taper Turning Rear Tool Post (Verty Nice) £1450

MISCELLANEOUS

Jones & Shipman dig. form model AT new boxed £550
Bridgeport Slotting Head, excellent condition £800
Viceroy pedestal grinders, 2 off, ex cond (small & campact) £180
Leytool slotting machine, 3" stroke, small footprint, swivel head, rebuilt & painted £1175
LBridgeport milling head, 2 speed motor R8 power quill (fits most mills, ie Adcock & Shipley 1ES) £850
Eclipse magnetic chuck 19" x 12" £300
Flypresses .... from £50
Colchester Chipmaster lathe (breaking) £350
Harrison spares .... please phone
Swivel vertical head 4MT, make unknown but will fit Senior, A&S etc with modification £300
Collet chucks, box blocks, vices, angle plates, surface plates etc .... Please phone
Union Bench Drill £280
Student/Master Collet Chuck 2 of .... each £100
Student 18" Faceplate £95
Boxford 2MT Pillar Drill (Untidy) £80
Hort Pedestal Sander 15 Disc Ex Uni £350
Hydraulic Stacker Truck Ideal for Lifting Vices and Chucks 800 kg £350
Jones Shipman Bench Centre .... POA

WE ALSO PURCHASE QUALITY MACHINES & TOOLING • DELIVERY SERVICE AVAILABLE
PLEASE TELEPHONE BEFORE TRAVELLING – WEEKEND & EVENING VIEWING AND DELIVERY SERVICE

More machines always in stock.
Tel: 01274 544409 & 780040 Mobile 07050 272169
4 Duchy Crescent, Bradford, BD9 5NJ

HI-TEC 3-PHASE CONVERTERS

Speed Controls, Fwd & Rev Switches, 12 volt & 24 volt dc. to mains 230 volts ac full sine wave inverters. Static and Rotary Phase Converters 0.8 kW to 45 kW to run 3-phase 415 volt machinery from a Single Phase. We can also supply Transformers and Components.
Website: www.phaseconverters.co.uk

BOOST ELECTRICAL ENGINEERING
Tel: 01959 534073 Fax: 01959 532726

TOOLCO

The home of good quality used tools and machinery
www.toolco.co.uk
or send for full itemised stocklist.
Unit 4, Ebley Ind Park, Ebley, Stroud, Glos GL5 4SP
Important: Phone for opening times before travelling.
(Just 4 miles J13 M5 Motorway) Tel: 01452 770550
E.Mail: sales@toolco.co.uk Fax: 01452 770771

TRUE PHASE CONVERTERS

ESTABLISHED FOR 60 YEARS

- RUN THREE PHASE MACHINES FROM A SINGLE PHASE SUPPLY
- REVOLUTIONARY DESIGN
- OUT PERFORMS OTHER CONVERTORS
- MONEY BACK GUARANTEE

DANEBURY ELECTRIC LTD
PHONE, FAX OR EMAIL FOR COLOUR BROCHURE
email: truephasesales@daneburyelectric.co.uk
Tel: 01202 524888 or Fax: 01202 530940

THE PEATOL LATHE

£160 including 3 or 4 jaw chuck. Milling attachment and other accessories available. Centre height 2¼" distance between centres 9½". Full details send 2 x 2nd class stamps.
Peatol Machine Tools, M.E.W, 19 Knightlow Road, Harborne, Birmingham B17 8PS Price inc. VAT

ENGINEERS TOOL ROOM

The tool supplier for Professional and Model Engineers – Contact us for a Quotation
CUTTING TOOLS: HSS – COBALT – COATED
CHECK OUT OUR SPECIFICATIONS and PRICES BEFORE ORDERING YOUR MACHINES
Drills: metric, fractional.
Reaming: metric, fractional hand & machine.
Threading: taps, boxed sets, metric, imperial, unified, BA.
Dies: split & solid dies, die nuts, metric, imperial, unified, BA.
Milling: end mills, slot drills, horizontal cutters, slitting saws.
Turning: tungsten carbide tipped tools.
Workshop Machinery: lathes, milling machines
Part Exchange on some machine tools welcomed
Full Machining Service Available: Turning, Milling, Grinding, Wire & Spark Eroding, Tool & Mould Making.
262 PARK ROAD, CWMPARC, TREORCHY, MID GLAMORGAN CF42 6LE
Tel/Fax 01443 777167 Mobile 07770 988840
Web Site: www.engineerstoolroom.co.uk
Email: regpugh@aol.com

www.eternaltools.com

secure ordering online

DIAMOND WHEELS

All Shapes for all machines:
Quorn, Kennet, Bench Grinders
Prices from: £34.95 inc VAT

"Bring life to old carbide tools"
Eternal
tel/fax: 020 8880 0974

R.A. ATKINS

MYFORD ML7 SUPER 7B, as new	£2,650
MYFORD SUPER 7 LATHES, choice from	£850
MYFORD ML7 LATHES, from	£500
MYFORD ML10 LATHES, choice from	£550
BOXFORD AUD 22" LATHE	£850
SMART & BROWN SABEL 4"×18" LATHE, equipped	£675
SHERLINE LATHE SHERLINE ILL, each	£300
BCA BENCH JIG BORER	£600
FOBCO UNIV BENCH DRILL, COORD TABLE	£325
WARCO MINOR MILL/DRILL, p/table	£595
PROGRESS ½ PILLAR DRILL, choice	£125
HARRISON HORIZ MILL, vert head	£675
BOXFORD VERT MILLING SLIDE & VICE	£200
MYFORD DIVIDING HEAD, 2 plates unused	£450
MYFORD VERT SWIVEL SLIDE	£110
DOWNHAM MINI BORER, well equipped	£1,150

100'S MODEL ENGINEER TOOLS & EQUIPMENT – WE URGENTLY REQUIRE TO BUY WORKSHOPS
HUNTS HILL HOUSE, HUNTS HILL, NORMANDY, GUILDFORD, SURREY GU3 2AH
Tel: (01483) 811146 Fax 811243

MODEL ENGINEER 1940–1998

E in M 1979–1998, Engineering Books.
Send your requirements to:
The Tool Box, Colyton, Devon EX24 6LU
Tel/Fax: 01297 552868

COWELLS SMALL MACHINE TOOLS LTD

Tendring Road, Little Bentley, Colchester, Essex, CO7 8SH
Tel/Fax +44 (0) 1206 251792 E-mail sales@cowells.com
MANUFACTURERS OF PRECISION SCREW CUTTING LATHES, 8MM HOROLOGICAL COLLET LATHES AND MILLING MACHINES.
www.cowells.com

BLACK-IT!
Easy to use Chemical Blacking for Iron and Steel
Produces a professional satin black finish in less than 15 minutes.
Standard Kit (4 x 500ml) ideal for modelmakers **£27.99**
Large Kit (4 x 2 litres) **£64.99** – **Black-it!** Kit for brass **£15.99**
All prices inc. VAT & next day delivery.
Pixel-Plus, Bryncroes, Pwllheli, Gwynedd LL53 8EH
Tel/Fax. 01758 730356 Access, Visa & Switch accepted
For more details, visit our web site at www.black-it.co.uk

COMPLETE HOME WORKSHOPS
AND MODELS PURCHASED. DISTANCE NO OBJECT

SCOOP PURCHASE OF EX COLLEGE MACHINES
Harrison M300 with DRO & Colchester Master from £2,250
BBC MACHINE TOOLS LTD.
Carluke, Strathclyde, Scotland
Tel: 01555 751121 Fax: 01555 751682

ATTENTION MODEL MAKERS
NEW ARRIVAL – Harrison Horizontal Mill with Vertical Head, PowerFeed to Table, Arbor, Autolock Chuck, Machine Vice, change Gears and Guards.
B.B.C. Machine Tools Ltd.,
Carluke, Strathclyde, Scotland.
Tel: 01555 751121 Fax: 01555 751682

TAPS & DIES
Also: Drills, Reamers, Endmills, Slotdrills, Stubdrills, Toolbits, Slitting Saws, Cutters Side&Face, etc - Send SAE Free Pricelist

Every size manufactured/stocked - Sold 25 years -
EXCELLENT 1st QUALITY HQSS TAPS & DIES
*Fax/phone Enquiry/Orders - **SAME DAY POST***
BSW,BSF, UNC,UNF, Metric, BA, Cycle, BSP, ME
Individually or in Wooden & Metal Boxed Sets
Our brands: 'T&D-HQS' & 'ZN' & 'TOTEM'
DISTRIBUTORS REQUIRED
THE TAP & DIE CO.
445 West Green Road, London N15 3PL.
Tel: 020 8888 1865 Fax: 020 8888 4613

TO ADVERTISE HERE CALL 01322 660070

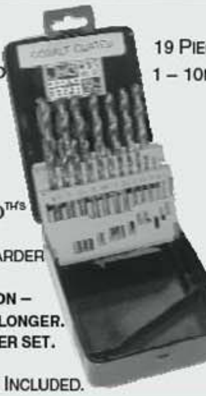
SOCIETE-GENOVESE JIG BORER TABLE
15" x 20", model MP3K with DRO and tooling.
Delivery available. £1400 plus VAT
01789 778174 / 07711 034240

PICADOR
Plummer Blocks, Handwheels, Pulleys, Flexible Couplings, 'Lubronze' Bushes and other Transmission Products. Switches, Microswitches, Synchronous Motors, Transformers, Vices, Chucks, Lathe Tools and Centres, Micrometers and more.
FREE CATALOGUE AND LISTS
TOWNLEY TIMES
Harehill, Todmorden, Lancs OL14 5JY
Tel: 01706 814931 Fax: 01706 812382

HEAR AT LAST, THE BIG SCREEN 6" LCD DIGITAL CALIPER

HARDENED STAINLESS STEEL + A.B.S.
DUAL RANGE – METRIC/ IMPERIAL + CONVERSION,
RESOLUTION 0.01MM / 0.005 INCH.
ACCURACY ± 0.02MM 0.001 INCH (<100MM)
RS232 INTERFACE FOR COMPUTER READ OUT.
MEASURES INSIDE, OUTSIDE & DEPTH.
COMES WITH A CARRY CASE & A SPARE BATTERY.
VAT & POST + PACKING INCLUDED.
STILL ONLY £44.95
FROM: JBG, 226 WHITEHORSE ROAD, CROYDON, SURREY **CRO 2LB**
TEL: 0208 665 1041 **FAX:** 0208 684 2523
E-MAIL enquiries@jbgroves.freeserve.co.uk

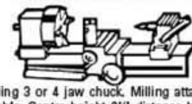
COBALT NITRIDE COATED DRILLS



H.S.S.
FULLY GROUND
SPLIT POINT
DRILL SET.
19 PIECE
1 – 10MM
THIS COATING IS ONLY A FEW 1000TH'S OF A MILLIMETRE. THICK – YET IS HARDER THAN STEEL!
REDUCES FRICTION – LASTS LONGER.
ONLY £19.95 PER SET.
VAT & POST + PACKING INCLUDED.

MODEL ENGINEERING SERVICES
Machining ★ Fabrications
Copper Boilers ★ Welding etc.
Eddie Ions 01670 855124

THE PEATOL LATHE



£160 including 3 or 4 jaw chuck. Milling attachment and other accessories available. Centre height 2¼" distance between centres 9½". Full details send 2 x 2nd class stamps.
Peatol Machine Tools, M.E.W, 19 Knightlow Road, Harborne, Birmingham B17 8PS **Price inc. VAT**

WANTED
TO PURCHASE
($3^1/_2$" or 5" Gauge)
LNER "A3" LOCOMOTIVE
Fully Detailed to Exhibition Standards. Coal Rail Tender Type

Please Contact:
Ian Earp-Smith
The Smithy, Thoroton, Nottingham NG13 9DS
Tel: 01949 850323

ROYAL CHESTER 3" scale Alchin Traction Engine, now at advanced stage, engineering, machining, gear cutting, fabrication completed, awaits your boiler £2,000.

GREENLY & STEEL 1" scale Traction Engine, show piece model, fine detail, fitted working generator, lovely to look at, drawings included £1,650.

MODEL DIESEL ENGINE 3.5" gauge, 12 volt electrics, 2 speed, forward and reverse, professionally built and painted, with carry/storage box, new track and sleepers £475.

DORIS 3.5" gauge, 4-6-0, rolling chassis with smoke box, fitted brass cylinders, tender parts and body, many spare castings, related parts complete with spare chassis, drawings £650 all inclusive.

CLAYTON UNDER TYPE STEAM WAGON rolling chassis with leaf springs, steering connected, copper boiler completed, fitted final chain drive diff, all gun metal castings, boiler fittings, materials, drawings £650.

Tel: 01483 274464. Delivery can be arranged - free within the UK.

Britannia 71/4" made by Winson.
Kits 1 to 14 including the boiler – costing price 13.296 £
Model Works will normally supply soon the kits 15 to 18 (4 kits x 52.3 £)
Please write or call Patrice Libiez
32 avenue Emile Vandervelde
B-1200 Belgium.
Phone 00-32-2-779.50.25 (evenings)

WARCO WTM 500 lathe/milling machine, QC toolpost, 2 chucks, cabinet stand, clamping kit, 1 year old. £899 ono. Tel: 01379 641436 (Diss).

MODEL ENGINEER 82 copies 1977, 1984 to date, not consecutive £15 plus carriage. Model Engineers Workshop. Issues 41-51 inc. and 57-80 inc. £10 plus carriage. Tel: 01322 330556 (NW Kent).

BOXFORD LATHE, Model C, 5" swing 34" bed, power feed, single phase, screw cutting, 3 & 4 jaw chucks extras £750 ono. Tel: 07855 103733.

TO ADVERTISE CALL 01322 660070

NEW 7" x 40" LATHE 3 phase no 3 jaw list £6000. Any offers phone Alf on 01923 776136. Similar to Student. (Rickmansworth).

THREE & HALF INCH "GREEN KING" FRAMES bogie wheels done "Western" boiler drawings articles £620. O.V.N.O. Tel: 01422 256969 (Halifax).

SAND BLAST ATTACHMENT (needs good compressor) cost £250 accept £70 plus carriage. All pipes G.W.O. Tel: 01422 256969 (Halifax).

WANTED for $3^1/_2$"G Duchess drawings B7 H. Clarkson of York. Purchased. Borrowed etc. Any help greatly appreciated. Tel: 01626 353533 (Devon).

DUCHESS, BRITANNIA, CASTLE or similar wanted $3^1/_2$" - 5"G must be well built, detailed, consider unfinished project. Tel: 01626 353533 (Devon).

MODELS & MATERIALS

SERVICES

TONY GREEN
Steam Models

Stationery, Wheeled and Marine Models – Mamod, Wilesco, Unit Steam Engines and MSS. Spares for most models including Hornby Rocket. Secondhand, Restored and Collectors Models sometimes available. MSS Loco and Spares. Steam and R.C. Boat Kits – Midwest, Artesania Latina and Mantua Range.

SEE US AT MAJOR EXHIBITIONS AND RALLIES.

Visit our web site: **www.tgsm.co.uk**

or send four first class stamps for full catalogue to:

19 Station Road, Thorpe on the Hill, Lincoln LN6 9BS

Tel: 01522 681989 Fax: 01522 683497

Email: tgsml@btinternet.com

MAJOR CREDIT CARDS ACCEPTED

5" GAUGE POLLY LOCOMOTIVES

turning your dreams into reality . . .

If you have ever dreamed of building and driving your own steam engine then the range of POLLY LOCOMOTIVES is meant for you!

Polly Locomotives are freelance steam locomotives designed in a 19th Century style. The kits are manufactured to a high standard and incorporate many traditional features that appeal to all enthusiasts from beginner to the committed club member, and can be driven for pleasure in the garden or club track. Depending on the model, they will pull six to eight people providing pleasure for family and friends.

They are available in five different models:–
- Polly I   0-4-0 Side Tank Locomotive (approx. 6 person capacity)
- Polly II   0-4-0 Tender Locomotive (approx. 6 person capacity)
- Polly III   0-4-0 Side Tank Locomotive (approx. 8 person capacity)
- Polly IV   0-6-0 Tender Locomotive (approx. 8 person capacity)
- Passenger Driving Truck

The complete locomotives are supplied in kit form with assembly drawings and a full set of instructions. They are straightforward to build, but we will always be pleased to help with queries.

FOR FURTHER INFO ON THE POLLY MODELS RANGE

TEL: 0115 8491560 (Mobile: 07790 116339)

189a DERBY ROAD, LONG EATON, NOTTINGHAM NG10 4LQ.

PRATT & BURNED 4 jaw independent chuck 4" bin. For ML7. Unused. £50. Tel: 01276 471659 (Lightwater, Surrey).

ELLIOT 10" stroke shaping machine. Good condition £100.00 ono. Tel: 020 8904 1344 (Wembley).

5"G TERRIER EVANS Boxhill design wel detailed BR lined black reliable steamer, engineer built. £3250.00. Tel: 01189 326286 (Hants).

"SPENCER" part built, all castings and parts including boiler ICIT to complete, no drawings. Offers 01566 774884 (Launceston).

COLCHESTER CHIPMASTER 5" x20" good condition 3 jaw chuck face place quick change tool post £850 o.n.o. tel: 01243 375148 (Emsworth).

WANTED Tether car parts, wheels, tyres, engines, coils, plugs, anything considered. Please telephone: 01481 726168, engineer@internet.guernsey.gg.

INTERESTING OBJECTS from workshop clearout. Antique dynamo, boiler, motors, etc. Stamped envelope for list. Wallace, Nappleton, Kempsey, Worcestershire. tel: 01905 820341.

MAGNETIC CHUCK Fimax 12" x 8". Full width poles. Very good condition. £250. Tel: 01425 470014 (Ringwood).

3$^1/_2$" ROB ROY 0-6-0 TANK LOCO professional boiler with current certificate finished but unpainted £800. Tel: 01245 401326 (Essex).

I D STEAM SERVICES. Locos to 7$^1/_4$" gauge traction engines to 4" to order. Tel: 01553 768578 / 07799 804671 (Norfolk).

MYFORD VERTICAL swivelling slide £85 rear tool post £20. Union bench drill £185. tel: 01932 229725 (Surrey).

CHESTER LATHE / MILL / DRILL. New motor, stand and chuck. Usual additional tooling. £550 o.n.o. Tel: 01268 775 184 (Essex).

5" G.W.R. 7200 class 2-8-2 tank loco 2 years old, excellent quality and condition boiler certificate £6500. Tel: 01189 341038 / 07887 955679 (Berks).

WANTED Tether car parts, wheels, tyres, engines, spark ignition parts coils, condensers, anything considered. Tel: 01481 726168 after 6pm.

TOM SENIOR M1 Milling machine, horiz only, 25" x 6" table, power feed, s/p. 3MT spindle, IMP graduations, private sale. £625. Tel: 01945 780767 (West Norfolk).

EMCOMATT LATHE with vertical milling attachment on stand 3 & 4 jaw chucks collets steadies fully tooled, excellent condition £1000. Tel: 01922 413162 (West Midlands).

5 INCH CENTRE DIVIDING HEAD. With one 15-47 index plate. No tailstock. £65. Tel: 01245 224698 (Essex).

600 TAPS dies B.A. metric whit. B.S.F. 40, 32, 26 BSP. Good condition in cabinet £250. Tel: 01253 354478 (Blackpool).

PART BUILT 5" A3 OR A4 wanted by private collector, model engineer. Tel: 07979 248776 (Worcs).

5"G & 7$^1/_4$"G TRACK ALLOY RAIL close to scale sleepering large quantity 5"g 350ft in 7$^1/_4$"g one point mainly good condition. Tel: 01749 840210 (Radstock).

EMCO VERTICAL MILLING drilling attachment with motor, coordinate table, keyless drill chuck, collet chuck. £600.00. tel: 01282 616052 (Lancashire).

THETFORD TOWN SHOWMANS ENGINE DRAWINGS unused £45. Lickham Hall 3$^1/_2$"G drawings unused £25. Tel: 01254 725505 (Lancs).

OXY ACETYLENE GEAR, gauges, hoses, torch, key. £50. Please telephone: 02380 262941 (Hampshire).

MODEL ENGINEER

LINEAGE/SEMI DISPLAY COUPON (Model Engineer) Advertisement Dept.
Nexus Special Interests, Nexus Media, Azalea Drive, Swanley, Kent, BR8 8HU.
No reimbursements for cancellations.

FOR ENTHUSIASTS BY ENTHUSIASTS NEXUS

PLEASE TICK ONE BOX ONLY

☐ WORKSHOP EQUIPMENT ☐ MODELS & MATERIALS ☐ BOOKS & PUBLICATIONS ☐ SERVICES ☐ GENERAL

PRIVATE SALE/TRADE SALE (DELETE NON-APPLICABLE)

TEL. NUMBER					

ALL ADVERTISEMENTS MUST BE PRE-PAID. NO REIMBURSEMENTS FOR CANCELLATIONS.

I enclose my Cheque/Postal Order* for £ .... for .... insertions, made payable to Nexus Media Ltd.

(*Delete as necessary) or Please debit my Mastercard/Barclaycard No. Expiry Date

£ .... for .... insertions.

Name ....

Address ....

....

.... Post Code ....

Daytimes Tel. No ....

email .... @ ....

Signature .... Date ....

PRICE GUIDE – Tick one box

18 words or less
FREE!! (private sales only)

18-25 words, in colour
only £10

26 words +
in colour £15

Private ad, in box, full colour, endless word count – 2.5 x 1 £25
3 x 1 £30
3.5 x 1 £35

CHESTER UK LTD
Clwyd Close
Hawarden Ind Estate
Hawarden
Nr. Chester
Flintshire
CH5 3PZ
CHESTER U.K.
LIMITED
INTRODUCING THE NEW DB RANGE OF LATHE'S
From £880
Mini - Multi
Lathe £295
Mill & Lathe £395
Price include VAT & Delivery UK
Conquest Lathe
NOW INCLUDES TEST CERTIFICATE
£395
Price include VAT & Delivery UK
920 Lathe Deluxe
STANDARD EQUIPMENT
£850
Price include VAT & Delivery UK
Model B-Super
STANDARD EQUIPMENT
£725
Price include VAT & Delivery UK
Comet Lathe
£1155
Price include VAT & Delivery UK
Centurion
STANDARD EQUIPMENT
£1395
Price include VAT & Delivery UK
Craftsman Precision Belt Drive
STANDARD EQUIPMENT
£1725
Price include VAT & Delivery UK
Cub 620/630
STANDARD EQUIPMENT
From £2460
including VAT
Call for our latest Tool Catalogue 01244 - 531631
Visit our Website for more Information www.chesteruk.net
E-mail us at Sales@chesteruk.net