MODEL ENGINEER

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at
EAST HERTS
MINIATURE
RAILWAY
on
13 OCTOBER

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ENTRIES
INVITED

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SEE INSIDE
FOR DETAILS

ATMOSPHERIC ENGINE

Working model of Newcomen's pump

RULE STAND

Useful workshop accessory

9 770026 732094 52

THE MODEL ENGINEER EXHIBITION

29th December 2001 - 1st January 2002

AT SANDOWN PARK EXHIBITION CENTRE, ESHER, SURREY

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On the cover ...

Chris Leggo in California, USA set out to build a working miniature replica of Newcomen's atmospheric engine of 1712 which was designed and used to pump water from the mines of the day. Much of the challenge was in getting the model to operate for more than a few strokes, and this short series which begins on page 114 in this issue describes how such an atmospheric engine works, the construction of the model, and the subsequent development work necessary to keep it running.
(Photograph by Chris Leggo)

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SMOKE RINGS
With the Editors

S. T. A. Jackson

The *In Memoriam* panel for *M.E.* 4151, 27 July 2001 included reference to Stewart Jackson of Melton Mowbray DMES. Since publication of that issue, Mr. Jackson has been in contact to assure us that he is both alive and well.

As one of the Proprietors of Arrand Engineering, regular advertisers in this magazine and suppliers of excellent tooling, etc. Mr. Jackson is naturally concerned that the premature announcement of his death would have serious business implications.

We apologise to Mr. Jackson for the regrettable error and hope that this announcement will assure readers that Arrand Engineering are still very much in business and keen to supply their customers' requirements.

Model engineering courses

We are very pleased to publicise the following model engineering courses and thank the readers who have brought them to our attention.

Engineering Manufacture for Model Engineers - NVQ Level 2 (Course No. 20289C) at Chelmsford College, Moulsham Street, Chelmsford, Essex CM2 0JQ. Contact the Course Information Centre (01245-265611) or tutor Steve Fewell (01245-265611 Ext 5468). The course will run for 36 weeks on Mondays 6-9pm commencing 17 September 2001.

Model Engineering at Reid Kerr College Renfrew Road, Paisley, Strathclyde PA3 4PR. Contact Eileen Mooney (0800-052-7343). The course will run on Mondays 6-9pm commencing September 2001.

Model Engineering at The Leys School Cambridge CB2 2AD. Contact Edward George (01223-508936). The course will run for three 10 week terms on Wednesdays 7-9pm

Model Engineering at Southgate College The High Street, Southgate, London N14 6BS. Contact the College (0208-982-5050). The evening course will run on Tuesdays 7-9.30pm commencing 2 October; two daytime courses are also scheduled, one on Wednesdays 9.30am-12 noon commencing 3 October and the other on Saturdays 9.30am-12 noon commencing 6 October.

If you are responsible for a similar course or have the necessary information and care to let us know about it, we will be happy to bring it to readers' attention in this column. There is no charge for this service, we are pleased to have the opportunity to support and promote those prepared to give their time for the benefit of fellow enthusiasts.

OMLEC

I have just returned from a most enjoyable weekend spent at Stoke Park with the Guildford MES members who organised this year's replacement event for IMLEC. Readers will recall that IMLEC was cancelled principally due to foot and mouth disease which kept members of Bristol SMEE away from their track in Ashton Court for many weeks, thereby preventing them from preparing the site for the event.

OMLEC, an 'Open' Model Locomotive Efficiency Competition, was run on the general lines of IMLEC but with less formality and few restrictions. This ensured that all competitors and visitors had a very good time. The first runs on Saturday set off a few minutes after 9am while, as if to make up, Sunday's first competitor took to the track a few minutes before 9am. There were a few last minute changes to an original field of 28 entrants and in the event, results were recorded for 26 locomotives and drivers. Four 3½in. gauge locomotives competed during the weekend, the rest were 5in. gauge.

The weather was kind. Saturday was mostly sunny with a pleasant breeze to temper the warmth of the sun and, while mainly overcast, Sunday remained dry for all but a couple of brief, light showers. It was particularly pleasing to note how those present gathered into groups to discuss matters of mutual interest throughout the event while the action took place on the elevated track. Welcome refreshments were available to sustain all and sundry, and an ice cream vendor did a brisk trade from his van when he arrived on site on Sunday afternoon.

I plan to present a report for these pages soon, but since many of the locomotives and drivers are regular IMLEC competitors, I have no intention of making it a full blooded blow-by-blow account. Suffice it to say here that Dave Mayall took the award for the Best 3½in. Gauge Locomotive with his LMS 4F following a very fine run for which he turned in an efficiency figure of just over 0.75%. Len Steel was placed third overall following a spirited run with his 5in. gauge Britannia *Coeur de Lion* and an efficiency just short of 2%. Geoff Moore had an excellent run with his 5in. LNER B1 *Impala* and returned an efficiency of nearly 2.5% to take second place overall while Lionel Flippance dominated the event with his 5in. gauge 2-8-2 *George Eveniss* and an efficiency of over 3.5%.

Trophies and prizes were presented at the end of the event and when winner Lionel Flippance received a generous voucher handsomely donated by Bruce Davey of Bruce Engineering he immediately announced that its value should be distributed between the winners. This gesture typified the friendly atmosphere of the event.

Thanks are due to the team of Guildford MES members who worked hard to prepare, manage and clear up after the competition, and to the GMES Council of Management who sanctioned it. We are also most grateful to our friends in the trade who supported the weekend and, of course to the competitors without whom there would have been no contest. A jolly good time was had by all, to such an extent that it remains to be seen whether this OMLEC will turn out to be the first in a series.

New bogies for historic tram

A £500 grant from the national Transport Trust will help Milton Keynes Museum to build new bogies for the No. 2 tramcar of the historic Wolverton & Stony Stratford Tram as the final stage of a three year restoration project.

The cheque was handed to Ray Bellchambers, President of the Museum, Stan King, restoration project leader, and Pat Seymour, Mayor of Milton Keynes by John Butler and John Robinson of The Transport Trust at a special ceremony at the Museum in June.

"This grant will help us complete the restoration of this important exhibit." said Bill Griffiths, Museum Director at Milton Keynes Museum. *"The tramcar has local and national significance and will attract interest from far and wide."*

The Wolverton & Stony Stratford Tram ran between the two towns from 1872 and 1926 and was the last steam hauled tram in the UK. The tramcars are believed to be the largest ever built in this country.

The No. 2 tramcar has undergone a major restoration in the last three years. A team of Museum volunteers led by Stan King, a retired Wolverton Works carriage maker, has rebuilt the 44ft (13.5m) car to its original condition using traditional materials, tools and skills.

The construction of the bogies for the tramcar will complete the restoration project. The Museum will display the completed tramcar on original track inside its Hall of Transport where it will be one of the major features.

The tramcar was spilt into two sections when it was taken out of service in 1926. The separate sections were used as garden sheds in local villages before being salvaged by the Museum some years ago. The first stage of the restoration involved joining the two sections of the lower deck together. This was followed by the construction of a completely new upper deck using original plans supplied by the National Railway Museum in York.

The Transport Trust is a national charity dedicated to preserving Britain's transport heritage. It supports museums and other organisations by providing financial assistance and advice.

Milton Keynes Museum is dedicated to the story of the Milton Keynes area from 1800 to the present day. Its artefacts and displays illustrate the lives of the people and the social, domestic, agricultural and industrial development of the area.

The Museum has created a special website **www.mkheritage.co.uk/mkm** about the tram as part of the *Jewels of Milton Keynes* project. Additional information about the Museum can be found at **www.mkmuseum.org.uk**

Free Greenweld catalogue

The name Greenweld is likely to be well known to those readers whose projects include electrical or electronic elements. For those to whom the name is as yet unfamiliar, this company produces a catalogue which is distributed free of charge to anyone requesting a copy

Timothy Knight, Director, observes *"We receive lots of calls and letters from our customers telling us just how much they enjoy receiving our catalogue ... our great prices on bargain items are a secret that everyone ought to know about!"*

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Readers are welcome to apply for the latest free Greenweld catalogue by mail to PO Box 144, Hoddesdon EN11 0ZG, by 'phone to 01277-811042, by fax to 01277-812419, by e-mail to **bargains@greenweld.co.uk** or via their website at **www.greenweld.co.uk**

POST BAG


Mr Rouse's 7¼in. gauge 08 shunter awaits suitable decals.

Malaise

SIRS, - On the weekend of 1/2 June Leeds SMEE had the pleasure of hosting the 19th Don Young Designs Rally. Due to the problems recently encountered by Reeves, main sponsors of the rally in the past, at one time there had been some doubt about proceeding with the event. However, we decided to go ahead and on the day all was ready; the weather was good, the track site had been groomed to perfection, the track had been tuned and the new locomotive unloading table had been commissioned awaiting its first duty.

Saturday morning, 9.30 and the first visitors arrived. These were Mr. Penney from Chesterfield with his superb LMS 2-6-0 Crab to Don's *E. S. Cox* design and John Richardson from Brighouse with Mr Rayner and his Aspinall 0-6-0; and we had only just got the kettle on! We were soon ready for the rush. What rush? While we waited, we offloaded our own DYD models: my A4 Pacific and Arthur Bellamy's Hunslet. Bill Holland had his superb A3 and his Director 4-4-0, but where were the rest of the visitors?

The site at Eggborough is in the grounds of the British Energy power station and is ideal for holding rallies, There is plenty of space for car parking and for caravans and a licensed club at hand serves good food at reasonable prices together with a wide choice of beverages (intoxicating and otherwise). The motorway network is nearby and the site is close to plenty of local amenities (York railway museum for example) The visitors were soon in steam and circulating the track, to be joined in due course by our own engines.

Sunday saw young George Winsall arrive together with his dad Glyn and their Hunslet *Holy War,* which made a friend for Arthur Bellamy's Hunslet which he has called *Chatterbox, "In honour of the wife"* he says. Has Glyn ever missed a DYD rally? Then came Mr. Cottrell from Chester with his superb Aspinall 0-6-0. (Sorry about the formality but my memory for names is shocking and I only have the signing-in record to fall back on.) This kept up the average of visiting engines to two for each day.

We had quite a lot of spectators but that was the sum total of DYD locomotives on the track.

Only one part-built example was put on our display stand, this was Alistair Bootland's N2 chassis to Don's *Barnett* design. Don would have been disappointed at the poor turn out but not with the quality of the models or with their performance on the track. Even my A4 ran faultlessly after I had cured a problem with the bogie side control, which had caused a couple of disconcerting derailments on the Saturday.

Hugh Mothersole, who took over Don's designs shortly before Don's death in 1994 was a welcome visitor and now that the business has a new start, it was good to have Reeves in attendance. We wish them every success in their efforts but I am sure the amount of business they did on the day would hardly cover the lunch bill let alone the cost of the diesel to be with us. Still, they showed the flag and gave us some wonderful support.

On the Wednesday evening after the event, at our regular Natter and Noggin when we usually put the world to rights, we held a bit of an inquest on the poor response and decided that our advertising had probably been insufficient although some thought it a further sign of a general malaise in the hobby.

What can you do?

Tony Wall
Leeds SMEE

Cautious

SIRS, - Keith Wilson has started a hare with his comments on global warming, so let's give chase.

His figure of 3.5% for man-made carbon dioxide emission is probably right (I haven't checked) but he misses the point that natural emission adds nothing to the cycle. A cow breathes out CO_2 made from carbon in the grass she ate yesterday, which the grass fixed from the CO_2 in the atmosphere the day before. Similarly, volcanism is cyclic since most volcanoes occur over subduction zones and get their carbon from rock in which the carbon has been fixed by biological action. In each case, the rate of release is balanced by the rate of fixing. Net result: nil.

Equally, fossil fuel is the result of a natural process, of course, but the point is that the release of CO_2 resulting from Man's activity is far faster than anything that occurs in nature, and the results cannot be foreseen.

It pays to be cautious, doesn't it?

Roger Plenty
Gloucestershire.

Ladder safety

SIRS, - I recently borrowed an extension ladder from a friend to reach and clean out the gutters of my house, and to do some painting.

Having finished, I took the ladders back and on entering my neighbour's garden accidentally bumped a tree stump with the bracket which holds the two ladders in the extended position. The bracket snapped off like a rotten carrot.

On examination, we discovered that the while the bracket itself was sound, the 5mm bolt was corroded down to about 1.5mm diameter and the two rivets had become weak and powdery. We replaced the two rivets and the bolts with new bolts throughout and the extending ladder is now better than when it was new.

It is as well that the failure happened when it did and not while I was using the ladders, or I would probably not be writing this warning. My advice is to thoroughly check all fittings before using ladders, even if they look to be in good condition.

Eric Nussey
Lancashire.

Scottie dog

SIRS, - I have been building a 7¼in. gauge 08 shunter for about ten years now and am nearing completion as revealed by the accompanying photograph, but I can't find decals for the side like the British Rail sign or the Scottie dog as in the Scottish region.

Can anyone please advise me as to where I might be able to obtain such items—they seem to be rather hard to come by.

Bill Rouse
Midlothian.

Britannia springing

SIRS, - In American terms, I live just down the road from Nick Kendall (*Postbag, M.E.* 4147, 1 June 2001); it's probably a 15 hour drive, but at least we share a hobby that brings us close together.

I have built three steam locomotives of my own, all with copper boilers, and I've rebuilt a 7¼in. gauge 4-cylinder King. At the moment I am involved in building a 7¼in. gauge Duchess and a 7¼in. gauge Princess, both of which are fitted with leaf springs. I think the way to tackle the springs is to approximate the weight on each driving axle and the bogies and pony truck.

I started by considering the weight on each driving wheel to be approximately 100lb. You may think this a bit high, but I intend to lag the boiler with lead, 3/16in. or 1/8in. thick, whatever is available. This will give the engine more adhesive weight where it's needed and the springs that have been made will readily accept the extra weight and prevent the wheels from bouncing. If your Britannia were to be lagged with, say 1/8in. thick lead and then the normal brass cladding put over the top, no-one would ever know the difference!

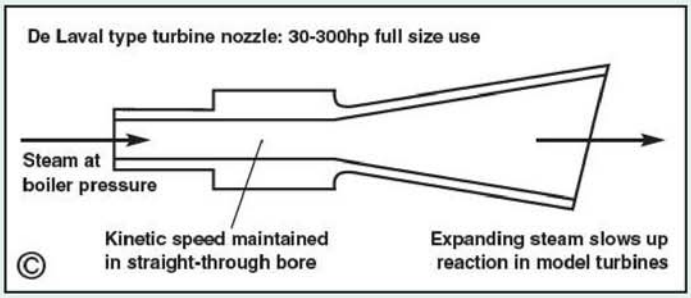
The way I went about testing my springs was to make a temporary spring consisting of 12 leaves using the 3/4in. wide x 1/16in. black steel bands used to bind most large crates nowadays. You can either drill the centre hole with a tipped masonry drill or punch it out if you have a little die made. To curve the material slightly, I bound a length of the strip into a 10in. diameter circle and left it for a month. When uncoiled, the nice curved shape was just right. I cut it into lengths using a guillotine and then set it on a vice with a dial type weight scale (as commonly found in supermarkets) suspended by the wires, and added weights to see how the springs responded. Too much deflection indicated that the spring was too soft and required another leaf or an increased width. The opposite also applied, of course.

When the approximate weight on each spring has been set—on a Britannia I'm thinking the locomotive would weigh about 150lb., which would increase to about 180lb. with lead cladding around the boiler, I would apportion it as follows: the smoke box and the front bogie, say 12-15lb.; the six drivers about 26.6lb. each with about 11lb. on the trailing truck. So, if your scales register about 27lb. and your spring deflection looks about right, then you have it.

Matt Jeffery
Pennsylvania, USA.

Satisfied customer

SIRS, - Having become used to the all-too-often poor standard of service which exists in many areas of the retail trade these days, it gives me pleasure to be able to record what I consider to be an outstanding



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Don Francis
West Yorkshire.

Turbine locomotives

SIRS, - With reference to Brian Holmes-Baker's letter (*Postbag, M.E.* 4148, 15 June 2001), three locomotives were tried in service by BR; No. 8000 was supplied by Brown Boveri from Switzerland in 1950 and No. 18100 by Metropolitan Vickers, Manchester in 1951. Both were the result of an initiative by the GWR in 1946. Each was painted black and looked similar to a Co-Co diesel locomotive.

The English Electric Company, Newton-le-Willows, built the third locomotive as a speculative venture in 1954. This was No. GT3 with a 4-6-0 wheel arrangement plus tender. It was painted brown and ran several thousand miles on the London Midland Region, particularly between Crewe and Carlisle as well as being tested at the Locomotive Testing Station at Rugby.

All suffered from poor fuel efficiency, particularly on other than full power which was needed only intermittently on BR.

No. 18000 passed to the BR Research Department and then into Europe (Austria I think) for electrical test purposes; it has since returned to the UK with the intention of restoration.

No. 18100 was converted into BR's first 25kv electric locomotive in preparation for the WCML electrification, and later cut up.

Reverse mechanism problems with GT3 were never resolved and the locomotive was returned to the English Electric Company where I saw it in store in the late 50s. It was subsequently broken up.

Mike Johns
Somerset.

Model turbines

SIRS, - I was concerned to read that Martin Evans has been unwell and is stepping down from his long and impressive service to our hobby with special regard to locomotive design and construction. I hope he enjoys a good recovery and continues to make his contributions as a consultant on technical matters relating to the steam locomotive.

In the matter of locomotive design and construction, Mr. Evans took over from Curly Lawrence (LBSC) who wrote for over forty years and made possible the successful construction of passenger hauling model locomotives which ordinary model engineers could build in their own workshops.

I have been particularly pleased to see that articles are appearing on both model gas and steam turbines—they are long overdue! The main trouble with turbines is the very high speed necessary before any real power is developed. This can and does create problems with lubrication, bearings, reduction gearing and not least, the right materials and how they are to be worked in the model engineer's workshop with limited equipment.

In my early days, I worked with gas turbines used in aircraft soon after Sir Frank Whittle's successful jet was developed. They all had single stage compressors, as is the case today with model engines developed by Kurt Schrekling and Thomas Camps. The single stage centrifugal compressor is not effective at 20,000rpm in model engines, hence the need for at least 60,000rpm to produce any real power. Using the air turbine as a blower for a final drive turbine on a model locomotive may seem attractive but the fuel consumption and the viability of long periods of running on club tracks would have to be assessed if the fuel consumption of model aircraft gas turbines is anything to go by.

The reason that the gas turbine electric locomotive built in the 1950s by Brown Boveri did not have any further development for regular use was the fuel consumption which was three times as high as a diesel engine doing the same job. All gas turbines are thirsty machines, that's one of their drawbacks. The truth is that we are really only at the beginning of the regular use of steam and gas turbines for model engineering purposes.

The following information on model turbine steam jets is based on some 60 years of experience making them. It has been known since the turn of the century that a straight-through bore jet is better than an expansion jet. This is because the steam expands too quickly on a model jet of this type, slowing the reaction and reducing the power output. The high speed steam isn't powerful enough to push the expanding steam out of the jet without a considerable loss of turbine speed and power output.

The weight of the steam in the expanding jet is the direct cause of the slowing up of the reaction. Any model engineers who do not agree should experiment and see if they can solve this problem in model turbines. Mr. De Laval developed this nozzle and used it with great success on the industrial impulse turbines he designed in the 1880s.

When used in model turbines it is unsatisfactory because steam from a model boiler has insufficient volume to maintain kinetic energy and high turbine speed if allowed to expand in a model version of the De Laval type nozzle. If more power is required from expanding steam then it should be obtained in a secondary stage of the turbine after the steam has left the primary nozzle jet

Many more years of development are required to make steam turbines into practical, reliable engines for model engineers of the future to use. That's why articles on the subject by contributors to *Model Engineer* are so important.

Dennis Yates
Stoke on Trent.

Starting small

SIRS, - Although I am not a constructor of locomotives, I must support Peter De Salis Johnson (*M.E.* 4147, 1 June 2001) who wrote concerning 2½in. gauge locomotives and tracks, noting a trend by some clubs to ignore this gauge.

I have observed at various exhibitions and other such events, the steady sale of small bench or table-top lathes and milling machines. There must be a great many aspiring model engineers who live in houses and flats with little or no room for a workshop, except perhaps in a spare bedroom. These folk must envy those whose purpose-built workshops occupy a corner of a garden and contain virtually industrial-size machinery. Maybe they have seen large locomotives hauling heavy trains in public parks and wondered how on earth it would be possible to move such a model from a small workshop in a flat to a track at a club. That said, it is quite probable that a 2½in. gauge locomotive could be manoeuvred single-handed.

Having caught the steam bug, a few years on, our aspirant might move home, acquire workshop space and progress to larger models, but the next generation of model engineers, probably with shallower wallets, must be able to start small. A small locomotive at the head of a train with two or three passengers is an impressive sight and the builder will rightly feel proud of his work, especially if he can pick the locomotive up at the end of the day, put it on the back seat of his car, drive home and carry it up several flights of stairs to his bedroom workshop in his flat to make any adjustments or modifications which may be necessary.

It view of the foregoing, it is good to know that support for the gauge, as reported by John Cook and Clive Young of the National 2½" gauge Association, is as strong as ever.

Peter Spenlove-Spenlove
Leicester.

Demons

SIRS, - As a former (long serving) member of the RAF, and a student of the history of the RAF from its formation in 1918, I really must correct the grossly inaccurate information given in Mr. Claridge's letter in *M.E.* 4148, 15 June 2001.

The *Demon* was not a Vickers aircraft at all, it was a member of the Hawker *Hart* family of very successful, and very beautiful aircraft with which the RAF was equipped from 1931 onwards.

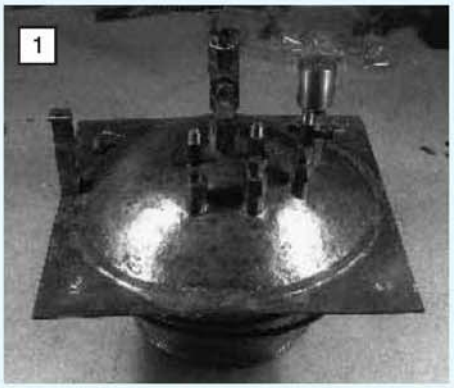
The *Demon* was a two seat biplane fighter, powered either by a Rolls Royce *Kestrel* 11S engine of 525hp. or by a *Kestrel* V(DR) of 585hp., both of which are water-cooled in-line engines which gave a fine nose to the aircraft. First deliveries were to 23 Squadron. in 1931, curiously enough as a stop-gap replacement for its Bristol *Bulldogs*. It was then called the *Hart* Fighter and was so successful that it was ordered in quantity. 41 Squadron received theirs in 1934 and 29 Squadron received *Demons* in 1935. By 1937 there were 234 in service with 12 squadrons.

It is true that it was replaced by the *Spitfire* and *Hurricane* as successors, not competitors, there being no *Spitfire* or *Hurricane* fighters to compete with it until 1937. Even by the outbreak of war in September 1939, the RAF still had 54 *Demons* on charge. Unsuccessful? Radial engined? I think not.

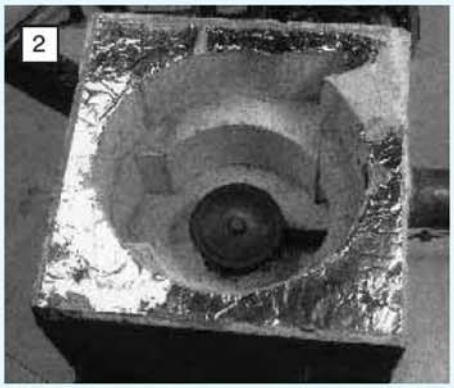
E. Black.
Co. Durham.

COVER FEATURE

Chris Leggo
in California, describes how he built his small replica of an item of industrial history, and then set about getting it to work reliably.
●*Part I*



The boiler is made in three pieces. An exercise in copper forming, the dome was finished by hammer forming over a bowling ball.



The boiler casing is made up of light-weight fire brick which saws like soft butter and takes kiln cement nicely.

A GIANT STEP BACKWARD

Over the years, *Model Engineer* has published hundreds, if not thousands, of construction articles on engines of beauty and elegance, both steam and i/c, but there have been only two such features on a model of the Newcomen engine. Both these articles pointed out the difficulty in getting them to run and it seems to be common knowledge that even when they do run, they are touchy.

I took this as a challenge, and everything they said was true! On first firing, I got about three strokes out of the engine, but after three weeks of tinkering, adjusting, some deep thinking, and a few lucky accidents, it will now run until the boiler goes dry, about 20 minutes at 12 strokes per minute, just like the prototype—but I'm getting ahead of myself.

Whereas today's technology has surpassed intellect, in 1700 technology had a long way to go to catch up with what the great minds had come up with in the previous century. Those were the days of Newton, Galileo, Hooke, Huygens, Boyle, and Papin. The principles had been laid down, but the means of carrying them to fruition were not available. Suitable building materials of the time were few, and there were no boring mills, screwcutting lathes, or milling machines in sight; craftsmen of the time had to be adept with the hammer and the chisel.

The only 'machine' to pump water from the mines was the Savery engine which had a limited lift of about 50 feet, had to be located within the mine shaft, and was fraught with danger, not even safety valves being used (**fig 1**).

The Newcomen engine (**fig 2**) was the first use of a piston in a cylinder. It created a vacuum within the cylinder by introducing low pressure steam and then condensing it to form a vacuum which then took advantage of atmospheric pressure to work the piston. The piston acted on an overhead rocking beam, the other end of which acted on the pump rod. In one giant step, the machinery was located above ground and there was no high pressure and no limit to the depth of the pumping machinery. The Newcomen engine met with widespread acceptance and held forth for the next 60 years and even after.

How the engine works

The Newcomen is not a steam engine; it is an atmospheric engine. The steam is only a mechanism to create a vacuum and allow the atmosphere to do its work.

Referring to fig 2 and starting with the piston at the bottom of the cylinder, steam is admitted as the piston is pulled up to the top by the weight of the pump rod aided by the steam pressure. When the piston reaches the top of the cylinder, the steam is turned off and injection water is admitted which condenses the steam in the cylinder to form a vacuum. Atmospheric pressure now pushes the piston down and the pump rod does its work.

The pump rod is always the heavy end of the beam. Water can be pumped either on the up stroke by a bucket pump, or on the down stroke by a plunger pump.

The engine needs several ancillaries to make it work. First, the condensing water and condensed steam need to be removed after each stroke. When steam is admitted to the cylinder at pressure, low as it is, water is forced through the eduction pipe which leads to a check valve in the hot well. There needs to be an auxiliary pump to supply the cistern at the top of the house which supplies not only the injection water but water used to seal the piston and to supply the boiler. A mechanism to open the water valve at the top of the piston stroke is operated by the plug rod

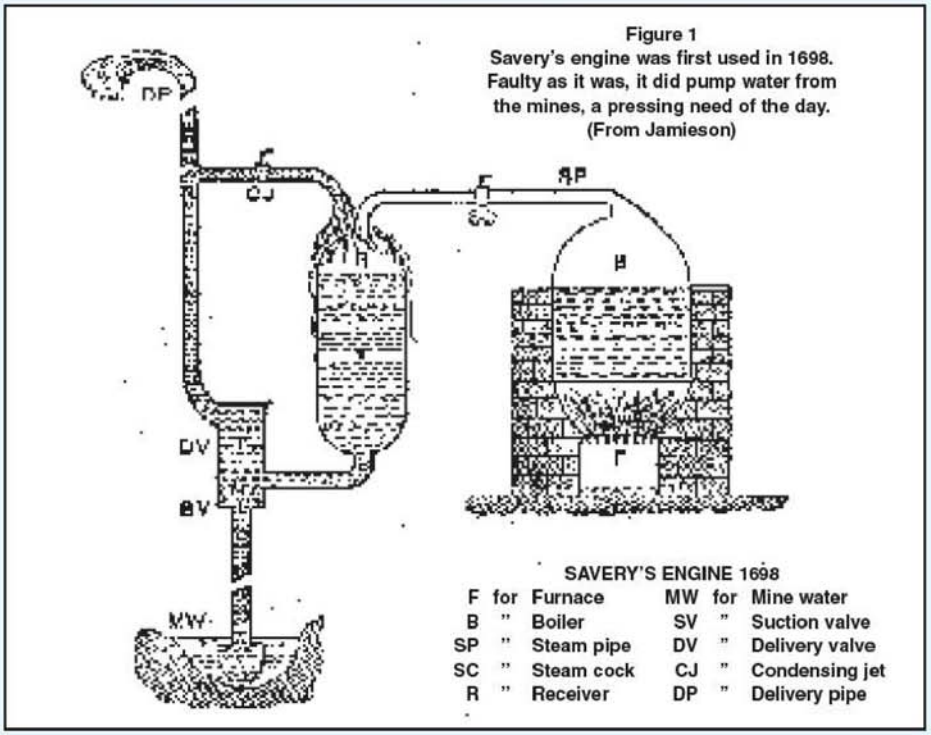
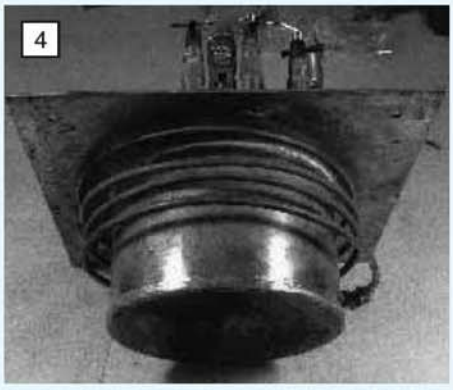
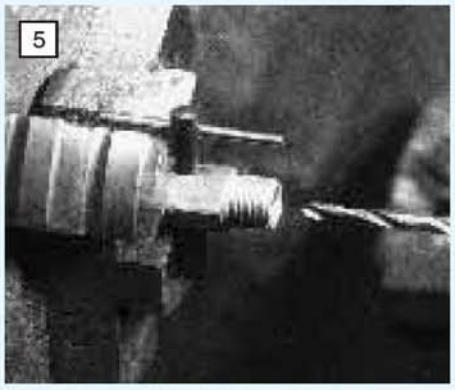


Figure 1
Savery's engine was first used in 1698. Faulty as it was, it did pump water from the mines, a pressing need of the day. (From Jamieson)

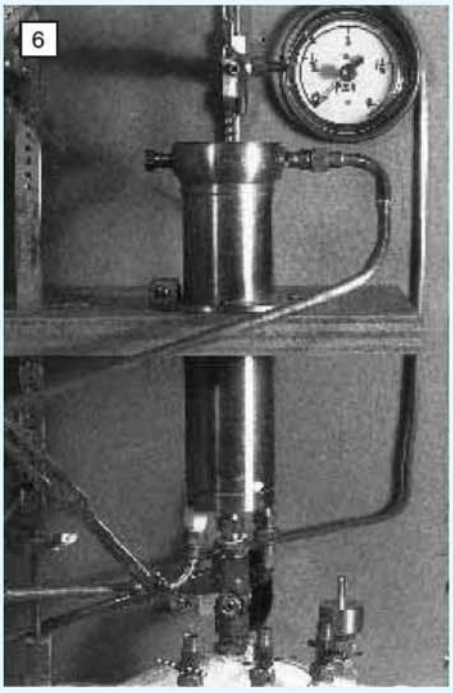
Fuel is propane supplied through a pressure regulator. To maintain 1/2psi in the boiler, only 2psi is required on the fuel.



The feed water heater had to be discarded when it boiled dry and became a flash boiler when water was pumped in.



Try cocks were drilled with the plug in situ. Commercial taper pins save a lot or work and headaches.



The cylinder is 1¾in. dia. and 4in. stroke and is soft-soldered. Connections are top drain, injection water, steam inlet, and eduction pipe.

which rises and falls with the pump beam. By means of a weight operated over-centre device, this plug rod also furnishes a snap action which opens and closes the steam valve. These valve operators are not shown on the diagram.

Construction of the model

The first item tackled was the boiler. It was made to represent the original very closely: a simple pot boiler with a domed top. The barrel is copper, 5in. diameter and 3in. high, with a copper top hammer-formed over a bowling ball and silver-soldered (**photo 1**). The fire is furnished by a burner from a camping stove, propane fired at about 2psi (**photo 2**). The gas system was originally fitted with a pressure regulator which had to be discarded when it was found that the cylinder drained the boiler at every stroke. The fire was thereafter controlled by hand using the pressure regulator on the gas bottle (**photo 3**).

The boiler was originally fitted with a dead weight safety valve, three try-cocks, a pressure gauge outlet, and a feed water heater consisting of four coils of 3/16in. copper tubing in the flue space (**photo 4**). The feed water heater proved unsuccessful and the boiler is now filled by gravity from the cistern at shut-down. As fitted, the feed-water heater boiled dry and when water was directed to the boiler it boiled in the now empty tube, the boiler pressure rose, the safety valve blew, and the engine stalled. For demonstration purposes, the boiler runs long enough without feeding and no further steps will be taken to accomplish auto feeding.

Boiler construction is straightforward, but something may be said of the try cocks and pressure gauge. The ends of the cock bodies are finished and centred but not drilled through. The body is then drilled and reamed for a taper pin and the pin fitted with a handle. The pin is now jammed into the body, the whole lot is put back into the lathe and the centre hole drilled, going through the taper pin in the same motion (**photo 5**). This is an easy way to make good fitting, leak-proof cocks.

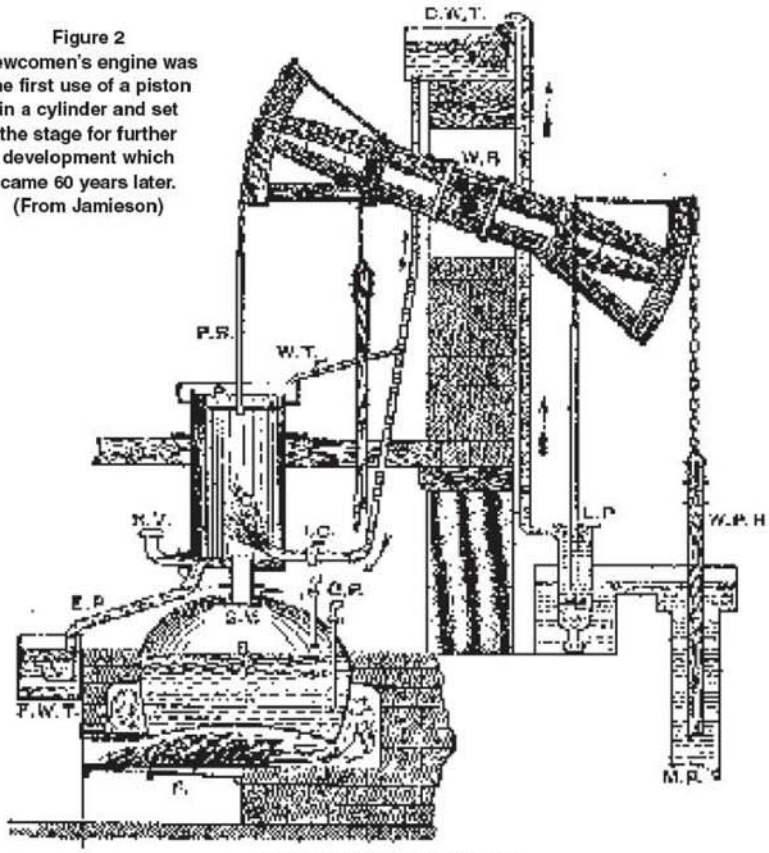
The pressure gauge was a problem. Gauges of 30psi and up are common enough, as are those to read inches of water, but a gauge to read a few psi full scale had to be modified from a low pressure gauge. Fortunately, there was a spot in the works where a supplementary spring could be inserted. It was then calibrated with a mercury manometer.

The cylinder is 1¾in. O/D drawn brass tube which was sufficiently smooth in the bore that no finishing was necessary (**photo 6**). Steam entry is at the centre, injection water is at one side through a fitting made of nylon to reduce heat transfer, and the eduction pipe outlet is on the other side at the low point of the slanted bottom. There is a reservoir at the top for the piston seal water. An overflow pipe runs into the hot well. Joints are soft-soldered.

Newcomen fitted both an eduction pipe and a snifting valve. The eduction pipe carried water (both injection water and the condensed steam) to a hot well which was situated below the cylinder to help pull the water out. The end of the pipe was fitted with a check valve so that water could escape while steam is entering the cylinder but shuts off when there is a vacuum. His engine was also fitted with a relief valve, called a snifting valve because it makes a noise like someone with a cold, to rid the cylinder of any air which would reduce the vacuum. When steam emitted from the snifting valve, one could be assured that all the air, being heavier than steam, had been expelled.

●*To be continued.*

Figure 2
Newcomen's engine was the first use of a piston in a cylinder and set the stage for further development which came 60 years later. (From Jamieson)



NEWCOMEN'S ENGINE 1712

F	for	Furnace	MP	for	Mine pump
B	"	Boiler	LP	"	Lift pump
GP	"	Gauge pipe	CWT	"	Cold water tank
SV	"	Steam valve	WT	"	Water tap to top of piston
C	"	Cylinder	IC	"	Injection cock
P	"	Piston	RV	"	Relief or snifting valve
PR	"	Piston rod	EP	"	Eduction pipe
WB	"	Wooden beam	FWT	"	Feed water tank
WPR	"	Weighted pump rod			

Pioneer *with the tide 'on the turn', the sponsons only just about covered and seaweed hanging from the cross braces.*

A view of the writer's model of **Pioneer** *on its 'O' gauge Hornby tracks as shown at the Runnymede Meccano Guild meeting, 5 June 1999.*

VOLK'S *PIONEER* SPIRIT

Mike Dennis

used Meccano to produce a 1:24 scale model of Magnus Volk's unique tram on stilts which ran on the Brighton and Rottingdean Seashore Electric Railway between 1896-1901.

●*Part I*

I was originally inspired to attempt this project when I read *Volk's Railways, Brighton,* a book borrowed from a work colleague in 1995. He was interested in narrow gauge railways, trams, trolley buses and steam transport. As a member of Romney Marsh MES he had close links with the Romney Hythe & Dymchurch Railway, the world's smallest public railway. He also expressed an interest in my philosophy and methods of applying model engineering principles to make compatible parts and complimentary sub-systems for use with Meccano scale models.

During my research for further information to prepare this more detailed work for modelmakers with Meccano and those with a general interest in the subject, I discovered from a club member that an article about Magnus Volk's railways appeared in the August 1937 *Meccano Magazine* describing his career. Earlier this year another member of HTMC and the RMG, kindly gave me a copy of *Model Engineer*, 3 November 1955 which contained another feature that dealt exclusively with *Pioneer* and the railway.

My own notes on *Pioneer* were derived mainly from the book by his grandson Conrad Volk, and other information provided by the Volks Electric Railway Association so I would suggest they are probably more reliable, having been drawn from the Volk family and Magnus Volk company records.

Meccano's natural scale potentials are 1:24 and 1:12; at first I thought it would be a challenge to design and make *Pioneer* to 1:12 scale, but the finished model would have been over 4ft. long. With authentic 5in. gauge track it would have been difficult to store and transport in a small car, very heavy and extremely expensive to produce! Having seen mine, Dave Taylor says he is going to make one using all Meccano, so I lent him my notes and hope eventually to see it emerging from his estate car at a club meeting!

I am informed that this model is the first to be made of *Pioneer* with Meccano in its near 100 years of history.

Introduction

Magnus Volk was the pioneer of electric railways in this country, and the Volks Electric Railway which commenced operation in 1884 is still in active use in Brighton today. In the years between 1884 and 1895 Volk had an idea of running a 'tramroad' the near 3 mile distance between Paston Place in Brighton, to Rottingdean on the seashore. Royal ascent was granted in June 1893 and track laying commenced early in 1894. It was a unique world first for Great Britain and *Pioneer*, its only passenger carrying vehicle, built by the Gloucester Railway Carriage & Wagon Company, was completed and transported to Brighton during 1896. Following the first trial runs, which began in September, it was described in the local press as a cross between an open top tram and a pleasure steamer with its own pier!

I saw the project as a model engineering with Meccano challenge and make no apology for designing many of my own, and using David Fellows' parts, in its construction. Others were specifically purchased from M. W. Models, Frizinghal Models and Railways and Mike Rhodes for use either 'as is' or for 'scientific mutilation' as required—and a good deal of the latter was involved!

Pioneer: leading particulars

Pioneer's elliptical deck was 50ft. long and 22ft. wide, supported on legs 22ft. long. The saloon was 25ft. 3in. long and 12ft. wide, its roof being accessible to passengers by way of outside steps at one end. It ran on two 2ft. 8½in. gauge tracks set 18ft. apart over the outside rails, placed on 5 x 3ft. concrete blocks 1ft. high and approximately 5ft. apart fixed deeply in the chalk.

It was powered by two 25hp electric motors housed on the deck, driving bogies in two of the four sponsons via shafts inside the legs. The other two legs contained the brakes. Power was supplied at 500 volts by an overhead cable 21ft. above the spring tide high water line via trolley pickups from an onshore generator which, I understand, continued in use for other purposes on the Volks Electric Railway long after the 'tram on stilts' was broken up.

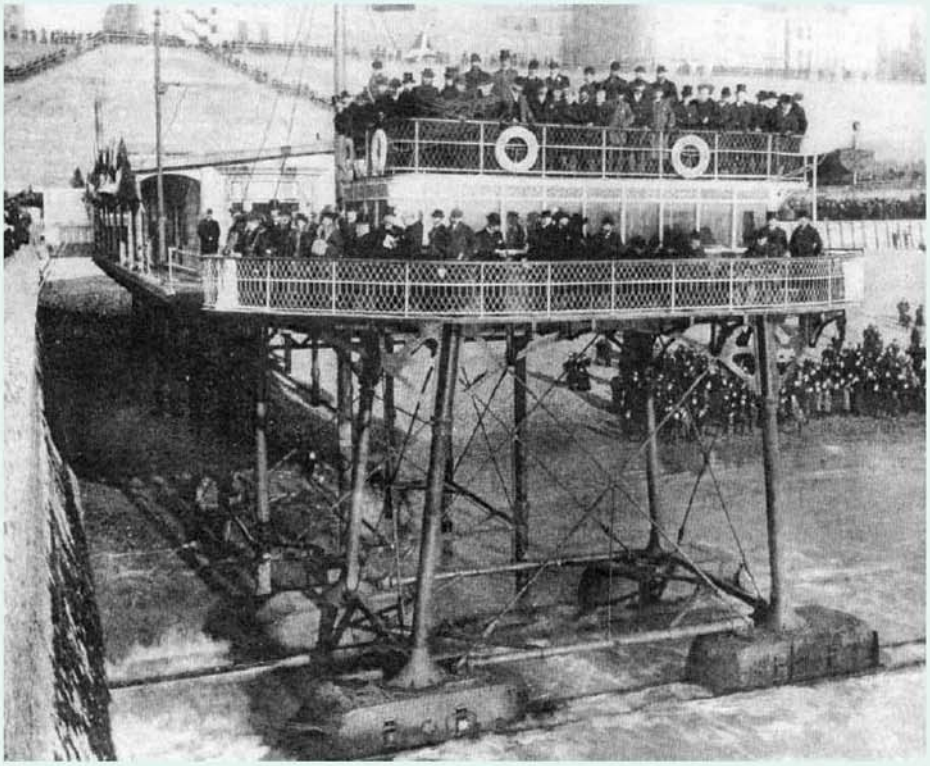
Performance

Pioneer was intended to travel at 6-8mph and took 35 minutes to cover the distance of just under 3 miles. It also became affectionately known as 'Daddy Long-legs', and the first full distance runs commenced in November 1895. It was almost totally destroyed by storm damage on the night of the 4/5 December but was completely rebuilt with the legs extended by 2ft., and services were restored on 20 July 1897.

During the rest of the year it carried 44,282

passengers over 2,601 car miles. Services continued throughout the winter and on Sunday 20 February 1898 the Prince of Wales made two trips on *Pioneer* accompanied by the Duke and Duchess of Fife. The vehicle could carry 150 passengers but it is obvious that the top deck was mainly for the fittest and most hardy. Doubtless some people today would say passengers were brave given that there was a potential of 500 volts across the vehicle and the sea!

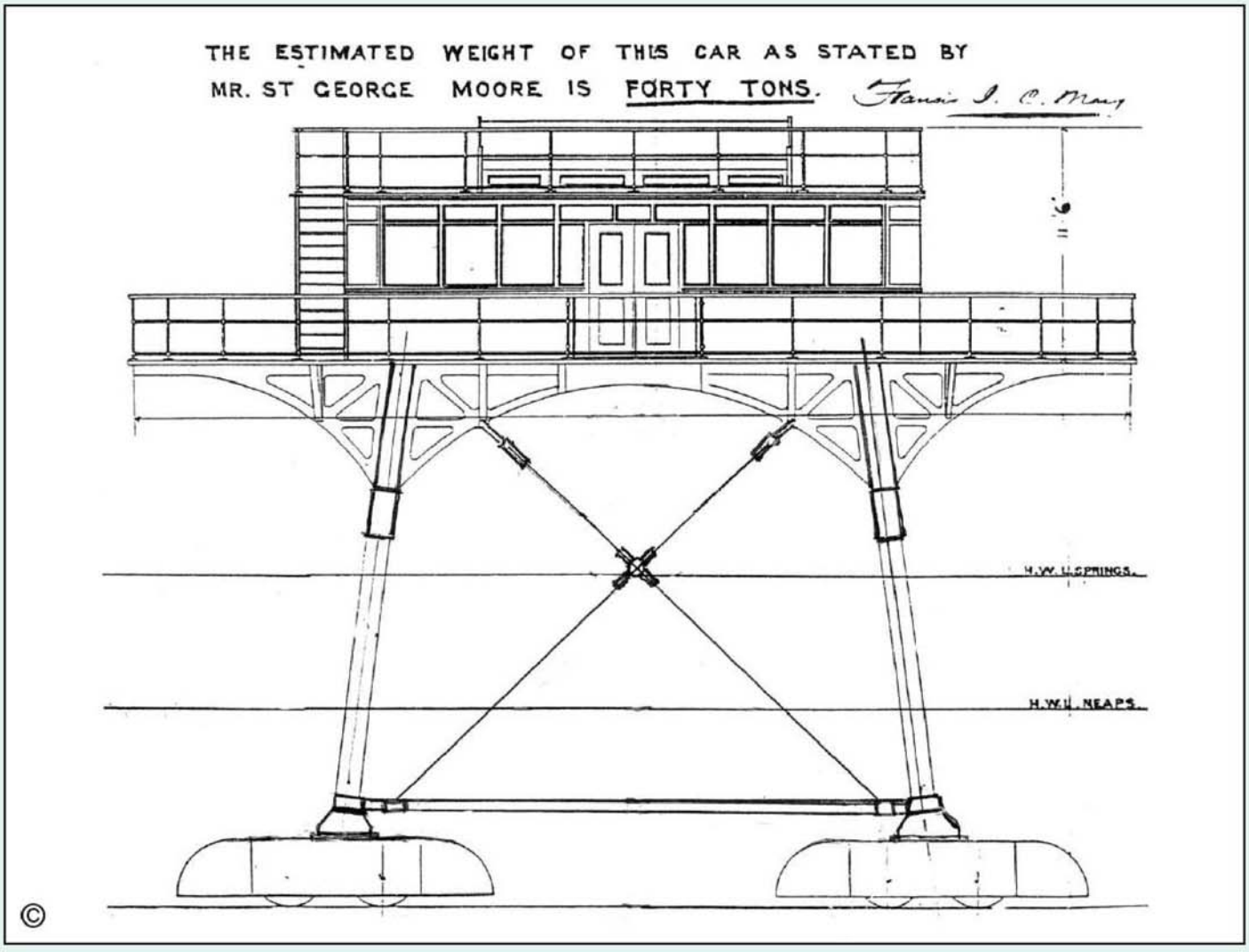
During the summer, an hourly service was operated at 6d each way but by 1900 the only way the company could maintain reasonable revenue was by operation as a fairground novelty attraction running short trips out and back to Banjo Groyne (Paston Place) instead of going the full distance to Rottingdean. The service was suspended for five weeks at the height of the season in July and August 1900, due to damage caused by bad weather. Only 28,717 passengers were carried and only 637 car miles run. By the end of March or early April 1901 it was decided the railway had to close, so in June *Pioneer* was tied up at Ovingdean Gap jetty where she laid until she and the tracks were finally broken up in 1910.



The railway was officially opened on 28 November 1896. Only a week later* Pioneer, *the long-legged car, was practically wrecked by the great storm which destroyed the Chain Pier.

Observations

On 18 September 1896, the *New York Herald* said that *"Mechanically and as a seashore novelty it beats anything yet done by us inventive yanks."* For all the interest and admiration shown it was very underpowered and operation of only one car failed to provide an adequate service. ▶



At low water it could just maintain 8mph but at high water this dropped to little more than slow walking pace! *Pioneer* was a confusing mode of transport: it was the only tram with a captain as a driver, a lifeboat and life belts (never needed), and carrying a warning bell!

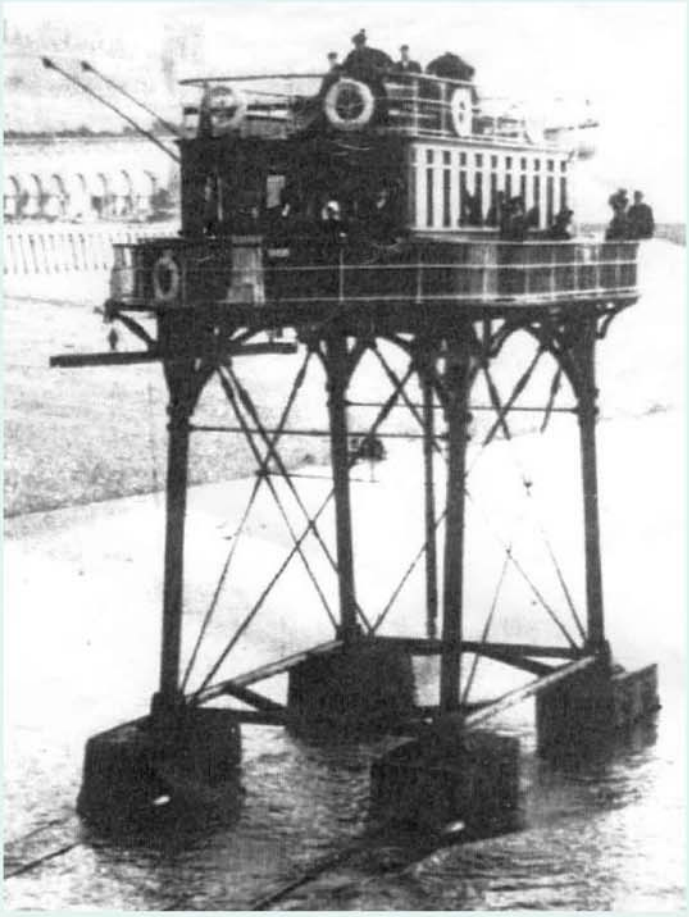
The end

Pioneer and the Brighton Rottingdean Seashore Electric Railway ceased operation in June 1901 when she was tied to the jetty at Ovingdean Gap until she and the tracks were finally broken up in 1910.

Parts of this remarkable unique enterprise could still be seen for many years later as the concrete blocks which supported the tracks were visible at low tide. Even after suffering the wear and tear of well over 72,000 tides in a century, small traces of them are left which indicates they must have been installed to the very highest standards of workmanship!

Model research and preparation

When I compiled the original written article to support my model at meetings, etc., I used notes and copies of illustrations I had seen and collected from books by Conrad Volk and Alan Jackson, and information from magazines and the Volks Electric Railway Association. After the model had been built I obtained the *Meccano Magazine* article and read that the railway opened in September 1896 when in fact, the railway was only completed during September at which time short trial runs were begun with no fare paying passengers. The first full distance runs started on or around inauguration on November 28 1896 which is confirmed in other articles. Such minor errors are not serious, except perhaps to students of railway history or 'serious' model makers, who make a model and want to write about it.



Photographed in 1897, the rebuilt car at low tide between Paston Place and Black Rock. The mesh normally fitted to the handrails appears to be missing.

The *Model Engineer* article deals specifically with *Pioneer* and refers to 'The Brighton and Rottingdean Sea-shore Tramway' to give it its full title, yet in the same article a poster is shown with the word Railway. This is arguably a minor point as I have also seen the word 'Tramroad' used in connection with the line. The paragraph *End of the Line* states that the railway closed in 1900, a decision which was not actually taken until the end of March or early April 1901. The line closed in June 1901 according to official Magnus Volk company records. The words 'Tramroad' and 'Tramway' could possibly have been used locally in order to distinguish the sea-going section from the other Volks Electric Railway on the seafront.

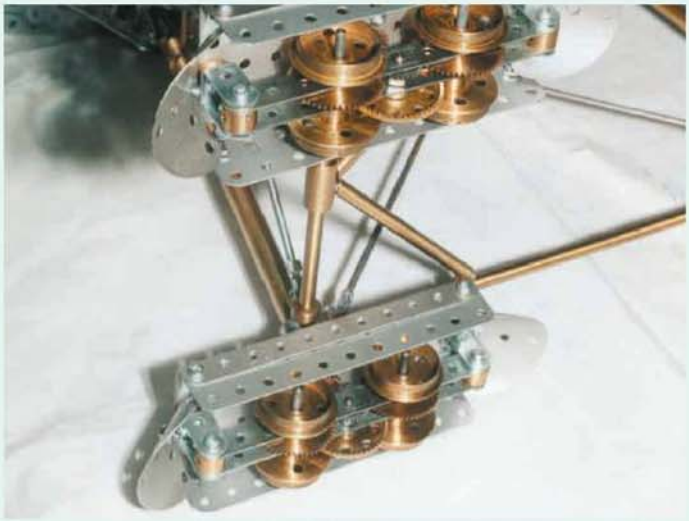
To any 'serious' potential model maker dimensional errors are a nuisance. The *M.E.* article states *Pioneer's* deck width as 24ft. which is incorrect even allowing for variations in all other articles I have seen. The article in *Engineering* 4 December 1896 quotes the length and width as 45 x 22 feet. I remember seeing other articles stating 45, 46 and 50 ft. and width variations of between 21 and 24 feet.

For any serious model engineering project, the obtaining of general arrangement drawings and photographs to work with are an essential part of preparation whether 'official' or made using photographs. In this case there was only one side view and one official Gloucester Railway Carriage & Wagon Company photograph taken before *Pioneer* left the works. The drawing states a length of 45ft. 8in. but I had been told the deck was extended equally at both ends after the photo was taken. I could not establish by how much except by more extensive, and expensive research so these were the two main items used for starting the project so I accept the 50ft. length and 22ft. width as near correct.

An enlarged copy was made of the side view to 1/24 scale for 1:1 direct scaling which I advise for any model, relative to size of course. Many may consider this to be cheating, but I have read of many great engineers who did likewise.

Next I settled for using the known dimensions and laid out Meccano straight and curved strips on graph paper on the bench. Using proportional scaling techniques and with reference to my photos, I drew up an elliptical deck plan showing the size and relative position of the saloon, leg mountings and other dimensions I needed to know.

●*To be continued.*



A view of the 'O' gauge powered bogie constructions in the sponsons which feature components made by the writer.

A view of the underframe showing the underside of the deck plus the lower gearing to the two powered sponsons.

Left: A 6.5cc sleeve valve engine built by the author to the Nicholson design.

Right: Component parts of a modified Nicholson sleeve valve engine by Bob Dunn.

I.C. ENGINE DESIGN

David Boote

reviews some interesting and unusual four-stroke engines which involve the sleeve valve concept.

●*Part III continued from page 15 (M.E.4150, 13 July 2001)*

In 1905 in the USA, C. Y. Knight designed a double sleeve valve in which two sleeves, one inside the other, were used to control events in the combustion chamber (**fig 1**). The double sleeve valve was closely followed by the work of P. Burt in Scotland and J. McCollum in Canada working simultaneously but independently on a single or mono sleeve. They jointly took out patents for this (**fig 2**). Research by H. Ricardo also gave support to the sleeve valve. In 1927, the Bristol Aeroplane Company under A. H. R. Fedden took up the Burt McCollum sleeve valve and ultimately made very successful aero engines. Prior to this, Vauxhall applied the valve in 1926, Continental made a nine-cylinder radial in 1927, Barr and Stroud made a 350cc motorcycle engine (**fig 3**) and Argyl produced a car engine. None of these was successful commercially.

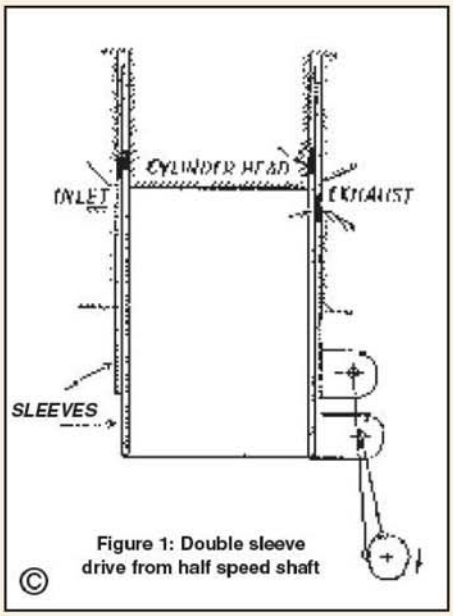


Figure 1: Double sleeve drive from half speed shaft

The Bristol engines were all of the radial air cooled type and can be seen at the Bristol Industrial Museum, RAF Cosford and Hendon, Duxford and the Science Museum, Kensington. Apart from Bristol, Napier also produced a large single sleeve valve aero engine. This team was led by F. Halford but the engine was of entirely different configuration to the radials. Named the *Sabre*, this was a liquid cooled H type with 24 cylinders using two crankshafts connected by gears. A number of these are to be seen at Cosford, Duxford and Kensington (**fig 4**). Developments of large sleeve valve engines by both Pratt & Whitney and Rolls-Royce were abandoned as the gas turbine demonstrated its future potential.

Of the engines described so far, all are full-size and very considerable understanding and skills are needed to attempt as models. Fortunately, a small number of projects are in being in various parts of the world to do just this. One such completed project is the Bristol 9-cylinder *Aquila* by Brian Perkins which was shown at the Model Engineer Exhibitions in 1999 and 2000. Its construction is currently being serialised in these pages.

There are some simpler applications and the following sections will describe some of these. ▶

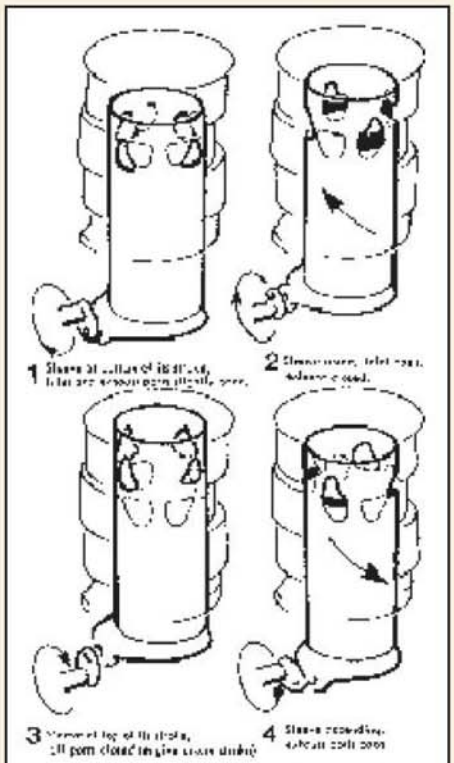


Figure 2: Burt McCollum sleeve valve *(Radio Modeller, December 1984)*

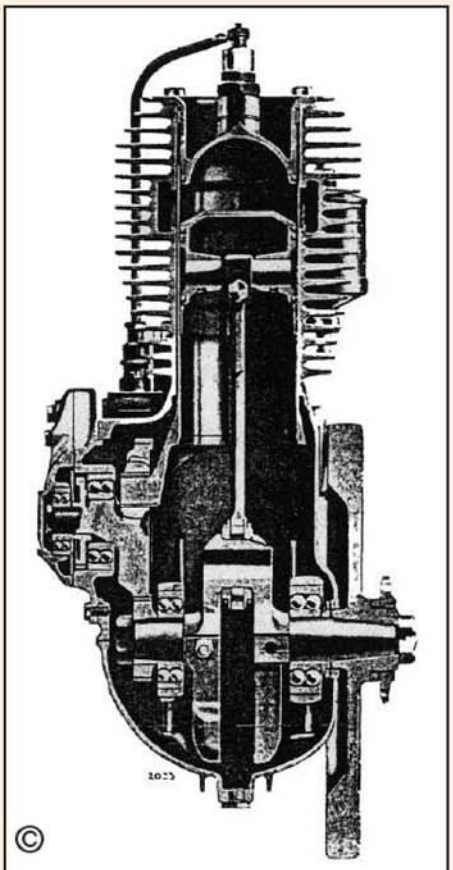


Figure 3: Sectional elevation of the Barr & Stroud 2 3/4hp single sleeve valve motor cycle engine viewed from the left hand side. The sleeve is shown in the position it occupies when the firing stroke occurs. *(Barr & Stroud catalogue)*

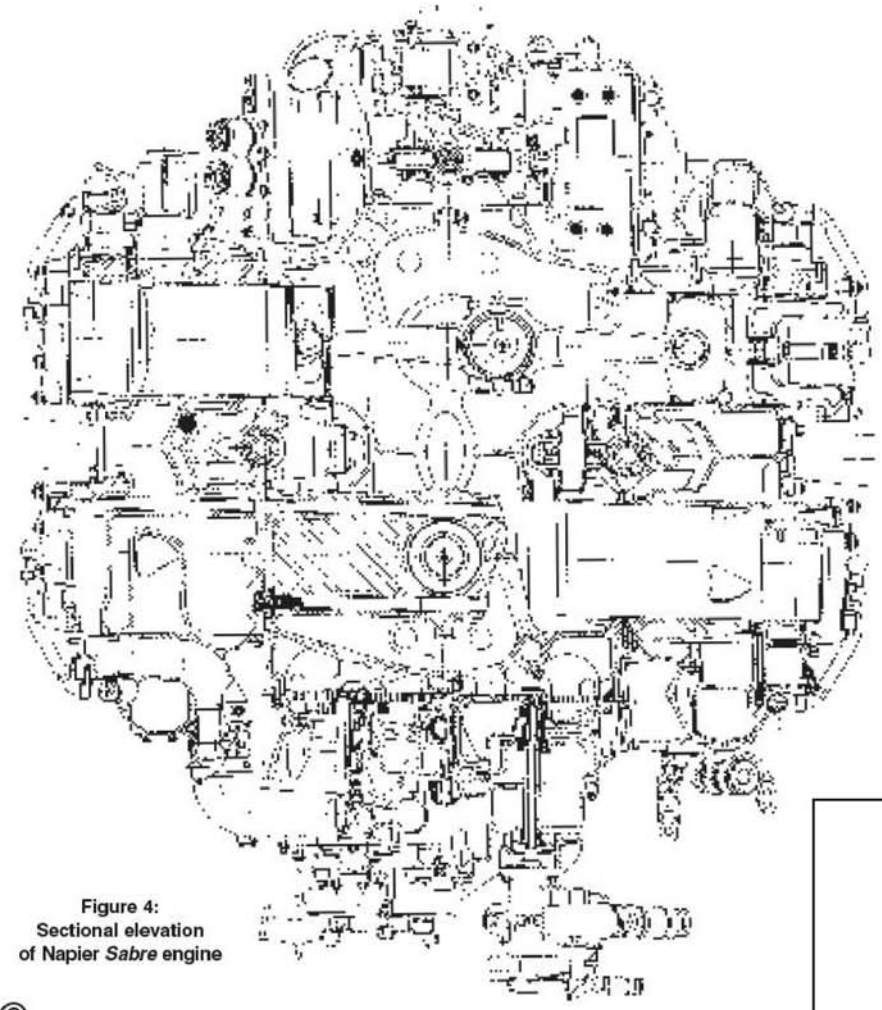


Figure 4:
Sectional elevation
of Napier *Sabre* engine

In the late 1930s *Marine Models,* a long since departed magazine, described a 30cc single cylinder engine intended for hydroplane use. This had been built by George D. Noble of Bristol and designed by a Mr. Amor. This engine was equipped with a single sleeve valve (**fig 5**).

In the Bill Gunston biography of Roy Fedden, L. F. G. Butler, one of the senior engineering team members is mentioned as having a son-in-law D. R. Amor, part of the same team—coincidence. It is thought that the engine now resides in France with the grandson of George Noble.

For more recent years, some re-reading of publications and conversations with other enthusiasts has revealed three examples of sleeve valve engines which form good starting points for constructors wishing to try something a little different. With the co-operation and permission of the designers, the engines that follow are all single-cylinder and air cooled, of 3.5, 6.5 and 10cc capacities. They are as shown in the illustrations and photographs and detail drawings are available from:

3.5cc: John Griffiths (tel: 01744-815884).
6.5cc: Peter Nicholson (tel: 01793-751416).
10cc: Derek Green (tel: 01225-862149).

None of these examples require castings and all proprietary parts are readily available. The gears specified are catalogue items modified to drawings. Readers wishing to make their own piston rings will find the methods well documented in *Model Engineer* volumes 172 and 173, 1994 and *Strictly I.C.* numbers 7, 8 and 9, 1989.

Rotol

The Rotol company was formed in 1937 as a joint venture between Rolls-Royce and Bristol, to make propellers for their engines. Development of the company led to a department for auxiliaries dealing mainly in gearboxes and power take-offs. This was headed by Douglas Pobjoy, already known as the designer of the *Cataract* radial aero engine.

Rotol—The History of an Airscrew Company by Bruce Stait tells us that in 1943 Rotol announced a range of three sleeve valve engines designed under D. Pobjoy. These were a single, twin and a flat six. The flat six was intended to supply auxiliary power for large aircraft and it had been coupled to a DC generator and a 250 Hz alternator. A pair of these engines were installed in a *Shetland* flying boat, stationed at Felixstowe. An accidental fire while at moorings destroyed both the engines and flying boat.

An effort to get back to source data on these engines has proved unsuccessful, but in *Modern*

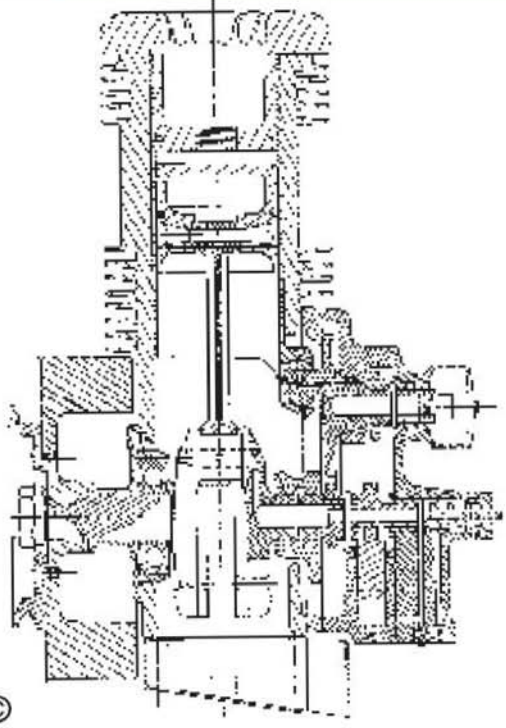


Figure 5: General arrangement of a 30cc petrol engine with single sleeve valve for use in a racing hydroplane. Bore 1 5/16in. Stroke 1 5/16in. Built by Mr. D. G. Noble. Designed by Mr. Amor. *(Marine Models c1930)*

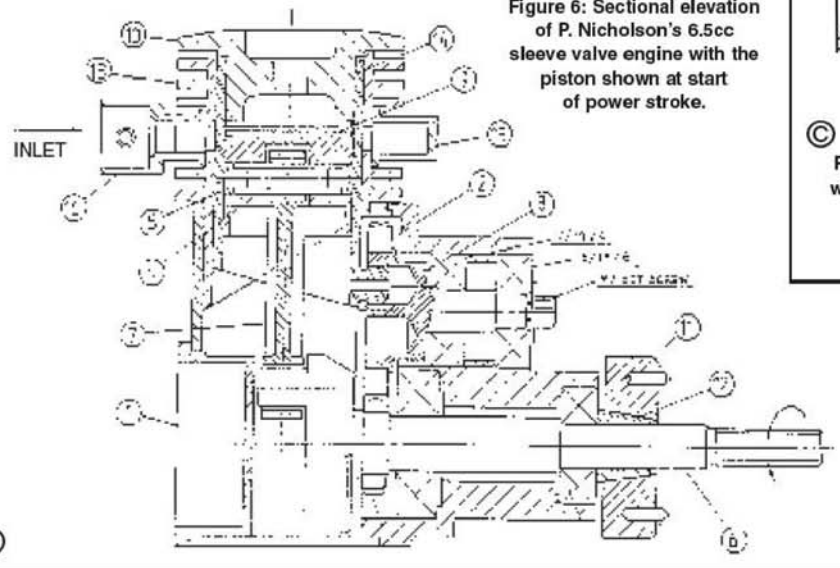


Figure 6: Sectional elevation of P. Nicholson's 6.5cc sleeve valve engine with the piston shown at start of power stroke.

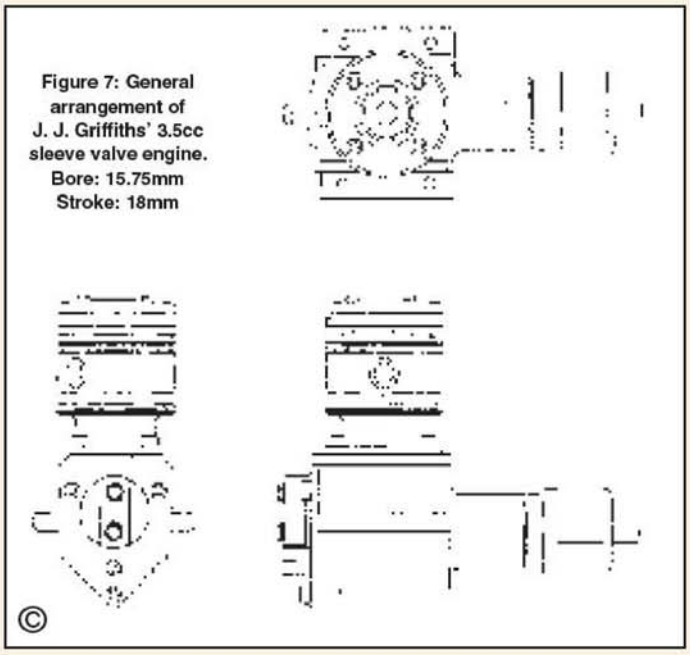


Figure 7: General arrangement of J. J. Griffiths' 3.5cc sleeve valve engine. Bore: 15.75mm Stroke: 18mm

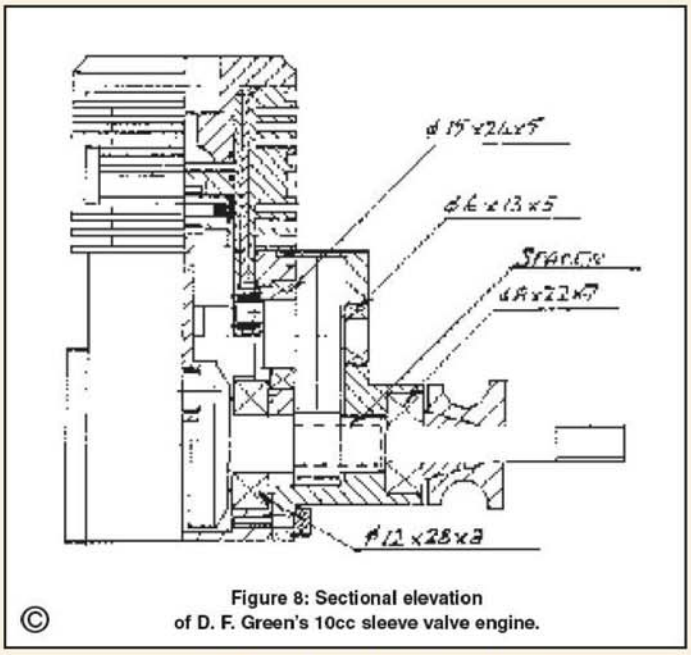


Figure 8: Sectional elevation of D. F. Green's 10cc sleeve valve engine.

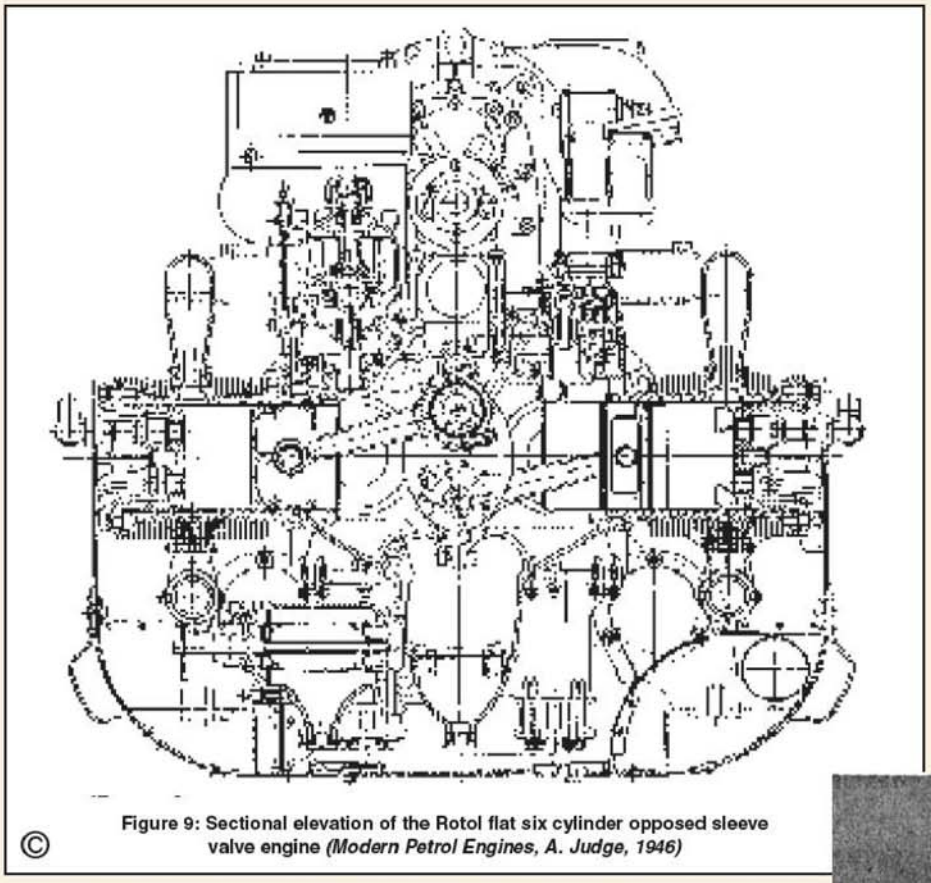


Figure 9: Sectional elevation of the Rotol flat six cylinder opposed sleeve valve engine *(Modern Petrol Engines, A. Judge, 1946)*

Opposed piston engines

This type of construction has been used frequently though has not found consistent favour at full-size. Between about 1910-1930, Professor Hugo Junkers devoted considerable effort to the two stroke diesel version and succeeded in producing the Junkers *Jumo* series of aero engines.

In England, Doxford applied the principle to marine engines and Napier took a manufacturing licence from Junkers. In the 1950s the Rootes Group produced the TS 3 engine for use in commercial vehicles and this was applied to a range of Commer trucks. It was a three-cylinder, six-piston layout using a Roots blower for induction/scavenging and was known for its power and noise. Organisations other than Rootes also used this engine for various R & D projects.

At model size in 1960 the late C. C. Brinton exhibited a semi-scale version of the TS 3. The last opposed piston model known to the writer was the Deltic type by the late Roy Amsbury. This was described in *M.E.* volumes 170-1, 1993, and is presently displayed in the York Railway Museum. Other full-size designs of more recent origin have appeared and two are included in this article.

Illustrations of the Tilling Stevens (TS 3) and Amsbury Deltic type engines will be included in the next part of this series.

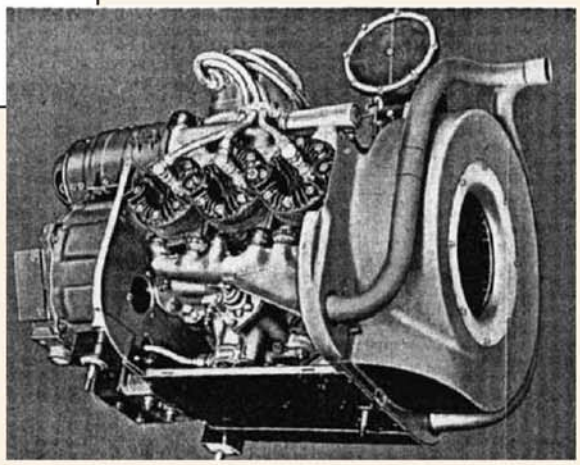
●*To be continued.*

Petrol Engines by Arthur Judge (1946), a cross- sectioned drawing and photograph of the auxiliary power unit appears. It is also a fair assumption that the fund of sleeve valve knowledge accumulated by Bristol would have been available to D. Pobjoy (**fig 9** and **photo**).

By this time A. H. R. Fedden had left Bristol and was working independently. One of his last engines was a flat six sleeve valve design intended for light aircraft. The prototype of the engine is in the Science Museum at Kensington.

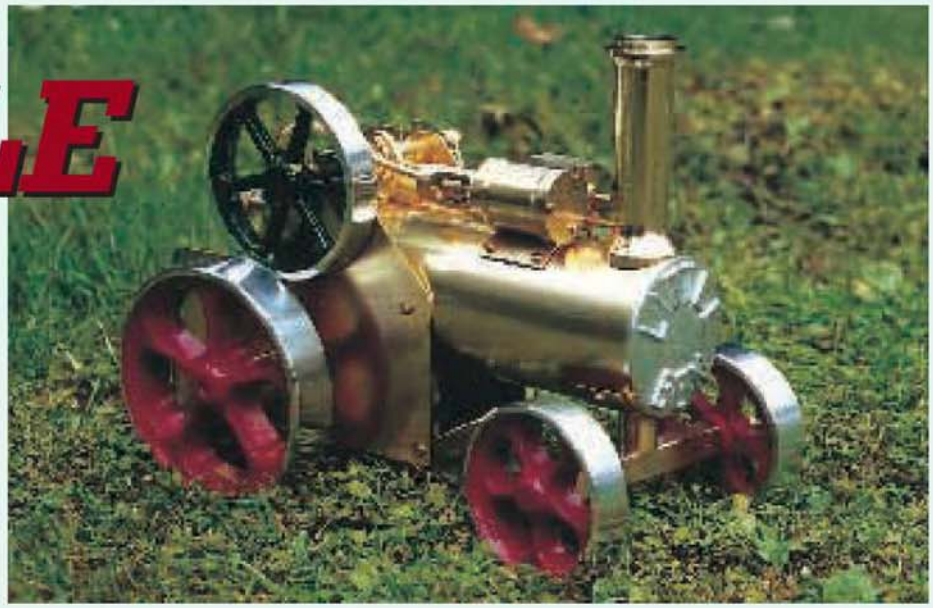
Documentation for either of these flat six engines has not come to light, although it is possible that that for the Fedden six is somewhere within the Science Museum archive, as yet unfound. Similarly documents for the single and twin engines by Rotol have not appeared. The B. Stait book does refer to an instance where a single providing radio power was seen on an Icelandic fishing vessel and that a batch of 50 twins was built. At the time of building only a Government Department would have had authority for a quantity of this size. Maybe there are some readers with a greater and better knowledge!

In summary there are two flat six sleeve valve engines awaiting attention from some intrepid model engineers. Not as complex as a radial but still needing considered and concentrated effort.



An external view of the Rotol sleeve-valve engine showing blower and air-cooled cylinder heads of three cylinders

LITTLE BEN

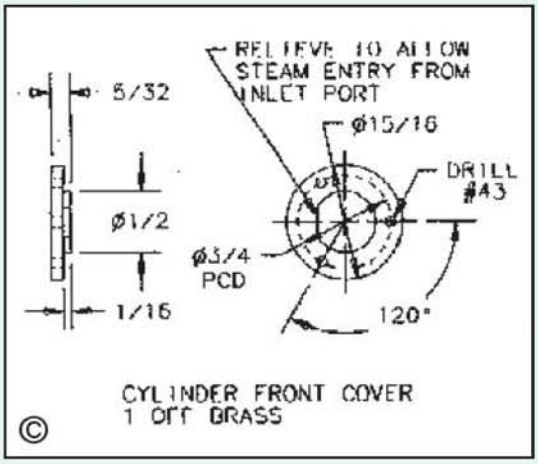


Bruce Robertson

continues with the cylinder assembly for this diminutive and attractive spirit fired traction engine.

●*Part VI continued from page 19 (M.E. 4150, 13 July 2001)*

The cylinder cover is turned from a piece of 1in. diameter brass bar. Start by gripping it in the 3-jaw chuck and turning the O/D to 15/16 inch. Face the end of the bar and then, using a sharply pointed tool, cut in a further 1/16in. down to a diameter of 1/2in. to make the bore locating boss. Try to be fairly accurate with the diameter of the boss; you should be able to get it to within 1 thou. of 1/2in. so that the cover will always locate in the bore in the same position. Part off the workpiece to a width of about 3/16in., turn it around in the 3-jaw chuck and face off the outside surface.



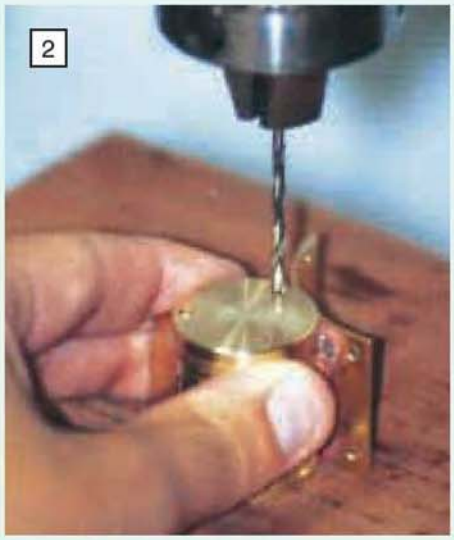
While the workpiece is still in the chuck, mark out a 3/4in. pitch circle diameter and, by using a stop under the jaws of the chuck to index at 120deg. increments, mark the position for the three locating screw holes (**photo 1**). Remove the workpiece from the chuck, carefully centre punch at the three points you have marked, and drill these No. 43 clearance for the 8BA screws. To finish the piece off take a small file and being careful not to damage the surface that will be sealing against the cylinder, carefully file a small recess in the locating boss between the screws that will be on either side of the inlet port. This will ensure that the steam will have a clear passage from the port into the cylinder.

To fit the cover to the cylinder, first remove the cylinder from the boiler and place it flat on your drill press table with the front of the cylinder facing upwards. Place the cover in position—it should be a nice snug fit in the bore—making sure that the steam inlet recess is in the right spot, and that the holes on either side of the inlet port are lying on a plane which is parallel to the valve port plane. While you are holding the cover firmly in position, run a No. 43 drill through one of the cover holes just enough to cut a small centre indent in the cylinder (**photo 2**).

Remove the cover, remove the No. 43 drill, fit a No. 50 and, using the start made by the No. 43, drill the hole 1/4in. deep. Tap this hole 8BA; take it slowly and use a cutting lubricant, the pain of snapping a tap in all your nice work is well worth avoiding at the cost of a little extra care! Refit the cover, again making sure the recess is in the right spot, and use an 8BA screw in the hole you have just completed to locate the position of the cover. Now that it is screwed firmly in place, spot through the remaining two holes with the No. 43 drill and repeat the No. 50 drilling and 8BA tapping. This should ensure that all of the holes in the cover line up perfectly with the tapped holes in the cylinder.

I have not found it necessary to fit or use a gasket on either end of the cylinder, but it is important to make sure that all burrs on both mating surfaces are completely removed—even the smallest proudness will open up an annoying steam leak and rob the engine of power.

Using a stop under each jaw in turn to index for three screw hole positions.



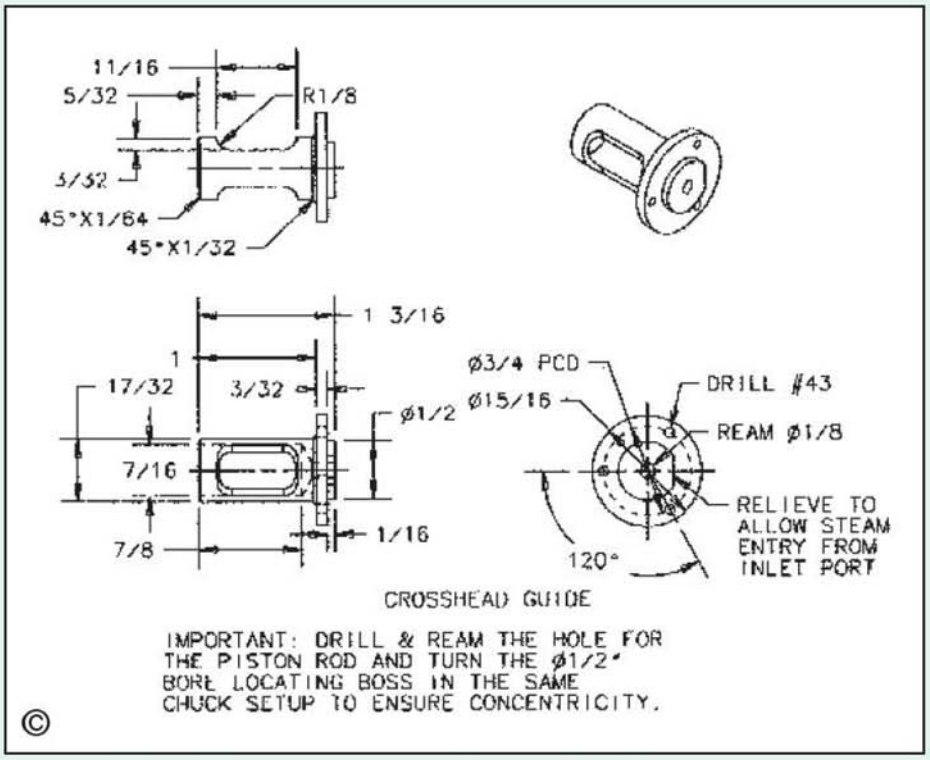
Spotting through the drilled front cover holes to locate screw holes in the cylinder.

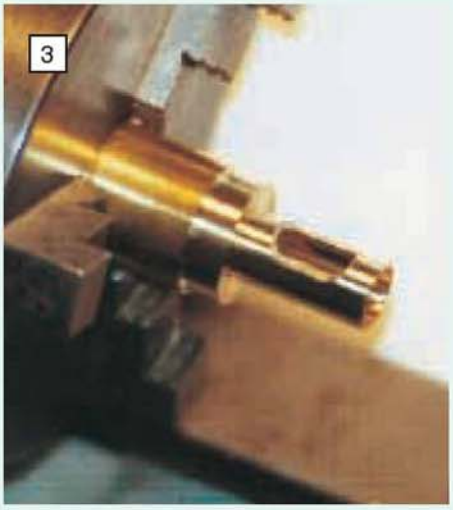
Crosshead guide

The crosshead guide is itself by name and not by function in this engine. By that I mean to say that it doesn't actually guide the crosshead at all. The reason for this is that I have found that the engine works very well without any crosshead guidance, hence having it would only add unnecessary machining complexity. Of course if you would like it to guide the crosshead you are most welcome to make it do so; maybe then you will better understand why I chose not to!

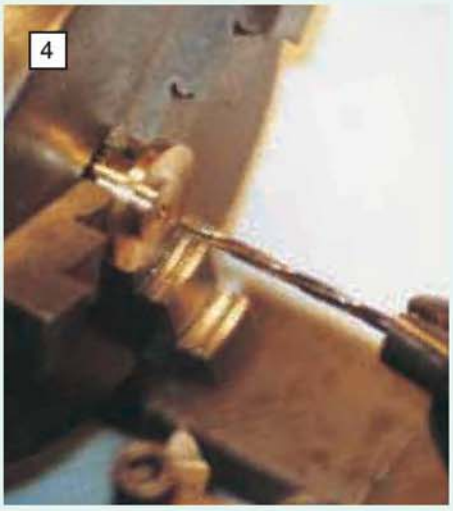
The component is turned from a piece of 1in. diameter brass bar. Grip it in the 3-jaw chuck with about 1 1/2in. protruding from the jaws, face off the end true, and reduce the O/D to 15/16 inch. Continue turning down to a diameter of 17/32in. for a length of 1in. on the end, which will form the outside of the guide tube. Make sure that the face between the 17/32in. and 15/16in. diameters is nice and square, as this is the face against which the locating screws will be tightened. Drill 7/16in. diameter to an accurate depth of 7/8in., any shallower and the crosshead will hit the end of the hole, any deeper and it will wear prematurely and there will be insufficient material to seal the piston rod properly against the steam pressure.

The cutouts on either side of the guide tube are made with a round file, best done with the workpiece still mounted in the lathe. There are no par-





It is convenient to file the side cutouts in the crosshead guide while still in the lathe chuck.



The bore locating boss is turned and the piston rod hole drilled and reamed at the same setting.

ticular tricks to doing it, just lock the chuck in position, carefully file the cutout to shape, move the chuck 180deg., lock it in position again and repeat the filing on the other side (**photo 3**).

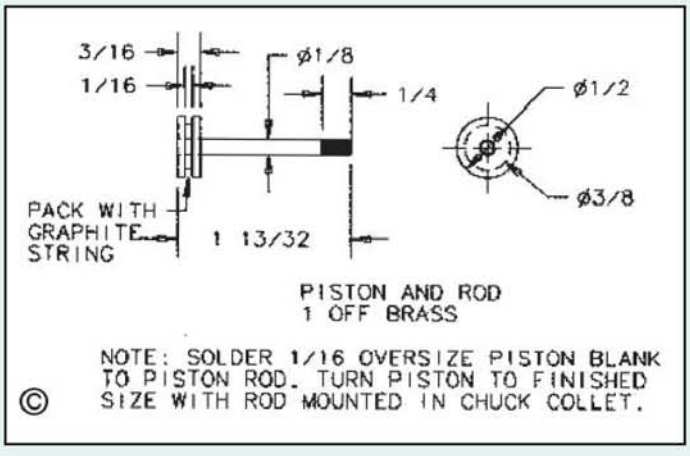
The workpiece is now parted from the 1in. bar using a firmly mounted parting tool and allowing a total length of 1 1/4 inch. Turn the component around so that the locating boss can be machined, just like the front cover. The accuracy of the boss diameter is even more important now however, as this will determine the concentricity of the piston in the bore. Once the flange is finished to a thickness of 1/8in. and the boss to a thickness of 1/32in., centre and drill the hole for the piston rod with a No. 31 drill, and finish with a 1/8in. parallel flute reamer. Note that it is critical that this operation is done without disturbing the workpiece in the chuck after turning the locating boss, otherwise it can be pretty well guaranteed that they will not be concentric (**photo 4**).

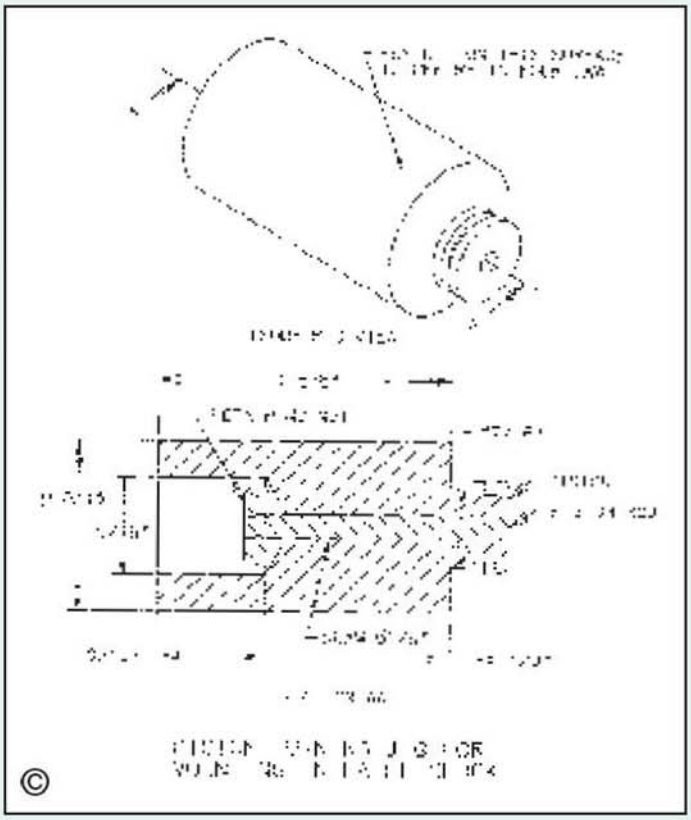
Don't be tempted to drill this hole in the first chuck setup when the 7/16in. hole was drilled or you will encounter problems. Before removing the component from the lathe mark out the PCD and the three points on the PCD for the screw holes, just as you did for the front cover. This time you'll need to be more careful however, as the holes will need to be correctly positioned with respect to the cutouts already filed in the sides of the guide tube.

File a recess in the locating boss like the one filed in the front cover to allow steam to enter the bore from the steam inlet port. Finally, spot through the position of the holes for the mounting screws, as for the front cover, again making sure that the guide tube cutouts are in the right position before you start drilling. I once drilled one 90deg. out and was extremely annoyed with myself for making such a simple mistake!

Piston, rod, and crosshead

The key to an engine which runs well is to have a very good piston fit in the bore. This not only means that the piston is the right diameter, it must also be perfectly concentric with the piston rod, and since we have just finished the crosshead guide we know that the hole for the piston rod is concentric with the bore locating boss, which is a near perfect fit into the bore, i.e., the piston rod will be concentric with the bore. I'll deal with how to achieve this in a moment, but first we need to make the rod and piston blank.





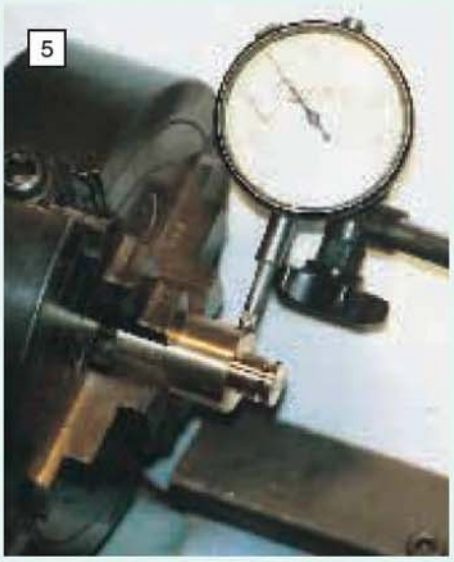
The rod is just a 1 13/32in. length of 1/8in. diameter brass rod with a 1/4in. length of 1/8in. x 40tpi thread on one end. The piston can be made from a piece of 5/8in. diameter brass rod. Mount the rod in the lathe, face off the end, and drill and ream a 1/8in. hole at least 1/4in. deep. Cut a 1/4in. piece off the end, remount it in the 3-jaw chuck and face the other side of it to give a finished thickness of 3/16 inch. The piston blank can now be soldered onto the unthreaded end of the piston rod.

Now back to the problem of getting the piston concentric with the rod, the piston needs to be turned to a diameter of 1/2in., but how to perfectly centre a 1/8in. diameter rod in the chuck? Using the dti on 1/8in. dia. rod is not an option!

My method is to use a simple mounting jig, as shown in the accompanying drawing. Make the jig by gripping a piece of 1in. diameter brass rod in the 3-jaw chuck, face off the end and take a cut along a 2in. length just enough to clean up the surface. Drill a No. 31 hole to a depth of 1 1/2in., and follow this with a 1/8in. parallel flute reamer. Turn a 1/8in. length at the end of the bar to 7/16in. diameter. Part off the workpiece to 1 3/4in. length, turn it around in the chuck, face it off, and drill 9/16in. dia. 9/16in. deep. Make up a 1/8in. x 40 nut, if you don't already have one, and your jig is ready for use.

Insert the piston rod through the reamed hole and secure it in position with the nut from the other side. Mount the jig in the 4-jaw chuck and now you can use the dti to centre the jig (**photo 5**). Because this is concentric with the rod, the latter will also be centred. As long as you go gently with the turning of the piston diameter, and use a sharp cutting tool, this will be enough to hold the piston and rod from spinning. Turn the piston down to about half a thou. under 1/2in., and try offering the cylinder up to it; it should enter without any tightness. If it does, perfect! Cut the groove in the centre of the piston with a 1/16in. wide parting tool (**photo 6**), this will later be packed with a few strands of graphited yarn to improve the seal of the piston in the bore.

The crosshead is a fairly straightforward job, cutting the 1/16in. slot being the only tricky bit. If you have the luxury of a slitting saw then you will have no trouble, otherwise you will have to resort to using a hacksaw cut and carefully fettling with a needle file.



Centring the piston and rod in the turning fixture with the aid of a plunger type dial gauge.

Machining the piston packing groove while the piston and rod are held in the mounting fixture.

Remember to thread the rod through the hole in the crosshead guide before fitting the piston.

Connecting rod

Start with a piece of 3/8 x 1/8in. rectangular brass rod at least 3/8in. long, but if you have it, a longer piece will be easier to handle. For reasons which will be explained later, file a small chamfer on one of the corners along the length of the piece just sufficient to distinguished that corner from the other three.

Square the end either by facing in the lathe or by careful filing and checking with a square. Mark and centre the squared end for the two screw holes; these will need to be done fairly accurately as there isn't much room between the screw holes and the hole for the crank pin which will later be drilled. Drill these holes No. 50 (8BA tapping) to a depth of 3/8in., making sure that the holes are parallel to the edges of the rod.

Use a square to mark across the workpiece exactly 1/8in. away from the face which was first squared off and carefully saw this piece (which is the big end bearing cap) off using a junior hacksaw, allowing sufficient material for the sawn surface to be filed back to the marked line. Make sure the filing is done well so that the surface is flat and square, and then redrill the holes through it using a No. 43 drill to allow clearance for the 8BA screws.

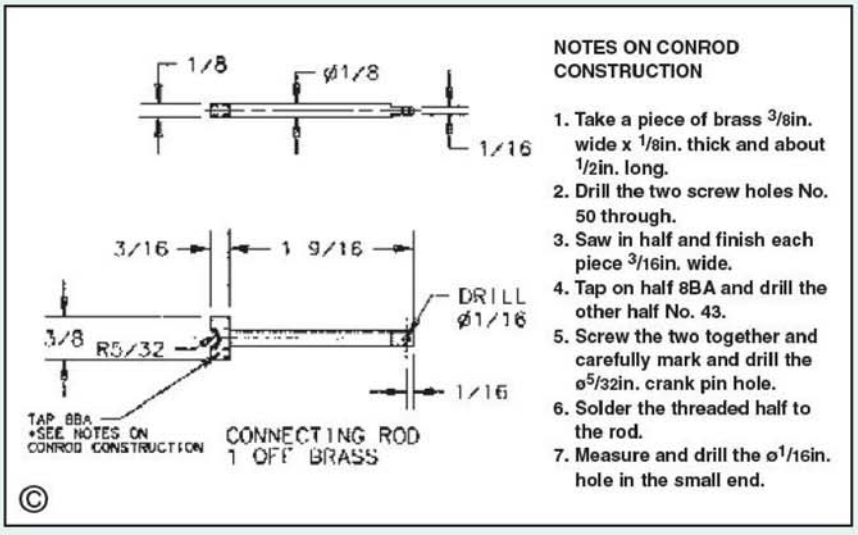
Returning to the rectangular rod, square off the sawn end again and tap the two No. 50 holes 8BA. Cut off a piece which can be filed back to 3/16in. wide, and assemble it with the big end bearing cap, making sure that the chamfers on the corners line up so the screw holes will align perfectly—hence the purpose for the chamfer.

Take a piece of 1/8in. diameter brass rod and cut off a 1 9/16in. length. Silver-solder this piece to the half of the big end bearing with the thread in it. The best way to do this is to lay out the two pieces on a flat soldering hearth, such as a refractory brick, and place some heavier items on them to hold them in place. After soldering give the piece a good clean up in an acid pickle, and run the 8BA tap through the threads again in case they have been fouled at all.

Re-assemble the two halves of the big end bearing and accurately centre on the parting line between them for the crank pin hole. Lay the conrod flat on your drilling machine table and drill through 5/32in. diameter.

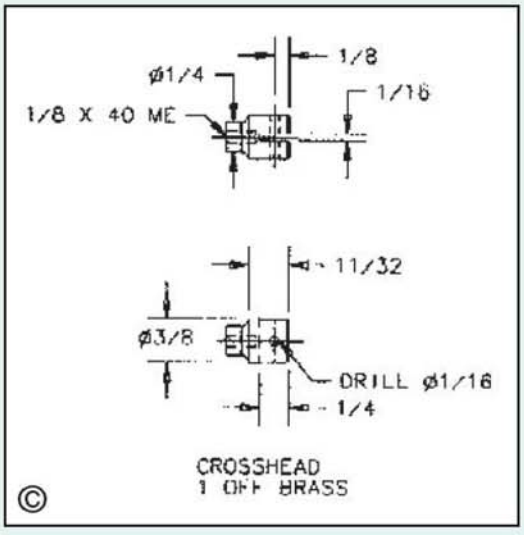
With the conrod again laying on a flat surface, carefully file the flats at the little end so the finished thickness is 1/16 inch. The trick here is to hold the workpiece firmly against the flat surface and draw the file over it, making sure that you hold the file parallel to the flat surface at all times. Mark, centre, and drill the hole for the little end pin on one of these flats, which should be 1 11/16in. away from the parting surface between the two big end bearing halves.

●*To be continued.*



NOTES ON CONROD CONSTRUCTION

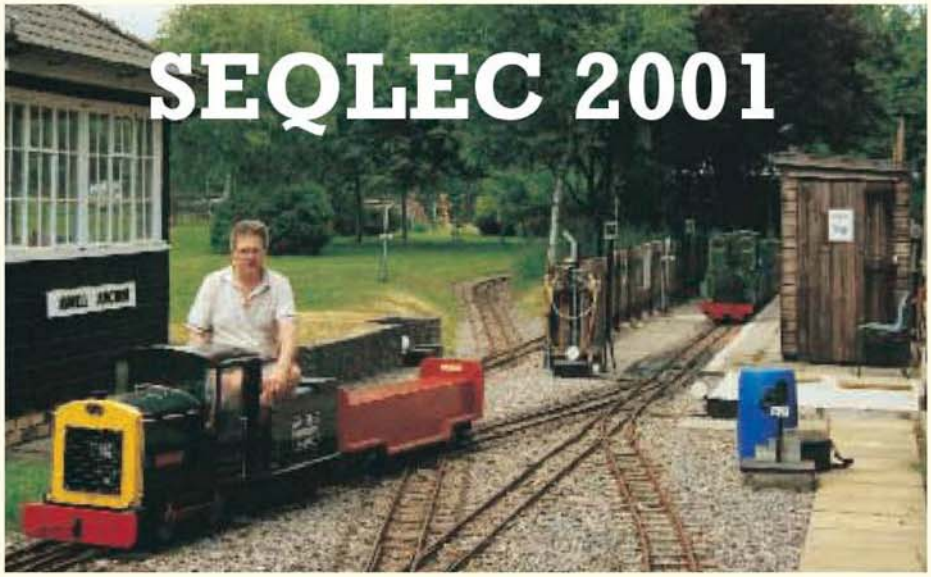
1. Take a piece of brass 3/8in. wide x 1/8in. thick and about 1/2in. long.
2. Drill the two screw holes No. 50 through.
3. Saw in half and finish each piece 3/16in. wide.
4. Tap on half 8BA and drill the other half No. 43.
5. Screw the two together and carefully mark and drill the ø5/32in. crank pin hole.
6. Solder the threaded half to the rod.
7. Measure and drill the ø1/16in. hole in the small end.



SEQLEC 2001

D. A. G. Brown

welcomes competitors and visitors to this year's event at an excellent track situated in the grounds of a garden centre.



Amwell Station and its signal-box; the diesel is crossing from the outer to the inner circuit, while **Tinkerbell** *waits in the platform on the outer circuit.*

This year's 7¼in. gauge efficiency competition is to be held at the East Herts Miniature Railway track at the Van Hage Garden Centre at Ware in Hertfordshire on Saturday 13 October. The company which operates the railway comprises a small band of enthusiasts who normally run for the benefit of the public during the summer months, mainly at weekends. On this particular weekend in October, however, they will be hosting our efficiency competition and also inviting members of the 7¼in. gauge Society for an Open Running Weekend after the competition has finished.

The picturesque setting for the track is flanked by woodland and well tucked away from the bustle of the garden centre. The route forms two concentric loops well separated from each other for some of the way, one loop passing through a short curved tunnel and the other over an attractive bridge across a stream. The two loops are connected in the area of the main station by a scissors cross-over in such a way that consecutive circuits of the track can be run over alternate loops without changing the points. The total track length is just over a quarter of a mile.

Signalling is arranged to permit operation in both directions and indeed when running the normal service, the sense alternates week about so as to equalise the flange wear on the locomotive wheels. The signals and points are controlled from a prominent signal box at Amwell Junction, the mechanical heart of the signalling system being an original London Transport miniature electro-mechanical lever frame from the District Line which seems to work far more reliably than the one which replaced it!

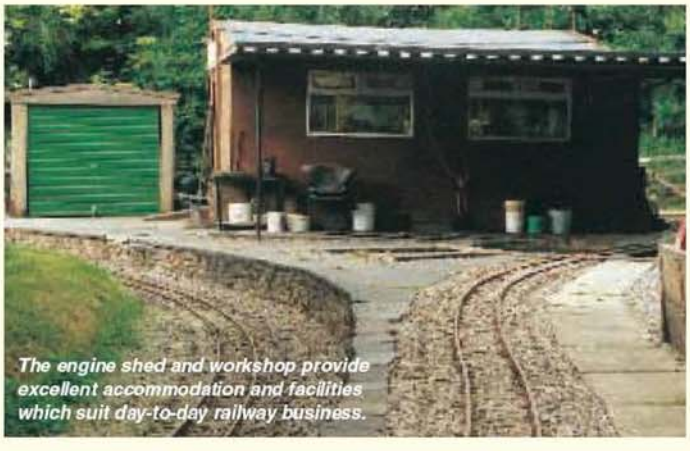
The track was originally laid with steel strip, but during recent years complete re-furbishment has been completed using 6½lb. flat bottom section steel rail. The sleepers are neatly ballasted and the track bed is well compacted, ensuring a smooth and comfortable ride, free from sudden changes in superelevation and radius; this should be well appreciated during the competition. The only speed restriction advised is 3mph over the facing points.

The railway operates a rake of heavy 'sit-in' carriages and another lighter set of 'sit-astride' pattern; vacuum brakes are fitted. Motive power is dominated by a *Tinkerbell*, a well proven design for public running. There is also a diesel locomotive as shown in the heading photograph. Support services are comprehensive, a 10ft. turntable lining up with an unloading ramp and several steaming bays. Workshop facilities are just what might be expected for servicing a railway, although it is to be hoped that such facilities will not be required at SEQLEC!

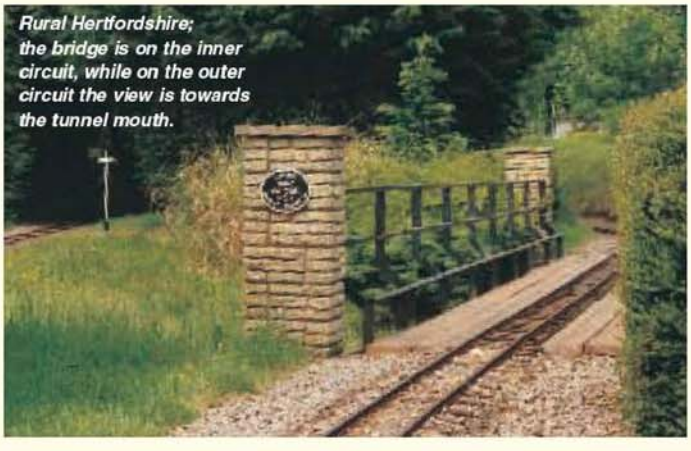
Arrangements for the day will be to receive engines from about 9.30am, with the intention to make the first run at 11am. Each competitor has to make a half-hour run with the load of his choice, having first had a test run around the track. Measured quantities of coal will be provided and the Sutton Coldfield Society's dynamometer car will be coupled at the front of each train to measure the work output and distance travelled by each competitor.

The Van Hage garden centre is easily found on the A1170, less than two miles south of Ware town centre. The railway is signposted within the garden centre car park, and is reached by means of a short dirt road that winds through the nursery area where one might expect to encounter Peter Rabbit being chased by Mr. McGregor with a lump of steam coal in his hand. It is suggested that visitors without locomotives should park in the main garden centre car park. Tea and coffee will be provided for those taking part in the event while a good restaurant serving food all day will be found in the garden centre.

Any prospective competitor requiring an official entry form and unable to make contact with the writer (01780-753162) should contact the *M.E.* Editorial Office (01442-269366).



The engine shed and workshop provide excellent accommodation and facilities which suit day-to-day railway business.



Rural Hertfordshire; the bridge is on the inner circuit, while on the outer circuit the view is towards the tunnel mouth.

A RULE STAND

Len Walker

describes an invaluable marking out accessory which will give much pleasure in its making and subsequent use in the workshop.

Designs for rule stands often involve large chunks of material, much of which is reduced to swarf in the process. This simple device can be made from readily available bright mild steel stock materials. By using carefully chosen sections, this design is just as stable in use as any other, with the advantages of ease of construction and ease of handling when in use for marking out. My original effort, shown in the photograph, has been further simplified.

When using a raised marking out block, beloved by toolmakers, this rule stand is sufficiently compact to sit alongside the work, using the same datum face. Its construction is straightforward but, as usual, some readers may prefer a few words of guidance.

Body (detail 1)

There is a choice of material for this item; use 1 x 1 1/2in. or 2 x 1in. bright mild steel, whichever happens to come to hand. Start by milling or filing the rectangular blank to size, making sure that the sides and ends are all square to one another. Don't form the angle yet.

Set the block in a milling vice, sitting on the 2in. long face to skim the top face true for use as a datum. Using, say a 1/2in. dia. end mill, machine the 1/4in. wide step as shown, then rough out the small dovetail to a depth of, say 0.065 inch. Replace the end mill with a dovetail cutter to carefully skim the dovetail to the full 0.070in. depth shown and form the 60deg. undercut. Easy does it! A slow steady feed and plenty of cutting fluid should give you a good finish.

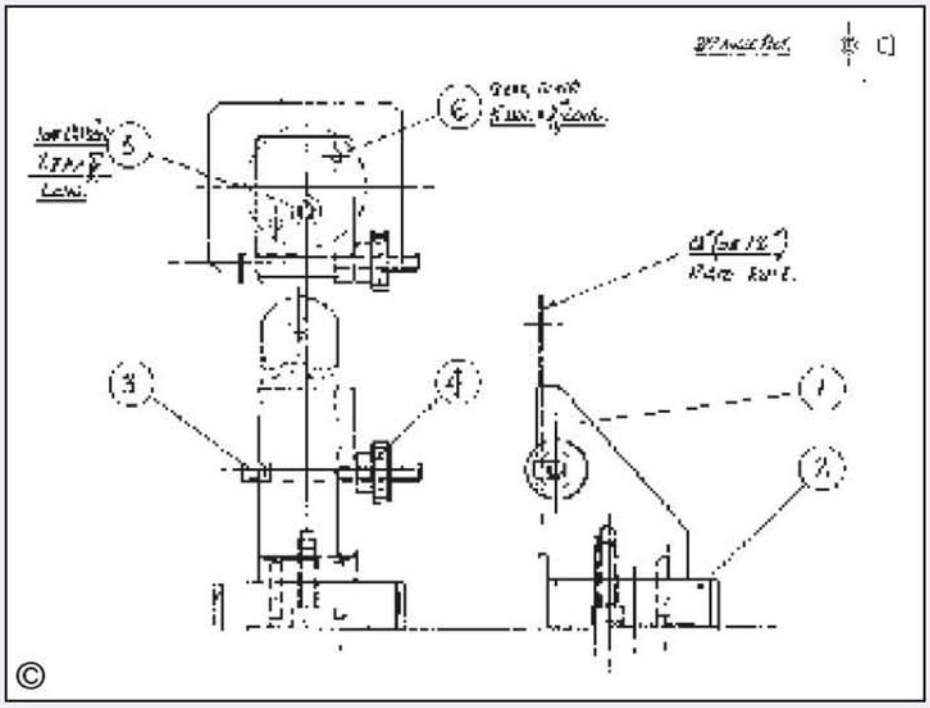
The large angled face can now be shaped. Most of the material can be removed by using a decent bandsaw if you happen to have access to one. Speaking of bandsaws, as a toolroom apprentice, I well remember the big Do-All machines which were worth their weight in gold being quite capable of cutting bright mild steel over 2in. thick without difficulty. These Do-All saws were equipped with their own built-in electric saw brazing and grinding equipment—and that was in 1937!

Having cut away such a large piece of the stock material, it would be as well to check that no distortion has occurred due to stress relief, and that the large flat face of the dovetail is still flat. If necessary, skim that surface over with the dovetail cutter once more.

Mark out and drill the 4.9mm dia. hole which is dimensioned from the flat face of the dovetail and form the small cut-out as shown on the drawing. Careful use of a needle file is probably as quick for this as any other method.

Base (detail 2)

A 1 3/4in. length of 2 x 1/2in. bright mild steel is required for this item. Mill, or file square and to size, and chamfer the corners.

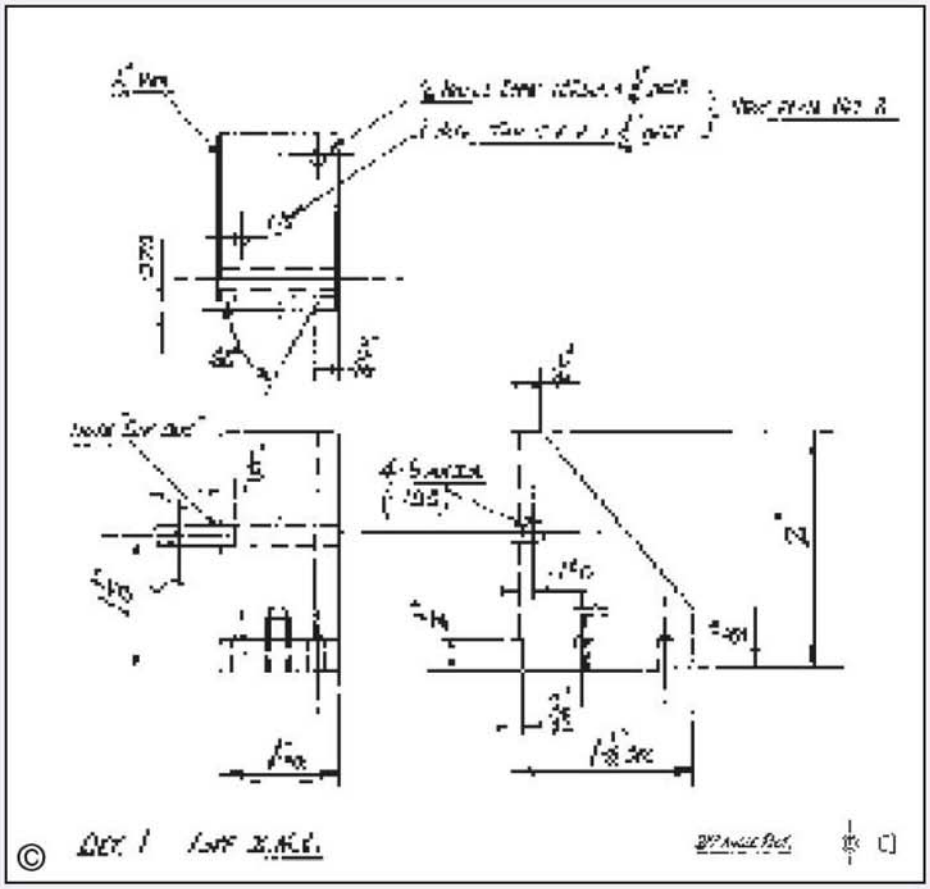


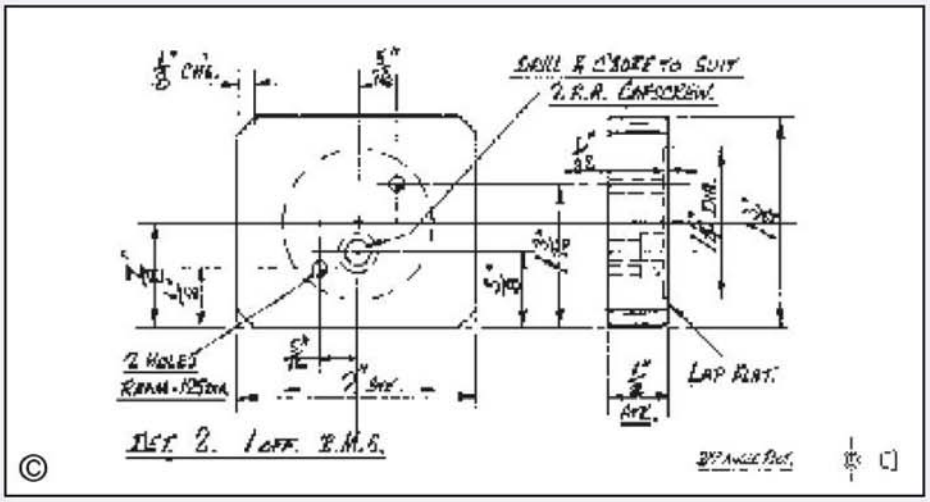
Mark off the centrelines and carefully centre pop at their intersection. Grip the workpiece in a 4-jaw independent chuck, set the centre pop to run true and bore the recess as shown on the drawing. The recess leaves a clean, relieved working face, which aids stability in use

Mark off, centre pop and drill for the capscrew and dowels. Lap flat.

Clamp screw (detail 3)

A length of 1/2in. dia. brass rod is suitable for this detail. Hold it in a 3-jaw chuck with some 2 1/8in.





The author's own version of this simple but invaluable item of workshop equipment.

projecting, gently face end and form a small centre. Preferably using tailstock support, turn a 15/8in. length to 2BA dia. (0.185in.) and 1/4in. or so to 7/16in. dia. for the head.

Undercut the head at 60deg. as shown and then, using a tailstock die holder, form the 2BA thread. Part off, then file the head to the shape shown on the drawing.

Clamp nut (detail 4)

A piece of 5/8in. dia. bright mild steel rod is suitable for this detail. Grip the material in a 3-jaw chuck with about 3/4in. projecting, face the end and just skim then knurl the outside diameter, using a medium straight knurl. Turn the 3/16in. length of 3/8in. diameter, centre, drill No. 21 about 1/2in. deep and tap 2BA. Chamfer and part off.

Carefully gripping on the 3/8in. dia., skim the face true, form a 10deg. concave angle, then finally chamfer and polish.

Assembly

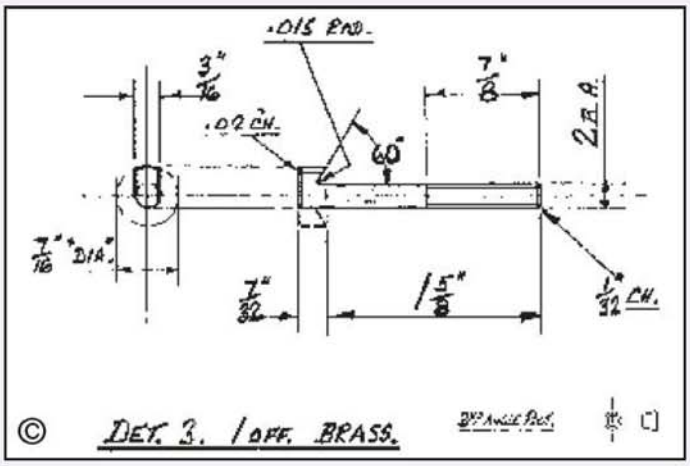
Centre the Base (detail 2) on the Body (detail 1) and set flush as shown on the assembly drawing, spot the position of the capscrew hole from detail 2 to detail 1. Tap the Body and fit a 2BA capscrew.

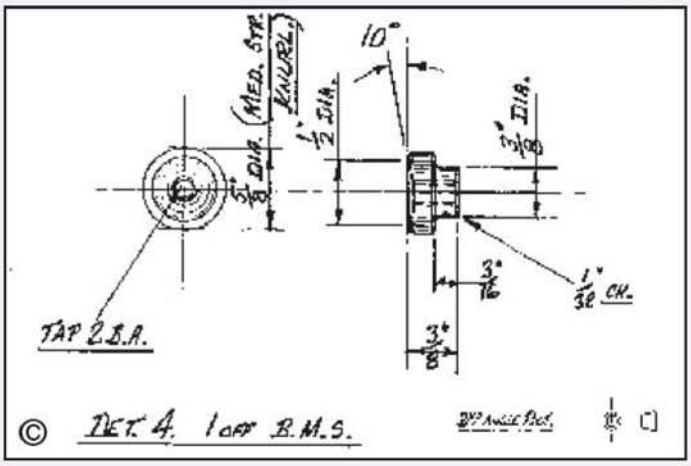
Finally, with the screw fully tightened and the flush condition checked, spot, drill and ream the two dowel holes.

Finish by heat bluing all the steel parts and quenching in oil which will give a professional finish and protect your new tool against rust.

Assemble, wipe over with light oil, and the job is done. As always, having well finished tools to work with encourages better work.

Good luck, and work safely!





FOR YOUR BOOKSHELF

The Last Steam Railroad in North America
ISBN 0 8109 8201 3
and
Steam, Steel & Stars
ISBN 0 0810 981 858
by O. Winston Link
Published by
Harry N. Abrams

O Winston Link, who died earlier this year, was arguably the greatest railway photographer ever. He trained as an engineer but operated as a highly successful commercial photographer specialising in technical subjects. His equipment was the best and most up to date, but that was nothing without the attention to detail he brought to his spare time interest of railway photography.

His main subject was the Norfolk and Western Railway which in the mid 1950s operated modern steam locomotives when almost all others had dieselised. As a major coal carrier they "burned what they hauled".

Link took his best known pictures at night, when he could control lighting precisely, using massive flash guns to illustrate just the features he wanted. This style of carefully controlled photography went out of fashion soon after and Link remained largely unknown as a railway photographer until recently.

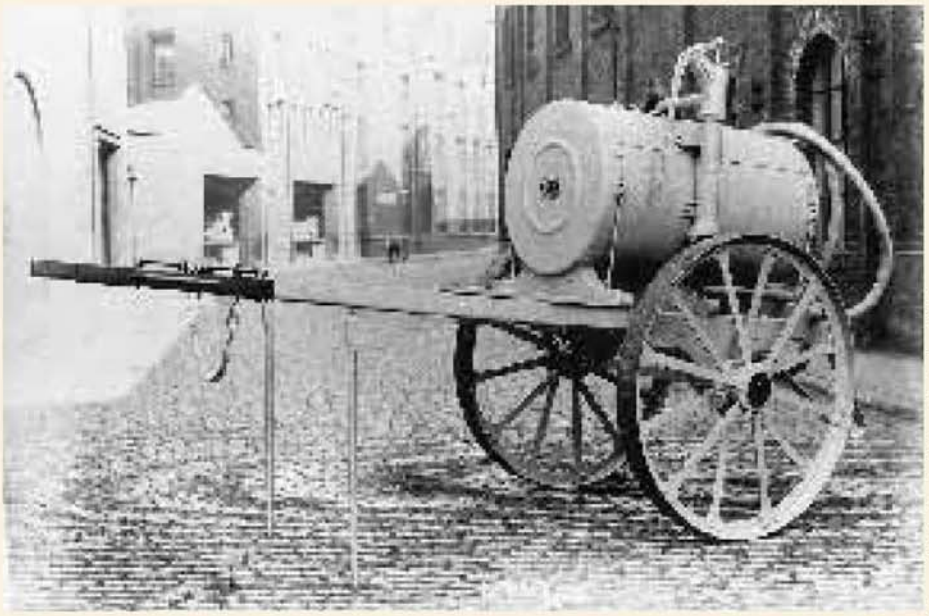
This new book also includes many daytime pictures including some in colour, taken on the delightfully rural Abingdon Branch. The photo of the train arriving at Green Cove, with a horse drawn sledge waiting, is a classic. Somehow this is more than just great pictures of trains, but a portrait of a rural American way of life that has now disappeared. Buy, read and enjoy for it is excellent value.

Steam, Steel and Stars is another fine collection of night time railway photographs by this superb photographer with the unique technique.

Both books are available for £16.90 each (UK delivery & VAT included) from **Camden Miniature Steam Services, Freepost (BA1502) Rode, Frome, Nr Bath, Somerset BA11 6UB; tel: 01373-830151; fax: 01373-830516; www.camdenmin.co.uk**

COUNTRYMAN'S STEAM

John Haining
describes the construction of an artefact from an age now long gone.



Print supplied by the Institute of Agricultural History & Museum of English Rural Life University of Reading.

FOWLER 2-WHEEL WATER CART

The visible handle which can be moved up and down and, if connected, a suction hose from which a flow of water is visible from the delivery pipe at the top of the pump as it flows down into the tank, probably makes my Fowler water cart a more popular exhibit with the (much) younger generation than the engines it serves.

It is many years since I constructed my water cart, but it still soldiers on and several recent requests for more information about it indicates that it has some adult admirers as well. The larger version of the two-wheeled water carts had a capacity of 230 gallons, the smaller one 150 gallons; both are equipped with a hand-operated suction pump for filling the tank, and a cock-controlled outlet at the back of the tank onto which can be screwed a hose to deliver water to the engine's bunker tanks. Both ends of the tank are flanged for insertion and riveting to the circular tank body.

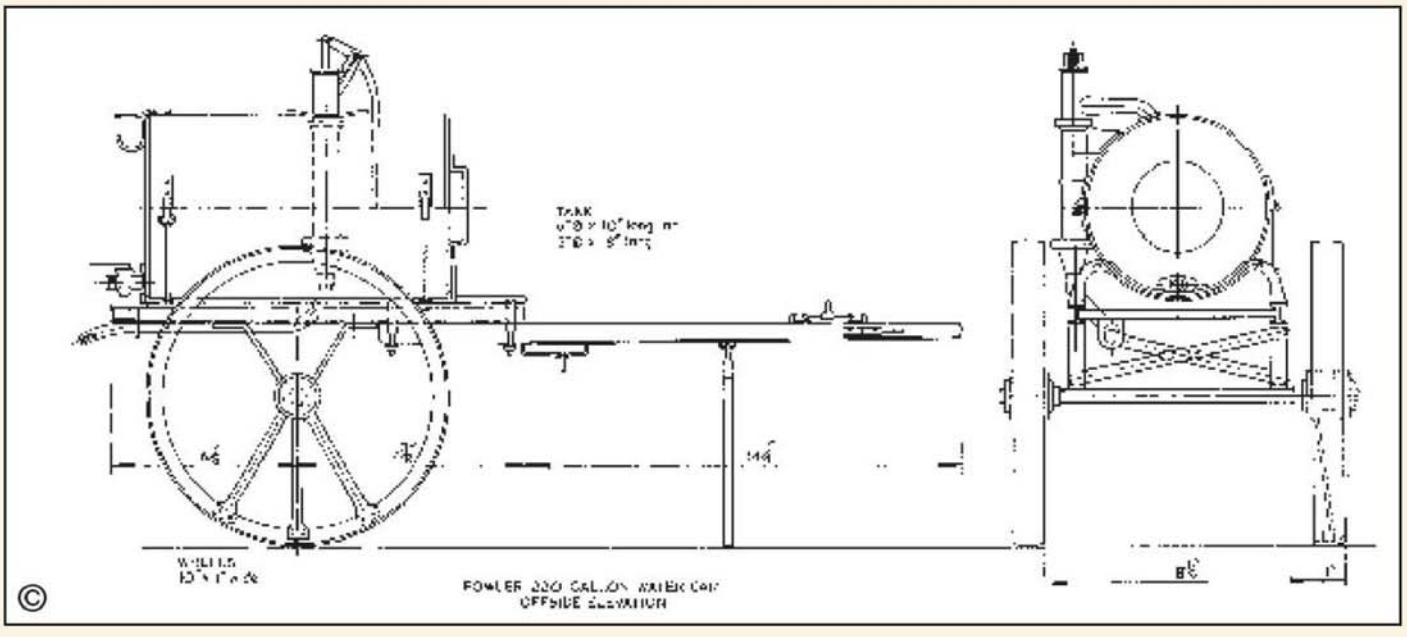
The tank itself rested on either two or three shaped cradle cross-members, visible in the Fowler works photograph of a wooden-framed water cart. I used the Fowler works drawings of their 220 gallon water cart with an all-metal frame, mainly because no earlier all-wood frame version was available in this area. Tank capacity appeared to be governed by variation in the length of the tank, maintaining the same diameter of rolled steel barrel. The water cart in the photograph is shown with a single pair of shafts suitable for a medium heavy horse. Delivery of water to a pair of steam ploughing engines at work was the responsibility of the farmer whose land was being worked, the cart being customarily drawn by one of the farm horses—quite a popular task among the horses, I always imagined, as the task was not too arduous.

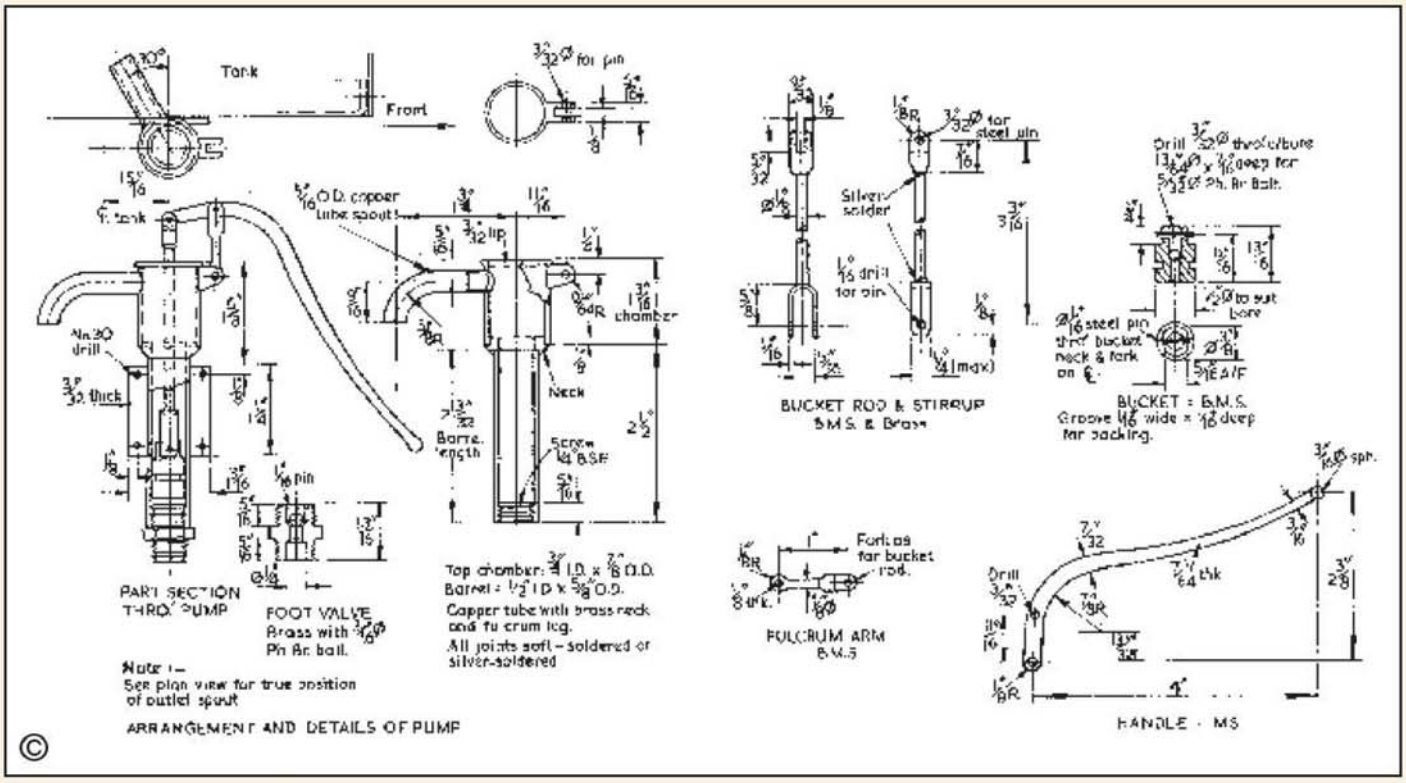
Water carts were never sprung, the metal frame having two axle brackets of flat mild steel formed as shown on the drawing, the shafts usually being replaced by a tractor type drawbar, at least in more recent years. The water tank shown in the photograph is anchored down into the radiused top of the heavy wooden cross members of the frame by means of four round mild steel bars with circular eyes at each end. My drawing (see Nexus Plans Service TE 26 and *M.E.* Vols 157/8) shows the oval and transverse type of water tank which has the two 1/2 x 3/8in. mild steel bars projecting downwards at 45deg. to prevent the whole assembly from tipping with shafts in the air when horse or towage is removed without due care to stabilise the tank first.

The purpose of the outlet flange shown on the under side of the oval type tank is for the attachment of the sprinkler pipe assembly, with its perforated water outlet arrangement. This, of course, has nothing whatsoever to do with the water cart being used for engine replenishment, and is only used if the sprinkler pipe is required for spreading the liquid contents or other field work.

If it is desired to represent the smaller capacity water cart, the water tank illustrated on my drawing can be reduced to 5in. diameter, maintaining the 8 3/4in. length. The wheels can either be left at 9in. of diameter or reduced to 8 1/2 or even 8in. diameter. My drawing details the oval transverse water tank. Readers have a choice of retaining this version or replacing it with the layout shown for the 220 gallon tank.

The pump and other details on the tank are all identical to those shown on my drawing, and can be repeated for the transverse or lengthwise type of tank. It is very rare nowadays to see a horse drawn water cart in operation, and most have long been converted to make them suitable for tractor haulage, with a triangular mild steel drawbar bolted to the wooden frame instead of two wooden shafts.



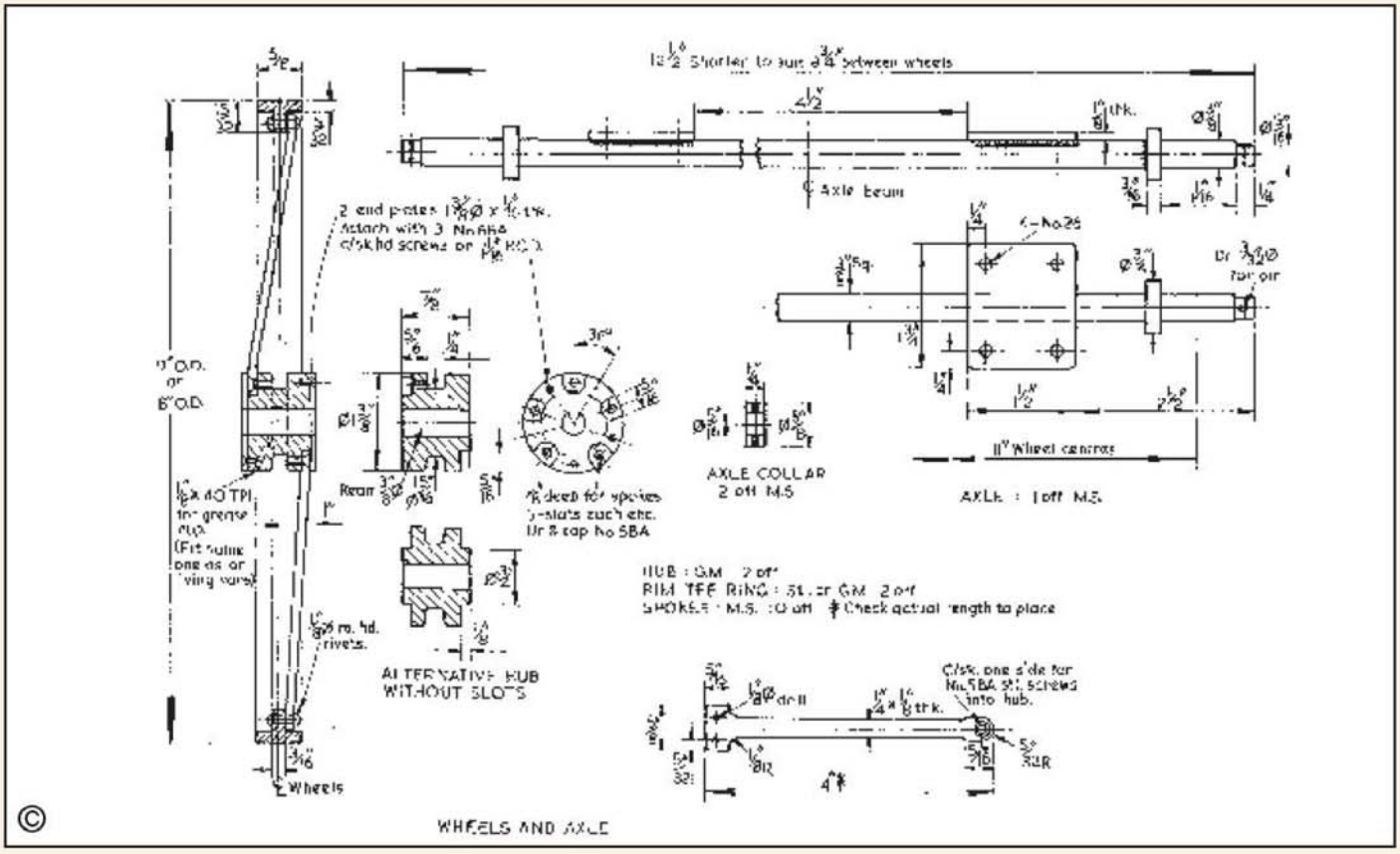


The large steel wheels follow the usual traction engine builders' practice, with a rim of deep tee section and 12 spokes with integral heads riveted to the leg of the tee section, each with two round head rivets, the lower end of each spoke being cast into the cast iron hub which has Fowlers' name cast around its circular face, all making up a very strong wheel. No steel tyre is fitted around the O/D of the wheel, and like all wheels constructed in this manner, a long life and many miles have left no trace of wear around the wheel, and little in the hub.

I think that it should not present any difficulties to build this water cart to the overall slightly modified dimensions I have suggested, or build it entirely to the drawing as issued, working to the visual details shown in the Fowler photograph.

One alteration which would become obvious if the water cart were to be built today would be the use of arc welding for all joints and even possibly the wheels, if they were not replaced by modern—and much smaller diameter—steel bolt-on wheels with pneumatic tyres. What a shame this would be, as I think the newly constructed water cart, still in works grey posing outside Fowler's works buildings presents a dignified and gracious picture of an engineering age which has, sadly, gone for ever. Like all Fowlers' products, engines or implements, the initial paint finish was a very smart 'works grey' with a few details picked out in black, especially for the works photograph which was to a very high standard of photography. Any oily finger prints were carefully removed and dirty hands were—or their owners were suitably reprimanded.

Back to the Sentinel S4 next month, if all goes well.



TROUBLE AT T' MILL

Jack Tait

describes how his problems with recently purchased new equipment were dealt with by suppliers who did their best to assist, in the hope that prospective new customers will be better informed.

For some years I have been designing and making specialist wide angle cameras. My problems began with downsizing my workshop equipment and parting with a Harrison L5 gap bed lathe and an Alpine Minor Milling machine, both of which gave years of trouble-free service. New equipment was expected be equally trouble-free. Experience in the photographic industry in terms of service and the reliability of goods had been exemplary.

The criteria for the new kit was that I had to be able to lift it in and out of a car boot either on my own or with the help of a friend. Throughout the problems described henceforth I have tried to hold on to my sense of humour; all exchanges have been friendly and cheerful.

New lathe

From Graham Engineering I bought a Clarkes CL300M lathe and a Chester UK Mini milling machine. The size and weight criteria were well satisfied and both machines looked promising. The mill motor was very noisy but seemed able to do most jobs with light tasks in aluminium alloys, brass and plastic materials.

The first problems arose with the lathe—the fibreglass gear casing was damaged on arrival but was easily repaired. The thread cutting system did not work owing to a badly aligned thread dial indicator block and a leadscrew mechanism which would not engage cleanly due to apron misalignment. The tailstock centring system was awkward; very difficult to adjust accurately and very slow to move, needing a spanner adjustment instead of the easy and quick to use cam and lever as fitted to the Harrison and many other lathes. Speed of use is important.

The motor drive pulley which floated in and out during running could not be adjusted to prevent fouling the motor casing. There was far too much play on the cross-slide screw, so much so that the job was grabbed when the centre position was reached on turning—the cross-slide gib strip adjustment was unsatisfactory in that its bed was inaccurately machined so that it was either too tight to use or too slack for accuracy. The saddle moving mechanism had a gear train in which there was excessive play in all the bearings. Finally, the saddle moving handle was situated far too close to the cross-slide handle with insufficient room to manoeuvre with normal size hands.

I contacted Clarkes who were friendly and tried to be helpful. Their technicians wanted to send me various replacements to cure the specific faults but their good intentions were defeated by their inefficient stores system together with the complete absence of spares for this lathe at that time. Parts were subject to an eight to ten week delay but I am now assured that this problem is solved.

In the event I cured the thread dial indicator problem by regrinding the casing so that it was square but could do nothing about the misalignment of the leadscrew engaging arms. I did try to modify the tailstock unit to effect a slight improvement, but the design limited what could be done. The upshot was that, in spite of a friendly dialogue with Clarkes chief sales manager Tony Trunkfield, I concluded that my machine was a failure under the Sale of Goods Act and was not fit for the purpose stated, i.e. it was not of merchantable quality. I put this in writing to the Manager of Graham Engineering, Roger Jeanneret who ultimately took the machine back and gave me a full refund. He then took this up with Clarkes who agreed to give Grahams a full value credit note.

Grahams come out of this very well and Clarkes have tried to be as helpful as possible. Senior management eventually discussed the problems with me and I have reached an agreement with Clarkes R&D manager that I had a 'Friday afternoon' machine. The return of the lathe might have been avoided by better communication between myself and Clarkes regarding their ability to repair/replace my machine quickly as soon as faults became apparent. I am led to believe that I was given the wrong impression regarding their day-to-day collection and delivery procedures coupled with a then poor spares position. However, in spite of my serious reservations regarding the lathe's design it is possible to take the view that with better quality control and some simple improvements to the tailstock, the CL300M could be a useful tool, albeit a little slow in use.

The variable speed motor is good, the main bearings allow accurate work and the bed is strong enough to match them. The bottom line is that I am seriously out of pocket and have lost a lot of time. I had to buy a more expensive second hand Myford from Grahams; the consolation is that it works and is fast.

New mill

Following this it was the mill's turn. In cutting aluminium alloys, the gear train between the motor and the gearbox disintegrated. Importers, Chester UK, were very helpful and sent me a replacement set. Soon afterwards, the motor, which had always been noisy, blew up in a shower of sparks and blue smoke. Chester UK again helped out by immediately sending a new motor together with new wiring and control boxes. On fitting this all was well for a few days and the new motor sounded very quiet. It turned out that the original motor had had a faulty armature part from new.

Next, the printed circuit board (pcb) unit on the mill blew the house trip switch after working for a few days without any problem. Apparently it produced a quasi-earth leak effect and I had to pay for my old trip to be replaced with a new RCD unit. The motor and controls were returned to Chester UK who tested it and found it working. It was despatched only to arrive damaged in transit and again was returned. Finally the third motor set arrived and worked, albeit at half speed owing to needing adjustments to the potentiometer settings in the pcb unit.

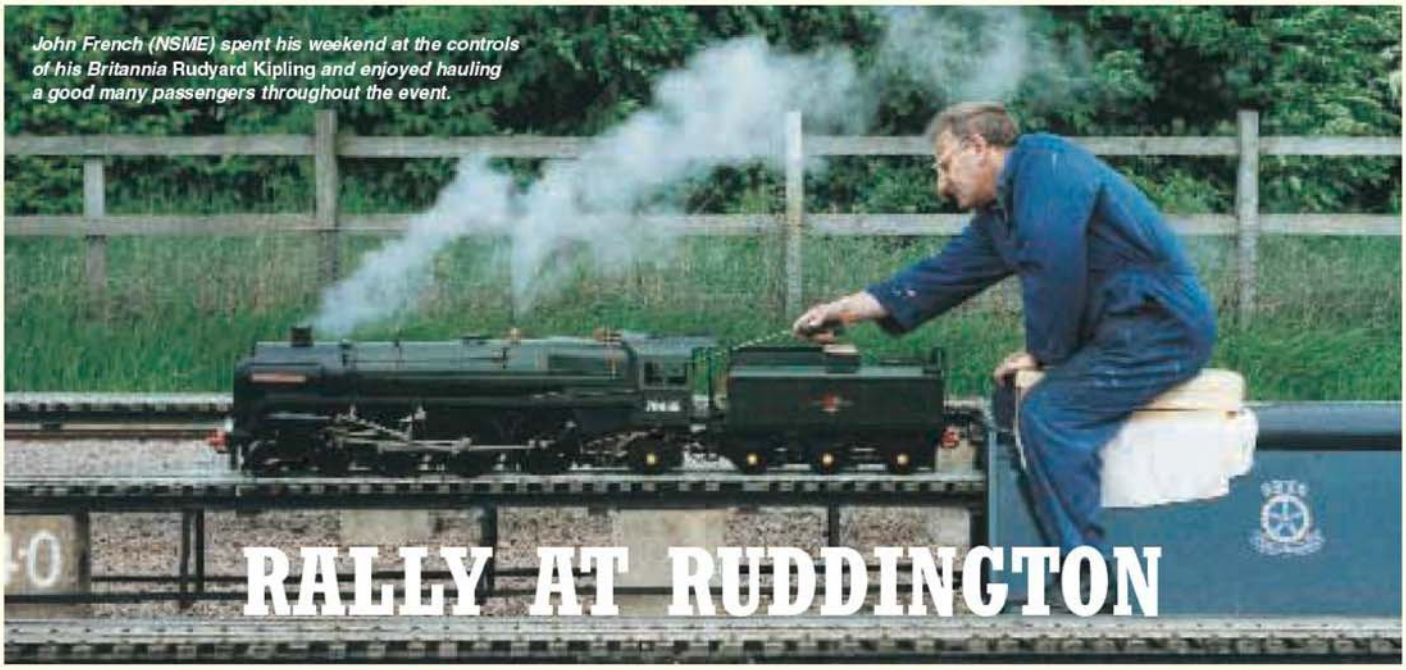
An example of the writer's workmanship—one of his special wide-angle cameras.

We are currently working on the problem of restoring full speed running without the penalty of motor creep when the speed control switch is set to off. At least I have a working mill but now have reservations about the reliability of variable speed DC motors compared with 'old-fashioned' AC units and belt drives.

This amounts to a saga of unfortunate coincidences and the suppliers/importers have done everything to help with good grace and humour. I admit to having had a lack confidence in the mill at the worst time, but it is difficult to find a substitute at that size and price. It is basically a good machine although hedged around with provisos not to subject it to heavy work. This is odd since it is supplied with an MT3 taper fitting which suggests using substantial drill/mill cutters.

I have to conclude that the help and service from Roger Jeanneret at Grahams and from Chris o' Hare and his colleague Graham at Chester UK have been very good and accept that Clarkes tried to do their best under difficult circumstances. It is interesting to quote Warco who import the same mill: they have seen fit to replace one plastic gear between the motor and gearbox with steel as do Chester UK. Warco also charge a little more for their machine and claim that they spend this on very high quality control and finish. The moral of the story I think!

My experience shows that the industry responds well in a crisis but could do much better in terms of quality control and effective communication with customers. Other users could still buy these goods knowing that they would be backed up but could ask to run the machines under load before they buy. I hope that my experience is not typical as I like to convey good news despite the problems experienced.



John French (NSME) spent his weekend at the controls of his Britannia Rudyard Kipling *and enjoyed hauling a good many passengers throughout the event.*

RALLY AT RUDDINGTON

Barry Jordan,
our Out of Town Correspondent, paid a visit to the Nottingham SME track hoping to see some engines from the Winson stable in steam. Was he disappointed? Read on ...

Nottingham Society of Model Engineers agreed some time ago to host a two-day Winson Rally at their Ruddington Track. Even after receiving the news that Winsons had ceased trading, the club committee decided to carry on as planned over the weekend 27/28 May.

It was hoped that Winson customers would attend and take the opportunity to vent their grievances and concerns with others in similar situations. However, fewer than expected attended. It can only be assumed, understandably, that modellers with half-finished locos and money paid 'up front' just did not want to talk about it so soon after the collapse. A few who did arrive had plenty to say, very little in Winson's favour.

Dave Wood, a NSME member, brought along his 9F which remained in the steaming bay throughout the two days. Dave built the locomotive exactly to the instructions and plans supplied by Winsons. Almost finished, it will not run—it is believed that the timing is way out which seems typical of many Winson models which just won't run. They may look nice all polished up on the mantle shelf but are non-runners. Those that do run have been built by knowledgeable and experienced model engineers who have discovered faults and rectified them accordingly.

Dave Wood (NSMEE) left his 9F on the steaming bay throughout the weekend.

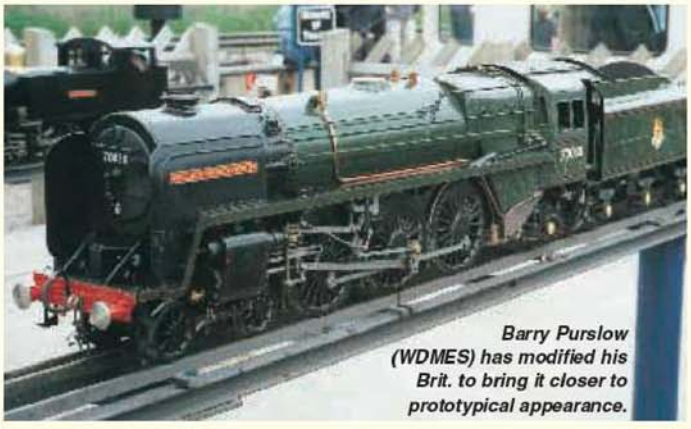
Barry Purslow from Warrington brought along *William Wordsworth,* his 3½in. Britannia which is a credit to its builder. Barry has, however, modified many features of the engine to enhance its appearance. One notable change Barry has made is the restyling of the cab. The top level has been raised slightly to make it more closely resemble the prototype. Half round beading has been added to the smoke deflectors and tender top edges. Running continuously for several hours, this model hauled eight or nine passengers with ease and is a fine model by any standards, I do hope Barry will take this engine to Harrogate next year as an entry in the Kit Built Model Class.

John French (NSMEE) also had his well finished Britannia *Rudyard Kipling* steaming each day, taking the many visitors on the extensive ground level track. John enjoyed every minute of the two days.

Dr. Peter Thomas (EVMES) came to the rally with his 14xx Tank engine which has been vastly improved from the original Winson design and finished to the highest standard. Dr. Thomas exhibited this locomotive in competition at the Harrogate Exhibition where it gained First Prize and the Maxitrak Trophy for the Best Kit Built Model.

As to the Winson Rally—it didn't really happen; the expected supporting locomotives just didn't turn up. The facilities at Ruddington are first-class, and it is a pity that such a few Winson models turned out.

Dr. Peter Thomas (EVMES) attended the Rally with his much modified 14xx.



Barry Purslow (WDMES) has modified his Brit. to bring it closer to prototypical appearance.

BRISTOL *AQUILA* ENGINE

Brian Perkins
sets to work on the inlet manifold and takes a complete break from problems with the magneto by enjoying a little woodcarving.

●*Part VI continued from page 24 (M.E. 4150, 13 July 2001)*

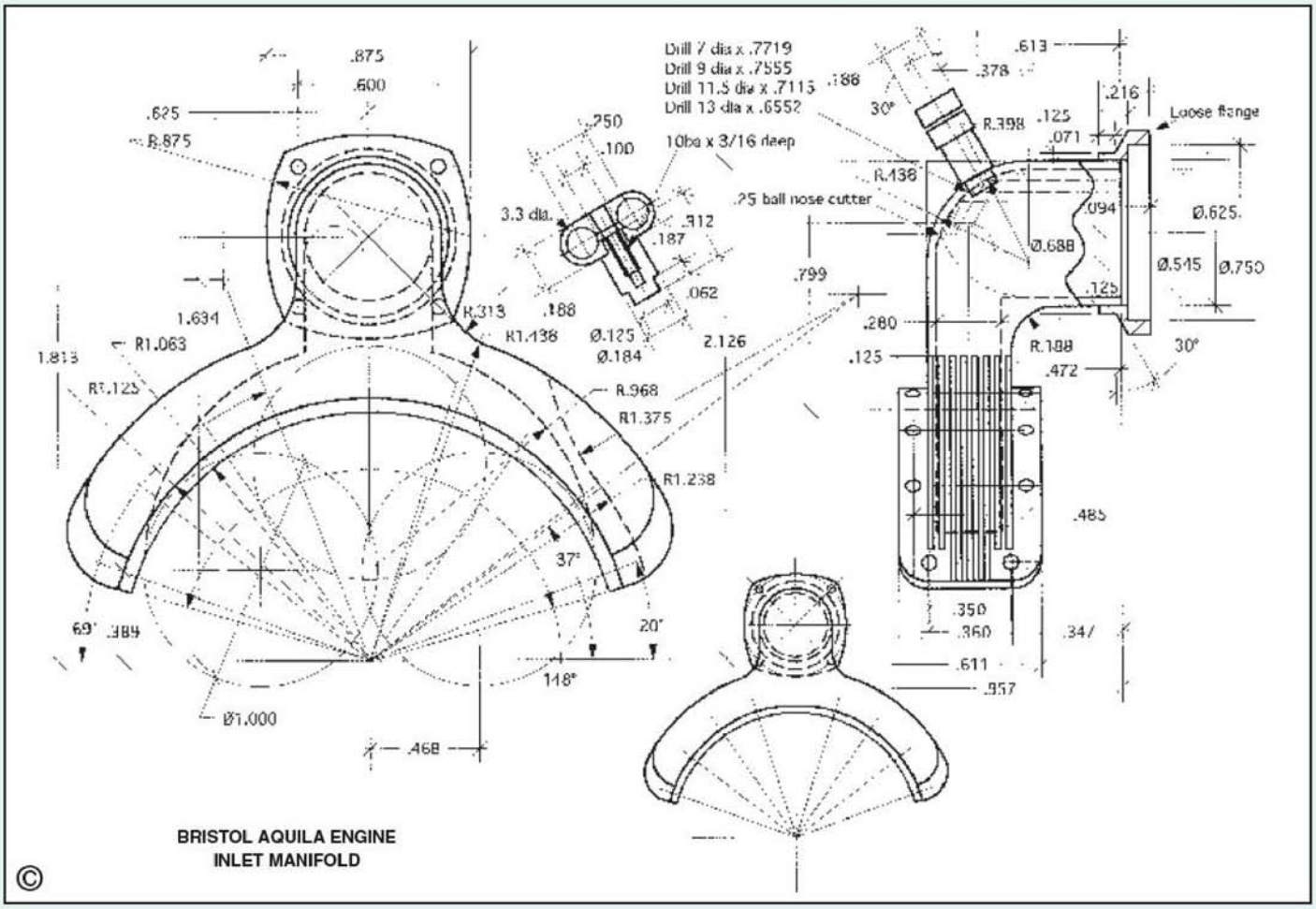
Earlier in these notes, I observed that I had finished everything which required to be made in quantity. However, I think this must have been some sort of mind over matter effect on my part for I suddenly realised that I had no method of getting mixture from the supercharger casing into the cylinders. On the full-size engine, the inlet manifolds are castings which are finned, wrap around the rear of the cylinders and are then flanged onto stubs on the supercharger casing. How was I to produce these for the model?

I re-read Bruce Satra's articles on investment casting several times but decided in the end that, with the thin fins and the necessary close fit to the cylinder, they would probably need to be machined anyway, and holding the castings for this work would be difficult. So it was back to solid lumps again and I ordered ten 4½in. diameter 1½in. thick blanks and proceeded to generate even more swarf. By producing two components from each blank, nearly all of the machining could be carried out before the blank was split, which greatly

Left: One of the ten inlet manifold blanks alongside another with the first stage of machining completed.

Below left: The extent of straightforward turning was reached with the machining of the second side, seen here marked out for the removal of surplus material.

Below: The bandsawn profile was cleaned up as here and the stubs then machined on an offset faceplate fixture and blended in by hand.



Left: After several false starts, the fins were machined into the inlet manifolds using a stack of saws mounted on an arbor.

Right: Surplus material between each pair of inlet manifolds was relieved with the job clamped to a vertically mounted rotary table.

facilitated its locating and holding.

The fins are of the same pitch and depth as those on the cylinders, so the time had come to experiment. The eventual solution turned out to be seven 0.021in. thick, coarse tooth pitch slitting saws spaced apart with shim washers and used dry. I initially tried them immersed in a bath of coolant but found that the swarf formed a slurry which packed into the gaps between the saws and involved stripping down the complete pack for cleaning after every cut. Used dry, the swarf seemed to fly clear and any chips caught in the tooth gullets could be cleared by holding a stiff brush against the teeth as they rotated.

Encouraged by this I now brought the almost forgotten cylinders back into the light of day and proceeded to cut the fins which I had been dreading for so long. This went quite well and I soon had a batch of cylinders complete with their 40 fins to go with the cylinder heads and everything was looking like the real thing.

I still cannot believe that they cut the *Hercules* fins in one plunge—my imagination boggles even more!

All that remained was to turn up the stubs and flanges for the supercharger housing, bore the holes and bond them in place. Now I could assemble the cylinders onto the crankcase with the inlet manifolds fitted and they would slide straight in to the waiting flanges on the stubs. At leats, that was the theory!

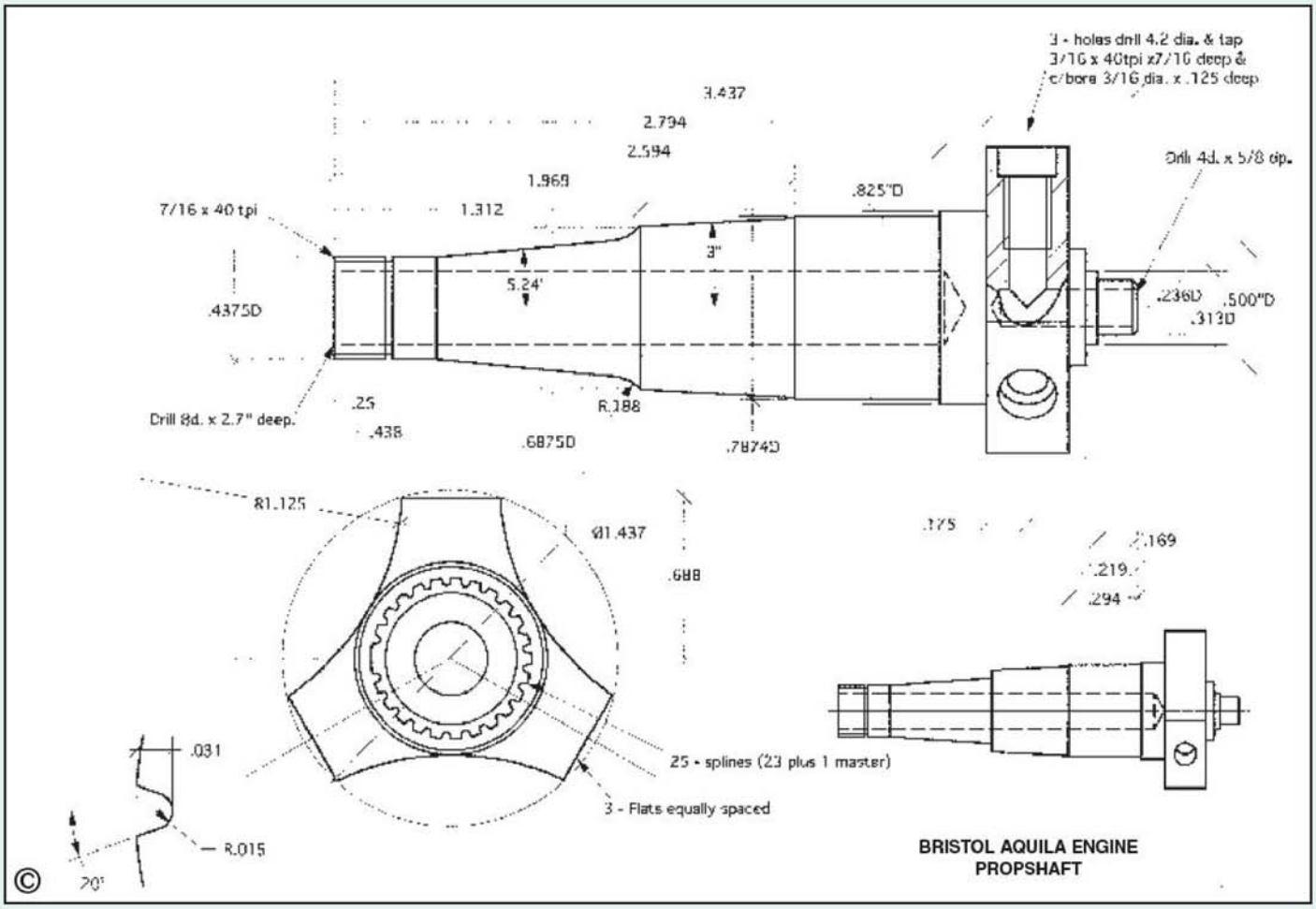
They certainly lined up with the stubs okay but on examining the stud holes in the crankcase through the clearance holes in the cylinder flanges I found that several sets of tappings were about half a hole out of position. Five sets out of nine on one engine and eight sets out of nine on the other; not a very good success rate.

These holes had all been jig drilled and I am still at a loss to know how they came to be out of position. They were drilled and tapped so long ago that I can't remember how I had located the drill jig but it was obvious that however I had done it was not very clever!

So another salvage operation was indicated and I set about producing 126 8BA aluminium plugs to Loctite into the incorrect tappings and then *very carefully* redrilled and tapped using the same drill jig. This problem came to light while I was in the middle of my trials and tribulations with the production of the four magnetos and, in a way, served as a little light relief.

Sparks

In another of the intervals between disasters with the magneto laminations I had a look at the problem of spark plugs. Two plugs are mounted in each cylinder head at the bottom of a 9/16in. diameter recess which is 1 1/8in. deep. At first it did not seem feasible to produce a plug and a suitable spanner to fit into this very restricted place. After another trip to the Trust to borrow a spark plug from the full-size engine, and some careful layout drawing, I found that by placing the plugs at 0.28in. centres, using 7/32in. hexagon for the plug bodies, and making a tubular spanner with a ▶



0.015in. wall thickness, it all became possible.

The plugs on the full-size engine are fully shielded which avoids the problem of producing a normal insulated plug body, so my plugs are made from steel with an M4 thread, a glass tube insulator at the lower end and a PTFE tube liner in the upper half to accept the HT lead. Electrodes are from mild steel with a flat head, the glass tube being extended from the end of the body to give the necessary spark gap.

I have also produced the ignition harness ring with shielded leads and the necessary push-on connectors for the plugs, all I need now is to sort out the continuing saga of the magneto problems which I still cannot bring myself to talk about. Let's just say that had I started work on the engine with the magnetos I'm quite sure that the frustrations would have put me off model engineering for life.

Details

However, to keep me sane there were still interesting details to make and I took my mind off the problems by producing some nice turned details in the shape of the prop driver and flange. I enjoy turning. The prop driver is located on its shaft by a tapered spline and I was rather worried about producing the female portion to fit the shaft. By using the mill as a slotter with the head set over to the correct angle it was not as difficult as I had feared and it was very satisfying when it seated on the shaft without any shake and with the correct clearance between the back face and the front of the gear casing although lining up the master spline is not easy!

The inner cavity was machined into the inlet manifold using a home-made cutter and offsetting the workpiece on the rotary table.

This success encouraged me to carry on and cut the parallel spline for the prop flange, which again went well. In the past I have cut female keyways, etc., by racking the saddle back and forth on the lathe, but it is so much easier using the lever operated quill on the mill and the rotary table for indexing. That is when you have worked out a suitable way of locking the spindle, otherwise you can get some very strange shaped slots!

It's nice when things go right for a change.

Woodcarving

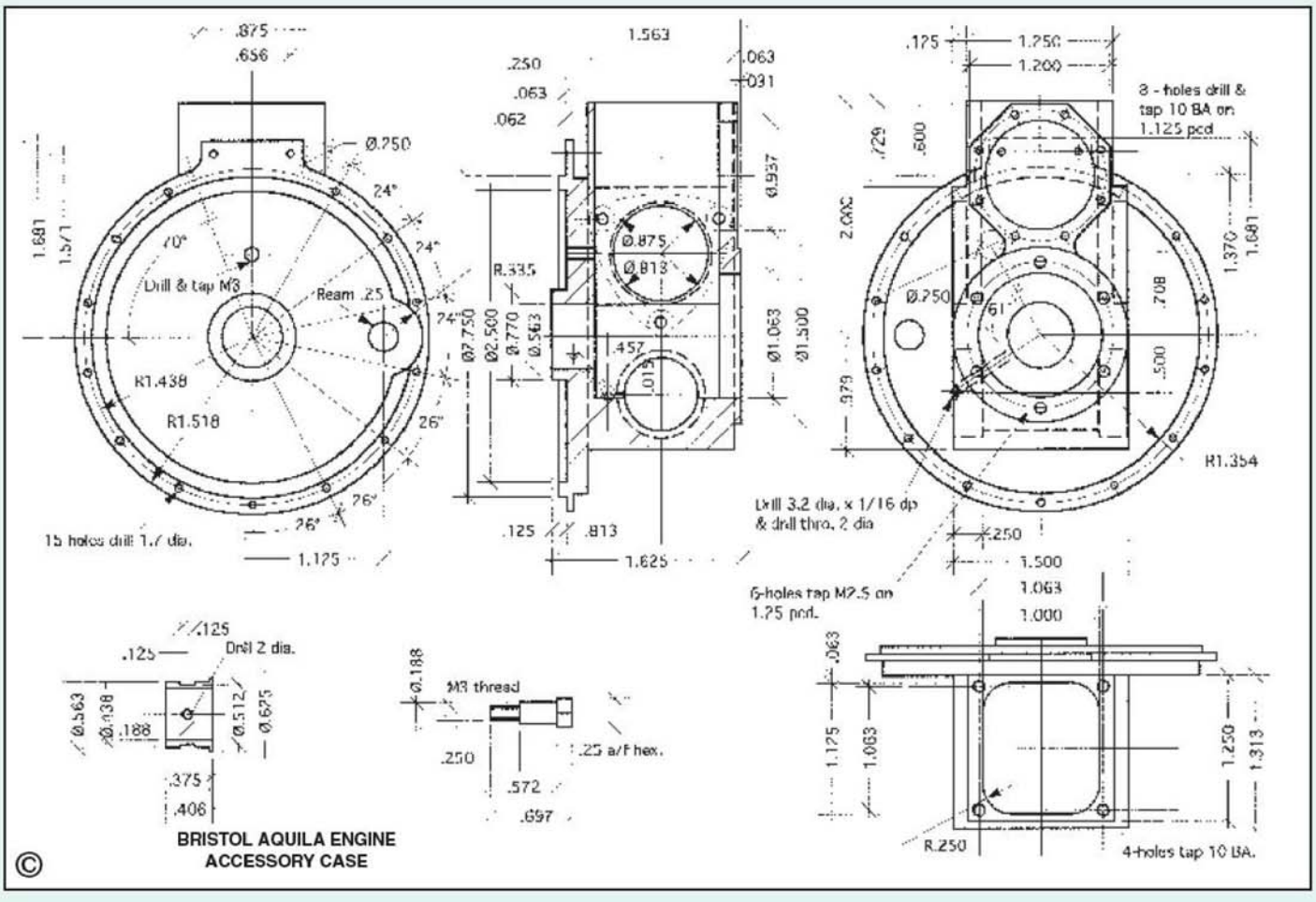
Having the prop driver assembly completed, it seemed a good idea to have a change of discipline and to try my hand at some woodcarving for a change. A friend who moved house recently no longer had room for a stack of mahogany planks which had originally been a very large and heavy door and this seemed the ideal fully seasoned timber for the job. When I carved the prop for the Volkswagen flat four model I had used two laminations of spruce and a central layer of mahogany, but this did not seem right for the *Aquila*.

It was difficult to find details of the likely size and construction of the full-size prop but one of the *Mercury* engines at the Heritage Trust had the central remains of the prop still in place which showed that it was made up of nine 7/8in. and two 5/8in. laminations with the central boss 12in. dia. x 9in. thick, so I had something to go on.

Incidentally, this engine had powered a prototype Bristol aircraft which had crashed in the 1930s and the engine had been thrown into the foundations of the West works flight shed. It had been rediscovered when the building was demolished to be replaced by a new postal sorting office. The Trust promptly laid claim to it and although it does show some signs of its time underground, it is now part of the collection.

Anyway, I was now able to prepare a drawing for the prop, cut the wood into suitable thickness planks, glue up the blank and start carving. With multi-coloured laminations it is easy to see the form of the prop as it appears and to keep the two halves balanced, not so easy with the all-mahogany item, but the greater number of laminations offset this to a large extent. My diary shows a total of five days between cutting the blanks and varnishing, unfortunately I did not record the hours but it made a pleasant change from cutting metal.

●*To be continued.*



KEITH'S COLUMN

Keith Wilson

tells a tale of whoa by dealing with brake blocks, cylinders and associated components.

●*Part IV continued from page 38 (M.E. 4150, 13 July 2001)*

THE TOAD

A GWR Brake Van in 7 1/4in. gauge

The brake blocks can be castings, in which case cleaning up the slot at the back and drilling three holes should be enough; however, a description of machining them from solid will cover the cast version.

Two 9in. lengths of 0.5 x 1.125in. black mild steel are a good starting point; begin by using a flycutter to cut the 2.438in. radius to match the wheel diameter. If of course you have a side-and-face cutter 4.875in. diameter then so much the better. Although this is unlikely to be a standard size, a worn one will serve if re-sharpened. In any case, if you use a full 5in. one the difference will not matter.

Although another curve is shewn some 3/8in. from this rubbing face, this would be most difficult to reproduce and would hardly be visible; the only reason I have shewn it is for completeness. If you have used castings then it might well be visible, but is of no real moment.

Turn upside-down (or down-side up, as you prefer) in the vice and cut the slot across the back. Mark out and drill the three holes, then carve out the shape using a hacksaw or bandsaw. Finish by filing or using a belt sander, cut off each block, trim it and that's it.

Note that there are three holes whereas only two are used. The third hole means that the required right- and left-hand versions are identical. There are other uses for empty holes in railway working, the vacuum reservoir comes to mind; no doubt others will find themselves in due course. In case you haven't noticed, the blocks are handed by the little ledge mentioned above, plus a curved bit visible in plan view to clear the wheel flange.

The little hanging links hardly need any mention beyond saying that life is easier if you do them in one long strip, parting just before rounding off the ends.

The hanging brackets weld nicely to the cross-beams; it's best to stick them on before welding up the whole frame set.

The suspension links have no obvious use, but they hang from pins in the inner frames to hold up the compensation lever. They also hold up the vacuum brake cylinder, one each side. These two will need cranking (or S-bending if you like) as they must fit each side of the cylinder and hang from the long inner frame bars.

The crossbeams are a right pain; when I made my own set of Toads in the late 1980s I had to make 24 of the censored things. However, since they are not easily visible, some poetic license is possible. I made mine by bending up two bits of 3/8 x 1/4in. and arc-welding them to the round shaft, the little bridging piece at the root of the fork being conveniently forgotten.

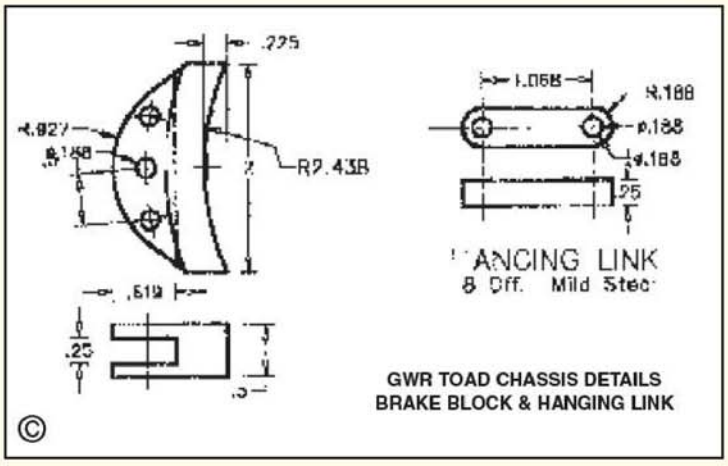
Mathematically inclined reader(s) will perceive that the braking effort is not completely matched each side of the wheel, but there's not a lot in it. In the drawing of the brake assembly, the right-hand block will press harder than the left-hand one by the amount of tension in the long pull-rod fixing into the fork-piece at the top of the compensating lever.

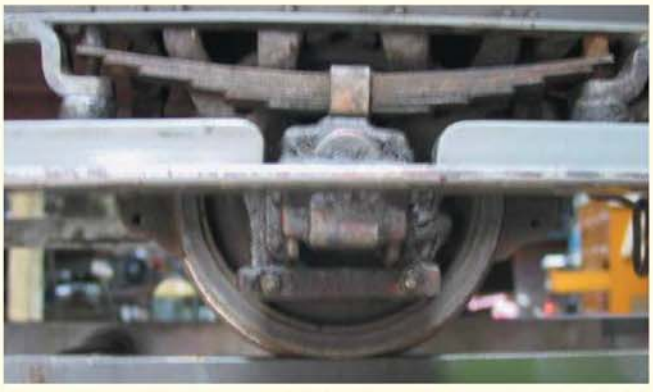
Ideally, the joint where the Link fits into the Crossbeam should be fairly stiff. There are places where brake linkage should be freely pivoted for best efficiency; there are others where the reverse is the case. Thus the compensating linkage should not be too free, as it is generally set on the first time the brakes are applied. Ideally, on a locomotive or tender with several sets of levers and blocks, the whole lot should swing freely as a unit, but blocks, crossbeams, compensation linkage, etc. should be less free, for if everything is free and easy blocks will tilt down to rub against wheels, and the brake gear could well need light 'return springs' to pull the brakes off. With free gear and the modern system of brake cylinder design these springs are not needed.

There are minor additions to the frames to accommodate the brake gear; two pairs of strips at each end and some holes in the long inner frames. The strips act as upper pivot points for the links holding up the compensating lever, and the holes in the inner frames do likewise for the brake cylinder.

Brake cylinder assembly

The actual brake cylinder unit is simple enough to make, it is only slightly different from 'scale' in that instead of a round cross-section rolling ring (a bit tricky in several ways) the more modern 'U'-seal allows less strict tolerances in machining of piston. Now, the original design of this type of cylinder called for a thin-lipped seal which just touched the cylinder wall. This meant that good accuracy was required so that the seal always ▶





A close view of the axebox assembly of the Author's vehicle as detailed in Part III of this series (see **M.E.** *4150, 13 July 2001).*

remained in contact; once it shrank in any way so as to miss the wall then it cattled-up the works. In all fairness, it was the idea that the 'pulling of the vacuum' would in fact cause leakage of air past the seal in the downward direction so the vacuum would 'fill all the system'. This worked okay, but I did some measurements and discovered that this 'leakage' had to be at least 3psi.

So methought that putting in a zero-back-pressure valve would assist efficiency, and you will see that a car-tyre valve is mounted in such a way that when the piston reaches the bottom of the cylinder, this valve is forced open; hence vacuum above and below the piston will be equal. This has the advantage that a definite force is applied to release brakes; hence return springs are not required, and also more brake power is available. Now old square-cube says that 'our' brakes are much more powerful than necessary—true—but o.s.-c. also says that small vacuum systems are disproportionally sensitive to leaks, and some spare power does not come amiss. A rather annoying point here is that due to sheer cussedness, once applied during normal use the brakes will tend to leak off, whereas once disconnected from the train (or in case of locomotive, when cold after a run) they will stay on most obstinately. Hence the release valve.

That stupidly named item, the vacuum reservoir (on the other hand what else could we call it?) is vital; it greatly increases brake power. Had we perfect vacua (plural of vacuum) available then it would be needless, but since we haven't, we need one. I have mentioned the reason before, but herewith a brief synopsis for new readers and those who have forgotten.

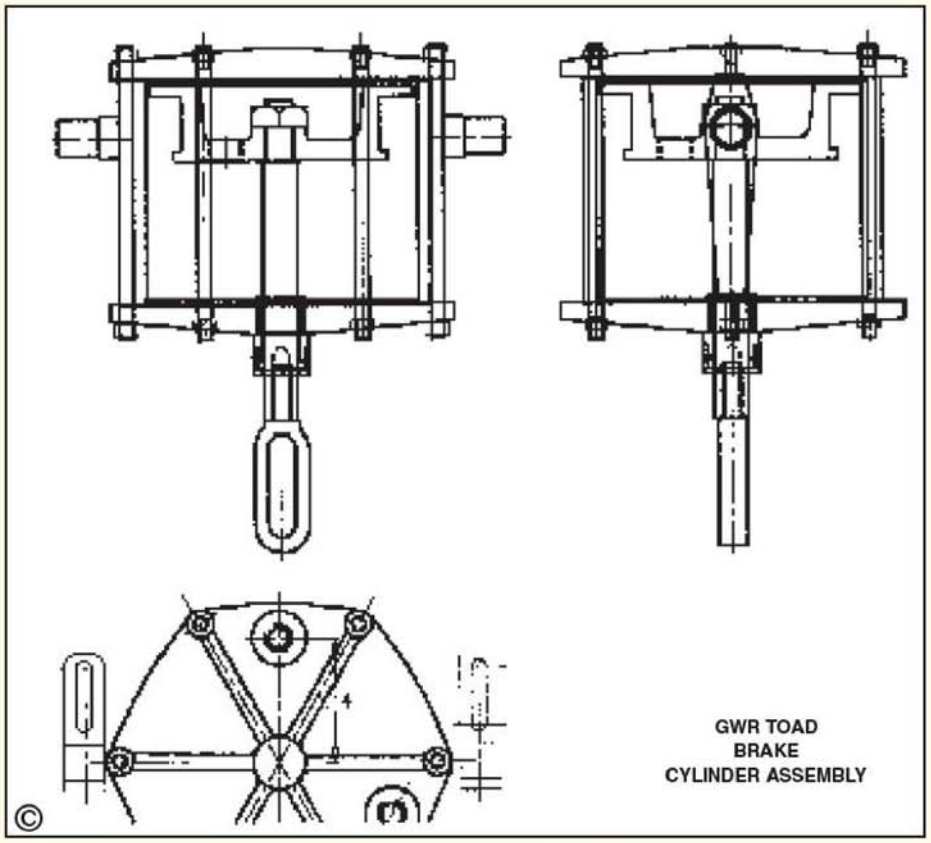
On a brake application, the residual air above the piston is compressed according to Boyle's Law, hence its pressure rises. This provides back pressure above the piston and so reduces available cylinder thrust. If the volume above the piston is increased, this rise in pressure is less, hence greater brake efficiency. Since we can hardly increase the length of the cylinder, we couple up a reservoir.

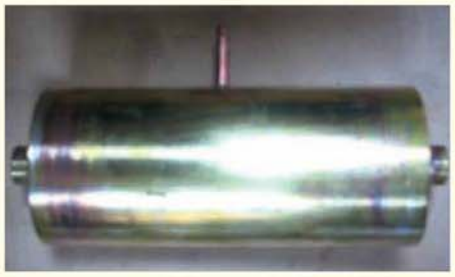
Many good ironmongers/tool shops stock transparent plastic tubing which is ideal for coupling up systems. Some 1/8in. bore does for connections within a vehicle, but go for 1/4in. between vehicles, and 1/4in. pipe all along each vehicle, teeing off with 5/32in. stub pipes silver-brazed together where appropriate. It works very well. Plain mild steel is okay for pivots for all these joints, for the movement is very little. Held in by circlips on the 'outer' end, they last very well.

The machining of the lot should need no great comment, but the gland needs to be true and central relative to the cylinder. The top cover, when completely machined, is best sealed onto the cylinder permanently; I use plumber's solder. Leaks anywhere in the system are very important, but a leak above the piston is even more important. (All leaks are equal, but some are more equal than others!) So test the release valve, the vacuum reservoir, and the top portion of the actual cylinder thoroughly. On assembly, the lower cover should be sealed onto the cylinder, but not permanently. Loctite 542 is ideal. A portion of graphite grease inside the cylinder aids operation.

A simple test to illustrate the need for the vacuum reservoir: human nature being what it is, you will try it. Put a piece of plastic tube over the spigot on the bottom of the cylinder and suck to pull the piston right down. Put a finger over the top outlet and suck as hard as you can. Remove your mouth, and note how far the piston moves. Now repeat the process, this time with the vacuum reservoir connected to the top outlet. You will then appreciate the use of the reservoir.

The precise length of the long pull-rods must be discovered 'on site'. A certain amount of adjustment is available; if this be set somewhere near the minimum, then as brake blocks wear down, the slack can be taken up easily.





A vacuum reservoir improves braking efficiency by increasing the effective volume above the brake cylinder piston.

A U-section ring seal for the brake cylinder piston permits greater dimensional tolerance on the components.

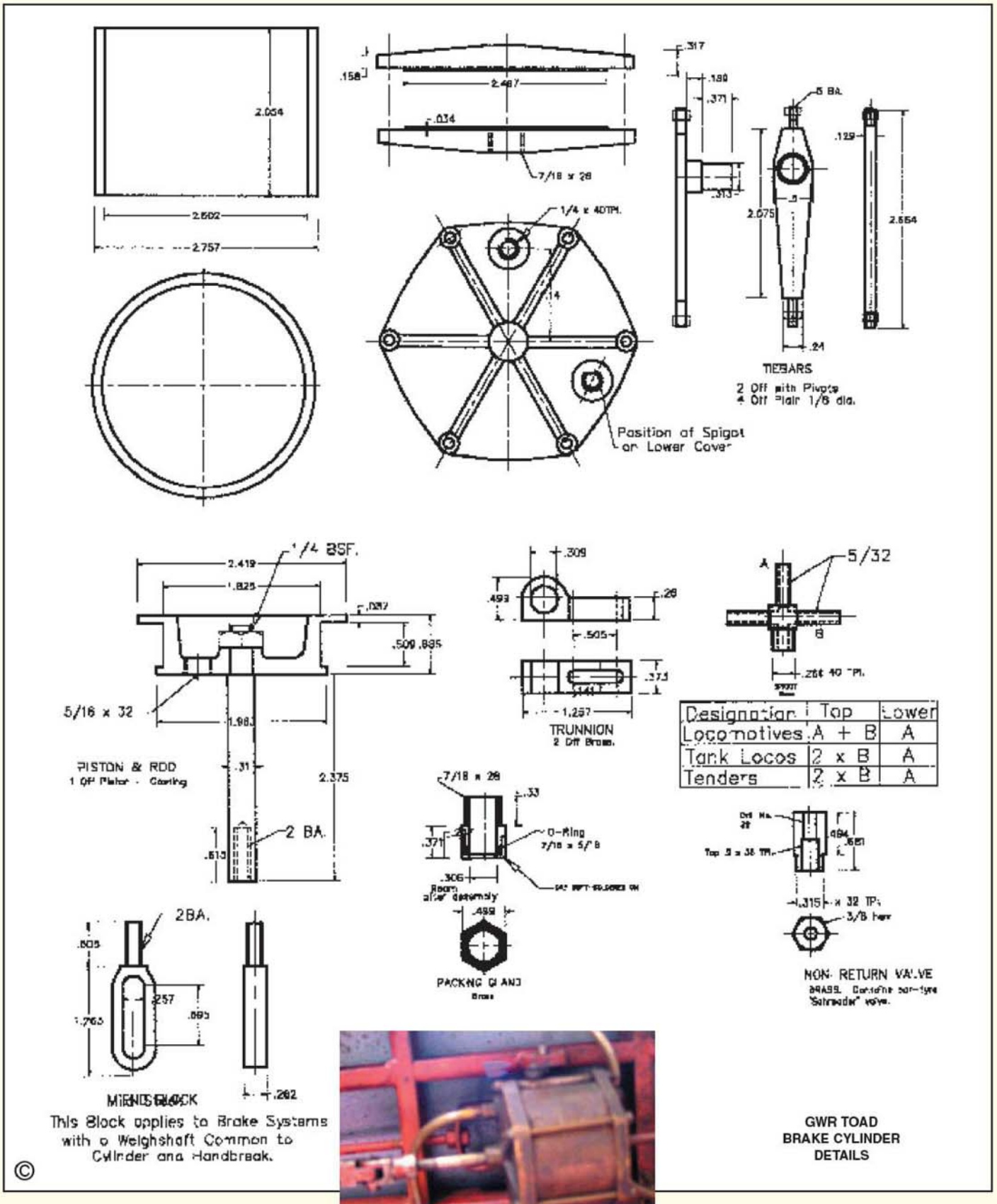
Miscellaneous

Doug Hewson has written to me about Toads, with some useful constructive critiscism—I like. He has available some quite fine drawings for a 5in. Toad, much more detailed than mine. So it is a matter of choice—if you want what might be described as a 'working' Toad, with lots of storage and water space, then go for mine. If you prefer the highly detailed type, then get his drawings and 'blow them up'.

Actually, when I did these drawings for my own batch of six, I could not see just how to work in the handbrake and yet have it clear of oilcans, oily rags, a couple of fat spanners, etc. Also, since in normal use the Toad would be semi-permanently coupled to its locomotive, the handbrake would be superfluous and also difficult of access.

Doug tells me that there were 13 different designs of Toads with 16ft. wheelbase. Knowing something of railways (just a little!) perhaps the words 'at least' would be well added just after '13'. It seems that the diagonal bracings were a feature added later, as were vacuum brakes; no doubt this accounts for the many different styles of said bracing. For the finicky, it seems that holed wheels were not used, many early ones were built with spoked wheels. Later, several types were built with plain disc wheels, with no holes or painted-on spokes. However, I have seen painted-on spokes myself, but in view of the rather grotty standard of said painting, clearly added later, perhaps by 'amateurs'? The obvious use of some sort of visible 'spoking' for easily detecting wheel lock is, er, obvious. For the curious, the 'diagram number' for this Toad is AA23, and copies of the Swindon drawing can be obtained from the National Railway Museum at York.

Friend Martin Evans has sent me some welcome information, to the effect that curving of the roof can be greatly facilitated (made easier!) by putting the flat roof in the top of an oven, with a bowl of water underneath. Gradual heating of the oven will then 'steam' the roof so that it will



Brake cylinder assembled and fitted beneath brake van. Note use of flexible plastic piping.

be much easier to bend, to a great extent retaining its shape when cold and dried. Excellent, but as so often happens, there is a snag: it needs a pretty hefty oven! However, all is not yet lost. I can see no reason why the roof should not be in two portions if matched up carefully and the join filled with plastic wood or something similar; Plastic Padding as used for car repairs comes to mind. If several coats of undercoat/primer are applied, spraying recommended, rubbing-down with fine wet-or-dry (preferably wet) betwixt each coat, a fine smooth surface will result.

Tip: fairly obvious, but there is always the first time; it helps a lot if, after feeling the smooth finish, it is washed off with water and kitchen towel or paper handkerchief and wiped dry. Meanwhile, a few more pictures of Toad details.

My recent remarks on the scam of *"global warming caused by cars"* has aroused a certain amount of interest in both directions. I suggest that those genuinely seeking facts and truth visit website **www.ringroad.com** for they will there learn much that governments and green (cabbages?) pressure groups would rather they didn't know.

●*To be continued.*

LETTERS TO A GRANDSON

M. J. H. Ellis
mentions the use of silver-steel rod for checking dovetail slideways and discusses scrapers and scraping.

●*Part XXXI continued from page 35 (M.E. 4150, 13 July 2001)*

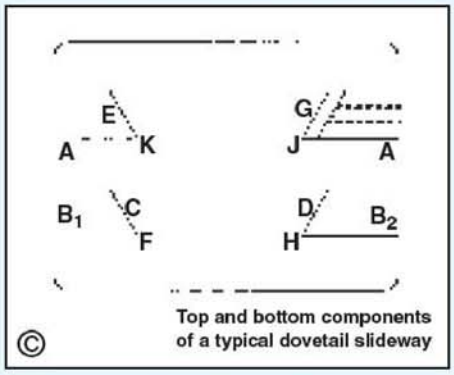
Dear Adrian, You should now be familiar with the use of silver-steel (drill rod) for such purposes as making D-bits or taper reamers. Another use has just occurred to me, which we haven't yet mentioned. It is in testing the accuracy of dovetail slideways, such as you would find, for example, in a lathe top-slide. I was going to say 'parallelism', but I don't see how two plane surfaces having a dihedral angle of 60deg. can properly be called 'parallel', even though an infinitude of lines lying within them are. I think that if we are going to get onto the subject of dovetail slideways it would be better to broaden the subject, and start at the beginning.

The usual angle for such ways is 60deg., and milling cutters for machining them are made to that form, being the shape of a poppet valve, with teeth on the head and the sloping under-surface. I have machined V-slides both by shaping and by milling. Neither method is difficult, but milling is the simpler of the two. If you had the job to do, you would naturally use milling, since you have your vertical slide but you do not have a shaping machine. Suppose however, for the sake of argument, that you did use a shaping machine, you would not want to turn the work around on the machine, any more than you would had you been milling. So, with reference to the accompanying diagram, having dealt with faces B_1 and C on the left-hand side, set the swivelling slide of the machine from 60deg. one way to 60deg. the other way and fitted a tool of opposite hand for dealing with face D, you would need to make provision to ensure that the horizontal face B_2 was at the same height as B_1.

Not difficult, and I don't recall how I actually did it, but one simple way would be to turn a little pillar of approximately the same height as B_1, but shorter. Then, with the dti or a surface gauge, you could compare the height of the pillar with that of B_1. Suppose B_1 is 0.006in. higher. Now you can take the pillar round to the other side, wind the inclined slide of the shaper down as far as it will go, and set the tool with a feeler gauge to 0.006in. higher than the pillar.

Had you used a shaper, the point of the tools should have had a small radius which would have been reproduced in the angles F and H. Milling would have left sharp corners; but in either case it is all the same, because when it comes to scraping, the thickness of the scraper will prevent it going right into the angle. Accordingly, a small flat must be formed along the edge K of the top slide, and similarly, along edge J of the gib-strip.

You need to plan your work in advance, because, as I have shown in my diagram, the lower part needs to be a little offset in order to accommodate the gib strip G. Another point to watch is this: you don't want to have to machine the gib strip to thickness, but to use bright mild steel of a standard thickness. Most likely 1/8in. or perhaps 3/16in. material will be appropriate.



Top and bottom components of a typical dovetail slideway


A 60deg. dovetail cutter (top) and the cutting edge of a commercial flat scraper; note the scraped texture on the surface plate on which they stand.

Neither do you want it to be a discreditably loose fit, hence, your machining needs to be done accurately. I think that a gap in which the gib strip is to fit of 0.005-6in. undersize would be reasonable, taking account of the fact that wherever scraping is done, the effect will be to increase it.

Scraping

I have mentioned scraping several times, but have said nothing so far about how you should set about it. Well, here goes. I feel sure that practice will be the best teacher, but first, to describe the tool. Not unlike a carpenter's chisel in appearance, the commercially-made article which I have before me has a tool steel blade of 1/2 x 5/32in. section some 4in. long, slightly broader at the end which has been forged down like the blade of a screwdriver to a thickness of about 1/16 inch.

Looked at from the side, the end is square like that of a screwdriver blade, but seen from the broad face, it is slightly curved. When sharpening the scraper, I hold it upright on an oil-stone with its wide faces parallel to the long edges of the stone, and rub it to-and-fro along the stone, rocking it slightly to maintain the curved cutting edge. To finish off, I give it a few strokes either side with the broad faces nearly flat on the stone.

In using the scraper, you hold it with the handle in your right hand at an angle of about 45deg. to the work, while you press on, and guide the end with the fingers of the left hand. Short strokes of around 1/2in. are all that is required, at the same time giving the tool a little bit of a twist. As the whole purpose of the scraping operation is to take down the high spots, it is on these alone that you operate.

To reveal the high spots, you start from a surface which you know to be flat, wiped clean and lightly smeared with marking blue. The work is likewise wiped clean and rubbed gently against the true surface. When you look at the workpiece now, you will see the blue adhering to the high spots. It is these which you should now scrape, so removing the blue. I have seen the statement made, and agree with it, that people usually start to scrape in too pussy-footing a manner, no doubt for fear of taking too much metal off, whereas in fact, the thickness of material which they remove is really very little, and they would have saved time by going at it in a more energetic way. Of course, more circumspection is needed as the surface approaches its finished state. If you were to look at a new surface-plate you would see that it was covered all over with closely-packed little scrape-marks, looking like a mackerel sky.

I can recommend the following procedure for fitting slides by scraping. By the way, I use a scraper made specially for the purpose from an old 1/2in. wide flat file. It comes to a more slender tip than the other, and the cutting edge is only 0.031in. (1/32in.) wide, the better to get into the angles of the dovetails. But to the procedure.

1: Scrape the bottom of the top member (A, A) to a surface plate or other true surface. In the absence of a proper surface plate, a piece of thick plate glass will do very well. In fact, my war surplus surface plate seldom comes out of the cupboard because I use a 7/8in. thick ship's porthole glass instead.

2: Use the surfaces A, A to scrape the corresponding surfaces B_1 and B_2 of the lower member.

3: You can now proceed to scrape the inclined surface E of the top slide. LBSC used to make fun of a mythical figure whom he called 'Inspector Meticulous', and I dare say such a person would advise making a bar of cast iron with a bevelled edge, which would be scraped flat and used for the present purpose. If anyone did so, I would admire his desire for precision, but in practice, as the length of the surface is so great compared with its width, you can manage perfectly well with a piece of straight silver-steel. You can leave the opposite bevelled surface alone, as this is where the gib strip G goes.

4: The last operation is to use surface E to true the lower bevelled edges C and D. There is rather more to this operation, however, because it is not enough for C and D to be flat, they must also be the same distance apart all the way along. Having got one of them flat (say C), you now have to scrape D to be both flat and equidistant throughout its length from C, as measured across two lengths of silver-steel in the angles F and E.

Hopefully, after this the gib strip will be a snug fit in the gap; but if it won't go in, you have the choice of scraping it down until it will, or taking a bit off A, A. I would go for the former.

Belatedly I mention what I thought should be obvious; the dovetail in the upper member must be deeper than that in the lower; first to allow for the scraping, and secondly, to make sure that the contact surfaces are A and B. Fitting the gib-strip is no trouble, but I will come to it in my next letter.

Your affectionate Grandpa.

●*To be continued.*

THE YOUNG ENGINEER COMPETITION

All eyes on the wind propelled vehicle! Will it make the grade? Judge Peter Gain measures the distance covered.

John Cook
congratulates all the entrants competing at this year's Rally.

Every year Guildford Model Engineering Society hold a Young Engineers competition for children who live within the old county boundary of Surrey. The event is sponsored by MEM 250 volt Circuit and Protection Ltd. and judged by three members of the Engineering Council Surrey Regional Organisation now known as the Exec Club.

Bastille Day 2001 (14 July) heralded the start of the 34th Annual Miniature Steam Rally and Model Engineer Exhibition at Stoke Park in Guildford and the finals of this competition.

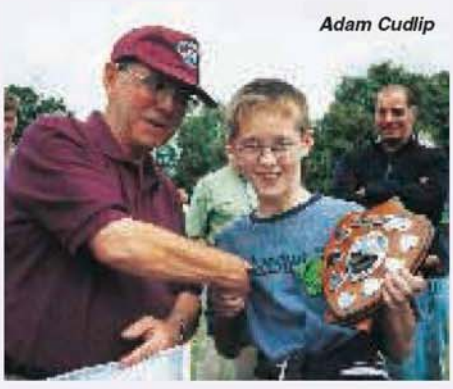
This year, despite one school with a large entry suddenly dropping out of the competition on the evening before the contest, the response was great. The task set varies every year and this time the youngsters were required to construct a wind-propelled vehicle on wheels which would convey the equivalent of one, two or three Mars bars (according to age group) up an inclined plane with prizes for design and distance travelled.

John Jones of Guildford MES presented awards to the winners who included: Jamie Mason from Ashcombe School, Dorking; Philip Carter from Chessington Community College; Peter Munden from Collingwood School, Wallington; Adam Cudlip from Epsom & Ewell High School and Vicky Chizlett from Northmead School in Guildford.

Some of the prize-winners pose with their vehicles and awards.

We should like to congratulate both Philip Carter and Adam Cudlip on their second wins in this competition—both in classes a year older and meeting stronger opposition.

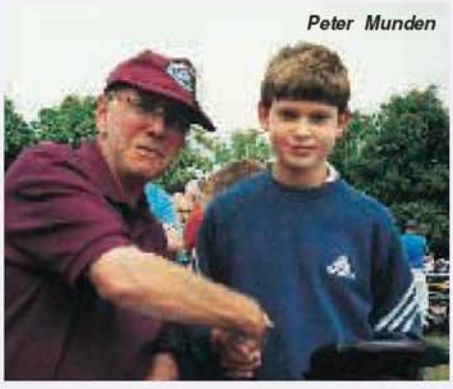
Our thanks to all the children who took part and to the schools which supported them. The standard was very high and we wish that we could have awarded a prize to every one of them. I commend them to Industry and say *"These are the Engineers of the Future."*



Adam Cudlip

Jamie Mason

Philip Carter



Peter Munden

Vicky Chizlett

Matthew Godfrey

CLUB CHAT
With Stan Bray

UK News

Progress on the new **Erewash Valley MES** ground level track could be described as 'making haste slowly.' Even so, the first locomotive has been run on the 60ft. or so already laid and the verdict given that it was very good and gave a smooth ride despite the lack so far of ballast. Progress is also being made on other work in hand, ancillary to the actual track, with the signal box nearing completion and needing only tiles and glazing before the inside is fitted out. Work on the cutting is being held up by a shortage of bricks necessary to retain the walls; members have been asked to search their gardens for any that might be lying around.

A three-man team from Banbury Portable Buildings arrived at **Sutton MEC** at 6.45am on 11 June and 45 minutes later a lorry carrying the club's new workshop building arrived. By 11.30am the building had been erected and was ready for occupation, all so much quicker than a DIY building job. It is anticipated that a couple of months will be required to finish the flooring, lining the walls, installing the electrics and putting up shelving, after which the machinery can be installed. The club benefited from a substantial legacy from the late Norman Longman, augmented by his nephew Bruce Coya in recognition of the camaderie enjoyed by Norman. This money has been put towards the cost of the building which has been dubbed Norman's Retreat. During the well attended annual Exhibition and Open Day the exhibits were judged for the awards which were made as follows. *Sir Malcolm Campbell Challenge Trophy:* Russel Coffin; *Johnston Foundation Trophy:* John Gates; *Cyril Kemp Memorial Trophy:* Peter Hitchin; *Vis Temporises Prize:* Keith Barnes; *Ted Poole Memorial Trophy:* Paul Harding; *Arthur Dare Memorial Trophy:* Paul Harding; *Willow Cup:* Clive Fox.

This year's **National 2½" Gauge Association** Northern Area Rally was held at the **York City DMES** track, giving members who cannot attend the more southerly events the opportunity to join in proceedings. At 1007ft. in length and with some 1:100 grades, the track provided an enjoyable challenge for drivers. A considerable number of locomotives were in operation during the day while finished and part finished locomotives featured in a fine display. The day was much enjoyed by all participants who were pleased to be invited to hold another Rally there in the future. The Association was also present at the **Guildford MES** Rally in July where, as well as models, they displayed the castings and drawings which they have available. Arrangement to take over the Dave Goodwin Castings business involved an agreement to make them available to non-members, of which more news at a later date. No fewer than 10 new members joined the Association during the course of the show, revealing the growing interest in smaller gauges.

The use of high visibility jackets by **Northampton SME** guards and station staff has been successful, making it easier for the public and other club members to identify those responsible for the various duties. The jackets were supplied by local company F. G. Metcalfe Ltd. Two new locomotives have been available for use on the 7¼in. gauge ground level track this year and the passenger wagons are being upgraded, including fitting them with vacuum braking gear which can be controlled by both driver and guard. The successful club Exhibition was good for publicity and made a useful contribution to club funds; it will be repeated in 2003.

The latest issue of *The Oily Rag*, the **Taunton ME** newsletter, carries a questionnaire regarding the future of the society. The main question concerns the possibility of a move to another track site and if so, whether any such site should be leased or purchased outright. Opinions are also sought regarding the types and gauges of tracks to be installed, and other relevant facilities.

Members of **Chichester DSME** are also involved in discussion about their future; in this case the concern relates to renewal of the lease held by the Local Authority. A 20 year lease has been agreed, with a rent review (upward only) every 5 years. The Council retains the right, after 5 years, to serve one year's notice should the land be required for redevelopment. In the event of the club being given such notice they will be entitled to compensation and the Council's assistance in obtaining another site.

Readers will recall that members of **Bournemouth DSME are** presently without a track; as yet there is no news of any development which might be considered hopeful. Concern for their welfare by members of neighbouring **Basingstoke DMES** who have offered the use their track has now been accompanied by an offer from members of **Reading SME** giving them access to their track in Prospect Park on the second Sunday of each month. Regular monthly meetings continue at Corfe Mullen Hall and are well attended with Bournemouth members able to enjoy a variety of topics.

Vandalism and theft continue to plague **York City DSME** despite numerous additions to their security systems in attempts to prevent it. The latest effort was when the culprits used a sledgehammer to smash the lock off a door to a building used to store passenger vehicles. Nothing was taken, but a replacement lock has set them back £60. Members are urged to make frequent visits to the site in order to deter unwanted visitors and with safety in mind are advised not to go alone. A popular and regular meeting is one known as the 'Best Work of the Year Meeting' at which the annual club awards are made. This year the *Dobson Trophy* went to Pieter Dekker for a Barr and Stroud Motor Cycle Engine, the *Les Walker Cup* to Peter Barber for a Precursor locomotive, the *Rose Bowl* to Eric Norfolk for a lightweight milling machine and the *Sedman Trophy* to Brian Wardman for a farm wagon.

Dependent upon whether the magazine production people get their act together for this issue, the following may just be in time to inform readers about the **Canterbury DMES** Open Day which will be held on 9 September. Visitors will be welcome and further information is available from Secretary Granville Askham (01227-463295) who will be able to provide directions to reach the track and glean some idea of how many they might have to cater for!

Despite vandalism being a problem in their area, **Wigan DMES** is going ahead with the construction of a permanent barbecue. Made of brick and ⅛in. steel and concreted into the ground, members hope it will withstand the attentions of vandals and thieves. A visit by some members of **Brighouse & Halifax ME** was spoiled by heavy rain which started at lunchtime. Fortunately the visitors arrived early in the morning and so most had the chance of a reasonable run before the rain set in. A hot-pot lunch prepared for them was much appreciated as they sat in the clubhouse watching the heavy rain. This welcome refreshment fortified a few hardy souls who decided to run depite the weather, but they were soon beaten back and the day finished with some very wet locomotives being loaded into motor vehicles for the return journey home.

Having cleared their track of mud and leaves, members of **Stamford MES** have been enjoying the opportunity to use it during the long summer evenings. Members have been busy sorting the workshop of the late Geoff Carr and cataloguing everything ready for Auction on 8 September, for which hopefully this note is in time. Proceeds will go to Geoff's widow. The particularly well equipped workshop is situated in a road notorious for its lack of parking facilities so when the time comes to remove everything, the assistance of local police will be sought. The auction is to be be held at Tinwell Village Hall and is open for anyone to go along, local societies having already received invitations to attend. As if all this effort was not enough, the society also put on a fine show of models at the **Peterborough SME** Exhibition in June, when a useful sum of money was raised for the Sue Ryder Home.

A Hot Air Balloon Festival in Cutteslowe Park, home of the **City of Oxford SME** track, resulted in a large number of additional passengers for the trains. Visitors had to pass the track to get to the Festival. With no previous knowledge of its existence, many took the opportunity to return during the day for a ride and to watch proceedings; several told members that the club was providing the best value in the park! This is something that could have a knock-on effect with folk choosing to return to the park just to see and ride on the trains. Continuing discussions with the Parks Authority about building a new club house has revealed that the Authority seems less than happy with the size and position of the building. A set-back for the club, although hopefully only a temporary one, it had been hoped that permission to start work would have been granted by the end of April.

Hopefully just in time for readers to get along, **Leicester SME** will be holding a Get-Together at their track in Abbey Park from 10am-5pm on 9 September to which all members of other societies are welcome. The club has a 1700ft. continuous ground level track catering for 5 and 7¼in. gauge locomotives as well as a 700ft. raised circuit suitable for locomotives of 1¼, 2½, 3½ and 5in. gauges. The Authorities have agreed to the running of miniature road vehicles on the extensive road and footpath system within the park. The usual conditions regarding boiler certificates and insurance of course apply. Refreshments will be available, and drivers will be supplied with a ploughman's lunch. There will be some public passenger hauling on

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.

Allan Cleaver	*City of Oxford SME*
Reg Cross	*Sutton MEC*
Les Downs	*Tyneside SMEE*
Alan Gay	*Staines SME*
Ken McKay	*Tyneside SMEE*
Roy Mayall	*Rochdale SMEE*
Fred Swain	*Canterbury DMES*

the ground level track between 2-5pm. Further information is available from George Finnemore (0116-243-3892) or Raymond Wallis (0116-285-8824).

In preparation for the annual Locomotive Efficiency Competition against neighbours **Harlington LS**, **Staines SME** held an in-house event in May. Six competitors took part this year running in the opposite direction to that normally used for passenger hauling, which it was alleged, gave the 3½in. gauge models a better chance. The overall winner was Jim Elliot with his *Speedy* while Dave Murray took the 3½in. Gauge Cup with his *Great Northern*. So to the big day! The members of the Harlington team arrived, their team line up being a closely guarded secret until the state of the track and the weather could be assessed. Details unfortunately leaked out giving the Staines lads the opportunity to sort out locomotives known to have previously beaten the Harlington line-up. As some of the Staines star performers were engaged elsewhere, it had actually been suggested they should use inferior models and let Harlington win the cup again this year, allowing Staines to take the much coveted second place (as they had for the last two); this, however, was turned down flat. Losing the 3½in. gauge section, things did not start too well and just as the 5in. trial got under way it was time to stop for lunch, a lovely meal supplied by the ladies. The question will always be asked: *"Were the visitors' drinks spiked?"* for from then on Staines were unstoppable and regained the trophy in fine style, a cause for great celebrations. Harlington returned to the end of the runway of Heathrow Airport to plan for next year when they will be on home ground.

The spring Open Day of **Tyneside SMEE** differed from the usual format this year as the model display was in a marquee, providing plenty of space for display and to view the excellent models on show. A number of northern societies were represented throughout the weekend, ensuring that the track was in continuous use. During the Sunday afternoon session the opportunity was taken to present the club trophies, these having been judged at the Harrogate Exhibition from the models displayed on the club stand. The *Williamson Thompson Memorial Trophy* went to Jack Heys for a Skeleton Clock, the *Chipchase Trophy* to Bill Kirk for a Horizontal Corliss Valve Engine, the *William Bartlett Memorial Trophy* to John Bolter for a 3½in. gauge NER class Q5 locomotive under construction, and the *Drummond Trophy* to Brian Nicholls for a 5in. gauge GWR King. Cups were awarded to Roy Chipchase: NE Coal Hopper Wagon and Phil Johnson: Triple Expansion Marine Engine.

Manx Steam & MEC have been prevented from public passenger hauling due to foot and mouth disease restrictions on the opening of the wildlife park in which their track is situated. This has resulted in a lack of income with which to repay the money borrowed to fund a track extension. Fortunately, the creditors are not pressing and there is therefore no real financial hardship, but future projects will have to be put on hold for a while. A letter to the Minister for Tourism for the Island produced a sympathetic reply, raising the hope that some financial compensation might be forthcoming but, if it materialises at all, this will take some time.

The cost of plastic sleepers has been investigated by **Harrow & Wembley SME** and finding them considerably more expensive than wooden ones, it was decided to continue with the use of wood. The track extension, known as the Millennium Extension made fairly slow progress for a while due to the bad weather; the very late hard frosts making it likely that any newly laid concrete would break up. One such stretch did in fact suffer damage and had to be re-laid. Although the club has a well-stocked and well-maintained first aid box it has been agreed to ask the St John Ambulance Brigade or the Red Cross to provide cover on Open Weekends. The *Tony Baker Award* for 2000 was presented to John Cousins. A plaque has been made and mounted on a wall of the carriage shed and will be used to record the names of Trophy winners.

It was quite like old times for members of **St. Albans DMES** when twelve of them arrived in terrible weather to start clearing the area round the track to which they they have been given access. Having lain unused for many years, the parking area and track were completely overgrown, but even so and despite incessant rain, a good start has been made towards getting everything usable again. Planning for the annual Exhibition is well advanced; one major change this year concerns the display tables. In the past the club has used furniture kindly loaned by the school on which to display the models and while this has certainly done the job it has also meant much hard work moving it all in when setting up. Worse still, it all had to be replaced at the end, when everyone was weary from their exertions throughout the weekend. The idea of hiring special tables is being explored with the hope that they can be delivered and taken away without the members doing the labouring.

World News

Belgium

Many readers we know visit the various rallies held on the continent, some just to view, others taking models with them and we can give this rather late news of an event in Belgium on 8/9 September. Hosted by the Koninklijke Yacht Club, Antwerpen which can cater for live steam locomotives in 2½, 3½ and 5in. gauges; there is/was also an Exhibition. Owners of models and one companion are/were supplied with a free lunch and a souvenir, and on the Saturday evening there is/was an evening meal at a small cost, to which all are/were invited, a social occasion when it is possible to get to know model engineers from other countries. The club grounds and track are at Rivierenhof, just off the Antwerp Ring Road at junction 17, the ring road itself being more or less an extension of the road from Ostend. Highly recommended, it is an event that a number of British people go to. Further information may be had from the Secretary via e-mail at **Etienne.deridden@pandora.be** or by 'phone: 0032 (0) 52/47 41 74.

Canada

After having tested several different types of coal, **Ottawa Valley LS&ME** finally decided that Welsh steamcoal was the best and had 6½ tonnes delivered from Britain. Thanks to negotiations with customs officials, duty was avoided and it arrived in two sizes, beans and grains, packed in 20kg bags. Individual members have bought it, each placing an order with the society, which then arranged for the shipment. The club was joined by some members of **Montreal LS** for their Heritage Weekend at the Heritage Museum in Cumberland where they have their track. As well as a number of locomotives running on the track, most of which were trying to prove the value of Welsh steam coal, there was a large Exhibition. Although the weather at time was indifferent, there was the customary well attended barbecue, which had to be postponed from Saturday to Sunday lunchtime.

Burglars have attacked the headquarters of **British Columbia SME**, getting into the machine shop by removing a pin from a hinge. They took a number of small power tools and some gardening equipment. An attempt to get into the station via the kitchen failed and while entry was gained to the traction engine shed, nothing was taken. It could have been much worse, the most expensive power tools were not taken, probably because of their weight and fortunately, apart from that caused in gaining entry, there was no damage for the sake of it. The alarm system is now to be extended to cover all buildings in the hope of preventing a repeat performance. Taking a positive view, passenger traffic has increased, thus generating more income for the club while the provision of covered picnic tables has proved very popular with visitors. The two club locomotives of the *Wren* design have both received attention and are now adding to the available motive power.

South Africa

By the time this is in print the whole of the **Bloemfontein SME** outside track will have been converted to 7¼in gauge, leaving only some steaming bays to be adapted. Work started on building a home foundry some years ago, but interest waned and the work was left part completed. However, it was recently decided to resurrect the project to provide a useful society asset.

Pietermaritzburg MES has nearly completed and fitted out its workshop, with a good variety of machinery for working in both wood and metal. Just a few more items are thought to be required and then members will be able to cope with virtually any job they wish. Other tasks have also been attended to, in particular the landscaping around the track and building new coal bunkers. Built of brick, these should not need to be replaced for many years. Running sessions have continued throughout June, with plenty of members bringing locomotives along to take care of a large number of passengers. Now the colder weather is approaching it will soon be time for workshop activities to take over from running.

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.

To 23 September Talyllyn Railway. *Vintage Train Sunday Special.* Enquiries: 01654-710472.
To 30 September Kew Bridge Steam Museum. *Exhibition: Maudslay, Sons & Field, Engineering Pioneers.* Information: 020-8568-4757.

SEPTEMBER

8 **BasingstokeDMES.** *Evening Run.* Contact Ian Shanks: 01420-561741.
8 **Halesworth DMES.** *Late Night Running.* Contact Chris Walliman: 01362-695735.
8 **Historical MRS (Essex Area).** *Visit to a Well Known O-gauge layout.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
8 **Northolt MRC.** *Exhibition & Open Day.* Contact J. Wilcox: 01895-234638.
8 **SM&EE.** *Open House - Stationary Engine Day.* Contact David Boote: 01202-745862.
8 **Wigan DMES.** *Visit to Butterley Park MRS.* Contact Bob Connor: 01257-423048.
8/9 **Vale of Aylesbury MES.** *Thomas the Tank Engine Weekend.* Contact Clive Ellam: 01296-623433.
8/9 **Birmingham SME.** *National Locomotive Rally Weekend.* Contact John Walker: 01789-266065.
8/9 **Koninklijke Model Yacht Club.** *15th Annual Steam Days.* Information: 0032 (0)52/47 41 74.
9 **Amberley Museum.** *Wood From The Trees.* Contact Derek Kilburn: 01798-831370.
9 **Andover DMES.** *'Rob Roy' Day.* Contact R.W. Hanman: 01980-846815.
9 **Brighouse & Halifax ME.** *Open Day.* Contact Bob Durham: 0113-293-8524.
9 **Canterbury DMES.** *Open Day.* Contact Granville Askham: 01227-463295.
9 **Erewash Valley MES.** *Invite to Derby MES.* Contact Jim Matthews: 01332-705259.
9 **Guildford MES.** *Members' Running Day.* Contact Dave Longhurst: 01428-606424.
9 **Harlington LS.** *Exhibition and Train Rides.* Contact Peter Tarrant: 01895-851168.
9 **Hereford SME.** *Club Running.* Contact John Arrowsmith: 01432-265151.
9 **Leeds SMEE.** *Steaming Day.* Contact Edwin Hughes: 01757-707454.
9 **Leicester SME.** *Open Day.* Contact Raymond Wallis: 0116-285-8824.
9 **Oxford (City of) SME.** *Charity Steaming in aid of The Nuffield Orthopaedic Hospital & Social Afternoon.* Contact Graham Toplis: 01235-771180.
9 **Sutton MEC.** *Track Day.* Contact Mike Dean: 0208-657-5401.
9 **Tyneside SMEE.** *Stephenson MMLA Efficiency Trials.* Contact Malcolm Halliday: 0191-262-4141.
9 **Guild of Model Wheelwrights** *at Heavy Horse Show,* Shugborough, Milford. Contact Biddy Hepper: 01492-623274.
9-23 **Talyllyn Railway.** *Vintage Train Sunday Special.* Enquiries: 01654-710472.
10 **Bedford MES.** *Rex Boyer: Press Tools, Jigs & Fixtures, etc.* Contact Alan Guildersleve: 01525-383010.
10 **Erewash Valley MES.** *Evening Meeting.* Contact Jim Matthews: 01332-705259.
10 **Frimley & Ascot LC.** *Club Evening.* Contact Bob Dowman: 01252-835042.
10 **Melton Mowbray DMES.** *Gordon Smith: Safety Valves.* Contact Phil Tansley: 0116-2673646.
10 **Saffron Walden DSME.** *Club Night.* Contact Ken Archer: 01763-862911.
11 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
11 **Sutton Coldfield MES.** *Meeting.* Contact Roger Timings: 0121-308-5875.
12 **Bournemouth DSME.** *Meeting.* Contact Mike Baker: 01202-383653.
13 **Leyland SME.** *Drivers' Tuition Night.* Contact Alan Wilson: 01942-715072.
13 **N. W. Leicester SME.** *D. Hulse: 18th Century Steam Engines.* Contact C.E. Handley: 01509-413473.
14 **Hereford SME.** *Bits & Pieces.* Contact John Arrowsmith: 01432-265151.
14-16 **Guild of Model Wheelwrights** at *Sandown National Woodworking Exhibition,* Esher. Contact Biddy Hepper: 01492-623274.
15 **Chesterfield MES.** *Southern Federation Autumn Rally.* Contact Mike Rhodes: 01623-648676.
15 **North Midlands Meccano Guild.** *Meeting.* Contact Julian Coles: 'Little Court', Main Street, Bleasby, Nottingham, NG14 7GH.
15 **Reading SME.** *Club Running.* Contact Graham Bustin: 01189-615450.
15 **Steam LS of Victoria.** *Invitation Run at Box Hill.* Contact Graham Plaskett: (03) 9750-5022.
15 **West Wiltshire SME.** *Club Barbecue.* Contact R. Nev. Boulton: 01380-828101.
15 **York City & DSME.** *Barry Jordan: Miniature Machine Tools.* Contact Ken Bateman: 01904-421445.
15/16 ***Bedfordshire Steam & Country Fair*** at Old Warden Park (home of The Shuttleworth Collection), Nr Biggleswade, Bedfordshire. Gates open 10am. Adults: £6; Senior Citizens: £4.50; Children: £3.50; Family: £15; Camping Weekend: £30. Contact Paul Worbey: 01462 851711.
15/16 **Bournemouth DSME.** *Luscombe Valley Autumn Weekend.* Contact Mike Baker: 01202-383653.
15/16 **Chesterfield MES.** *Steaming at Papplewick.* Contact Mike Rhodes: 01623-648676.
15/16 **Erewash Valley MES.** *Steaming Weekend.* Contact Jim Matthews: 01332-705259.
15/16 **Nottingham SMEE.** *Visitor Rally.* Contact Gerry Chester: 0115-9259096.
15/16 **Pentney Park RS.** *End of Summer Special Weekend.* Contact Hilary Webster: 01760-337479.
15/16 **Urmston DSME.** *Open Weekend.* Contact Bryan Cantwell: 0161-485-5174.
15/16 **Vancouver Island ME.** *Threshing Show.* Contact Dennis Dalla-Vincenza: (250) 480-7042.
15/16 **Guild of Model Wheelwrights** *at Wood Weekend,* Tatton Park, Cheshire. Contact Biddy Hepper: 01492-623274.
16 **Amberley Museum.** *A.E.C. Bus Show.* Contact Derek Kilburn: 01798-831370.
16 **Amnerfield Miniature Railway.** *Running Day.* Contact David Jerome: 0118-9700274.
16 **Basingstoke DMES.** *Visitors' Open Day.* Contact Ian Shanks: 01420-561741.
16 **Chesterfield MES.** *Open Day.* Contact Mike Rhodes: 01623-648676.
16 **Frimley & Ascot LC.** *Club Run.* Contact Bob Dowman: 01252-835042.
16 **Guildford MES.** *GMLEC.* Contact Dave Longhurst: 01428-605424.
16 **Kinver & West Midlands SME.** *Midland Federation Rally.* Contact John Campbell: 01384-891244.
16 **Leighton Buzzard NG Rly.** *Heritage Open Day.* Enquiries: 01525-373888.
16 **Northampton SME.** *Sunday Steam-Up (Visitors welcome).* Contact Pete Jarman: 01234-708501.
16 **Ottawa Valley Live Steamers.** *Steaming Day & Annual Picnic Lunch.* Contact John Bryant: 761-1109.
16 **Pinewood MRS.** *Pinewood Fete.* Contact J. Ephithite: 01344-885049.
16 **Romney Marsh MES.** *Visit to Wayside Railway.* Contact John Wimble: 01797-362295.
16 **Saffron Walden DSME.** *Running Day.* Contact Ken Archer: 01763-852911.
16 **The Society of Ornamental Turners.** *Summer Outing.* Contact N. S. Edwards: 01234-359392.
16 **South Lakeland MES.** *Running Day (Visitors welcome).* Contact Adrian Dixon: 01229-869915.
16 **Wigan DMES.** *Narrow Gauge Day.* Contact Bob Connor: 01257-423048.
16 **York City & DSME.** *Running Day.* Contact Ken Bateman: 01904-421445.
16-21 October Talyllyn Railway. *First Class for Sunday Lunch.* Enquiries: 01654-710472.
17 **Leicester SME.** *Stan Vaughan: On the lines (Mostly GWR).* Contact Raymond Wallis: 0116-285-8824.
18 **Basingstoke DMES.** *Meeting.* Contact Ian Shanks: 01420-561741.
18 **Chesterfield MES.** *Les Henshaw: Railway Films.* Contact Mike Rhodes: 01623-648676.
18 **Nottingham SMEE.** *David Carnell: NSK.RHP talk/Visit to Research Centre.* Contact Graham Davenport: 0115-8496703.
18 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
18 **Taunton ME.** *David Hartland: The Sparks Flew Upwards.* Contact Don Martin: 01460-63162.
18 **West Wiltshire SME.** *Meeting.* Contact R. Nev. Boulton: 01380-828101.
19 **Bristol SMEE.** *Quiz Night.* Contact Trevor Chambers: 01454-415085.
19 **Hull DSME.** *Roger Evans: The Humber Bridge.* Contact Chris Parsons: 01964-630563.
19 **Maidstone MES.** *Members' Afternoon Playtime.* Contact Martin Parham: 01622-630298.
19 **MELSA.** *Meeting.* Contact Graham Chadbone: 07-4121-4341.
20 **Halesworth DMES.** *Chat Night.* Contact Chris Walliman: 01362-695735.
20 **Isle of Wight MES.** *Marine Bits & Pieces.* Contact Ken Stratton: 01983-760762.
20 **Sutton MEC.** *Video Evening.* Contact Mike Dean: 0208-657-5401.
21 **Canvey R&MEC.** *Seen on the Table.* Contact David A. Clark: 01375-846921.
21 **Rochdale SMEE.** *Quiz Night.* Contact Mike Foster: 01706-360849.
21 **Romford MEC.** *Geoff Nunn: London Transport.* Contact Colin Hunt: 01708-709302.
21-23 **Frontenac SME.** *Open Weekend.* Contact Philip Ibbotson 2305 Findlay Station Road, RR#3, Gananoque, Ontario, Canada, K7G 2V5.
21-23 **Trevithick Society.** *Se-Tech 2001, Conference on the Future Applications of Steam.* Contact Philip Hosken: 01209-219715.
22 **Chesterfield MES.** *Running Day.* Contact Mike Rhodes: 01623-648676.
22 **Historical MRS (Bristol Area).** *Gerry Nichols: Bristol Temple Meads.* Contact Gerry Nichols: 0117-973-1862.
22 **Hornsby ME.** *Family Day.* Contact Ted Gray: 9484-7583.
22 **Welling DMES.** *Open Day.* Contact Reg Hawes: 0208-859-1952.
22/23 **Amberley Museum.** *Miniature Steam & Model Weekend.* Contact Derek Kilburn: 01798-831370.
22/23 **British Columbia SME.** *Fall Meet.* Contact Sean Laurence: (604) 931-1547.
22/23 **MELSA.** *Trainfest.* Contact Graham Chadbone: 07-4121-4341.
22/23 **St. Albans DMES.** *Club Exhibition.* Contact Roy Verden: 01923-220590.
23 **Andover DMES.** *Autumn Open Day.* Contact R.W. Hanman: 01980-846815.
23 **Canterbury DMES.** *Meeting.* Contact Granville Askham: 01227-463295.
23 **Guildford MES.** *Visiting Clubs Day.* Contact Dave Longhurst: 01428-605424.
23 **MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
24 **Bedford MES.** *Surgery Night.* Contact Alan Guildersleve: 01525-383010.
24 **Burnley & Pendle MRS.** *Meeting.* Contact Don Kitson: 01282-603031.
24 **Cardiff MES.** *Brean Sands Modellers' Visit.* Contact Trevor Jenkins: 029-207-55568.
24 **Hornsby ME.** *Meeting.* Contact Ted Gray: 9484-7583.
25 **Chelmsford SME.** *Alan Lusby: A1 Society.* Contact D Blake: 01376-324205.
25 **Historical MRS (East Lancashire/North Manchester Group).** *Chris Youett: And You Thought They Were All Clean Part 2, 1938-39.* Contact John Sykes: 01706-823989.
25 **Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
25 **Stafford DMES.** *Tuesday Evening Steam-Up.* Contact Chris Dobbs: 01889-270533.
25 **Sutton Coldfield MES.** *Meeting.* Contact Roger Timings: 0121-308-5875.
25 **Wigan DMES.** *David Barrie: The Darjeeling & Himalayan Railway Society.* Contact Bob Connor: 01257-423048.
26 **Historical MRS (Bedford Area).** *Presentation with Slides on Swindon Works in the Churchward & Collett Eras.* Contact John Chamney: 01442-851214.
27 **Leyland SME.** *Project Night.* Contact Alan Wilson: 01942-715072.
27 **Rugby MES.** *Night Steam-Up.* Contact David Eadon: 01788-576956.
27 **Surrey SME.** *2½in. gauge Rally.* Contact John Cook: 020-8397-3932.
28 **Canvey R&MEC.** *Evening Steam-Up.* Contact David A. Clark: 01375 846921.
28 **Hereford SME.** *Dave Timson: Clock Night and Bits & Pieces.* Contact John Arrowsmith: 01432-265151.
28 **Historical MRS (Essex Area).** *John Day: American Railroads From The Rockies to The Pacific.* Contact Jem Harrison, 27 Colne Place, Basildon, Essex SS16 5UZ.
29 **Guildford MES.** *Bits & Pieces.* Contact Dave Longhurst: 01428-605424.
29 **Leighton Buzzard NG Rly.** *Steam Glow Event.* Enquiries: 01525-373888.
29 **Maxitrak Owners Club.** *AGM.* Contact Eric Penn 0208-979-4335.
29 **York City & DSME.** *Spring Video Productions: Steam Driven Vehicles & Machinery.* Contact Ken Bateman: 01904-421445.
29/30 **Elmdon MES.** *Belbroughton Scarecrow Weekend.* Contact Chris Giles: 0121-458-1291.
29/30 **Elsecar Heritage Centre.** *Day Out with Thomas.* Contact: John Furniss: 01226-740203.
29/30 **Talyllyn Railway.** *AGM with Extra and Special Trains.* Enquiries: 01654-710472.
29/30 **Tank Museum.** *South West Model Expo 2001.* Contact Chris Wood: 01929-405141.
30 **Chichester DSME.** *Steam on Sunday.* Contact Brian Bird: 01243-542266.
30 **Elmdon MES.** *Steam-Up.* Contact Chris Giles: 0121-458-1291.
30 **Guildford MES.** *SMEE Day.* Contact Dave Longhurst: 01428-605424.
30 **MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
30 **Romney Marsh MES.** *Autumn Track Meeting.* Contact John Wimble: 01797-362295.

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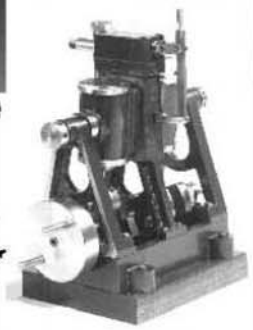

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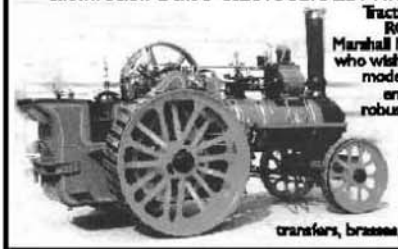

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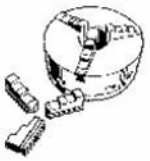

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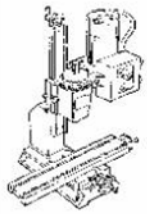

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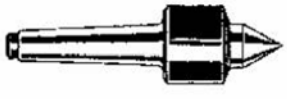

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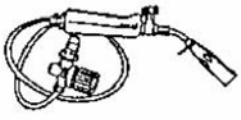

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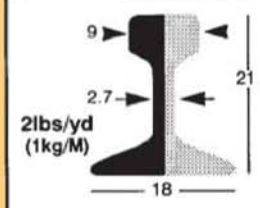

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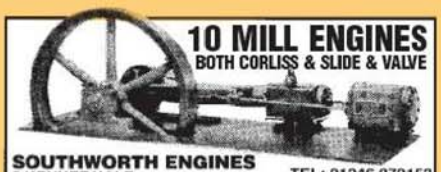

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EAGLE MODEL 2 surface grinder 20"x 6" table with 12" x 6" magnetic chuck £750
EAGLE MODEL 4W MKII 24" x 6" table with 14" x 6" magnetic chuck + dust extractor £1,150
JONES AND SHIPMAN 540 Surface Grinder & Magnetic Chuck ..... Ex College/See no work £1650
MILFORD 12" Pedestal Grinder £325
R.J.H. Buffing Machine, pedestal model £325
VICEROY Grinder, pedestal model £145
VICEROY Buffers, pedestal models ..... Each £250

MISCELLANEOUS/FABRICATION MCH.

HARRISON Slotting Head & Extension ..... Very rare £575
STARTRITE 352 Woodworking Band Saw £975
STARTRITE 14-5-5 Woodworking Band Saw £775
MITUTOYO 600mm Height Gauge no 520-150 Boxed £225
ALCOS GF 060/1 Rapid Melting Furnace £300
FLAMEFAST CRM 600S Rapid Melting Furnace £425
GABRO BF 620-2, 24" Box and Pan General Use Folder ..... Choice £325/£425
STARTRITE SC2500 Cut-of-Saw £525
WILLOW Bandsaw vertical 4 speed machine £400
MYFORD Burnerd Griptru 3 Jaw Chucks ..... Boxed £250
COLCHESTER/HARRISON D13 Burnerd 4 Jaw 8" light body independet chucks ..... Boxed £175
RJH 4" Linisher / Vertical (Build in Extraction) £625
ARBURG Plastic injection molding machine C4 Model £425
KASENIT oven (gas fired) ..... small £100
KASENIT oven (gas fired) model 2633 ..... £325
BONIARDE rolls (set each side and spare formers) £625
KILNS various ..... £200/£425
HAND Shaper £140
SCHAUBLIN 5340 high speed drilling head ..... Newer used £525
TAPPING HEADS 1-2-3 Morse Taper ..... Selection Just Arrived
RATCLIFFE/JONES AND SHIPMAN 10" x 5" sine table ..... As New £325
MICROMETERS and associated measuring tools ..... Still packaged as new
POTTERY WHEELS, kilns and associated equipment ..... Just In Cheap
SPEGAC Powder type press £225
ELLIOTT Horizontal and Vertical dividing head & 3 jaw chuck £325
HARRISON L6 Taper turning attachment £325
HARRISON L6 Imperial gearbox £325
HARRISON L6 Tailstock £245
HARRISON L6 Travelling steady £40
NEW FROM NEW ZEALAND – Machine vice, 55mm. Jaws precision miniature type ideal for vertical slides and smaller milling machines £65
MYFORD quick setting boat tool set £60
STARTRITE HB330 M Horizontal bandsaw, 1997 machine ..... As new £2750
SIP 1 TON MOBILE CRANE Manufactured 2000 ..... As new £375
MYFORD SAW TABLE for ML7 – Super 7 ..... £140
MITUTOYO grade A set of slips £245
WDS TOGGLE PRESSES, various ..... £30/£40
MARLCO KNURLERS (clamp type) £75
MYFORD coolant system ..... Hardly used £275
F.J. EDWARDS 24" hole cutter £525
RECORD NO.24 quick release bench vice £100
LINK 1.5 tonne vehicle crane + top hat £625
MITUTOYO 103-913 metric set micrometers £275
COLCHESTER CHIPMASTER/BANTAM turret capstan attachment £475
RAPIDOR 6" hacksaw machine £225
F J EDWARDS MODEL 1½ Besco bar cropper (hydraulic) 1½ round capacity £225
BENCH KNIBBLER, 240 volts £125
PRECISIMACHINE VICES 4" and 6" swivel ..... New £70 / £140
NORTON/EDWARDS Arbor presses ..... £75 / £145
AJAX 6" Hacksaw £425
SURFACE plates from 12" x 12" to 36" x 36" ..... Very Nice from £30
KEETONA 4ft treadle folder 16g £750
FLAMEFAST brazing hearth (good condition) 240 volts £140
ELLIOT 14S, 14" shaping machine £650
ALBA 1A, 10" shaping machine ..... From £250
TES, BOXFORD / MYFORD quick change tool posts ..... British / New £75
WEBER 1½ ton mobile garage crane, late blue colour £495
UNION 4½" x 30" bench centres £175
HARRISON L5 Vertical Slide ..... Newer used £345
HARRISON L5 Boring Table £165
CENTEC VERTICAL QUILL feed heads ..... Each £750
ELLIOTT 1250 STURDIMILL vertical head ..... One off (rare) £525
RJH linisher 4" wide belt, pedestal £345
DENBIGH/NORTON No.2/3 Flypress ..... From £145
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SWAGE BLOCKS ..... £125 / £145
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* THIS MEASUREMENT IS THE NARROWER PART OF THE T NUT

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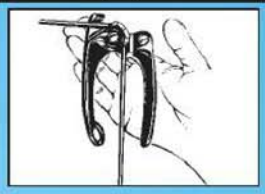

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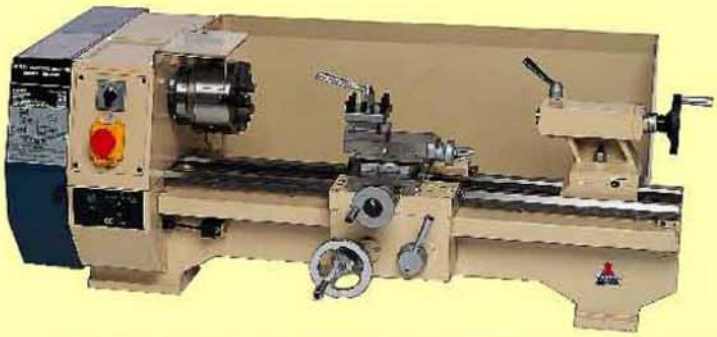

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