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On the cover …

Les Chenery's impressive Gnome 14-cylinder double-row rotary engine. Les still has some work to do on this, so it was entered as a loan model at the Sandown Park Model Engineer Exhibition (see page 372). Doubling up the 7-cylinder model involves some complexity, including a double throw crankshaft. Sorting out the valve timing presents more tricky problems. The engine is a four-stroke but works by drawing a rich fuel mixture from the crankcase through transfer ports, to be mixed with air in the cylinder.

(Photograph by Neil Read)

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With the Editors

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Diamonds that are not for ever
From time to time we hear from readers who are debating if a diamond grit grinding wheel would be a good buy. The answer to this question is 'yes and no'. If all your grinding is to be done on high speed steel or carbon steel tools then the answer is a definite no. If tungsten carbide or non-ferrous tools are to be ground then there may be some advantage in buying a diamond wheel.

Why is it unwise to use diamond wheels on steel tools? Well, cast your mind back to what you have been told about case carburising, and diamonds, in the past. At temperatures above its upper critical level, steel has an affinity for carbon and will absorb it. Diamonds are almost pure carbon. The required temperatures for carbon absorption in steel can be momentarily reached at the grit to work interface during grinding, so that carbon from the diamonds on the grinding wheel can enter the steel.

The steel will care not one jot where the carbon comes from. You have provided a supply of carbon and the steel may absorb it hungrily. We say 'may' because you could possibly avoid the reaction by flooding the cutting area with coolant and taking things easy. Why risk it? Most steels grind easily with aluminium oxide wheels.

If difficult to grind steels e.g. die steels, are being dealt with in industry then cubic boron nitride grinding wheels are usually resorted to though these are expensive to buy and need a special technique to get the best from them. They are not really suitable for the amateur unless he or she knows what they are doing.

Of course, the above comments do not apply to cutting tools made from tungsten carbide or stellite and if you need to grind these materials then a diamond grinding wheel may have a definite advantage for you. You can also use diamond laps and similar sharpening devices on steel tools. The low speeds of application ensure that the elevated temperatures needed to support carbon absorption are not reached. That is why your Derek Brown drill sharpening jig should still be giving good service despite sharpening lots of high speed steel drills.

Walking for Fred

Fred fans. Brothers (left to right) Jake, Joshua and Reece Greenstreet (photo courtesy of the **Birmingham Evening Mail***).*

In ten days time two young lads are doing a five mile sponsored walk. They want to raise £2000 towards a bronze statue of Fred Dibnah, to be erected in Fred's home town of Bolton.

The two boys, Reece, 8, and Jake, 7, from Shirley in the Midlands will walk a section of the Severn Valley Railway, between Arley and Kidderminster on April 24. Both are steam enthusiasts with a particular interest in steam traction engines, inspired by Fred's TV programmes.

Father, Mark Greenstreet, was brought up with steam, and his father was a keen model engineer. Fred's yard was a popular choice for a visit. Sheila Dibnah has now invited the new generation to visit the yard.

Mark says the boys loved the TV programmes. *"He was a genius with steam and they wanted him to be remembered."*

The statue is a project of the Fred Dibnah Memorial Trust, and is being backed by the Bolton Civic Trust, and the Bolton Evening News. Both are supporting the Greenstreet family venture.

If you would like to remember Fred and back the lads, call Mr Greenstreet on 0121 474 3381 or 07773732911.

OBITUARY
John Russell (Jack or Russ) Kerr

Jack Kerr was the last surviving founding member of the Manitoba Live Steamers which began in 1939. He shared his experience with model engineers around the world.

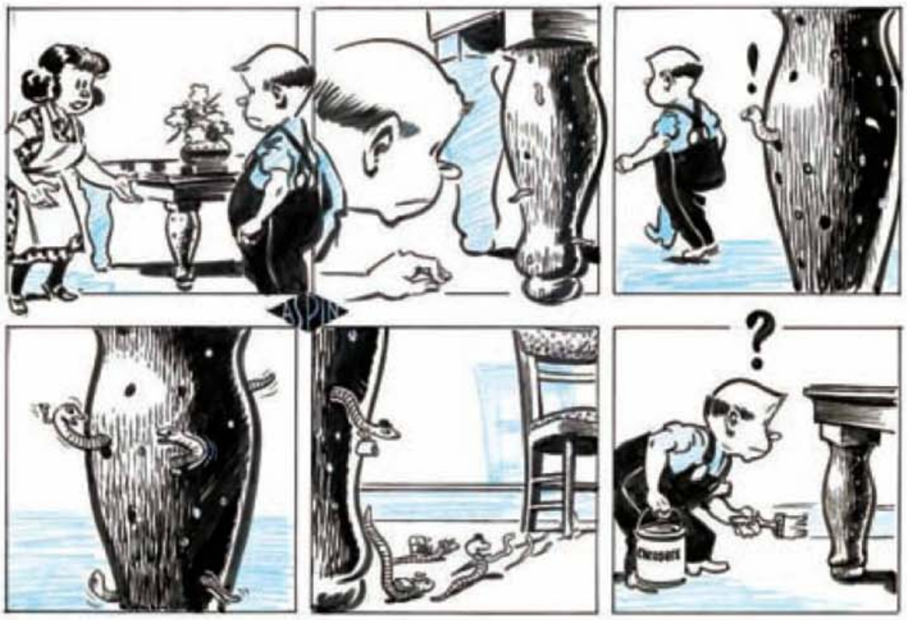
He was secretary of the Brotherhood of Live Steamers (now International Brotherhood of live Steamers) in Canada. His commitment to steam was recognised by a lifetime distinguished service award.

Over the years his 3/4in. scale New York Central Hudson ran thousands of miles on tracks around Canada and the United States. He built many other models and the last, a 3/4in. scale Northern Pacific Class A-5, took nearly 40 years to complete.

Some years ago he also acquired a Waterloo traction engine, found in the bush. He revived her over some months and eventually drove her out of the bush under her own power. The engine is still in operation at Austin.

Jack died just five days short of his 100th birthday, and will be sadly missed by his family and the Manitoba Live Steamers.

CHUCK, the MUDDLE ENGINEER — **by B. TERRY ASPIN**



POST BAG

N.E.R. Compound Atlantics

SIRS, - I thoroughly enjoyed Ron Isted's extremely well-researched article on Walter Smith and his 4CC compound locomotives. They did indeed incorporate novel technical innovations which I am sure his contemporaries would have scoffed at. The two locomotives however, confounded their critics with their excellent efficiency and outstanding performances.

Readers may be interested to know that the late Peter Dupen, after many hours researching archives and consulting works drawings, was in the process of building a superb model of No. 731, which would be an exact miniature replica of the locomotive.

At the time of his death, Peter had completed the locomotive chassis which was tested on compressed air. The four cylinders and associated valve gear mechanisms were a delight to watch and the exhaust beat was impressive.

The photograph below shows the cylinders and valve gears and also the complicated pipework on top of the cylinders. The boiler and smoke box were also completed and when erected temporarily on the frames, certainly gave the first impression of a very elegant miniature locomotive. I am sure that Peter would have had another award-winning locomotive with No. 731, but I am delighted to say that the locomotive is now being completed by Mr. John Rogers. It will certainly be interesting to see how it performs under steam.

Gordon Billiard, Alnwick.

The fine compound locomotive number 731 part built by the late Peter Dupen.

Myford M type lathes

SIRS, - Referring to correspondence on Myford 'M' Lathes in *M.E.* 4254, 19 August 2005 and *M.E.* 4263, 25 November 2005. I have one of these machines. They were made in two bed lengths, viz: M2 12in. and M4, 24in. between centres. Mine is a Model M4 No. LA878 with the bolted on headstock. The earlier models had a solid as cast headstock.

According to the date on the instruction book the lathe I have was made in 1943. I have a complete set of change wheels numbering 11 as well as a 127 tooth one for, I believe metric threads, although the screw cutting tables on the list indicates that a combination of the ordinary gears can be used for metric. I have many of the accessories for use with this lathe.

I purchased this machine some 20 years ago for £75 which included, as well as the lathe and some other tools, many of the accessories which can be used to extend the capability of the lathe.

I hope that this will be of some interest to you and perhaps some of your readers. If you require more information I will gladly supply it if I can. I have been a reader of *M.E.* for many years, and certainly well before the 1939-1945 war.

G. F. Beasley, Devon.

Flooring from the pit!

SIRS, - For the past 10 years I have carpeted my workshop with discarded conveyor belt from a local colliery. Needless to say this source is somewhat depleted but quarries could be a useful avenue of investigation.

It is very durable, stops the damp, protects dropped tools from damage and is easily cleaned. There are various types and colours; one of the thinner ones is well suited to our needs. It cuts easily with a sharp knife and can be laid in an hour or so. I hope this may be of use to fellow model engineers.

Malcolm High, South Yorkshire.

Feeble engines!

SIRS, - I wonder if you would please be good enough to inform Mr. Neville Evans that many are the adjectives used over the years in connection with Mr. Royce's wonderful *Merlin*, the engine that saved the world back in 1940, but never in my life have I seen it described as *"Feeble"*!

I am absolutely speechless - like a good many others I shouldn't wonder.

So much for the main message! Perhaps it is also worth pointing out that of the 18 marks of Wellington; only the Mk. Vs had the early *Merlin X*, of some 1145hp, not much, but nearly a hundred more than the Bristol *Pegasus* of the Mk. I. As Mr. Evans says, almost without exception the rest had the Bristol *Hercules*, a very good engine indeed, albeit the wrong shape. One exception was the experimental *Merlin 61*-powered high-altitude Wellington Mk. VI, one of which an old Rolls-Royce colleague saw plunge to its doom one morning over the outskirts of Derby when a propeller tip detached and pierced the pressure-cabin.

It would have been interesting to see how the Wellington performed behind a pair of *Merlin 24s* of 1620 anything-but-feeble horsepower and minuscule drag when compared to the big round *Hercules*, but with Spitfires, Lancasters and the svelte Mosquito to sort out who could be bothered trying to improve the ageing Wellington?

I am truly amazed there were still Mk. IIs around in 1951!

Martin Bourne, Cheshire.

Climate change

SIRS, - What Keith Wilson and other apologists for *'Corporate America'* and other similar interest groups singularly fail to address are a few basic facts. I will attempt to set the record straight, as far as I can in the context of *Post Bag*.

Firstly, regarding the amount of carbon dioxide in the atmosphere; The oldest chemistry text on my shelves is dated 1868, it quotes a surprisingly accurate value; by the end of the 19th century this quantity had been determined with considerable accuracy even by modern standards, thus we have over 100 years of accurate data to hand.

I know from personal experience that although many people know a little about the composition of the atmosphere, very few have any idea of the actual figures. The figures are: nitrogen 78%, oxygen 21%, and carbon dioxide 0.03%. These figures are percentage by volume for dry air (and therefore also give the ratios of molecules - Avogadro Principle). Consider the figure for carbon dioxide, it is less than one thirtieth of one percent, it is 30 times rarer than the rare gas argon (0.9% by volume of dry air).

However, despite the tiny amount of carbon dioxide in our atmosphere, it is fundamental to life on our planet as we know it. We tamper with it at our peril. Virtually all animal life on our planet is ultimately dependent on green plants, green plants in turn depend on atmospheric carbon dioxide to fix sunlight energy by means of photosynthesis, and the sun is our ultimate energy source.

There is another aspect to carbon dioxide, I was taught in my physics back in the 1950s, that whereas carbon dioxide is relatively transparent to short wavelength radiation (the blue end of the spectrum and beyond), it was much less transparent to the longer wavelengths (the red end of the spectrum and longer). The inevitable result of this is that sunlight energy is trapped by the carbon dioxide in the atmosphere, the more carbon dioxide there is then the more energy that is trapped with consequent heating of our planet, the so-called greenhouse effect (glass behaves in much the same way as carbon dioxide with respect to the sun's radiation).

There can be no question; an increase in the amount of carbon dioxide in the atmosphere must inevitably cause a warming effect - nothing more than simple physics is involved. This is additional to any natural variation. Quoting a figure of 3.6% increase is meaningless in the context of the carbon dioxide content of the atmosphere; if someone is shot through the heart by a small calibre rifle, the fact that only a small percentage of their body has been damaged is in the circumstances a pointless statistic, they will still be dead.

If something is finely balanced, it can take very little disturbance of the system to bring about a catastrophic result. The elementary physics of the transmission of different wavelengths of light by carbon dioxide has been known for a very long time; Arrhenius, one of the founders of modern physical chemistry, drew attention to the fact that burning fossil fuel would increase the amount of carbon dioxide in the atmosphere with consequent heating up of the planet some 100 years ago. This problem is not new to the scientific community.

Post Bag is no place to discuss matters such as climate change and I regard it as reprehensible that a contributor should use - or abuse - their position to express their personal views on such matters.

However, since Keith Wilson has chosen to do so, perhaps I may be allowed to go beyond the facts set out above. Climate change has been recognised and studied for over a century with ever increasing sophistication, carbon dioxide is not the only greenhouse gas and the greenhouse gases collectively are not the only cause of climate change.

Variation in solar radiation is also a major factor and sun-spot cycles have been correlated with historically recorded changes in climate such as the 'mini ice-age' a few centuries ago. There is now detailed knowledge of cycles involving variations in the earth's orbit, tilt and precession, these correlate with the succession of glacial and interglacial periods observed in the Pleistocene.

Again, studies of the oxygen isotopes extracted from deep-sea sediment cores have yielded valuable information with respect to mean temperatures which agrees well with the astronomical data. Readers may be surprised to learn that over the last 100,000 years, which span two major glacial periods together with intervening interglacial periods, mean temperatures have varied by scarcely 6deg. Celsius - yet from January to December we will experience a range commonly of 30deg. Celsius.

Only a small change in mean temperature brings a huge change in climate; a change of 1deg. Celsius with respect to the mean temperature can alter the distribution of a particular plant or animal quite dramatically. It should be taken into account that the Celsius temperature scale that we commonly use is purely arbitrary, if we turn to the more fundamental temperature scale we see things in a better perspective, zero Celsius becomes 273 K and six Celsius becomes 279 K - a change of only approximately 2%.

There is nothing that we can do about the natural world but we should be able to control our own behaviour, small changes in our atmosphere can - and will - have far reaching effects on our climate. For every scientist who doubts the dangers of global warming there are a hundred or more who do not, America included.

I will close with one final observation; as an academic discipline archaeology has been in existence for approximately a century and in recent decades has come to rely heavily on the sciences, archaeological studies have revealed many examples where well documented climate change has been seen to cause massive social and economic upheaval, sometimes involving mass migration. Climate change can not be lightly dismissed and neither can our part in it.

Roy Froom, Berkshire.

Information on firearms

SIRS, - With the publication of Peter King's letter (*M.E.* 4265, 20 January 2006) the protracted, and mostly clichéd and bigoted correspondence on this subject continues. I am still at a loss to know why technical information on making illegal real or imitation firearms should be made generally available in *M.E.* On this basis, again can we expect articles on cracking safe combination locks, constructing appendages to cash machines to facilitate the fraudulent use of cash cards or even uranium enrichment?

I respect Peter King for his admission that he is an active shooting enthusiast. Perhaps we should be told if Messrs. Hares, Perkins or the editor have a similar past or present background. I have done small and full-bore shooting in the past until the equation of cost and access to facilities adversely balanced with my enjoyment. I resent any covert attempt to use the columns of *M.E.* for promoting fringe political interests.

I agree with Peter King that concerns over gun safety ultimately resolve themselves down to the behaviour of individuals. I met a few inadequate and militia mentality personalities in full-bore shooting! In the UK, legislation for controlling access to guns and ammunition by civilians has evolved in recent years to react to fatal public incidents. Some correspondents appear to regard firearms control legislation as interference by the nanny state or control freaks - whatever they are. I consider that the columns of *M.E.* are an inappropriate forum for discussing firearms control matters.

By the way, can I describe anyone with a different opinion to myself as being politically correct?

David L. Francis, Somerset.

ED: Whether we like it or not, this issue is here, and it has affected this magazine.

The facts are straightforward.

Model guns have been a popular part of the hobby and the content of this magazine since the year dot. The only problem we have encountered arose from recent adverts from the United States for plans for a model Gatling gun, capable of firing live rounds. The Home Office pointed out the legal position and the publishers decided not to publish the advert in future.

Future editorial content will, of course, take into account the views of the Home Office.

For these reasons, we have been happy to publish readers' views on the subject, and no doubt, as apparently avid readers of Model Engineer, *the mandarins of Whitehall are now better informed on the subject.*

So it is probably time to call a halt to this particular debate - unless someone has something new to say. And it is definitely time to end the debate about the debate, from shooters and non-shooters alike.

Left; Mr. Coller's 'Walking Machine' in action. Right; The control equipment of the walking machine.

Measurement standards

SIRS, - Grandfather Ellis should recommend that his Grandson reads *The Measure of All Things* by Ken Alder published in 2002 by Little Brown Books, ISBN 0-316-85989-3, (usual disclaimer), regarding the measurement and introduction of the metre (*M.E.* 4265, 24 January 2006).

The book gives a very comprehensive covering of the instruments and methods used, the personalities and politics involved and the reasons that the measurement took so long.

Even the French had to be forced to use the new system. It is one of those books that one is reluctant to put down once started and it's over 400 pages long.

Colin Long, Essex.

Walking machine

SIRS, - I have made a model that as far as I know has never been done before. The photographs show my 'walking machine' which looks simple to make until you look under the plate it walks on and see the motor and electromagnets that supply the energy to drive it.

Some of the many problems to solve with the legs included; how to make each leg stand firm and then flex and bend; how to make the leg move forward and not kick back and how to make one foot lift without moving the other.

The electromagnets that drive it had to attract both legs and then hold one leg whilst lifting and moving the other leg forward. This was done with two 'one-way' clutches and a crank driven by the electric motor.

The model now works well at all speeds but only after many different designs, remakes and modifications.

Brian Coller, Wiltshire.

High pressure boilers

SIRS, - I am sure Mr. Collyer's letter, *M.E.* 4264, 6 January 2005, will elicit a few replies. I think he is far too worried by the slightly higher than normal operating pressure, if not then how can we account for the full size locomotive boilers with copper fireboxes working at much higher pressure? To explain further:

The temperature of saturated steam at 125psi gauge is around 175deg. C. Data sheets give the ultimate strength of copper reduced by around 22% at this temperature as compared to room temperature. However, no copper boiler should be designed to work anywhere near this value as with elongation to failure of over 50% the distortion would, to say the least, be noticeable.

A much better figure is the proof stress, quoted for copper as 0.5% proof, which is a measure of the onset of permanent deformation. For annealed copper this stress is around 1/3rd of ultimate. Boilers should be designed to gross stresses which do not exceed this at first test pressure, otherwise measurable distortion will occur, irrespective of any safety factors applied to the failure (or ultimate) stress. The 0.5% proof stress reduces by around 10% at 175deg. C, a more reasonable figure.

His comment on the boiler being overstressed and some sort of irrecoverable 'partial plastic flow' within the thickness not being eliminated by (presumably designed-in) thickness increase is simply not true, or at least not at the pressures in steam engine boilers.

Take a cylinder containing pressurised gas (steam). The stress normal to the surface is maximum at the inner surface and equal to the gas pressure. Whilst this is independent of thickness the stress is so well within the capability of the copper material (less than 2% of proof) that there is no need to even consider it during design. The stress parallel to the surface is a maximum tangential to the cylinder, is constant through the thickness for thin wall cylinders, and is known as the hoop stress. It is calculated by the equation:

Stress = (pressure x cylinder radius) / (wall thickness)

From this it can be seen that adding thickness reduces the stress, so compensation for higher working pressure or lower allowable stress is a simple matter.

Of course this is only one of the features of the boiler to be considered but is presented as a useful illustration. Other features such as plate bending between flanges and /or stays, local bending of flanges etc whilst obeying different equations respond correspondingly to changes in thickness; the stress normal to the surface is unvarying and trivial whilst the stress parallel to the surface is reduced by increased material thickness.

Perhaps Mr. Collyer was referring to local stress concentrations. Here again there is no great need for concern provided adequate test pressures are used. These local stress concentrations occur at corners and intersections and may be visualised by imagining lines of stress trying to take a short cut and clustering around the inside of the corner. This effect is very common, occurring to varying degrees in all practical structures. When metals are used then the local high stress causes yielding and plastic strain. Because the slope of the stress strain curve reduces above proof this limits the stress and prevents failure. Copper has a very high elongation to failure so the local yielding caused by the stress concentrations in copper boilers is readily accommodated and may be virtually ignored; being so localised as to be undetectable by eye. There may also be some proof strength increase caused by work hardening, which could be considered beneficial.

What happens, then, when the pressure is relaxed? The locally plastic strained areas are compressed past zero by the much larger surrounding areas as they relax, pushing them to a negative stress. Effectively this re-datums their local 'zero' to a negative value and after loading under test pressure they will have lower stress at working pressure than if they had not been taken to the higher test pressure first. Residual compressive stresses like this are a little bit of magic that can actually increase the fatigue life of the component, an effect known as coaxing.

I don't know if there is anything in the new boiler test codes that limits the allowable working stress (I don't have a copy yet and have seen one only briefly) but my 1994 edition does not. However, from the above a simple 10% addition to the test pressure would prove a 125psi boiler to the equivalent level of safety of a more 'normal' 80-90psi one. So testing a copper boiler to 400psi is more than adequate to clear 125. Whether or not it is wise to allow amateurs to construct boilers to work at this pressure may be questioned, however provided adequately designed and tested I personally can see no reason why not. Trusting this may be of some interest

Gerald Martyn, Somerset.

Gremlins

SIRS, - Do you have a workshop gremlin? I have, he's been around for quite a while now and is always active whether I am in the workshop or not. If I am in the workshop and drop any item it promptly gets snatched away, never to see the light of day again. If I am not in there tools etc., simply just move around. Well can it really be me that put the Jacobs chuck key in the Allen key box?

I once turned a small item for my Sweet Pea, I took it out of the lathe chuck admired it for a few moments, placed it on the bench, turned round for a few seconds and it was gone, no amount of searching found it, the replacement one was placed straight in a box!

A few years ago I moved my workshop and during the course of the move my 7mm drill holder broke within the plastic drill stand, it was carefully placed in a box with other tools. The other tools came to light when I set the workshop back up but that drill is still missing!

However, I am beginning to think the little fella has made a New Year's resolution. Back in October I bought at an antique fair a brand new boxed set of HSS metric drills ranging from 6mm to 10mm in 0.1 steps, cost £10, quite a bargain I thought.

They were placed on the shelf alongside all the other drills, a few days later the new drill box crashed to the floor spilling the contents (you are in front of me on this one aren't you!) All the drills were gathered up, the box lid repaired and the drills replaced except the 9.3mm, which was of course missing never to see etc., etc! Down on all fours to search around on the floor trying to establish a likely trajectory, nothing, so there stood my new drill box with another vacant hole.

Early in January I was changing a carbide tip in a tool holder where the tip is retained by one of those infernal 'Torx' screws which was just marginally bigger than a pinhead, I dropped it!

But you are not in front of me on this one since when I again got down on all fours the very first thing I saw was the 9.3mm drill peeping out point first between two boxes, the little devil had given it me back along with another number drill, several BA screws to the point where I shall not be writing to EKP for a year! And believe it or not the 'Torx' screw. Welcome 2006!

I recently found out the name of my gremlin, it seems to have Norse origins, 'Older'! To save time and effort I now enter the workshop on all fours!

David Spooner.

Mystery solved

SIRS, - Your mystery object (*M.E.* 4267, 17 February 2006) is a mould for making thermitwelds (Thermoweld and Cadweld are two proprietary names.)

Thermitwelds are produced by melting a suitable filler material using an exothermic material such as aluminium and/or magnesium. The molten material runs into the area to be welded and makes a bond. Most readers will have seen the technique being used to join continuous welded rail. The technique is/was seen frequently on TV producing a shower of sparks as a background to a piece on rail maintenance.

The mystery object is a smaller version probably for thermitwelds of 15 to 25gm. The actual example would be intended to make a thermitweld on a horizontal flat surface and would stand on the surface with the handle upright. The body is a graphite crucible with a hole in the bottom, say 5mm diameter, which would let the molten metal run down into shaped recess in the base. A 'U'-shaped recess in the base allowed the bared end of a copper cable (say 6mm sq) to enter the recess. The molten metal would attach itself to the flat surface and the copper end. This procedure enabled cables to be bonded to flat surfaces/pipes as required.

The mould construction could be varied according to the required position e.g. on a horizontal or vertical surface, very useful for bonding. To bond a copper cable to a surface the procedure would be to prepare the cable and position the mould on the surface. A cartridge containing the t/weld powder could then be poured into the crucible having first placed an aluminium disc in the crucible bottom (often forgotten!).

The cartridge retained a small amount of magnesium powder which was teased into position near the top of the crucible. A flint gun was then used to spark off the magnesium followed by a rapid flip of the lid (the U-shaped piece in the photo) before the burning mixture burnt the hand holding the mould handle.

Once the technique was learnt this was a very rapid process, particularly suited to locations where a permanent electrical bond was required in remote locations.

I have used the past tense in the description above since it may be in this namby pamby age that such operational skill is not permitted. I used the technique in deserts, offshore North Sea, and the knee-deep mud of the UK over some 20 years without distress.

Care was required to ensure that the mould, cartridge etc were suited to the purpose. Post-weld testing in this type of weld was fairly limited, one hit it gently with a hammer!

I would welcome up to date comment on the process.

Mick McKie, by e-mail.

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Responses to published letters are forwarded as appropriate.

The $7^1/_4$in. gauge Britannia class locomotive William Shakespeare *built by Michael Jones. The model brought back memories of the full size locomotive for the author of these notes.*

LOAN MODELS
AT THE 75TH MODEL ENGINEER EXHIBITION

Brian Davies
reviews some remarkable models.

As ever I arrived at Sandown Park for the 75th Model Engineer Exhibition in anticipation of the loan models I was to review, excited to see what marvels had been created by my peers. I was far from disappointed. The results were, as always, quite remarkable.

Loan model one, **photo 1**, was breathtaking. This view reminded me strongly of the occasion 50-odd years ago when I photographed the *Golden Arrow* as she steamed up the slope over Cray Avenue and past St. Mary Cray station belching smoke and steam. I was crouched down close to and alongside of the track, the noise, the sight and the smell were breathtaking. The model is of the Britannia class locomotive *William Shakespeare* built by Michael Jones, in $7^1/_4$in. Gauge.

Les Chenery's superb Gnome 14-cylinder rotary aero engine.

What looked like a highly complex model was that of the Gnome 14-cylinder rotary engine, built to a scale of 1:5 by Leslie Chenery. As can be seen in **photo 2**, this model is beautifully executed, the detail being quite excellent. A completely different model is shown in **photo 3**. This is a 5in. scale model of the 0-6-0 class 3F locomotive 'Jinty' well finished in black with red plates and shown on a section of track, complete with ballast and built by Alan Walker.

Another quite different model can be seen in **photos 4**. Built by Martin Ranson this is *Little Minn*, an open steam launch to a scale of 1:12.

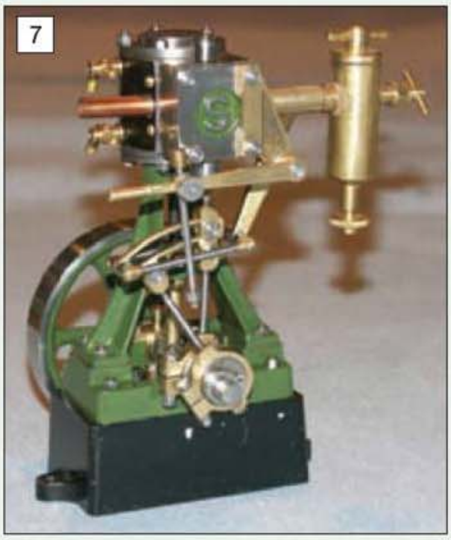
Photograph 5 is of a Burrell 8 ton steam roller, but what makes this model by Michael George so much more interesting is the addition of a living van and road mending equipment, complete with a barrier and notice. The Burrell is to a scale of 2in. to the foot and finished in burgundy, black and gold, and all items shown mounted on a section of roadway.

A fine 5in. scale model of the 0-6-0 class 3F locomotive 'Jinty' by Alan Walker.

An eye catching open steam launch to a scale of 1:12 built by Martin Ranson.

Michael George's 2in. to the foot Burrell 8 ton steam roller complete with a living van and a set of road mending equipment formed a nostalgic glimpse at how local authorities used to carry out road maintenance tasks.

Beautifully made and cleverly displayed was this Mallet Class C4 compound of the Swiss Central Railway by John Wilks.



A neat Stuart 10V stationary steam engine by John Engall.

Also mounted on a suitable base, a track this time, is the 1:12 scale model by John Wilks of a Mallet Class C4 Compound of the Swiss Central Railway (**photo 6**). This one I would love to see running.

A number of stationary engines were on display all being finished to a high standard and the one pictured in **photo 7** is no exception. This Stuart model 10V is a stationary steam engine with reversing gear and was built by John Engall. Also built by John Engall is the Stuart D10 2-cylinder vertical steam engine in **photo 8**, both models being well finished.

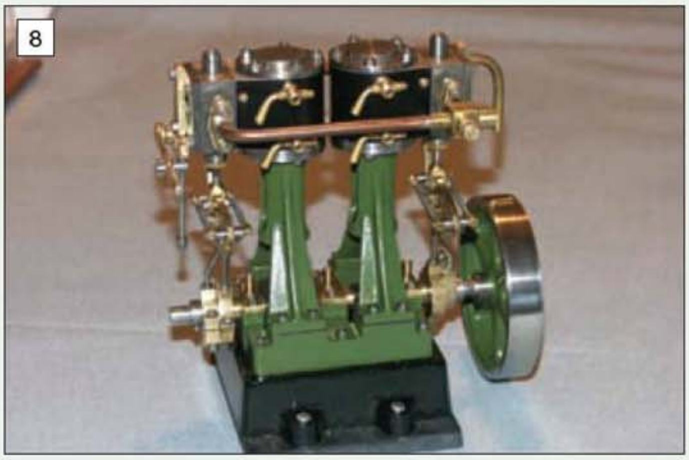
Some tooling was on display and **photo 9** shows an unusual item. This chuck jaw making fixture was build by Kenneth Thornton and shown mounted on a rotary table. Should you too need to make special soft jaws for any chuck this device would help to make the task that much easier.

Part build models are always a feature of the loan section of the exhibition and several were being shown. **Photograph 10** is of a small Metro locomotive in 5in. gauge to a scale of $1^{1}/_{16}$in. to the foot and is being built by Mike Stevens.

One of the more unusual models displayed was the one in **photo 11**, simply titled 'Between Decks' it is a 1:23 scale model by Eric Milne of an old-time warship and shows the gun emplacement and all the paraphernalia associated with cannons.

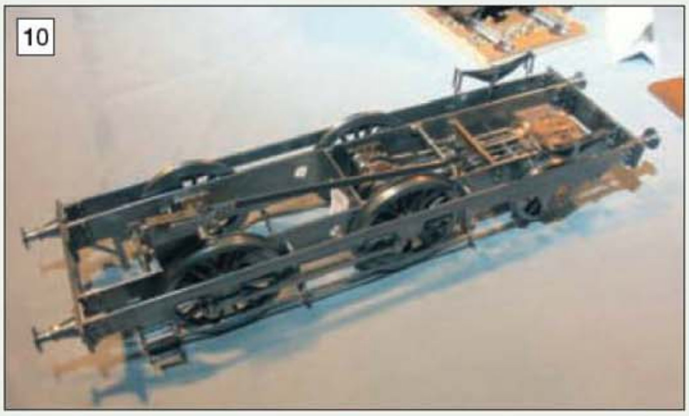
Norris Bomford exhibited another fine example of a vertical twin stationary engine displayed here on a polished wood plinth and finished in black. **Photograph 12** clearly showing the governors and the fine finish on this model.

Another unusual model is shown in **photo 13**. This is a 3-cylinder paddle steamer engine designed by Henry Greenly and built by Stan Bray. It is not generally realised that Henry



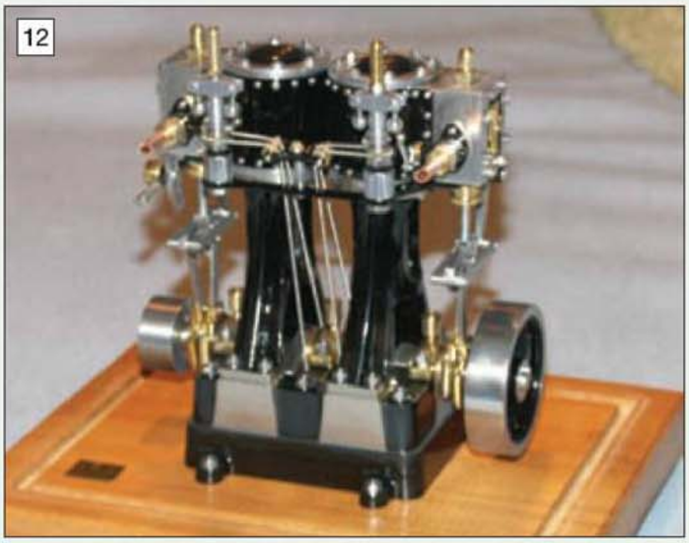
Also by John Engall was this smart Stuart D10 two cylinder vertical steam engine.

A special device, utilising a standard rotary table, for machining the teeth in soft chuck jaws by Kenneth Thornton.

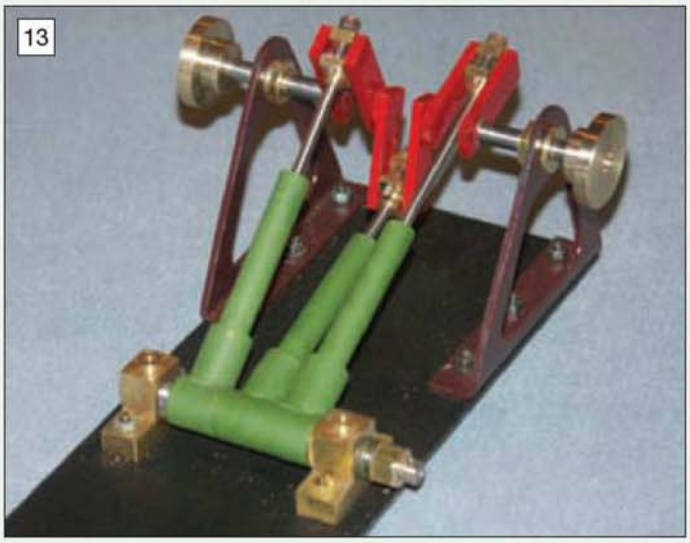


Coming along nicely! The chassis of a 5in. Metro under construction by Mike Stevens.

'Between Decks' is a 1:23 scale model of the gun deck of a man o'war in the era of sail by Eric Milne



Black beauty. Norris Bomford's vertical twin cylinder stationary engine was neatly made and well finished.



An unusual 3-cylinder paddle steamer engine built to a Henry Greenly design by Stan Bray.

Greenly was deeply involved in work other than locomotives, he was also responsible for some of the Stuart Turner stationary engines. Stan Bray built this model especially as a tribute to Henry's valuable contribution to the hobby.

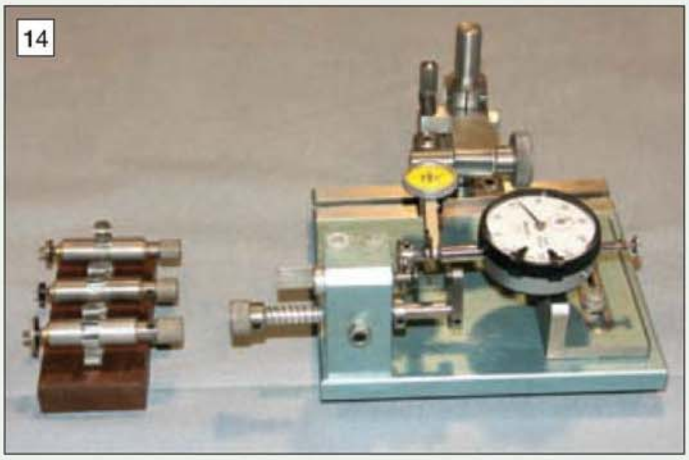
One of the more unusual items of tooling is shown in **photo 14**. This is a wheel testing fixture built by Geoff Helliwell. It is designed to test wheels for 3mm Society Model Railways, and shows a pair of wheels mounted on their axle being tested.

It is always nice to see something slightly different and **photo 15** is a fine example. Built by Bryan Finch this is of a 1:12 scale overtype steam wagon and trailer, complete with a load of crates. An attractive freelance model based on a 4 ton Foden of around 1913. The design of this model, well finished in red, blue and black, was originally described in *Engineering in Miniature* by Barrie Neville in the late 80s and early 90s.

Loan model 28 is depicted here in **photo 16**. This is of a small boilered 'Tich' in $3^{1}/2$in. gauge and built by Ronnie Brown. As yet unpainted I look forward to seeing this model in the competition sections at the Exhibition next year. Ronnie reports that the most challenging part of the model was the construction of the boiler. He enjoyed the copper bashing but failed to appreciate, at the outset, the benefits of using various grades of silver solder, or the need to insulate various parts in order to reduce the amount of heat needed to raise temperatures to the point where the solder would melt.

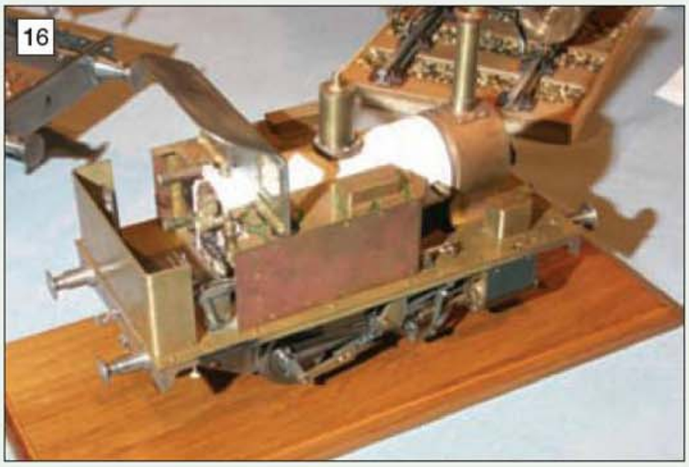
Turning to another item of tooling **photo 17** shows a copying device for a Warco 300/2 lathe. Built by Alan Barrett this is an imaginative piece of tooling and likely to be of interest to a number of model engineers, me included.

Regular readers will recall the story of *Annabel*, the engine rebuilt by LBSC and now ▶

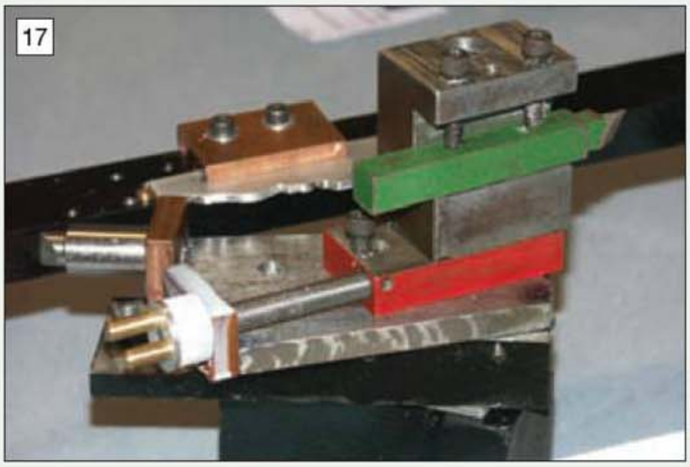


An unusual and nicely made wheel testing fixture for 3mm railway wheels built by Geoff Helliwell

Bryan Finch's overtype steam wagon and trailer was displayed with an appropriate load.



Always a popular choice, a small boilered 'Tich' in $3^{1}/_{2}$in. gauge and built by Ronnie Brown.



A useful copying device designed for a Warco 300/2 lathe and built by Alan Barrett

Living history - the 2-6-6-4 American outline locomotive* Annabel *extensively rebuilt by LBSC and now owned by Jim Robson.

Derek Brown's 71/4in. gauge* Anna *continues to take shape.

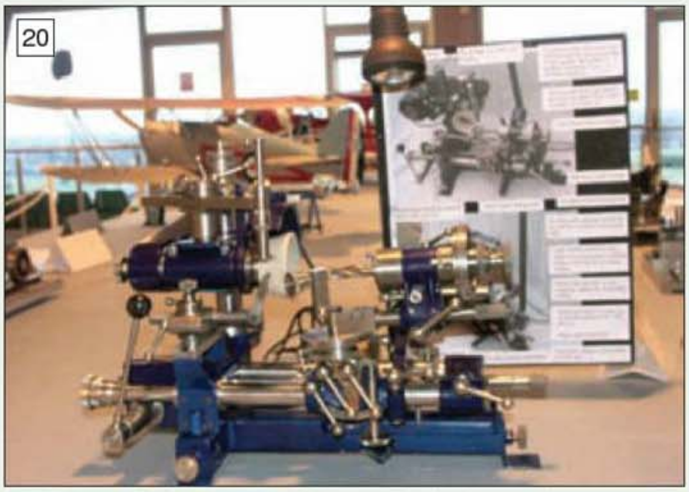
owned by Jim Robson (*M.E.* 4232, 15 October 2004). **Photograph 18** shows *Annabel*, a $2^{1}/_{2}$in. gauge 2-6-6-4 locomotive to American outline, as she was presented at the Exhibition. This very finely detailed model looked outstanding and is a real piece of living history.

Photograph 19 will be instantly recognised by readers of this magazine as being the $7^{1}/_{4}$in. scale model of *Anna* being built by Derek Brown, the articles having just concluded. I certainly look forward to seeing this model next year to see how much progress Derek has made.

Something I intend building in the future is a Quorn tool and cutter grinder. On show this year was a particularly fine example by Martin Gregory, his Quorn is shown here in **photo 20**. Together with the machine Martin had a display board with pictures of the equipment all captioned out. This can only spur me, and I'm sure others, to knuckle down and start building their own machine.

The model pictured in **photo 21** is a part built GWR 56xx 0-6-2 tank engine constructed to a scale of $1^{1}/_{16}$in to 1ft., being made by David Murray. As can be seen this model is well underway and again I look forward to seeing the progress at the next exhibition.

Photograph 22 shows one of four oscillating steam engines built by Tony Haylor. For security purposes these were displayed inside a glass showcase and hence the photographs do no do justice to the models. The display included a horizontal twin (photo 22) and a very neat little V-twin (**photo 24**). The finish on all four would not have looked out of place had they been clocks.

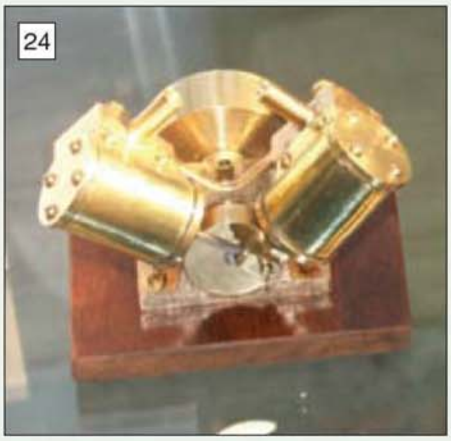


Martin Gregory's heavily modified Quorn tool and cutter grinder was displayed with plenty of information.

Under construction by David Murray, a GWR 56xx 0-6-2 tank engine. Next job the boiler!

This little horizontal oscillating engine was built by Tony Haylor.

A battery powered model of the English Electric GT3 locomotive being built by Jack Darby to a scale of 1:12.



Also by Tony Haylor was this V-twin oscillating engine.

A well finished, 1:3 scale model of the Pitts 51-55 by Mike Hibbins. Could we have more aero-models next year please?

A battery powered locomotive to a scale of 1:12 and being built by Jack Darby can be seen in **photo 23**. This is an English Electric GT3 and very handsome it is too. It is well finished and I am sorry to say that the photograph does not do it justice.

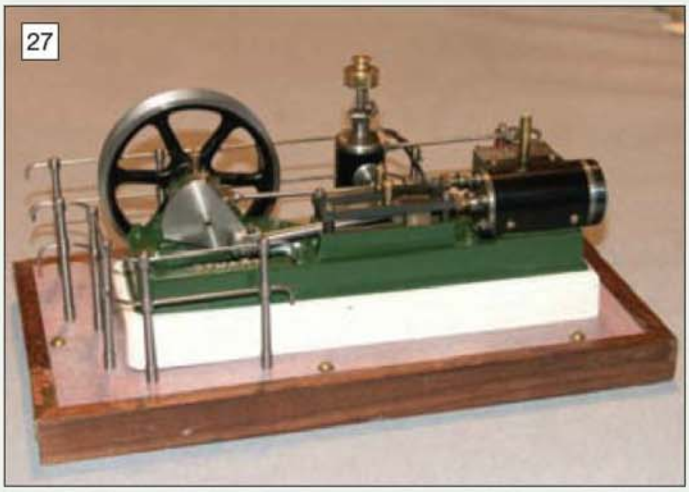
Photograph 25 is of the only aeroplane in the loan section of this exhibition, which is a pity. My first love was model aeroplanes and I can really appreciate the time and effort put into this model of a Pitts 51-55. The finish is excellent and having been built to a scale of 1:3 I would love to see it in the air, Mike Hibbins you are to be congratulated.

The $3^1/2$in. Juliet depicted in **photo 26** brings back memories of the Juliet my father started to build back in the 70s. This engine, built by Michael Law, is finely detailed in every respect and displayed on a section of track, complete with ballast. It really looks the part and I was not surprised it won the Curly Memorial Bowl Competition in 2005.

A horizontal stationary steam engine *Sally* is shown in **photo 27**. This is a Stuart Turner model built originally by the late T. D. Walshaw (Tubal Cain) and exhibited by M. Bell. Very nicely presented on a wooden base complete with handrails it certainly was eye-catching and brought back fond memories of Tom Walshaw's articles.

Well, once again we have run out of space before running out of models. In conclusion I would add that I enjoyed these models and can only hope, rather vainly, to aspire to the standards set here. I am always astounded at the quality of the workmanship displayed and end by congratulating all builders on these quite remarkable models.

LBSC Memorial Bowl winner 2005, Michael Law's little Juliet Fred *drew many admiring glances.*



Mr. M. Bell's Stuart horizontal stationary steam engine Sally *was built by the late T.D. Walshaw.*

Nemett
gives news of the passing of two influential members of the miniature I/C engine world and introduces the Nemett 15cc single.

I received news of the passing of two important and respected members of the miniature I/C engine world recently.

Gig Eifflaender

Gig Eifflaender passed away on 01 December 2005. Many readers will know that Gig was the designer of the well known PAW range of compression ignition engines produced at the Progress Aero Works in the UK since 1957. The engines are much sought after for use in competition and will continue to be produced by the company under the management of Paul and Tony Eifflaender.

Dick McCoy

Dick McCoy, designer of the famous McCoy range of engines, passed away on 30 December 2005 at the age of 98.

Dick began designing and building his own engines for use in tether cars in the 1940s after becoming disillusioned by the performance of the commercial engines of the time. His engines were very successful and the resulting demand was such that he arranged a deal with a Hollywood company, Duro-Matic, to produce the engines. The engines were in production for 35 years during which time Dick retained design responsibility. The McCoy engines are still much sought after by collectors.

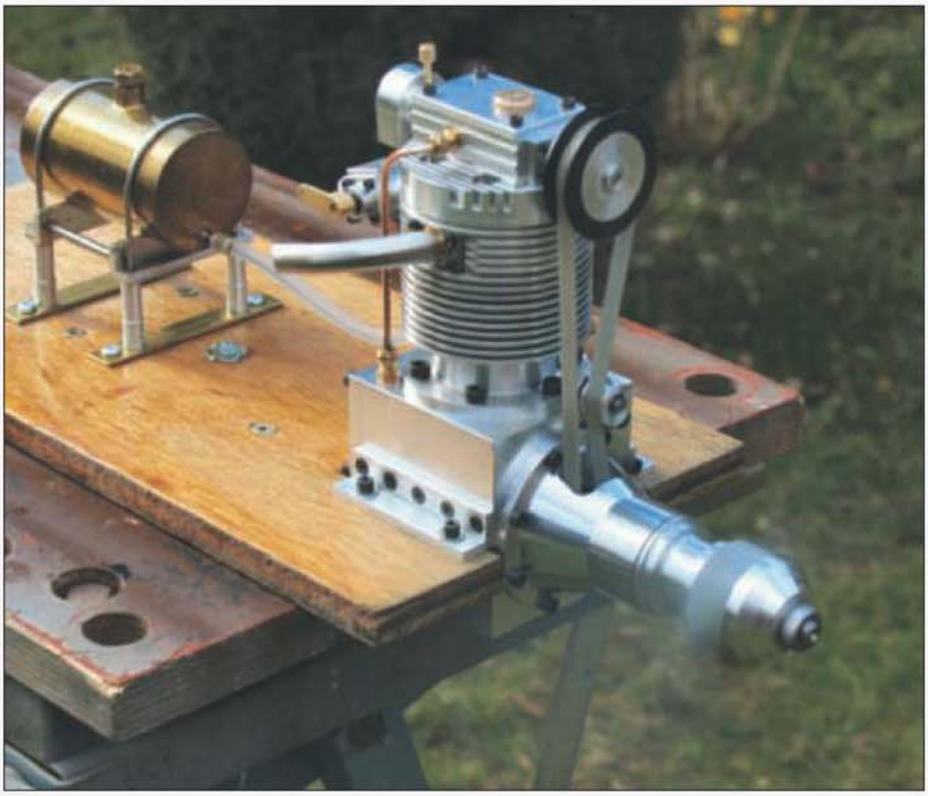
I am sure readers will wish to join us in expressing our condolences to both families on their sad loss.

The *Nemett* 15S

I write this having just had a successful first run of the new engine (**photo 1**), so am now confident enough to launch the beast onto the big wide world and to introduce the construction series which will run in this column over the next few months. The first outing was very successful and the engine was running within five minutes of setting everything up. Unfortunately the battery in my optical rev counter was flat at the time so I have not got an accurate RPM figure yet but the engine turned a 14 x 7in airscrew well and has a nice crisp even exhaust note.

The run was not without incident because the first start saw a 16 x 4in airscrew wizz past my left ear, but more on that later in the series!

The first run used glow plug ignition proving that the 9:1 compression ratio is satisfactory for

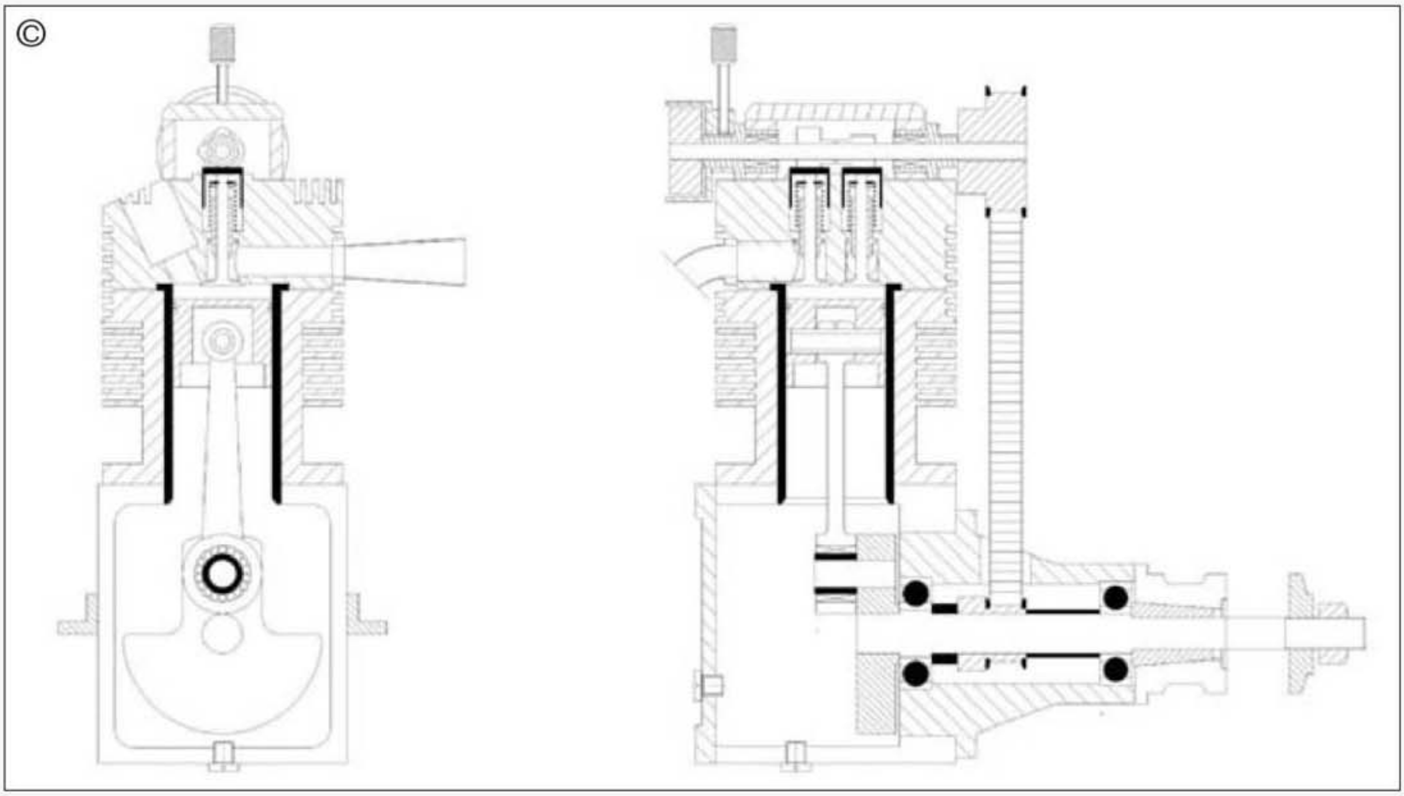


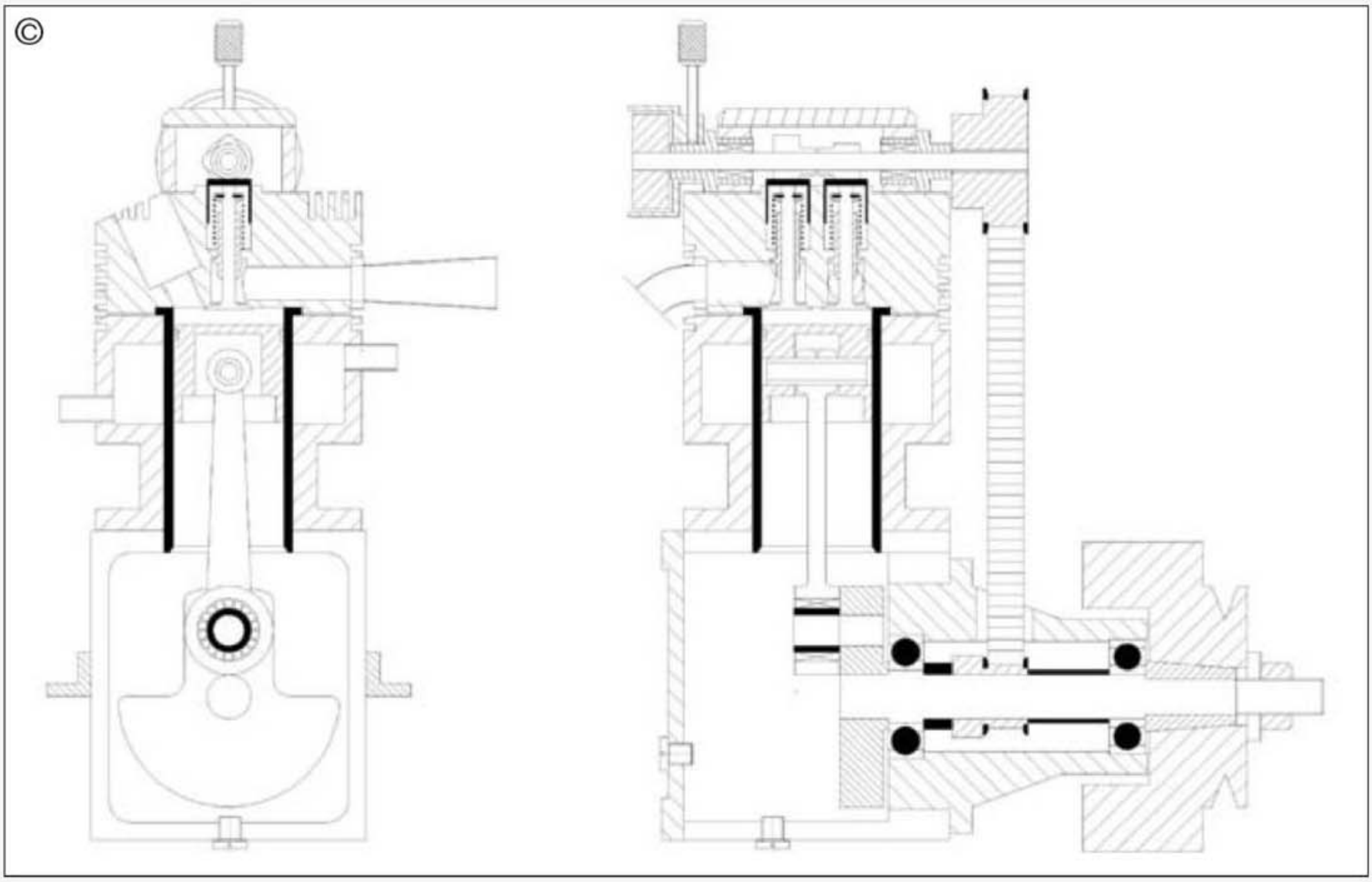
1. The first run! The engine turning a 14in x 7in airscrew on glow fuel.

The main parameters of the engine are:

Type	Single cylinder, single overhead cam shaft four stroke with air or water cooling options.
Bore	25mm
Stroke	30mm
Cubic Capacity	14.7cc
Compression Ratio	9:1
Length (including carb)	200mm
Height to top of cam box	165mm
Width (crank case)	63mm
Width across bearers	88mm
Weight	1.4Kg
Cam shaft drive	Single 2.5mm pitch 6mm wide toothed belt.
Carburettor	Barrel type with adjustable fuel needle and slow running air bleed. Choke diameter 7mm.

2. Exhaust side of the engine showing the cam shaft drive.





that type of ignition. This means that the engine should be capable of being used on either spark or glow plug ignition without modification.

I first introduced the basic design when I was in the very early stages of construction (*M.E.* 4261, 25 November 2005) and enlarge on the specification details in the table.

The cam shaft drive is taken from the front of the engine in order to be able to use a simple overhung crank shaft. This is of built up construction and runs in ball race main bearings and has a needle roller big end bearing. This allows the use of splash lubrication without the complexity of oil pumps.

The drawings show both air cooled and water cooled marine versions and the engine can be run on methanol based fuels with glow plug ignition or petrol with spark ignition. The engine is designed so that it can easily be changed from aero to marine configuration by simply swapping the cylinder jacket and fitting the flywheel.

The final version of the engine has some minor variations from the original design and I have included views of both the air (**fig 1**) and water cooled (**fig 2**) versions.

I suspect that the engine is a bit large for the average model aeroplane but would suit a large

3. Engine from the front.

4. Rear view showing the carburettor and ignition rotor and housing.

5. Close up of the barrel type carburettor

vintage type of plane and also a hard chine cabin cruiser type of model boat of around 4ft 6in length very well.

As I said before, the engine is drawn using metric dimensions with metric threads and bearing sizes being used throughout but for all you 'imperialites' out there with vast stocks of BA screws and bolts I have included a table of BA equivalent thread sizes on the drawings.

All the materials are easily obtainable from any of our usual suppliers and the toothed belt and pulleys for the cam shaft drive can be obtained from HPC Gears (01246-268080). The bearings can be obtained from any local bearing supplier or Arc Euro Trade (0116-2695693).

For those building the spark ignition version, a simple electronic ignition kit, coil and spark plug can be obtained from Woking Precision Models who advertise regularly in *M.E.*

I changed the method of cutting the cams from the original Westbury method using the lathe and used a rotary table in the mill with a set of 'offsets' specifying the cam lift (hence depth of cut) for each degree of cam rotation. I will explain this fully in due course but it is a very easy (if slightly tedious) way to cut cams and they require very little finishing afterwards. I am indebted to Ron Chernich for permission to use the figures which were calculated using his Camcalc program featured on his excellent web site at **http://modelenginenews.org/index.html** . This site contains a wealth of information on all aspects of miniature I/C engines and should be compulsory viewing for those interested in I/C.

The set of figures are included on the drawings and I have also left the Edgar Westbury type cam cutting jig on for those who wish to use the lathe. The disadvantage of the Westbury method is the fact that the cam nose has to be filed by hand whilst the milling method gives a very accurate cam profile at all points.

The only significant part I have changed since the original design was shown is the size of the gudgeon pin (which has been increased) and its position relative to the top of the piston. This was on the advice of Eric Offen to whom I express my thanks.

Other alterations were mainly related to ease of construction and in a couple of instances I moved the position of bolt holes to avoid any possible problems with holes breaking through into each other. I also show the cylinder head cooling fins milled at an angle to correspond with the spark plug hole angle. This is to allow access to the plug for the ignition connection because as with most overhead cam shaft engines the plug is set in a deep hole.

I have included some photographs of the finished engine. There is a side view of the complete engine (**photo 2**) and front and rear views (**photos 3 and 4**).

The barrel type carburettor (**photo 5**) was chosen because the type performs well and is easy to make. The jet is 0.8mm (or number 67) and I used a sewing needle to make the fuel needle valve. I have shown a slow running air bleed adjustment but this may not be needed because the engine seemed to throttle quite happily with the bleed shut on the first run! I will check this out further in due course.

Finally, so that you know what you are letting yourselves in for, **photo 6** shows the complete set of 'bits' for the engine. There are around 50 items on the parts list excluding nuts and bolts.

The prototype was machined using a Warco WMT300 lathe with an ER32 collet chuck used for many parts and milling carried out on an Arc Euro Trade X3 mill fitted with digital readouts to all movements. If you do not have digital readouts fitted then you will need to use the machine indexes. For those that do not have a digital readout on the vertical axis I will describe a method of using a dial gauge for this during the cam cutting process where the ability to set an accurate depth of cut is critical and the increments between cuts are very small.

A rotary table is beneficial for many operations but either that or a dividing head is essential for cam cutting on the mill.

Drawings will be available shortly and consist of 15 A3 sheets (produced using Turbocad) and details will be provided next time.

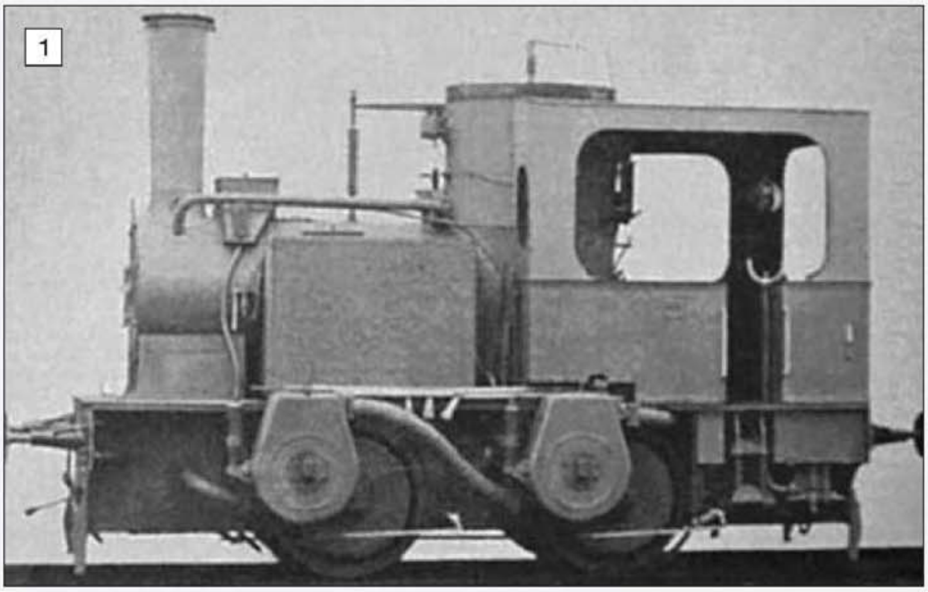
Once this construction series has finished, I will include full building instructions with the drawings and will provide them to anyone who has purchased drawings prior to that.

Next time I will start the construction proper and hopefully provide some more information on the performance of the engine.

As I have said before, I believe that any competent model engineer can build an I/C engine, so lets have some of you steam enthusiasts trying something different. It would be nice to see at least one Nemett 15S at the Model Engineer Exhibition this year.

6. The kit of parts!

"Few experimental realms in steam locomotive design can have been explored by steam locomotive designers with more persistence and less ultimate success than that of steam-turbine propulsion".
From *The Railway Gazette*, August 1952.



The first steam turbine locomotive, built 1908 in Italy. Note the boiler.

STEAM TURBINE LOCOMOTIVES OF THE WORLD

P. J. M. Southworth
begins a new series on the steam turbines from around the world.

When I was building my experimental 5in. gauge 0-6-0 steam turbine locomotive *Turbo,* I wondered how many full size engines had been built. I knew about the LMS engine having seen it running, but how many more had been built. Looking through *The Guinness Book of Rail Facts and Feats*, some information was found, but not in any detail as one would expect in such a book. Also missing from it in the edition I had, as I found out later, were a number of engines. This limited information got the better of me and curiosity took over which led to quite a long and interesting search, in the end turning up 24 steam turbine locomotives that had been built. There were a number that only got as far as the drawing board that have not been included. Fortunately I started looking into the full size engines after *Turbo* was built and running, otherwise I might have been put off with all the complications and problems that the full size engines had, and possibly the final result would have been different, perhaps not for the better.

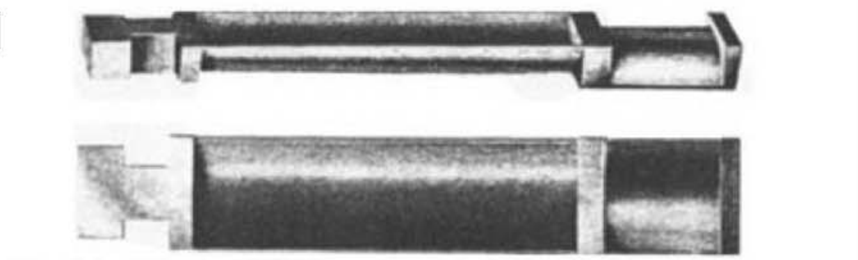
We must ask why was the steam turbine locomotive unsuccessful. Bearing in mind that we are in the age of the steam reciprocating engine which was simple, reasonably cheap to produce and easy to repair due to its basic engineering. The turbine was a great deal more expensive to produce, due to a large number of parts that required high quality machining and tighter tolerances, six times as much in the case of the Beyer Peacock locomotive, but building a one off is always more expensive. Extra to the basic power unit were the expensive reduction gears that had to be run in an oil bath. Then to reverse the engine, another turbine or extra gears along with their operating mechanism was required, adding yet more cost. One or two of the designers thought that the principle of the power station could be transplanted on to a set of wheels. But the environment that the locomotive had to work in, dusty, dirty and open to the elements, was not one that suited the turbine and its support equipment. The condensing engines, apart from being more expensive to produce with the condensers and extra turbines to drive the auxiliaries, had all that extra complication which in the long run was the cause of a lot of the trouble.

Some of the engines looked very odd in comparison to the conventional steam locomotive, with one or two of them looking as though they are going backwards. As with all experimental jobs, the difference in design varies considerably from the simple to the over complex, but in the end it is the accountants that have the final say, and as far as the locomotive world is concerned, diesel or electric. One of the turbine locomotive's big advantages was the smooth drive due to absence of any hammer blows brought about by the reciprocating components of the piston driven engines.

At the risk of comparing a full size engine with a toy, the 5in. gauge *Turbo* has both forward and reverse turbines on the same shaft, as a number of the full size locomotives had. This works very well in small size. When wanting to slow down the brakes can be used of course, but also the forward nozzles can be turned off and the reverse nozzle opened. The only turbine locomotives left are in Sweden these being the 2-8-0 non-condensing engines.

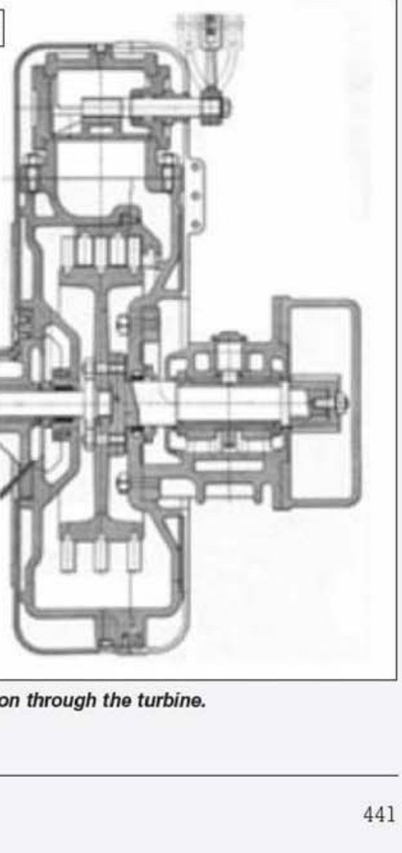
If anybody is interested in the 5in. gauge locomotive *Turbo,* it was written up in these pages over the following issues: *M.E.* 4136, 29 December 2000; *M.E.* 4138, 26 January 2001 and *M.E.* 4140, 23 February 2001. Also, in *M.E.* 4142, 23 March 2001, there is a short article on the Lempour exhaust which I used in the smoke box. This got round the problem of the reduced and less effective blast, due to the smooth exhaust from the turbine, a problem full size engines had. It also had the added advantage that the diameter of the blast could be enlarged, so reducing back pressure in the turbine. Could this have been used on the full size engines to improve matters?

1a



A turbine blade with the inner part for forward and the outer for reverse.

1b



Section through the turbine.

In Chapelon's *la Locomotive a Vapeur*, 2nd edition, there is a two line reference: *"that locomotives with turbo-electric drive and others with pulverised coal firing have been tested in the U.S.S.R."*

Societa Anonima Officine Meccaniche, Italy

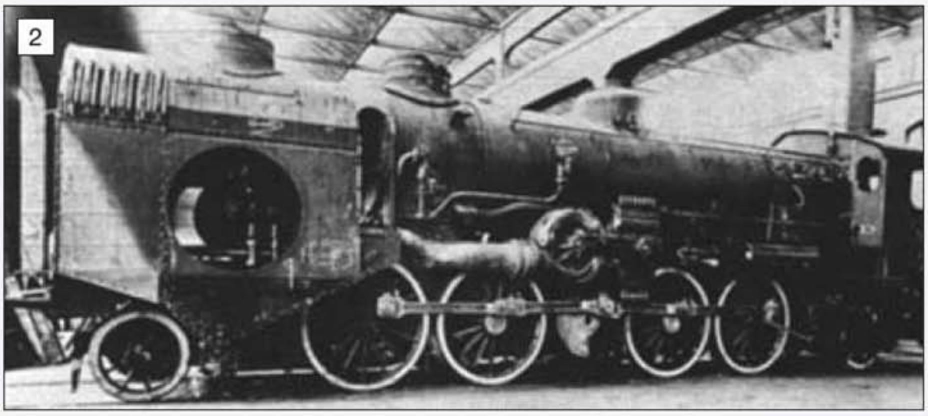
The first steam turbine locomotive was designed by Prof. Belluzzo and built in Italy by the Societa Anonima Officine Meccaniche, Milan in 1908. It was converted from an old 0-6-0T shunting engine, having a turbine on each wheel, driving the wheel through spur gears having an 8:1 reduction. Boiler steam was first led to the right hand front turbine the exhaust of which passed to the rear turbine via a flexible pipe, then over to the other side before exhausting from the fourth turbine to the blast. Each turbine had three rows of blades with each row attached to a $16^{3}/4$in. dia. disc. Each blade incorporated a forward and reverse section, with the inner section curved one way and the outer curved the other **photo 1a**. The outer section being about a third of the length of the inner. The inner part of the blades had two nozzles directed onto them for forward, while the outer section of the blades, used for reverse, had one nozzle impinging on them. The valves on each turbine were all connected together and operated simultaneously. The turbines maximum speed was 2,400rpm. It seems it was not 'discovered' in the UK until November 1921 when it was reported in Engineering, by which time it had *"recently been dismantled"*. It must have been reasonably successful to have lasted 13 years, in fact by steam turbine locomotive standards it had a reasonably long life, especially with it being the first.

It was used for shunting and therefore had to reverse quickly. Unlike future engines that had direct drive from the turbine, along with all their reversing complications, this one was not a problem. When going either way the steam could be shut off and immediately the steam turned on to the other section of blades, not only to slow the engine down, but to reverse it. Both forward and reverse nozzles could of course be opened at the same time and no damage would occur, though there is no point at all in doing that. Presumably there was some form of interlock to stop this happening. This duplex turbine blade not only simplified the engine, but would have made it very suitable for shunting work. Length 23ft. 4in., Weight 26 tons, heating surface 323sq. ft., boiler 150psi.

Italy

Built in 1932 under the direction of Professor Belluzzo, it was not the most attractive of engines, but had the rare distinction of having two chimneys. Interpreting the drawing, it would seem that there were two forward turbines, and as there are only one set of control valves it is possible that there were high and low pressure turbines. They are situated on the left-hand side driving through double reduction gearing onto the jack shaft. The three larger gears having springs between hub and teeth to absorb any shock. The turbines seem to have eight nozzles, seen in **photo 2** to the rear of the turbine, controlled by cams operated from the cab, the number of nozzles open depending on the power required.

2



Italian condensing locomotive built in 1932 under the direction of Professor Belluzzo.

Though the reverse turbine is not shown in the drawing, there is another gear on the right-hand side of the jack shaft which could have the turbine driving onto it from its position on the right side of the frame. From the turbines, the exhaust steam was passed to the condenser which was sited under the smoke box. Cooling water for the condenser was cooled by passing it through vertical pipes situated at the front of the engine. Forward motion of the locomotive would force air over these pipes and was assisted by a vertically mounted fan in the casing immediately below the front chimney. The fan was driven via bevel gears from a separate turbine having its own condenser. Where the steam comes from to operate the blast under the rear chimney when the main turbine steam is being condensed is not at all clear. However, it could be that the turbine and its appendages were an add on job to a standard engine, including moving the front pair of driving wheels forward to make room for the turbine, with the blast equipment getting left where it was. Engine length 47ft. 1 inch.

Officine Meccaniche Miani-Silvestri-Grodona-Comi

The third Italian engine was built in 1932 for the Italian State Railways as an express locomotive. It was a non condensing 2-6-2 with the turbine under the smoke box driving a jack shaft via gearing. Little is known about the engine.

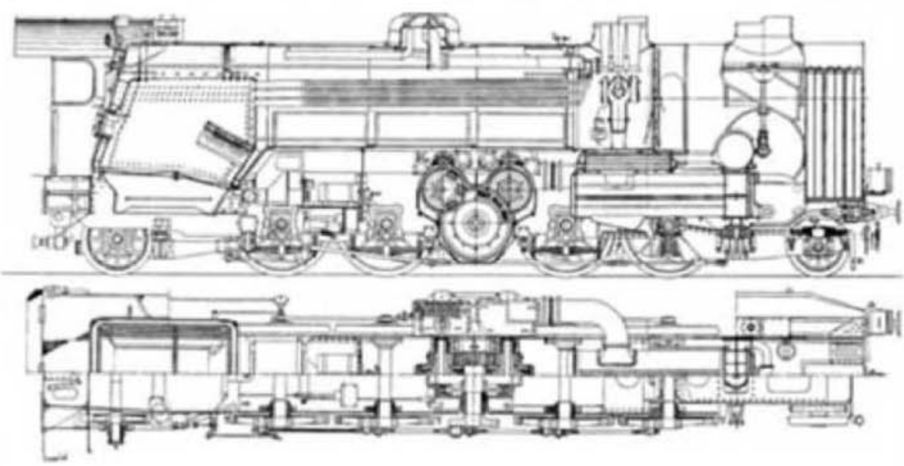
Engine weight 72 tons, boiler 175psi, grate 37.7sq. ft., heating surface 2056sq. ft., superheater 522sq. ft., turbine 7,000rpm. Driving wheel diameter 73 inches.

Aktiebolaget Ljungstrom Angturbin, Sweden

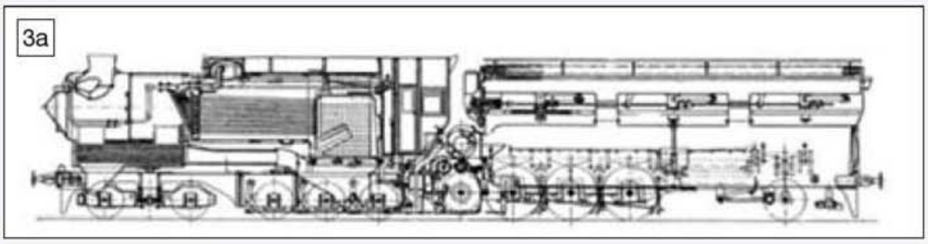
The first Ljungstrom turbine locomotive was built in 1921 and rebuilt in 1923. Designed by F. Ljungstrom in close collaboration with Swedish railway engineers, the engine was built by Aktiebolaget Ljungstrom Angturbin where his brother was general manager. The front 4-6-0 uncoupled chassis contained the boiler, coal bunker and under the smoke box an air preheater. Air for the fire was first drawn through the preheater, raising the temperature to about 150 deg. C, then through ducting to the ash pan, the heater obtaining its heat from the flu gases. As there is no main turbine exhaust steam, due to the steam being condensed, for the usual blast, the air was drawn through the fire by a turbine driven fan in the smoke box. It is thought that this was the first time preheating of the fire air had been used on a locomotive. Coal is contained in the saddle back bunker over the boiler. The 0-6-2 rear vehicle had the main turbine at the front which was about 3ft. from the driver. The drive to the wheels was via double reduction gearing to a jack shaft, then to the six coupled wheels via a connecting rod. Depending on the power required from the turbine, 1 to 5 steam nozzles were used. Also on this chassis taking up most of the room is the air-cooled condenser of 10,764 sq. ft. Air was driven through the condenser by three horizontal fans sited underneath the condenser driven from the main turbine. Another small turbine drives, through gearing, the condensate pump delivering water to the boiler feed pump which is also driven by a geared turbine. From the feed pump the water

2a

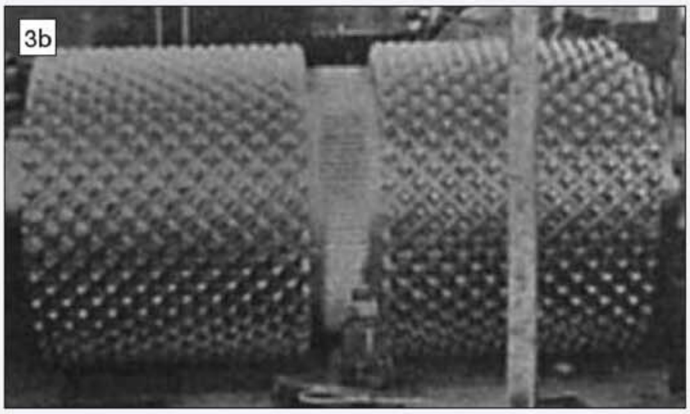
Layout of the second Italian locomotive.



The first Ljungstrom Turbine Locomotive as first built. Showing the coal bunker over the boiler and air heater under the smoke box. The rear vehicle houses the turbine at the front and condenser behind.



Above; Layout of the first Ljungstrom. Left; A double helical gear cut both ways.



passed through three heaters before entering the boiler. Reversing was done hydraulically by dropping the jack shaft gear to disengage it from its pinion, then an idler pinion, **photo 3a**, engaged between the two. To enable it to engage both gears, this rather odd looking double helical gear, was cut both ways, making it look as though it had been knurled, and because of this had only half the surface area of teeth of a normal helical gear. Safety features were used to stop the gear being changed except when locomotive and turbine were at rest. The engine also had forced lubrication to all running parts including the coupling rods. Before the engine was put onto the rails it was tested over a period of months on a test bed that was built at the works consisting of three pairs of friction wheels spaced to suit the driving wheels. Each pair of friction wheels were coupled to a water-cooled dynamometer brake.

In the rebuild of 1923, the air heater under the smoke box was replaced by a Ljungstrom rotary heater inside the smoke box, also there was a new and more powerful main turbine and a more robust gearbox. Also another turbine was added (making a total of five) to drive the condenser fans, so that they could be run independently of the motion of the engine. The main turbine was replaced by a more efficient one, along with other alterations. *"The general conclusion from the series of tests carried out was that it would work express trains with 35 per cent less coal consumption than the ordinary Swedish locomotives designed for such traffic".*

A painting of the first Ljungstrom locomotive in its original form appeared on a card in a packet of cigarettes by W.D. & H.O. Wills & Co. in the 1930s.

Overall length including power 'tender' 72ft., weight in service 126 tons, adhesion weight 48 tons, coal capacity 7 tons, boiler pressure 300psi, grate area 28sq. ft., heating surface 1,130sq. ft., superheater 861sq. ft., tractive effort 26,800lbs, turbine 1,800bhp at 9,200rpm, ratio turbine to wheels 22:1, maximum speed 60mph, tractive effort 33,000lbs, driving wheel diameter 54.7 inches.

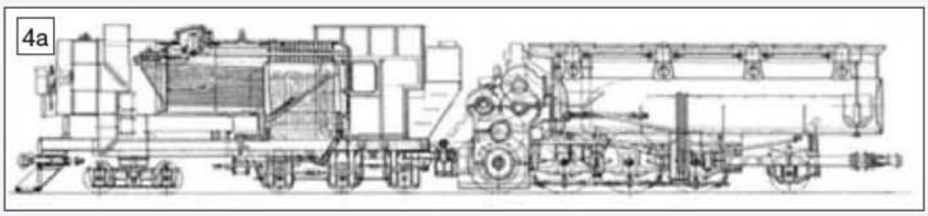
Nydquvist & Holm Aktiebolag, Sweden

The second Ljungstrom was built in 1925 by Nydquvist & Holm under licence from the Ljungstrom Company, for the Argentine State Railways *"to be fit for both goods and passenger service"*. The contract also specified it had to negotiate curves of a minimum radius of 492ft. and a gradient of 1 in 50, a tractive effort of 30,800lbs at a maximum speed of 40.4mph. A total weight of 118 tons, maximum weight per axle of 12.3 tons and total adhesive weight on the four coupled axles of 110,000lbs Acceptance trials were to take place during all the seasons so as to cover all climate conditions. The water consumption was guaranteed not to exceed 88 gallons per hour plus or minus 10 per cent and travel the 495 miles between Tucuman and Santa Fe, which demanded full power, without having to take on extra water. A 50 per cent saving in fuel in the cold season and 40 per cent in hot weather was guaranteed over the piston locomotives supplied by the American firms. Though it was never able to develop the promised 1,600bhp at the draw bar, the experience with the locomotive was very satisfactory. Its main advantage being its great economy in water. However, due to the high maintenance costs, it was taken out of service in 1929.

Similar to the first engine, the front chassis was basically a steam generator, but this time using oil as a fuel. Housed in the smoke box was a rotary air heater. Combined with this was a turbine driven fan to create draught for the fire. As with all condensing turbine locomotives there was no exhaust steam for the blast. The turbine sited at the front of the rear chassis transmitted the power through triple reduction gearing. The last gear being mounted elastically on its shaft and the shaft connected to one of the driving axles by linkage allowing movement between gear box and axle. Reversing was done by an idler wheel inserted between second and third motion shafts and was operated mechanically. This time the three condenser cooling air fans were sited above the condenser and driven by a separate turbine, drawing the air through, rather than pushing it through as in the first engine.

Overall length including power 'tender' 70ft., weight in service 120 tons, adhesion weight 51 tons, water 2,300 gallons, boiler pressure 280psi, heating surface 1076sq. ft., superheater 618sq. ft., tractive effort 33,000lbs., turbine 10,000rpm, maximum speed 41mph, driving wheel diameter 58 inches. This engine was the only narrow gauge turbine locomotive that was ever built.

Above; The second Ljungstrom built in 1925 for Argentine Railways. Metre gauge. Below; Layout of the second Ljunstrom.



Beyer, Peacock & Co. Ltd., UK

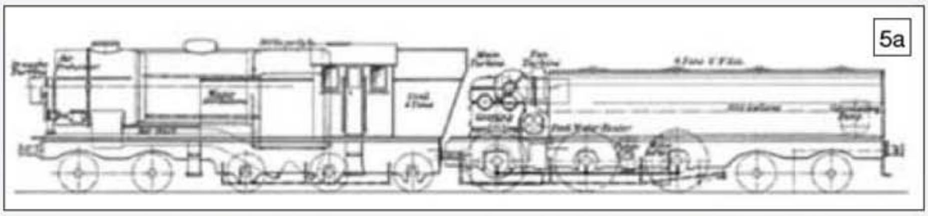
Taking to the rails on the 4 July 1926, the third Ljungstrom engine was built by Beyer Peacock, under licence from Ljungstrom of Sweden. Though built to standard gauge, this third Ljungstrom, was mechanically similar to the Argentinian engine. As in the Argentine engine, there was a separate 300hp turbine, driving through bevel gears, and three vertically mounted fans of 6ft. 9in. dia. above the condenser. It ran reasonably well throughout its life, in later days achieving 85mph. During one run with 13 coaches and dynamometer car totalling 400 tons between Derby and Bedford, it had no problem in keeping time.

When going through tunnels the efficiency of the condenser was reduced due to loss of vacuum. This was possibly caused by closeness of the tunnel wall reducing the airflow through the condenser. During 1927 the firm were in negotiation over the sale of the engine to Australia for use on the desert runs. However, during this time the locomotive had been in trouble with hot axle boxes which contributed to the engine staying in England, also it was plagued with minor problems. This along with the cost to build of about £37,000 as against £6,000 for a conventional engine, higher maintenance costs and 4% greater coal consumption, though water consumption was down, meant that the engine was an uneconomical proposition. Also there seems to have been problems with the licensing arrangements with the Lujungstrom Turbine Company in Sweden. *"The high cost of the engine along with the likely problems of maintaining the high pressure boiler, the complicated auxiliaries as well as the condenser itself, outweighed the advantages there ought to have been from increased thermal efficiency"*. In 1940 the boiler was pressed into service in the works boiler shop, presumably the rest was scrapped.

Overall length 73ft. 11in., weight in service $143\frac{3}{4}$ tons, adhesion 54 tons, coal capacity 6 tons, boiler pressure 300psi, grate 30sq. ft., heating surface 1620sq. ft., superheater 640sq. ft., tractive effort 4,030lbs, main turbine 2,000bhp at 10,500rpm, maximum speed 75mph, draught turbine 30,000rpm driving through a reduction to the fan which ran at 6,000rpm, ratio of main turbine to wheels 26.25:1, diameter of driving wheels 63 inches.

5

5a



Above; The third Ljungstrom built by Beyer Peacock, Manchester. (Photo: MSIM) Below; Beyer Peacock layout, the ducting from the draught fan to the ash pan can be seen under the boiler.

Nydquvist & Holm Aktiebolag, Sweden

The fourth Lungstrom engine was again built by Nydqvist & Holm in 1927 for the Swedish State Railways to be used as an express passenger engine. Like the third locomotive that Beyer Peacock built, it had the same wheel arrangement and a turbine of 2,000bhp with a maximum of 2,400bhp at 10,000rpm. The Swedish conditions required a maximum of only 56mph with a tractive effort of 3,300lbs, the axle load had to be kept down to $16\frac{1}{2}$ tons. The wheel base was slightly shorter at 60ft. 9in. as against 64ft. of the Beyer Peacock engine.

In general design it was similar to the first rebuilt Ljungstrom and the Beyer Peacock engines having triple reduction gearing and spring drive to the leading drive axle, mechanical reversing gear and the rotary Ljungstrom air heater.

Length 75ft. 6in., weight in service $154\frac{1}{2}$ tons, adhesion weight $48\frac{3}{4}$ tons, coal capacity 7.4 tons, boiler 284psi, grate 31.2sq. ft., heating surface 1453sq. ft., superheater 807sq. ft., gear ratio turbine to wheels 32.25:1, driving wheel 63in. diameter.

Nydquvist & Holm Aktiebolag, Sweden

In 1932 the first non-condensing Lungstrom locomotive was built, with two more following in 1936. They were built for a Swedish iron company for hauling mineral traffic and quite different from the others. This time the turbine was sited over the front bogie and in front of the smoke box door, driving the wheels via triple reduction gearing through a jack shaft and coupling rods. They were also non-condensing. The Lungstrom Company believed, from its experience, that the advantage of the turbine over the reciprocating drive were so great that for certain classes of work the turbine would prove superior. Dynamometer car trials with trains of 1,500 tons, showed savings of 7.26 per cent in coal and 14.9 per cent in water. A steady maximum drawbar pull of 48,384lbs was achieved. They worked up to 1953 and were never used for passenger hauling during there working life.

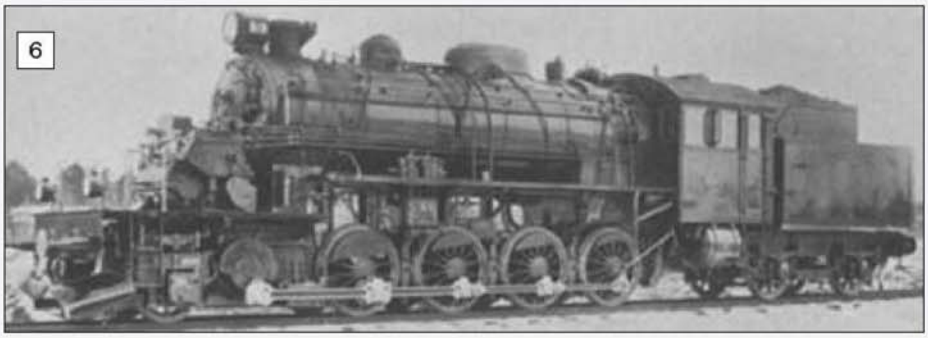
Length including tender 58ft. $8\frac{3}{4}$in. weight in service 117.5 tons, adhesive weight 70.84 tons, coal capacity 5 tons, water 3,300 gallons, boiler pressure 185psi, grate 32.3sq. ft., heating surface 1618sq. ft., superheater 1076sq. ft., tractive effort 47,286lbs, maximum speed 37.3mph, driving wheel diameter 53.15 inches.

It was this locomotive that representatives of the LMS Railway and Metropolitan-Vickers Co. went to inspect in Sweden, and was the inspiration for the LMS 6202 *Turbmotive.*

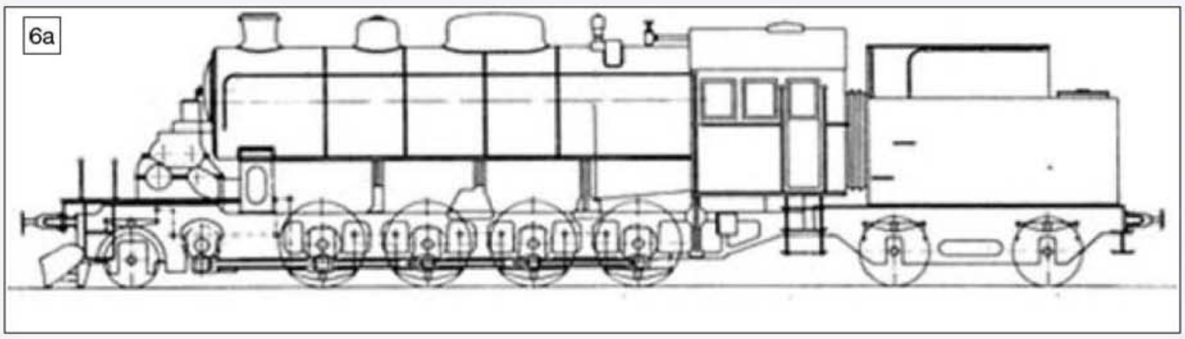
These locomotives survive at the Swedish National Railway Museum at Gavle. In 1991 the turbine of one of the engines sustained irreparable damage to the last four stages. As full tractive effort was no longer required at the museum, the blades of the four damaged stages were removed, the discs machined to remove the blade mountings and the rotor re-balanced.

●*To be continued.*

6



6a



No. 6: One of the three non-condensing Lungstrom locomotives. No. 6a: Layout of the three-non condensing Lungstrom locomotives.

LETTERS TO A GRANDSON

M. J. H. Ellis

gives some final notes on the use of light in metrology.

●*Number 87*

Dear Adrian, I promised that I would relate an anecdote, but on reflection, I rather doubt whether that was the right word for it. I hope that you will find it interesting, but it can hardly be called amusing.

When I was at school, the Upper Sixth was allowed the run of the school library, which gave access to the prestigious scientific journal *Nature*. I was much intrigued by a letter which appeared on 4th March 1931, written by M. E. J. Gheury de Bray of 40 Westmount Road, Eltham in London. He quoted the following determinations of the velocity of light:

1904 Perrotin	299,901 ±	84km/sec
1924 Michelson	299,802 ±	30km/sec
1926 Michelson	299,796 ±	4km/sec
1928 Karolus & Mittelstaedt	299,778 ±	20km/sec

"If the velocity of light is constant, how is it that invariably new determinations give values which are lower than the last one obtained, the observations distributing themselves so as to put in evidence an excellent linear law of variation, as can be observed by plotting the above results.

The graph does not show the slightest sign of a tendency to approach asymptotically a horizontal line. It is frankly oblique to the axis of time. There are 22 coincidences in favour of a decrease in the velocity of light, while there is not a single one against it...

...Vrkljan has shown (Zeit. für Phys. vol. 63 p/p 688-691, 1930), that a decrease in the velocity of light is not in contradiction with the general theory of relativity. Certainly, it is time that the constancy of the velocity should be established beyond doubt on experimental evidence, instead of merely postulated theoretically. The relatively large error of this new determination prevents it from deciding the question. A re-determination of the 'constant' by Michelson would settle it once and for all."

My plot of the figures is enclosed (**fig 1**), on which the shaded band represents the margin of experimental error. The letter aroused interest in scientific circles, and was certainly not received with scepticism. The view which gained the most support was that the velocity of light was not steadily falling, as de Bray had supposed but that it was more likely to be subject to cyclical fluctuation. Here are a few extracts from the correspondence which ensued:

20/08/1932. Roy J. Kennedy: Interference experiments suggest that if de Bray's supposition is correct, the velocity of light is diminishing at the rate of 4km/sec a year.

26/08/1933. *"A Central News message from New York states that a well-defined periodic variation in the speed of light has been registered in the experiments now being carried out at Mount Wilson which were begun by Michelson."*

03/02/1934. (Regarding the above) *"The announcement that the latest experiments indicated a periodic variation in the velocity of light has been construed in the sense that some seasonal instrumental error was at work. Science Service now issues an official confirmation of this view, given by the Mount Wilson authorities. The report adds that the best value for the velocity of light is now 299,774km/sec and that further analysis is only likely to change the last figure by one or two units."*

24/03/1934. De bray points out that the above result is in harmony with his trend-line.

19/05/1934. Frank K. Edmonson, Lowell Observatory, Flagstaff, Arizona: Suggest the velocity of light could be a periodic function of time, in accordance with the formula:

$c = 299{,}885 + 115 \sin (2/40)(t - 1901)$, t being the number A.D. of the year.

17/11/1934. Raymond T. Birge, University of California: Suggests two superimposed variations, both of about 20km/sec, one with a period of $14^3/_4$ days, the other of one year.

"If the value of c in terms of the standard metre and mean solar day is actually changing with time, but the value of λ (a particular wavelength) in terms of the standard metre shows no corresponding change, then it necessarily follows that the value of every atomic frequency, in terms of the mean solar day, must be changing. Such a variation is obviously most improbable."

17/10/1936. De Bray states that he has collected his investigation in an article in *Isis*, (25.2., September 1936).

With that, interest subsided, but it is pertinent to note that although the subject was worthy of serious attention at the time, more modern determinations of the velocity of light resulted in a figure of 299,792.458km/sec being adopted by the BIPM, and controversy on the subject is now only an interesting fragment of forgotten history.

I have the feeling that enough has now been said on the subject of metrology, and indeed, I have omitted a certain amount of detail in order to keep my discourse within reasonable bounds. However, before we leave the subject of measurement altogether, we might profitably give a little time to considering the practical aspect of measuring the size of a piece of work.

The simplest requirement is a graduated rule, and this, of course is the means for carrying out two functions; scribing a straight line, and measuring its length. The common-or-garden rule is, in fact, the humbler counterpart of the accurate scale which is an essential part of a measuring machine. Henry Maudslay went to immense pains to make by hand an accurate leadscrew for his lathe, and once this had been accomplished, no doubt further leadscrews were replicated from it, and more still from those in turn. To what extent metric leadscrews were produced for use abroad I do not know, but it would have been a lot of work to make one from scratch when, with a little trouble, one of Maudslay's progeny could have been used instead.

I mention this, because the earliest machine for producing accurate linear scales was constructed by De la Rive and Thury in 1865. At that time, there was no legal relationship between the yard and the metre; but as we shall see shortly if, by suitable gearing, a British-made leadscrew could be made to cut a thread very close to what was desired, final adjustment, to give precisely what was required was possible. This could be done by means of a 'correction bar', which Thury had invented. The engraving tool of the machine was traversed by a leadscrew, very much like a screw-cutting tool on the lathe. However, the nut of the dividing-machine was free to rotate one way or the other about the axis of the leadscrew, and had a projecting arm, the end of which ran more or less parallel to the leadscrew. If the pitch of the leadscrew was perfectly correct, the edge of the bar could be straight and strictly parallel to it. If the pitch of the screw was uniformly a little out, the bar could be inclined to its axis to correct it, whereupon the nut would rotate slowly as it moved along. In the same way, if the pitch varied from one part of the screw to another, the edge of the bar could be made to undulate, and so correct it. Note that it was the slope of the edge away from the straight line which did the correcting. Sorry to leave off here, more to come.

Your affectionate Grandpa.

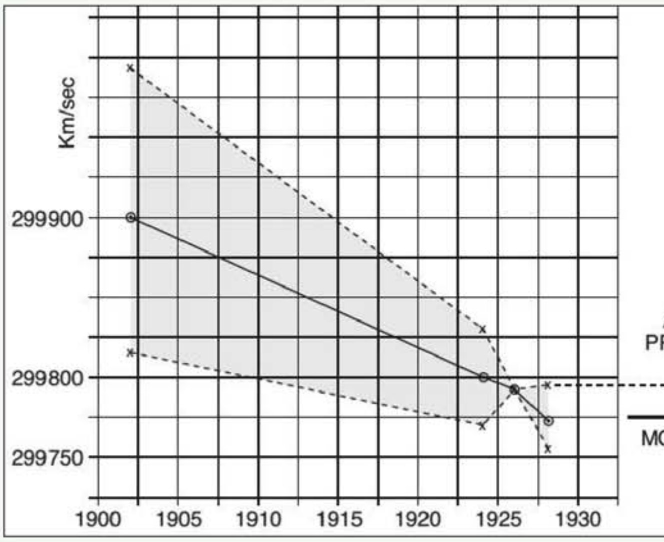
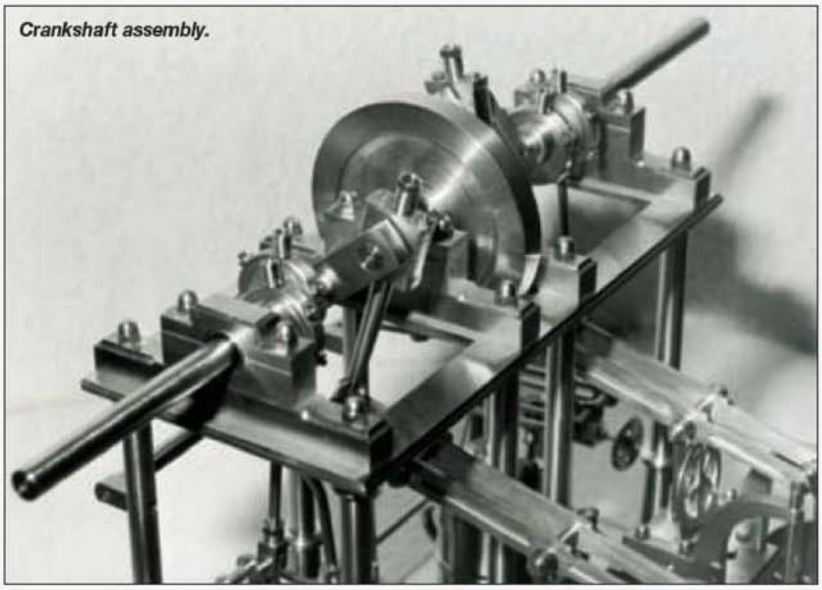
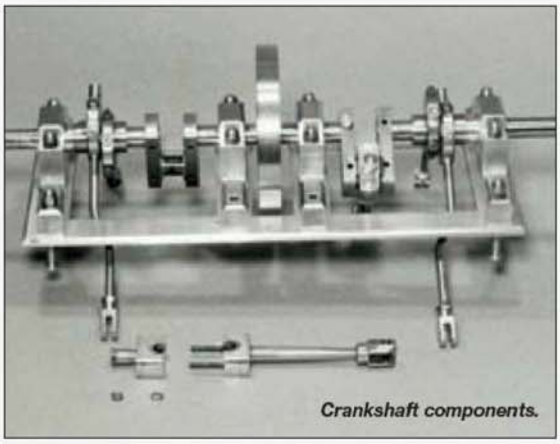


Fig 1
Determinations of the velocity of light 1904-1928


Crankshaft assembly.


Crankshaft components.

THE GORGON STEAM SHIP ENGINE

Guenter Kallies

in Germany continues construction of his engine with the crankshaft and connecting rods.

●*Part IV continued from page 323 (M.E. 4269, 17 March 2006)*

While the crankshaft on the original engine was obviously forged, the model version is assembled from various components. Due to the requirement for a functional model, a Flywheel (4.8) was added. There was, of course no need for one on the original design because the two paddle wheels installed at each end of the Crankshaft had the effect of flywheels.

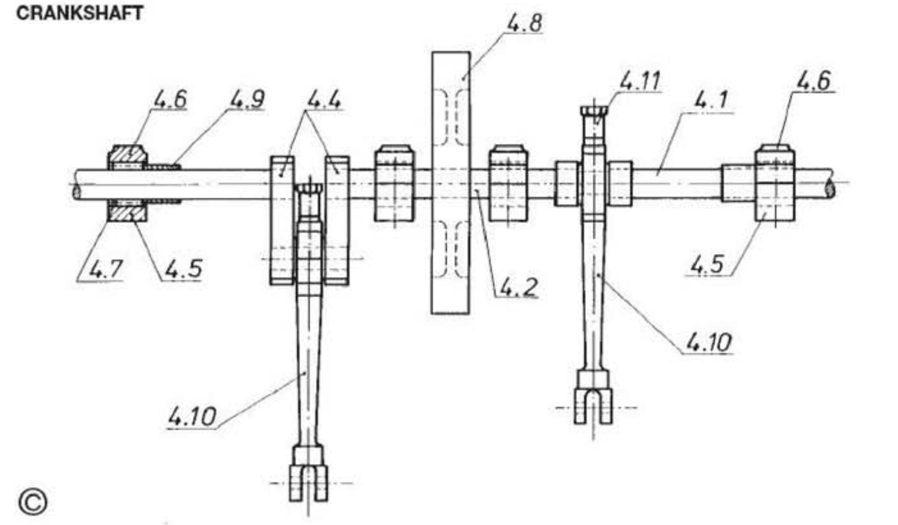
Another deviation from the prototype is the use of needle bearings on the crankshaft. This type of bearing reduces friction considerably when the engine is running.

For the Shaft elements (4.1), (4.2) and (4.3), ground stock material like silver steel or, even better, stainless steel should be used. The Crank webs (4.4) are made from brass. It is not so important to keep the 20mm hole distance but it must be equal from one to another of the four parts. It is advisable to solder or clamp all the parts together temporarily to drill and ream the holes in one path. The crank webs are fixed to the shaft ends using 2mm dia. roll pins or split pins. Don't forget that one crank must have an offset of 90deg. to the other.

The Bearing housings (4.5), (4.6) should also be clamped together, but with one or two layers of paper between both parts. The holes can now turned out on the lathe with the assembly fixed to the faceplate. When the paper is removed, a clamping action is achieved to hold the needle bearings. The outside shaping of the top cover can be done using the same tools as used on crown plate. The Flywheel (4.8), the Spacers (4.9) and the Oilcup (4.11) are simple turning jobs which don't need explanation.

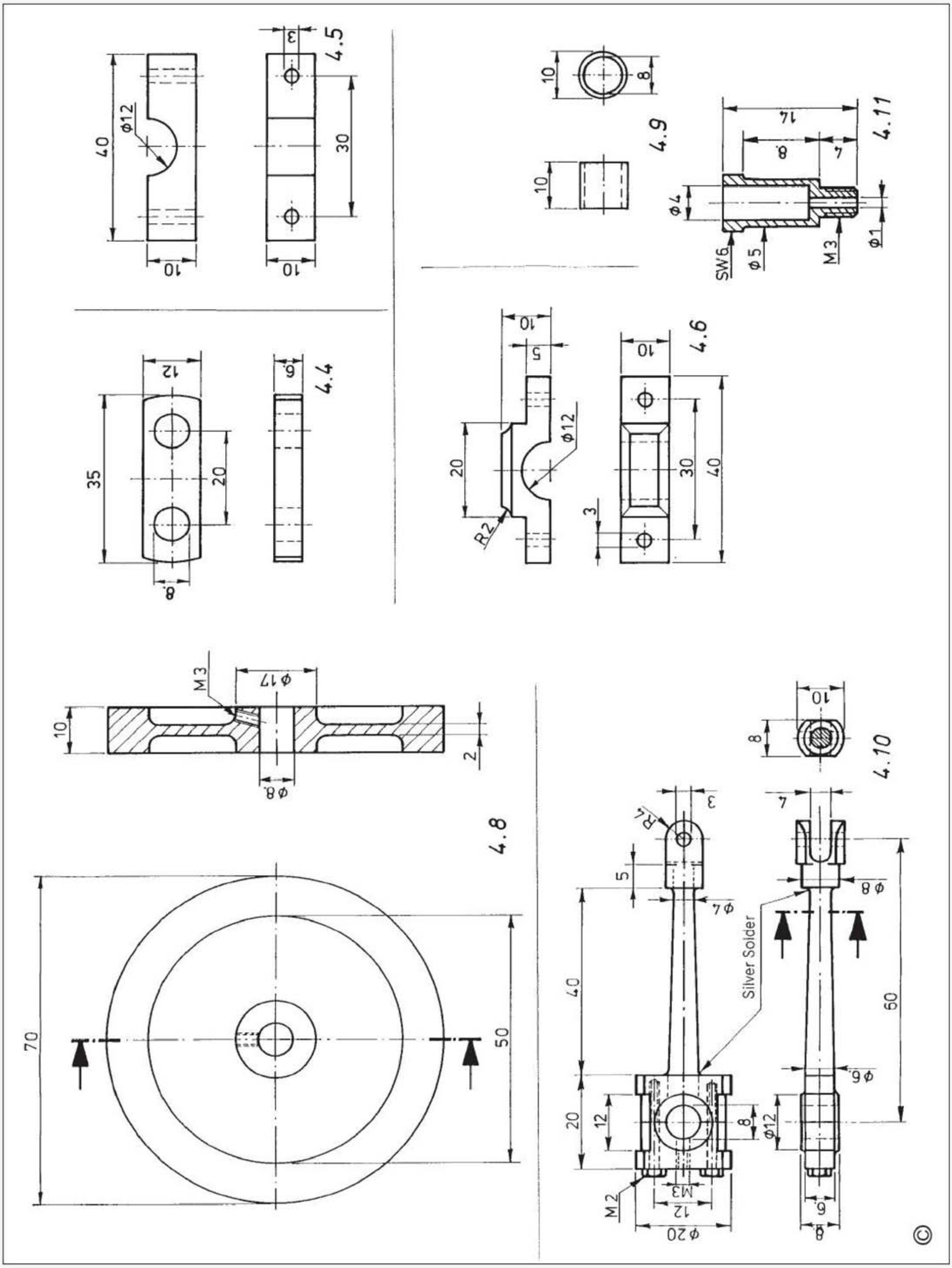
Flat brass 20 x 10mm is a good starting point for the Connecting rods (4.10). Bolt a length of

CRANKSHAFT



Group No. 4: Crankshaft Parts list:

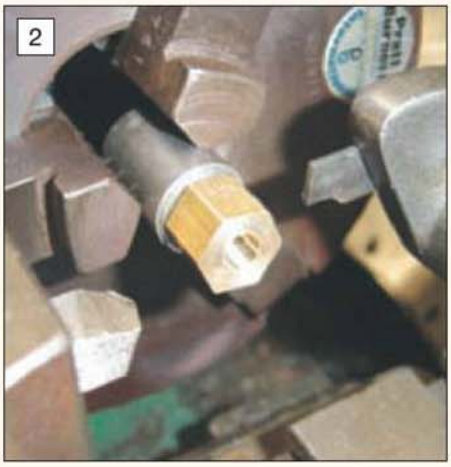
Item	Quantity	Name	Material	Dimension
4.1	2	Outer shaft	stainless steel	Ø8 x 120
4.2	1	Middle shaft	stainless steel	Ø8 x 67
4.3	2	Crank shaft	stainless steel	Ø8 x 20
4.4	4	Crank web	brass	35 x 12 x 6
4.5	4	Lower bearing housing	brass	40 x 10 x 10
4.6	4	Upper bearing housing	brass	40 x 10 x 10
4.7	4	Needle bearing	RHNA 081210	Ø8 x Ø12 x 8
4.8	1	Flywheel	brass	Ø70 x 10.
4.9	2	Spacer	brass	Ø10 x 10
4.10	2	Connecting rod	brass	see drawing
4.11	2	Oilcup	brass	6 a/f x 15
4.12	8	Screwed rod	brass	M3 x 25
4.13	4	Screwed rod	brass	M2 x 20
4.14	8	Nut	brass	M3
4.15	4	Nut	brass	M2
4.16	8	Split pin	steel	Ø2 x 10
4.17	1	Socket grub screw	stainless steel	M3



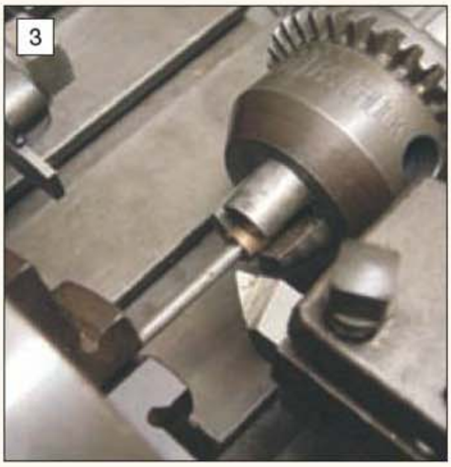
10mm onto a piece of 65mm using two M2 screws. Centre drill both ends of the assembly and turn to size between centres. Cross drill and ream the head and the bottom part. Turn over the side face of bottom parts held on the faceplate of the lathe. The last operations are slotting of the head and drilling and tapping the oil hole in the bottom part.

●*To be continued.*

Preparing to finish double headed unions. A threaded bush is in the chuck.



The part finished union screws into the bush and is firmly held for final machining.



Long thin parts can be prevented from deflecting by supporting the end in a suitable bush.

CHANGING HINDSIGHT INTO FORESIGHT

Mick Appleyard
continues his practical, lathe tips with some opening remarks about making double ended unions.

●*Part VIII continued from page 215 (M.E. 4267, 17 February 2006)*

To holding those double threaded unions in the chuck first machine and thread one end and part off to length from the parent bar. Instead of trying to hold the other end by the small hexagon portion of the union, take a suitable piece of round bar and set up in the chuck. Now drill and tap it to the size of the union forming a bush. Countersink a little to ensure that the union will butt up tightly.

Screw the union into the bush and machine the other end and cut the thread as required. The union will not pull out of the chuck and will run concentric. This method can be used for any item where one end is threaded and the other end is to be machined concentric. Keep the bush for further use (**photos 1** and **2**).

Another special bush, this time for thinning nuts. It is fitted with a threaded stud.

The author is available, at reasonable times, at 17 Aintree Road, Lords Wood, Chatham, Kent ME5 8PY; tel: 01634 669875; e-mail: mickapple@aol.com
The articles can be obtained in book form from the author together with a CD-Rom containing the photographs.

Machining thin rod in the lathe

When you are machining thin rod in the lathe you know that it will tend to move away from the tool such that obtaining a parallel surface is difficult. If you machine a short section of the rod to size with only the minimum protruding from the chuck this can now be used as a bearing. Make a short bush out of a piece of scrap brass or bronze with a reamed hole to your finished size. Place this in the tailstock chuck with a little oil in the hole. Your rod can now be held in the bush with the required length protruding for machining. I find it best to take the last cut in both directions (**photo 3**).

Machining half nuts

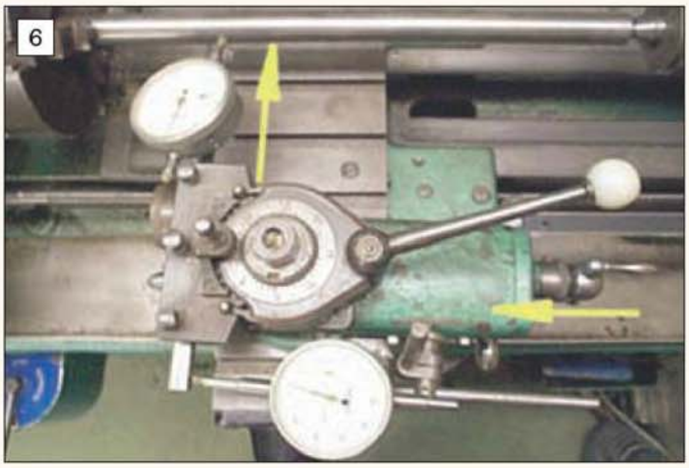
Making BA half nuts from standard nuts can be very tricky as it is difficult to hold them in the chuck. To overcome this, place a small piece of scrap round bar in the lathe chuck. Its diameter must be larger than the diameter of the nut being machined. Face off, drill and tap a blind hole in this the same thread as the nut being made, and fit a stud. Now fit the nut on the stud and lock up. Set up a rear parting off tool and a chamfer tool. Using the parting off tool take a single cut with fine feed to machine the nut to thickness (saddle locked). Using the compound slide, align the chamfer tool such that the chamfer can be machined without unlocking the saddle, machine the chamfer. Remove the nut leaving the stud in place and screw on the next nut, part off and chamfer. All nuts will now be the same thickness. You can use the stud to gauge the thickness while machining the next nut if you do not have a rear mounted parting off tool (**photos 4** and **5**).

Accurate machining of tapers

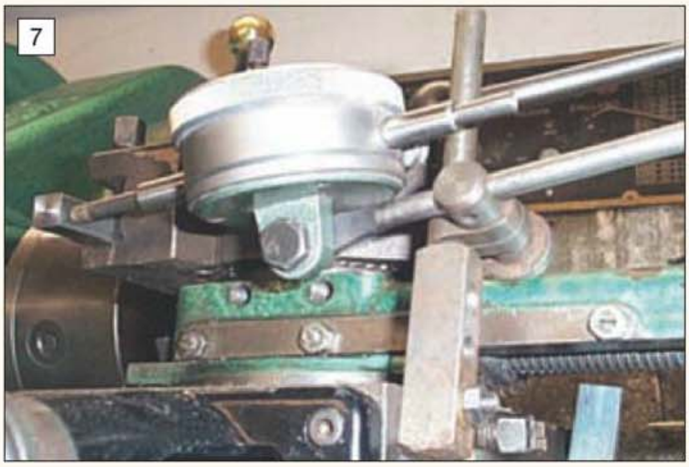
To accurately machine a taper we need to know how much the tool will travel in, and over what distance. If we rely on the compound slide degree scale to set the taper we will not know what the error is or the amount of correction necessary. The first step is to work out, using trigonometry, how much the tool will travel in for the given taper. Our Zeus tables have the formulas detailed on the last page. As an example let us say we want to machine a taper of 10 degrees. If we use a standard distance to check the taper over, say $\frac{1}{2}$in. (0.5in.), then the formula we require will be based on an angle B and length 'a' as detailed in the Zeus tables (I am using 'a' as opposed to 'c' as I will be fitting a dial test gauge onto the compound slide to measure its movement which will be along the hypotenuse). The measuring distance will be dependant on the length of travel of your dial gauge. Remember the longer the travel, the more accurate the taper will be (**photos 6** and **7**).

Known information:
B = 10 degrees
a = 0.500in.
Therefore to find 'b' we need the formula:

The nut can be screwed on for thinning and chamfering operations.



Setting up the top-slide for a taper turning operation using a parallel bar and two dial test indicators.



The mounting bracket for the dial indicator selected to measure the travel of the top-slide.

Turning tools for forming complex shapes on parts can be made by machining and filing gauge plate and then hardening and tempering.

A simple tool height setting gauge is well worth making. This one can be used to set tools mounted in both the front and back tool posts.

b = a x sin B

From the natural sine table look up the sine of 10deg. which is 0.17632.

So b = 0.5 x 0.17364

b = 0.08682

This is the amount that the tool will travel inwards over the 0.5in. test distance.

Now select a piece of round bright mild steel approximately 3/4in. diameter and set it in the lathe chuck. Fit a dial gauge in the tool post and run the compound slide along the bed to check if the bar is running true and parallel. Now attach another dial gauge onto the cross-slide with the clock plunger measuring off the tool post onto the work. Set the compound slide to 10deg. and nip up. Wind the cross-slide to one end of its stroke and take up any backlash. Set both clocks to zero. Now move the compound slide forward by 0.5in. as measured on the gauge. The other clock will now tell you how much the tool has travelled in (or out); this should be the calculated figure for 'b' i.e. 0.087 inch. The angle on the compound slide can be adjusted and re checked, until the angle is correct. If one has an odd angle to machine then most engineering books contain a set of trigonometric tables. You may wish to keep a record of measurements for any tapers cut.

It is worth making up good fittings for both dial gauges, as they will be used many times over during one's model engineering career.

Gauge plate lathe tools

When making components such as valves it is quite easy to make form tools out of gauge plate to turn the shape on the component. Select a piece of gauge plate 1/4 to 5/16in. thick and cut about 3in. long to suit your tool post, its width suitable for the component. If the component contains a spherical section, place the gauge plate in the milling machine set at an angle to give a front clearance of, say, about 7deg. and cut the radius with a milling cutter the same diameter as the spherical surface required. File the rest to shape including the front clearance using a fine file. Rub the cutting face on an oilstone to obtain a good finish. Heat to cherry red and quench in cold water. Clean the face with emery cloth and re-heat to light straw colour and quench in cold water. Rub the face on oilstone to sharpen the cutting edge. *(We would be failing in our duty if we did not point out that gauge plate is more usually quenched in oil during hardening and tempering operations. Heat treatment instructions are usually supplied on the material wrapper or your supplier should be contacted to determine the recommended procedure for your material - Ed.)*

A permanently mounted lever on the saddle lock screw saves much time.

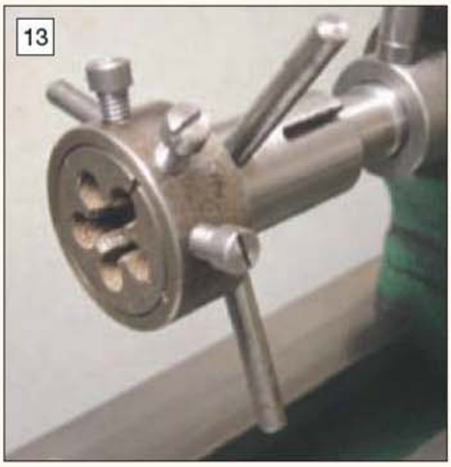
Set the tool up in the tool post. Place the work material into the chuck with the minimum protruding, plunge the tool into bar and part off. Check the first component for dimensions and, if necessary grind the tool to adjust the shape. It is worth producing a few surplus components when making such items (**photo 8**).

Lathe tool centre height gauge

Cut a piece of, say, 1 1/2in. dia. round bar about 3/4in. long and face off both sides, drill and tap a hole in the centre say, 1/4BSF but this is not important. Fit a piece of screwed rod into the base and lock up. Fit one further nut just below tool centre height. Make two fingers out of say 1/2x1/8in. material about 3/4in. long with a 1/4in. diameter hole 1/4in. from the end. Fit these over the screwed rod and secure with another nut. Arrange the fingers opposing each other, 180deg. apart. Now set up a tool in the lathe and place a piece of scrap bar in the chuck and face off. Adjust the tool such that no pimple exists on the faced off surface. This will be tool centre height. Now place the height gauge on the cross-slide and adjust the fingers so that the underside of the top finger touches the tool and lock up. This will now give you tool centre height every time. The top of the opposing bottom finger will give rear

Cleaning the scroll of a 3-jaw chuck with a specially made brass comb.

A special holder for centre drills avoids tying up the drill chuck multiple parts are to be drilled.



Indispensable for rapid thread production, a tailstock die holder.

tool post tool height. Manufacturing sizes are not important, however have a sturdy base (**photo 9**).

Lathe saddle lock bolt

Most lathes have a bolt to lock the saddle, which requires a spanner each time you wish to lock it. Remove this and make a lever operated bolt. This will save a lot of time (**photo 10**).

Care of 3-jaw chucks

When we use our 3-jaw chuck there are times when we need to tighten the jaws a little more than usual. This puts strain on the jaws and, over a period of time, will cause the jaws to run eccentric. I have two 3-jaw chucks, one is for every day use and the other only used for precision work. I will never over tighten the jaws on the precision chuck this way I keep one in good order.

3-jaw chuck cleaning

Cut a piece of $^{1}/_{16}$in. thick brass plate about 3in. long x 1in. wide and file the teeth form, the same as the jaws on the chuck, on one end. Now each time you remove the jaws set the bottom slot vertical, insert the scraper into the scroll at the middle and rotate it until it reaches the outside. This will remove all the swarf that has worked its way into the scroll. Keep this in a safe place for re-use. Using a brass wire brush clean the threads on the jaws. This two-minute job will keep the chuck in good working order (**photo 11**).

4-jaw chuck material alignment

Set up the material concentric in the chuck using the rings on the front face of the chuck nipping it lightly, and set the jaws of the chuck in the vertical and horizontal planes. Now set up a tool in the tool post and wind it in to touch the material, note feed screw reading or set clock to zero (if the recommended lathe modification has been carried out). Move the tool and rotate the chuck 180deg., move the tool back to touch the work and note the reading. Move tool away and set to mid point, rotate work to low point move tool back into place and then move the material over to touch the tool. Repeat for the other set of jaws.

Blank end, Morse taper arbors

These arbors are now being supplied my many of the engineering companies present at the various model engineering shows. They are usually supplied as free cutting steel with a ground surface with a parallel section between 1 and 2in. long, and $^{3}/_{4}$ to 1in. diameter. Some also contain a tapped hole for a draw bar. They tend to be cheap and save the work of machining a good fitting Morse taper. This will then give you a head start when making the various items detailed below.

Tailstock centre drill holder

Using a centre drill as a preliminary to drilling will take up the use of a drill chuck; an unnecessary use if one has several different drills to use during production with only a limited number of chucks. This can be overcome by adapting a soft, blank Morse taper arbor to hold your centre drills. For holding centre drills one only needs to purchase an arbor with a tang. Set this in the headstock and drill and ream it to a depth equal to $^{3}/_{4}$ of the length of the your largest centre drill. Now cross drill it and tap the hole for the Allen securing screw to lock it in place. I have also cross-drilled a $^{1}/_{16}$in. hole in the base of the hole on mine to release any air.

Now make a sleeve to fit the arbor and the various sizes of centre drills, which you use. Drill and ream each of these to a depth equal to $^{3}/_{4}$ of the length of the centre drill. Place these sleeves in the arbor and, using the hole for the Allen screw, drill though the sleeve. Remove this and open it out slightly larger than the screw clearance hole. This will ensure that the securing screw will lock on the centre drill and not on the sleeve. I have made my sleeves with a small flange to assist in removal. Now grind a small flat on the centre drill to ensure that it does not turn when locked up and in use (**photo 12**).

Tailstock die holder

The tailstock die holder is the one accessory, which I have looked at for many years thinking that one day I would make one. I had obtained a drawing many years ago, which I still have in my files. It was not until I visited the 2002 Model Engineer Exhibition and noticed how cheap the soft blank end Morse taper arbors were that I realised that this was half the work in making the die holder. As a result I decided to have a few days off of building the model and make the die holder. The manufacture is straightforward turning and needs no explanation. An arbor with a tang will be okay for this. The only thing I have made different is the hole for the tommy bar; mine has three equally spaced as I felt this would be better for operation.

Since most of my dies are of $^{13}/_{16}$in. diameter I have made two holders of this size. During the manufacture of this I had to make the adjusting screws and was in a position to use the die holder when threading them. I was amazed how quick and easy it was to use and cannot understand why I have not made it before now. I suppose its a matter of having never used one before so you do not know the benefits. I believe there is a 20% time saving on the threading of a bolt using this. Now if you multiply this up by the numbers of bolts/screws we make think how much time will be saved (**photo 13**).

A tailstock tap holder made using a drill chuck. Note the three, permanently fitted tommy bars.

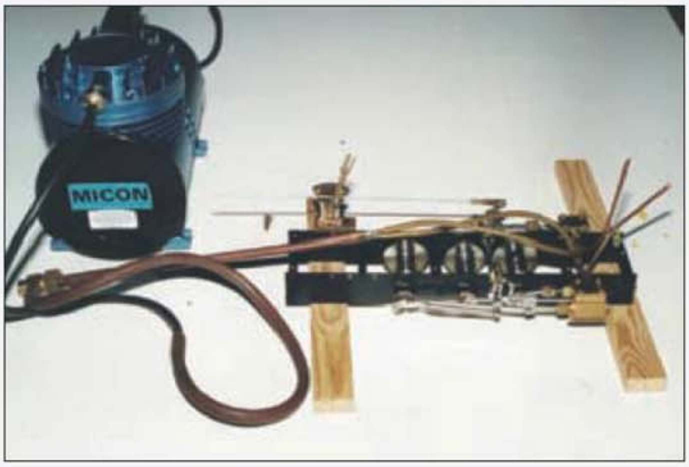
Tailstock tapping adaptor

Having made the die holder I decided to make the tap holder. For this I decided to use a spare chuck I had to hold the tap and made a holder similar to the die holder with the exception that the front was machined to take the chuck. The die holder arbor can be used for this (**photo 14**).

Fly cutters

One can also use soft, blank Morse taper arbors for making fly cutters but chose one that has, or can be adapted to take, a draw bar so that there is no risk of it coming loose during intermittent machining operations.

●*To be continued.*



Running in the chassis using a compressed air supply generated by the airbrush compressor shown.

This is the boiler kit supplied by Roundhouse for Lady Anne. Fortunately a flask of steam oil is included.

BUILDING LADY ANNE FROM THE KIT THE DIARY OF A BEGINNER

Dick Mundy

from France, now turns his attention to the body kit for this model.

●*Part III continued from page 327 (M.E. 4269, 17 March 2006)*

Yes, so it was time to order the body kit and as the card statement had just arrived that lump of cost would not appear until the following month, much to my wife's relief. I also ordered, as extras, the gas filler adapter and a complete radio control kit.

I also remembered to pin those return cranks and, as the motion seemed to be running very well in both forward and reverse and the chassis has now had just on 9 hours running in under compressed air, I decided to do it there and then. This turned out to be not the easiest of operations and despite using brand new 1.5mm dia. twist drills bought specially, I found myself in trouble. My first hole ran out and in trying to correct the situation the drill broke. It was a good job they are sold in pairs so I had another one. No sooner did I try drilling again when that one broke as well, into three pieces that time - the shank, the middle bit (which disappeared forever) and the point that remained in the hole! I managed to extract the latter with pointed tweezers so I was pretty lucky. But I had no spares and no chance of getting more until the next day when the shops opened. I had a bit more luck when I found I could grip the end from the first broken drill in the chuck. So, I turned over the return crank to the opposite side, centre popped again and started the drill this time with some cutting oil. By taking things slowly it gently broke through and from that same side I inserted the roll pin and tapped it into place with a small hammer and a nail set - success! It looked a bit of a mess where the drill ran out so I will not look too closely at that again and perhaps no one else has noticed. The only problem is that I know that it is not quite right there!

Now for the crank on the right-hand side. This was centre popped and carefully drilled through (perfectly this time) and the roll pin tapped in. I gave the chassis a quick run on compressed air and found everything still okay.

It was now back to fitting the boiler, *et al.* Definitely something was wrong here, it looked as though the boiler band went on the outside after all as I could not pinch up the sleeve at the cab end sufficiently to get the clamp screw back in. On going back to the handbook it told me it goes outside the wrapper. What an idiot! Now I found that I could not line up the boiler mounting foot with the hole for the fixing screw in the base. It had taken me some time, and close examination, to find that I needed to put a tighter bend in the front of the superheater tube to stop the interference with the boiler in the smoke box. This allowed the boiler to slide in that much more and suddenly it was properly in place and now it was only a matter of aligning the top fittings upright and making sure the boiler was parallel to the frames. Then it was time to tighten up the clamping screws but not too tight as I did not want to shear them off.

Having brought the fibre washer on the steam outlet to thickness I tried putting a little PTFE tape around its thread but this was much too thick and I could not tighten up the regulator without excessive force. This meant a trip to the shops to buy the French equivalent of 'Bosswhite' which I found is called *'Pate a Joint'* and is not located with all the plumbing fittings but on the shelves with adhesives. Anyway, the steam regulator was now in place and the outlet was more or less at 8 o'clock or perhaps about a quarter past.

I placed the gas tank in position and paused to take a photo at this stage of assembly. There were not very many bits left in the box now and the body kit had not arrived yet. Importantly this would contain the gas filler adaptor (ordered as an extra) to allow me to fire up.

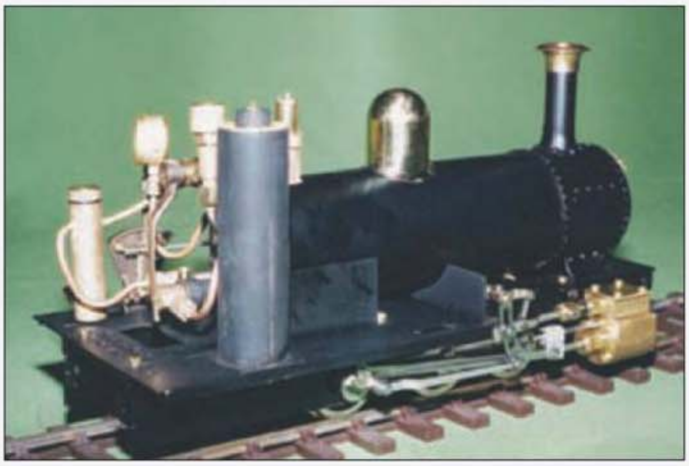
I had managed to bend the gas pipe into shape and fitted it between the gas regulator and the burner. Bending the copper pipe into shape was particularly difficult and mine bears little relation to the sketch shown on page 3 of the instructions. I feel this should either be pre-formed by Roundhouse for a 'bog standard' Lady Anne, with a slightly longer length being available as an option for a custom built job. On my piece the bends at either end had to be at right angles close up to the fixing nuts, not nice gentle curves that can be done with fingers but sharp turns needing pliers to create the form.

Consequently I have distorted the pipe badly at the lower bend and it is somewhat flattened. Not very pretty at the end of the day and I was worried not only that my pipe was damaged but that I had shaped it to fit too far forward and thus interfere with the cab when I fitted it. I was not at all happy to the extent that I have now emailed Roundhouse and asked for a replacement part but pre-formed to suit the standard layout. I hope they can help me.

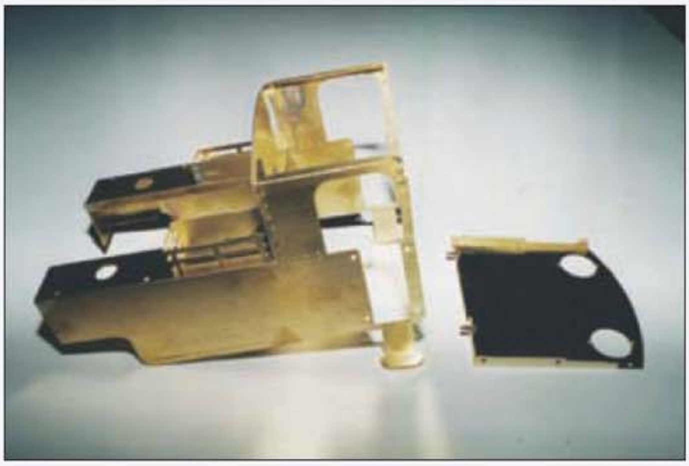
The package with the body parts and radio control items then arrived, safely packed as always from Roundhouse, and after unpacking the parts (including the gas adapter that I was waiting for) all are present and correct as usual.

I had a very old can of Taymar butane gas and the cap was a bit rusty but I thought it was all systems go for a test under manual control and up on blocks to start with. It was dark by now (and finger nipping cold) but if it was fine I decided I would have a go the following day. I was a bit wary of 'gassing up' inside so planned to light up outside but, in the meantime, I tried to clean the rusty top of the gas cylinder and fit the adapter. It seemed okay. There was a bit of a smell around the screw adaptor but I could not hear any hissing but to be on the safe side I put the canister with the adaptor fitted outside in one of the barns overnight (and planned to sniff it again in the morning).

There was also a message for me from Roundhouse saying the replacement pipe had been bent up for me and was already in the post. They have my thanks. One could not ask for better service and not only that it was free of charge.



The model now looking a little more like a locomotive. Here it was ready for its first steam test under manual control.



The laser cut, brass body shell after bending up and assembly but prior to finish painting.

It was overcast in the morning but still very cold being around the -1 to -2 deg.C after two weeks of perfect weather. The butane canister seemed all right so now it was crunch time under a bit of temporary cover. I had oiled up and watered and at first it seems that gas was going in and then liquid gas started escaping around the seal between the canister and the adapter. I put it down quickly. The gas tank seemed cold to the touch compared to the boiler so perhaps there was gas in it. Out came the matches and sure enough as I turned on the gas supply the flame gets drawn down the chimney, there was a pop and I could hear the burner which promptly went out within a few seconds. I tried again and exactly the same thing happened - was it the gas pressure? I tried the butane again and there was a serious leak at the canister joint, enough to frighten me anyway, the stuff was going everywhere.

The only other fuel I had was the Butane Propane mix, endemic in France - one cannot buy plain Butane except as Camping Gaz and that comes without a threaded fixing. I had a new canister, the adapter fits perfectly and I tried gas filling again but when it came to lighting, well, it would not! I took off the gas jet to check for a blockage only to find that it was perfectly clear and I wondered if it was just too cold. However, when putting the gas pipe back in place I did notice a possible crack where I was too ambitious with the pliers when bending it the previous day. I decided I would leave it off and wait for the replacement part to arrive before doing any more testing. I was feeling very frustrated. I tried to bleed off the gas outside and heard a slight hiss then almost immediately there was silence so I assumed the gas tank was empty. I decided to get on with the body shell although I would have liked to have known the rest of the thing worked!

The body shell was all pretty straightforward, the most difficult bit was getting the narrow flanges to finish square and I found the solution was to bend them over a piece of hardwood well under square. The odd bits of soldering were also simple enough and the secret of a good soldered joint was absolute cleanliness. I cleaned up the areas to be joined with fine glasspaper and tinned them by flooding them with solder. This was then wiped off with a cloth before the solder had set (easier to do than describe). The parts were then clamped together and heated and a little more solder applied along the seams to give a good joint.

As it happened, I found that the boiler and its fittings had to come off in order to fix the cab floor, and my boiler strap clamping screw was in the wrong place too. The boiler also needed turning slightly clockwise as the filler cap was not vertical and with the smart brass dome in place, the error was very apparent looking head on compared to the chimney.

The cab floor was in for painting (black again) whilst I attended to the body sides. This was my first experience of using laser cut brass and I was finding it easy to fold to shape but rather more difficult when it came to clamping the cab to the sides for soldering, a case of needing two pairs of hands really. I manage by using various blocks of wood to hold things temporarily and then fitting the clamps. I had been lucky in that on the first side my clamp just missed squashing an embossed rivet head which I had not noticed until removing the clamp - prudence is the order of the day.

I typed this part of the article while the body shell was cooling down, and I then removed the clamps and it was all holding together. It all looked fairly square as well although there was plenty of flexibility for a final little tweak if needed. Quite by chance, and I cannot say why, I opened the gas valve on the loco chassis which was standing alongside my temporary bench, and I heard a continuous hiss. Gas was obviously being expelled so it was it just the cold outside the previous day that gave me problems. Tests would be done in a warmer place in future.

I decided to fit the front coal bunkers on the tanks but used an instant glue to fix them in place. Although there are solder lugs they are so close to the already soldered seams it seemed foolish to risk the assembly coming apart if I was to place heat in their vicinity again. Indeed, the handbook says the same. I had to reduce the width of the tabs nearest the cab in order to slot in easily as the soldering flange was an interference fit, but no problem.

An envelope from Roundhouse then arrived - was it the replacement pipe? No, it was the replacement crosshead with a note saying this one was perfect but as it is only cosmetic the little crack did not matter anyway. Sorry, Roundhouse, I will try harder next time.

The back of the cab as bent up and the brass fixing screws in the bottom flange were soldered in place. I kept them steady by running up a steel nut on the underside and left them like that. I tinned up the side flanges and then the edges of the cab sides, finally assembling up ready for soldering by using 7BA steel screws and nuts through the holes for the hand rails and two small clamps at the tops (one each side). It was important to use steel in these cases as it was unaffected by solder. I lit up the blowtorch, played the flame on the joints one at a time and as each section heated up, I removed the flame and run a little solder (the small diameter type with 3 flux cores normally used for electronics work) along the seam. This was easy enough to do as long as one had a steady hand and something alongside to rest the wrist on. Too liberal an application of solder, a great temptation, leads to a lot of unnecessary cleaning up afterwards, I found out.

I then fitted the rear coal bunker and, having bent it to shape, I ran a little solder along the butt joints at the sloping bottom. That made it a bit more solid and it was still a good push fit onto the back of the cab.

Now I became annoyed. I paid a visit to our local DIY store to get more aerosols of primer and matt black and I found that a black satin finish had become available in aerosols. It was not available when I started out and that was what I was looking for. Very cross!

Back to the rear coal bunker, which I see is described as an option but without this in place I cannot see any slots for mounting the lamp brackets directly on to the back of the cab. A straight backed cab might be an attractive option although I suppose the lamp brackets could be fixed in place without the tabs easily enough. The tabs remind me of tinplate toys from days gone by.

The next stage was a good clean up of all the metalwork (especially removal of the flux) and I notice that some of my seams are not very smooth. Is it a case of a bit of 'Milliput'? Wonderful stuff, I use it for all sorts of things. At this stage I decided to leave it 'as is' and see how it looked after the primer stage, so it was into the 'spray booth' after fixing up various hooks and support blocks.

Having painted up the footplate I now fitted it in place after removing all the previous fittings which I could have left until now except I wanted to try it under steam which was unsuccessful anyway. My wife was then in England with a request to bring back a half dozen cans of butane.

Everything else had gone back in place. The sides of the smart brass steam dome are now parallel with the smoke stack (which leaves the safety valve a degree or so off vertical but this is far less noticeable) but I was now having great difficulty in screwing the gas tank back in place. The 6BA fixing screws now have to go through two sections of plate before going in to the base bracket of the gas tank. They certainly would not go, I could see by looking down the hole(s) they would not go.

● *To be continued.*

TRADE TOPICS

ADHESIVES STEAM AHEAD

Philip Stevens
of Henkel Loctite Adhesives Ltd.
relates further applications for this company's products.

Kim Ward and Stuart Jones formed Aspect Modelmaking in June 1992. Initially, they worked on architectural and landscape models but, once their expertise was recognised, they expanded their business to include the building of a number ships and cars.

The first cars constructed were of a Williams FW16, followed by Indy Cars from the United States for Penske Racing and then McLaren in Formula One. From those small beginnings commissions have come from other teams including BAR, Reynard, Stewart Grand Prix, Jaguar Racing, Ford and Others.

The size of models has also grown from miniature scale replicas to 1/2 size and even full size show cars. In addition, large scale simulators of racing cars for exhibitions and trade shows are now produced. These simulators include built-in screens that show computer-based racing games which create the illusion of actually taking part in an event.

"We have used body fillers in conventional ways and on conventional cars for years," says Kim Ward. *"But we also found that Plastic Padding Ultima works with just the same efficiency on the models."*

What makes this application especially interesting is that Plastic Padding's makers - Henkel Loctite - also provides a whole host of products on the full size Team McLaren Mercedes' Formula One racing car. In fact, almost 100 different applications can be found on the current vehicle.

Ultima is suitable for all surfaces including galvanised, zinc coated, aluminium, mild steel, glass fibre and polycarbonate. It creates an excellent build quality and a fine finish and can be used for both infra-red and low-bake applications.

"We chose Ultima because it gave us just the finish we require," reports Kim.

The filler is used on both the masters and the finished articles themselves. Kim explains that where two components are bonded together as part of the model construction process, the filler is used to blend the parts together so that the join becomes invisible.

"We produce models to the very highest standard," declares Kim Ward, *"and it is essential that the products we use match that criterion. Plastic Padding Ultima provides us with that assurance."*

Full steam ahead

Although Ifan Thorner has retired as a lecturer in mechanical engineering, his life is far from idle. In his workshop on the Isle of Wight, he has been busily constructing the mechanical parts for a two-metre long scale model of the 1898 paddle steamer *Juno*.

"This is a bespoke working model for the renowned international marine artist, Martyn Mackrill," explains Ifan. *"Building from scratch has proved to be quite demanding and much research into the design was necessary before we started. But we are very pleased with the results."*

Both linear and angular clearances demanded close tolerances on the relative movements of all moving and stationary parts. Indeed, they proved essential in order to achieve maximum efficiency in driving the hull through the water.

View of one of the paddle wheels fitted to the model of the paddle steamer **Juno.**

"Our work has met with the approval of Nick James, past chairman of the Paddle Steamer Preservation Society," reports Ifan. *"His advice throughout has been of great value."*

The paddle wheels are made of brass with mechanical fastenings prepared from the same metal. In all, some four hundred 10 and 12BA nuts, bolts and locating dowels have been used. In addition, Marine grade stainless steel has been employed for the bearing stub axles with Ertalyte Tx (made by Quadrant Engineering Plastic Products) being chosen for the bearing material.

The sponsons are constructed from aluminium alloy and the whole mechanism is supported and built into a custom made carbon fibre housing - thereby achieving the necessary stiffeners and tightness. Ifan relates how Loctite anaerobic 222 and 2701 adhesives are used throughout the assembly. *"They have proved invaluable on lock nuts, tabs and so on. For security reasons, conventional locking systems were not considered an option - but Loctite products provide the assurance we needed."*

He describes how Loctite 222 will allow the renewal of worn bearings at some time in the future. Although it provides secure locking of the nuts, the adhesive's low strength ensures easy disassembly without shearing or thread stripping. Parts requiring permanent locking are secured with 2701. Ifan says that its dependability is essential since any breakaway would be catastrophic.

He concludes, *"Loctite products have certainly proved to be an essential part of this complex project. In addition, I greatly value the help and assistance that the specialists at Henkel Loctite are able to provide. They know their stuff and put us on the right track when we had questions about fastenings."*

For more information please contact:

Henkel Loctite Adhesives Limited, Technologies House, Wood Lane End, Hemel Hempstead, Hertfordshire HP2 4RQ; tel: +44 (0) 1442 278000, fax: +44 (0) 1442 278071; website: www.loctite.co.uk; Email: technical.service@uk.henkel.com

A member of the Aspect Modelmaking team working on another highly detailed model.

Ifan Thorner and his model paddle steamer, which has made good use of Henkel Loctite products.

BOWMAN

Marcus Rooks

continues work on the safety valve.

●*Part II continued from page 338 (M.E. 4269, 17 March 2006).*

The starting point in constructing the valve is to chuck a piece of 3/8in hexagonal brass and turn one end down to 1/4in. dia. and thread 1/4in. x 26 TPI. This may seem a little coarse but this was the standard thread at the time, however, 0BA. is a good substitute. In order that the valve can be seated in the boiler use a small Swiss file hard against the shoulder and remove the dead shoulder space from the thread, leaving it slightly relieved as shown.

Next part off enough to make the body and face and centre the piece remaining in the chuck. Drill and tap 1/4in. x 26TPI and lightly countersink. The embryo body can then be screwed into this adaptor for finishing.

Use a sharp tool and cut the outer profile, finish with fine emery but do not over finish. The body is then drilled 7/64in. dia. (or nearest) and countersunk for the valve head. When you are satisfied unscrew and admire.

We next need to make the valve stem and to achieve a semblance of accuracy with these two parts I will describe how I do it, which I am sure will offend the purists but it does seem to work. After you have made the valve body and removed it from the chuck, replace it with the drill that was used to form the seating. Slacken the tool-post nut and gently manoeuvre the cutting edge of a parting tool or similar until it is at the same angle. Lock the tool post and it can be used to produce a corresponding seat on the valve stem. The valve stem is machined from a piece of 1/4in. dia. brass. The stem is first machined to 3/32in. thickness and threaded 7BA at the end. With the tool still at the preset angle the valve seat is formed at this setting. The stem is then parted, reversed in the chuck and the conical shape can be generated.

To make a nice steam tight joint grind the two components with fine valve grinding paste until a nice even dull finish is achieved. I tend to finish off with some toothpaste, being a dentist I use the Fluoride variety of course.

The spring can be wound from thin stainless steel or phosphor bronze. You will have to use a little trial and error to get the right setting. We need to get this safety valve to blow its top at about one bar pressure (14.5psi).

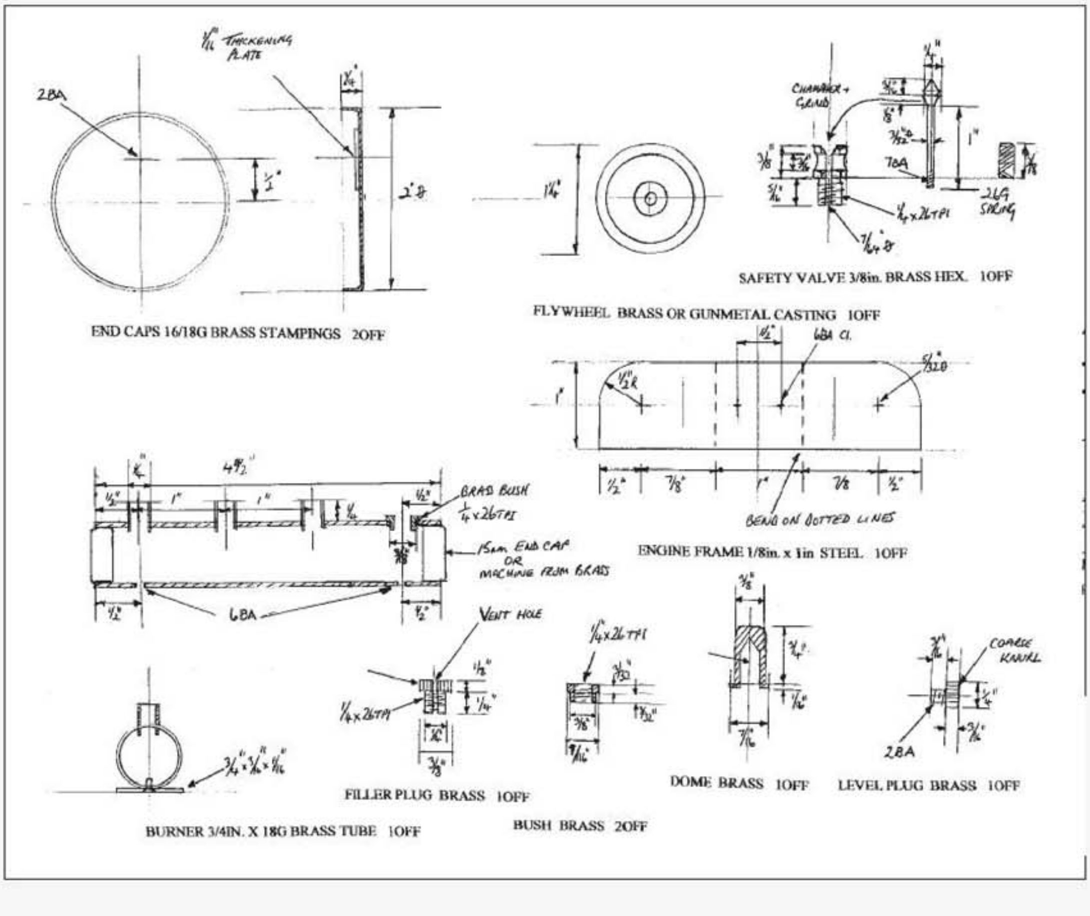
Whilst we are in a machining mood we can make the level filling plug. Most British boilers at that time did not fit water gauges merely a plug to assess the water level, when water dribbled out of this hole there was enough water in the boiler. Once again there were many designs, which identified a particular maker. I have described the version used by Mersey Models, I have, however, shown the designs used by the other makers. Mamod type water gauges are easily bought and can be fitted instead of the plug, this would comply with European regulations on the subject.

The plug is made from a piece of 1/4in. dia. brass bar. Chuck and turn down one end and thread 2BA. The large diameter is then given a course knurl and the item parted off. This is a euphemism in my workshop for cutting the piece off with a hacksaw and the raw edge smoothed accordingly.

Bowman boilers possessed a steam dome. This served two functions, firstly it collected relatively dry steam and the other was to support the chimney. It is a simple turning from 3/8in dia. brass drilled 1/4in.

A bush will be needed for the safety valve, which is again a very simple turning job, screwed to match the safety valve. Make sure that it is a tight fit in the boiler, which will prevent it from falling out as it is inserted from the inside. By doing this we end up with a nice flat surface flush on the outside of the boiler. As we are soft soldering the boiler the inner lip will prevent the bush from going into orbit should the boiler fail (Heaven forbid).

The first step in assembling the boiler is to solder the dome and bush in place. The items are assembled and the inside is fluxed and soldered. Play the flame on the outside of the boiler and capillary action should draw the solder into the joint; hopefully you will end up with a nice fillet on both the inside and outside. Give it a nice clean with soapy water and wire wool. Next thread a length of well annealed 1/8in. copper pipe from below so that it nestles nicely inside the dome and solder in place. Finally the end caps are soft soldered in place.



END CAPS 16/18G BRASS STAMPINGS 2OFF

FLYWHEEL BRASS OR GUNMETAL CASTING 1OFF

SAFETY VALVE 3/8in. BRASS HEX. 1OFF

ENGINE FRAME 1/8in. x 1in STEEL 1OFF

BURNER 3/4IN. X 18G BRASS TUBE 1OFF

FILLER PLUG BRASS 1OFF

BUSH BRASS 2OFF

DOME BRASS 1OFF

LEVEL PLUG BRASS 1OFF

An important tip whilst soldering, unless you really want all the fittings to end up rattling inside the boiler, screw a steel bung in the safety valve and level plug holes, thus holding them in firmly in place. It is important to use steel as the solder wont adhere to it and you should be able to unscrew the plug afterwards.

Once soldered to your critical satisfaction give it a good going over with steel wool and soapy water to give it a nice appearance. Talking of which I am sure a few eagle eyed readers will have noticed that I have used a copper barrel with brass end caps. Guilty as charged. At the time of making the toy a bout of financial anaemia struck, necessitating using what was to hand and a piece of 2in. copper tube came to hand, so it was used. I would recommend using one metal or the other not a combination.

The boiler is held onto the firebox by a 1/2in. x 18 gauge mild steel strap cut from a suitable sheet. The approximate length is 10 7/8in.. but I would suggest measuring from the job to get the exact length before

The chimney was flared at the top by means of a suitable tapered drift. The material was carefully annealed before this operation.

Completed Cyldon/Rees meths. burner. A simple design, wicks are fed into the tubes and trimmed to 1/4in. length. Try to get your wicks in line!

bending, otherwise things may be a bit loose.

To attach the completed unit to the base poke a 6BA countersunk steel screw through the drilled hole to hold the strap firmly in place. The hole at the other end of the strap can be transferred onto the base and drilled 6BA clearance. The second screw can be inserted and the boiler will be held firmly in place and nice it looks as well.

Burner

We can now construct the burner. Burners were as recognisable as safety valves for each maker so we have a number to choose from, I have chosen a type made by Cyldon/Rees. In many ways it is one of the easier types to construct as the body is made from a length of 3/4in. brass tube.

Firstly cut a 4in.. length of 3/4in. x 18 gauge. brass tube, grip lightly in the lathe and square the ends. The end caps are in fact domestic 15mm. copper end caps, readily available from most DIY places. Cut them so that they have a flange about 1/4in. deep. These should be a nice push fit in each end.

If you do not fancy using these caps then simply machine end caps from brass stock You can also take the opportunity of making a screw fitting at one end to attach a carrying handle.

Mark out and drill the holes for the wicks and filler plug as indicated. The two smaller holes can be drilled at this point and tapped 6BA. I machined the wick tubes out of brass rod and drilled 3/16in. diameter. In this way they can be made a tight push fit in the holes and they can be made thin walled as well, which looks a lot better.

The filler bush is a simple brass turning, threaded either 0BA or 1/4in. x 26TPI. This is made a nice push fit as well. The supporting feet are made from 1/16in. brass and held in place with 6BA brass countersunk screws. Make sure that the burner rests nice and evenly before final assembly. When happy that all the bits and pieces fit together clean with wire wool, flux the joints and soft solder. Unlike me, try to keep the amount of solder to a minimum. If you are uneasy about using methylated spirits as a fuel then I have included a drawing of a suitable tray for solid fuel pellets, you can make your choice as you prefer.

Chimney

The chimney is made from the same section brass tube as the burner. Cut to length and square the ends. The top of the chimney needs to have a small ornamental bell-mouth. To achieve the desired shape, firstly anneal the end. With brass I have found that heating to red heat and allowing it to cool, rather than plunge in water gives a more pliable result. The bell-mouth is formed by whacking a suitable taper plug in the end. This taper can be machined or you may be able to find a suitable taper in the workshop. The other end is radiused to suit the boiler. With such a small item it seems hardly worthwhile setting up to machine; 5 minutes with a half round file should do the trick.

A fixing collar is now needed, which is machined from brass to a tight fit inside the chimney and a push fit over the boiler dome. A slice about 3/8in. thick should give more than enough support to the chimney.

At this point I would like to make a startling admission. I am sure that when you study the photos you will notice that the wick tubes may not be exactly in line or that a row of holes may sway slightly. Although designing and making steam engines for ages and I do strive to get the best results, I always seem to get things a little wrong. I mention this only so that you will not get discouraged in your own efforts if things sometimes are not as correct as they should be. It is a hobby after all!

Engine

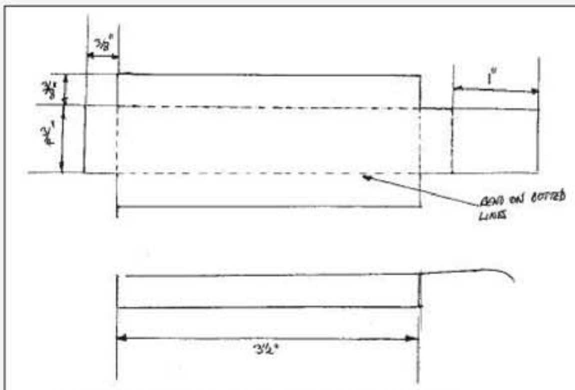
The boiler assembly can be put to one side and we shall get on with the cylinder assembly. I have again used a combination of typical English engines from between the wars, drawing heavily on Bowman and Mersey Models. The unit is a single cylinder horizontal oscillating engine with a solid brass flywheel

We need to start with the engine support. This is made from a length of 1/8in. x 1in. steel section. This is one area that marking out is important, especially the holes for the crankshaft. If these are not parallel the whole lot will seize up. Do not mark the holes for the horizontal support or those that will be used to attach to the base plate.

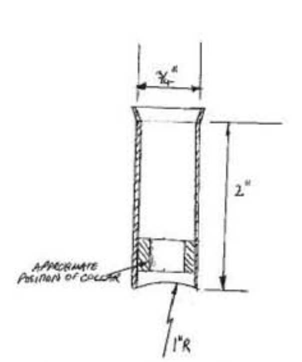
Once drilled to satisfaction, carefully bend to shape. You will need to find a hefty piece of metal to support the second bend. Use a piece of metal between the hammer and the work to prevent marking it. If you bend cold, as I did, the metal will probably crack along the creases; I do not think that it is a serious problem and I have left mine as cracked. Once bent, check for alignment with a set-square and adjust accordingly. This is a euphemism for whacking it with a hammer to correct any misalignment. This can be checked by spinning a 5/32in. dia. steel rod through the bearing holes to see if it is free running, adjust until it is.

The next stage is to drill the holes that are used to attach the frame to the base plate. First score a line down the centre of the frame from the underneath, mark the position and drilling one of the holes 6BA clearance. Next bolt the frame in position with a 6BA countersunk steel screw. Check that it is square to the edge and drill the other hole using the base-plate as a guide. A second 6BA screw is then used to hold it firmly in place.

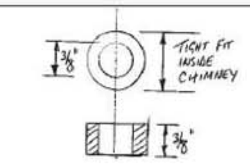
●*To be continued.*



ALTERNATIVE SOLID FUEL TRAY THIN GAUGE BRASS/STEEL

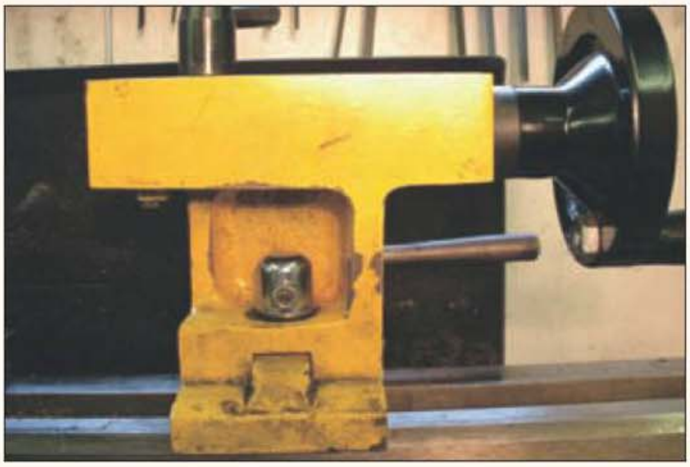


CHIMNEY 3/4in. x 18G BRASS TUBE 1OFF



RETAINING COLLAR BRASS 1OFF

The few, simple parts necessary to convert the tailstock to lever clamping can be made on the lathe itself.



Here the tailstock is shown clamped to the lathe bed. Note the lever lies in the horizontal plane.

A TAILSTOCK LEVER CLAMP FOR MINI-LATHES

Neil Wyatt
describes a simple modification designed to speed up production on these popular lathes.

One of the most annoying and time-wasting features of mini-lathes is the reliance on a simple bolt clamp to fix the tailstock. Reliable and solid but very slow. Nothing would speed up repetitive tailstock operations more than a quick-release mechanism for the tailstock. I thought out several possible solutions, but never got 'a round tuit'. While idly sifting through one of my 'bits boxes', I turned up a redundant, cycle wheel quick-release unit. If this can hold a cycle wheel solid as its (terrified) 190lb rider plunges down a steep, bumpy track at 40mph, then surely it can clamp my tailstock, methought. After prizing out a circlip, a simple eccentric cam arrangement was revealed.

The lazy solution would have been to shorten the quick release spindle, re-thread the end and run it through a plate beneath the bed ways, but I wanted a longer clamp lever that would also be out of the way behind the tailstock. I decided to follow the principle of the clamp, but making it rather more robust. The device consists of a 'cam bolt' which a lever turns in a 'cam nut' drawing it into an outer sleeve. The cam bolt pulls on a spindle threaded into a replacement base plate, clamping the tailstock to the bed between the base plate and the sleeve. To place the lever at the back of the tailstock, the cam bolt is extended through a hole in the tailstock web. This design has advantages over some other designs as all the clamping force is directly on the base of the tailstock casting.

The dimensions in the drawing will give a lift of 4mm if the cam is turned a full 180 degrees. In practice, 90-100deg. can be achieved, giving about 2mm lift. This is sufficient to allow for variations in the thickness of the webs on the lathe bed casting along its length and gives adequate grip.

I can honestly say that this single adaptation has made a huge difference to the pleasure I get from my lathe. Any sequence of repeated tailstock operations becomes quick and easy. Most usefully, when drilling a deep hole one can release the tailstock and pull the drill out to clear swarf faster than one can wind it in and out with the hand wheel.

Cam nut

The size of this component is critical. The 8mm hole, together with the play of the head of the nut in the sleeve, is just enough to ensure that the cam bolt will not jam it in the sleeve.

The cam nut must be made from hardened and tempered silver steel or high tensile alloy. It will be under considerable tension, and it needs to be tough. The lever for clamping a cycle wheel is only half the length of the one I made for my tailstock, yet it clamps with sufficient force to withstand some really large shock loads. You should only need modest force on the tailstock lever to lock the tailstock solid.

I tempered my original cam nut to dark straw, thinking this would be sufficient. This appeared to work, but the day after I fitted it I heard a sudden crack from the tailstock, and it had fractured. I was not even using the lathe at the time. A salutary reminder that hardness alone is no substitute for toughness. I made a replacement, but instead tempered it to a blue 'spring' temper. The new version has served for nearly a year without incident, so I recommend using this temper.

Spindle

Depending on exactly how you set it up, the lever clamp has about 2mm of travel for a 90deg. movement of the lever. This is not a lot, so adjustment is critical, and is provided by the combination of an M6 and M8 thread on the pillar. These have pitches of 1mm and 1.25mm respectively. By turning both ends of the assembly by one turn, the overall length will change by 0.25 millimetres. Alternative and simpler arrangements would be to have a one-piece pillar, but this would only allow adjustment in steps of 0.5mm. A spindle passed through an unthreaded hole in the clamp plate could be used, but this would require locked pairs of nuts on both sides of the plate.

Cam bolt

I made the cam bolt from high tensile steel hexagon stock. Mild steel would probably wear too quickly in this application. You could use silver steel but, if you do, temper it to a different hardness to the cam nut.

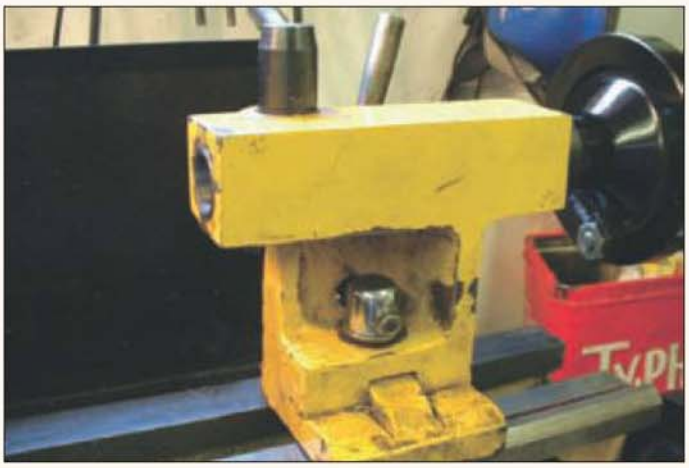
It doesn't matter if you make the cam bolt from hexagon or bar stock, though the latter will be a little harder to hold and drill for the handle. Start by turning down the 3/8in. diameter (this section passes through the hole in the tailstock). Now turn the 9mm section over length, to provide the material for the cam, and the 5mm section at the same setting, so they are concentric. Thread the end of the latter M5. You now need to turn the cam, which requires offsetting the work by 2 millimetres. This is most easily done using a 4-jaw chuck, but you may also do this by packing one jaw of a 3-jaw chuck. Align a suitable mounted point as a gauge (or even the tip of a tool), close to the joint between the 9mm and 5mm sections. Adjust the work so that the extremes of eccentricity are alternately at the 5mm and 9mm diameters. Now turn down a section of the 9mm diameter to 7mm, taking fine cuts to ensure the work does not slip.

Mill or file a flat for mounting the handle. This should be opposite the 'high spot' of the cam, so that pressing the lever down will raise the cam and tighten the clamp and that the maximum movement will occur as the lever passes the horizontal. The dimensions given for the lever handle are intended to give a good match for the existing tailstock and tool holder levers.

On final assembly the cam bolt should be retained in place by a washer and two locknuts or a single Nyloc nut.

Sleeve

I admit it, I have never got around to replacing the original cycle clamp sleeve. It works fine, though it does look a little out of place. The item in the drawing will do the same job, but take care to ensure that the two holes are exactly in line with each other and the centre line of the sleeve. As the clamp locks, the cam nut will move from side to side within the sleeve not just up and down. Significant clearance is needed, more than



This photo shows the tailstock released and free to move along the bed. Very little force is required to lock or loosen the clamp.

The only major modification to the machine is to drill a hole through the web of the tailstock casting.

just a sloppy fit, or the clamp will appear to lock without gripping the lathe bed.

Lever Handle

This is a simple design, it could be even simpler, but this shape blends nicely with the other screw levers on the machine, and I have copied it on other devices I have made. It isn't as pretty as Quorn-style ball handles, but they are neat, quick to make and possible more comfortable to use.

You could argue that the lever is too long, as it allows tremendous force to be applied, and can foul the tailstock barrel locking lever. In practice I only turn the latter lever when the tailstock is locked, so that isn't a problem. As to the mechanical advantage of a long lever, only a few pounds of pressure will lock the tailstock securely. This is part of the pleasure of using the clamp, but one must take care not to over do it.

I made an attempt to black the lever by heating it and dropping it in clean oil. I don't think it was clean enough, as the result was rather patchy, but even so it is not showing any signs of corrosion from my sweaty palms!

Base plate

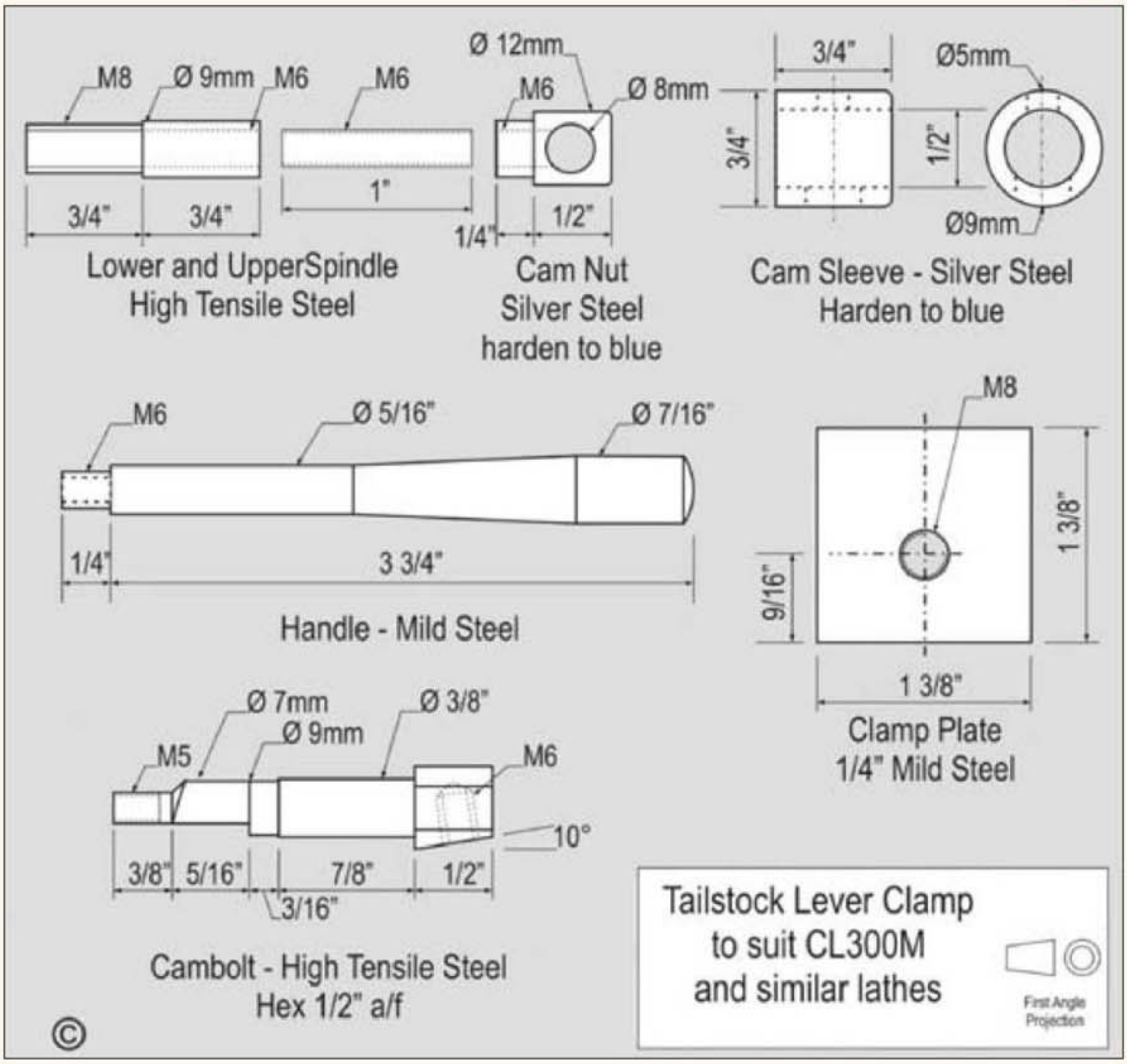
I made a plate that was rather thicker than the original, as that showed signs of distortion. It also meant I had the original as a spare, should the replacement fail! Note that it is offset in order to clear webs in the lathe bed, I suspect the offset will vary between machines, so check your dimensions from the original plate.

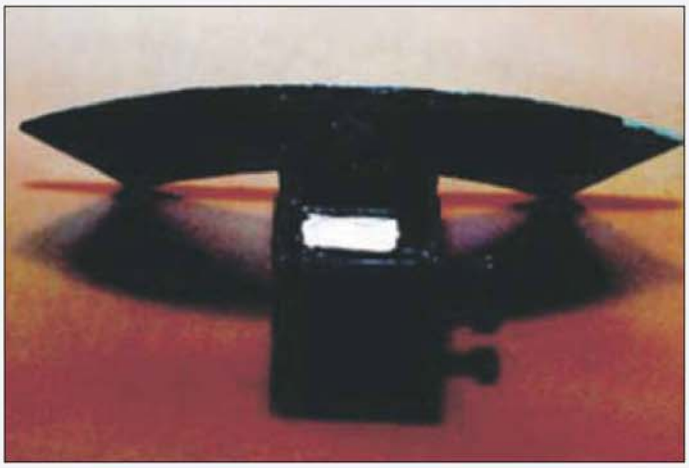
Tailstock Modification

In order to mount the handle at the back of the tailstock, it is necessary to make a hole in its web. The exact location for the hole should be marked on the web with the other components in position; take care to ensure there will be space around the cam bolt so it can move up and down. I opened the hole up in two stages, drilling the initial hole, then plunging in a slot drill to open it to full diameter. After carrying out this operation it is important to check that the tailstock is still properly aligned.

Assembly

It can be tricky to put the whole thing together, especially as you may need to make fine adjustments to get the clamp to lock along the whole length of the lathe bed. An added complication may result if the holes in the upper and lower parts of your tailstock do not align well. In this case you may need to thread the upper spindle in from above, as the cam nut may not fit through the holes. Once you have the correct length I suggest using threadlocking compound to keep the two parts of the spindle together, the rest of the assembly will be kept aligned as they cannot rotate once the cam bolt is in position. Don't forget to put a little grease on the cam on final assembly.





Rear view of the nameplate showing the mounting block. Sizes are not critical and can be varied to suit your locomotive.

Some typical plates made up for various special occasions using a combination of cut out images and computer generated script.

HEAD CODES CAN BE FUN

Ted Jolliffe
looks at head codes and how they can help enhance the public image of our hobby.

Many clubs and societies open their tracks to the public at some time during the season. There are various reasons for this. Perhaps it is a condition of the lease on the land, or to raise funds, or just because members have large and powerful locomotives and want to pull a hefty load. Added to this, many clubs entertain local disadvantaged groups as private parties. At my own club, as well as our monthly running, we host kiddies birthday parties through the summer. Just a couple of hours running with one engine after school or in daytime during holidays. Great for the little ones, Mums love it because they don't have problems with entertaining kids at home, and it is a good source of revenue for the club.

One of the little touches which make the day for many parents and older, hence more literate, children is to place a head code on the engine with the birthday boy or girl's name on it. It is very little trouble. Many parents quickly latch on to the idea of videoing the front of our engine with its head code to form their title sequence.

For public running events I try to make something appropriate to the season, or to some special event we are hosting. Believe it or not our regular visitors look for the head codes, and have even been known to suggest titles for the next running day!

So if the idea appeals and your, or the club's, locomotive has a suitable fixing bracket how does one set about the job? Have a look at most books about steam railways to get an idea of proportions. Mine are for a 7 1/4in. gauge 2-6-0 express locomotive. Locomotives of 5in. and 3 1/2in. gauge would obviously need to made smaller to remain in proportion.

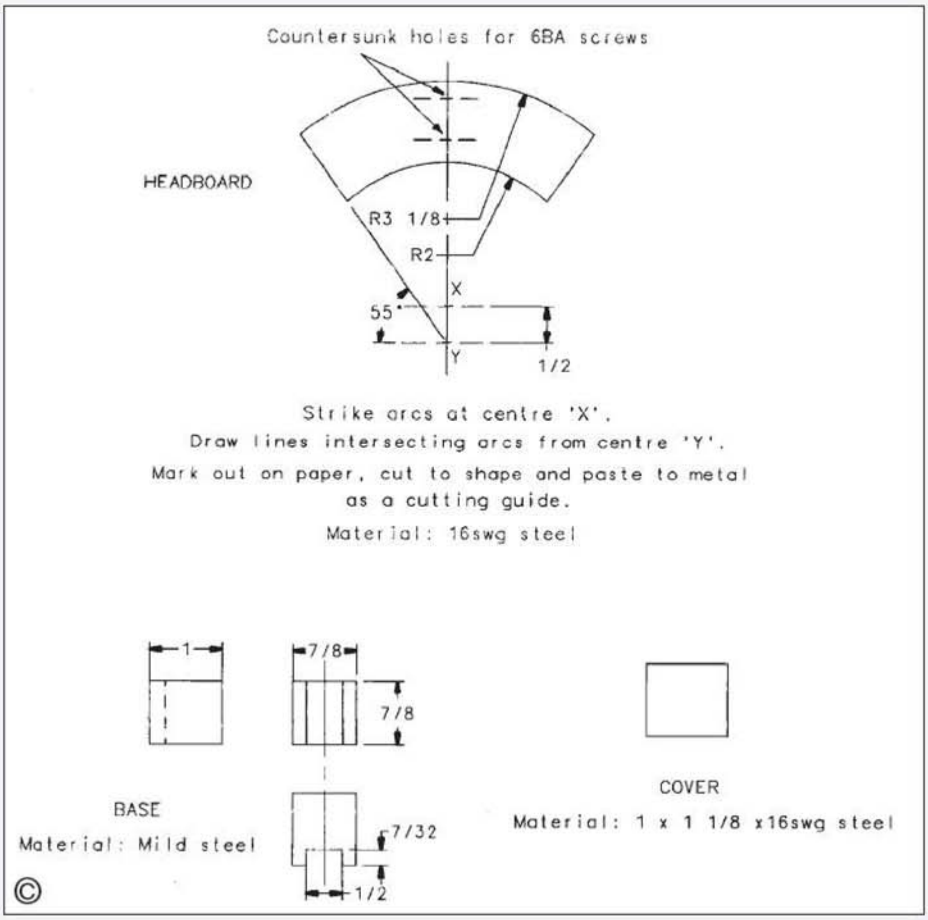
All the materials are from off-cuts or the contents of the scrap box, so little cost is involved, and making one is a relaxing way to while away a couple of hours in the workshop.

Construction

The first part to make is the base. Size will depend on the bracket on the engine, so I will stick to the sizes I use suggesting that you alter dimensions to suit your needs. First thing to stress is that the whole thing needs to be a drop on fit. It should stay in position by its own weight. I start with a 1in. length of 7/8in. square steel. I have used other sizes but this seems right for our club engine. It gives a little out stand from the smoke box front and is heavy enough to stay in place with no other fixing needed.

To make an easy drop on fit I milled a slot 1/2in. wide by 7/32in. deep in one face, leaving an equal upstand on either side. On the first one I made I drilled through the side of the slot and inserted a 4BA screw to lock the board in place; it has never been used. On that one I removed a 1/4 x 1/4in. slot from the two sides, but have not bothered since, no-one sees the block and it just wore away my milling cutters to no purpose.

Next have a rummage in the scrap box for a scrap of sheet steel. I used 16swg because I had a suitable off-cut, but most thicknesses will serve. Cut out a small rectangle, a little larger than the base, and silver solder it to the upstands, to form a slot to drop over the bracket on the locomotive. File or use your belt sander to take off the surplus. This will make the joint almost invisible and gives a clean base for painting.



Now turn your attention to the front or nameplate. This is a piece of sheet steel. Mine was a scrap of 16swg and it came out of a piece $1^3/4$ x 4 inches.

Marking out for the segments of a circle was at first a bit of a puzzle, until I hit on the simple way of doing the job. I simply marked out on a sheet of paper (See my sketch for details). If the radii of the circles is greater than your normal compasses can handle use a cheap school compass, or a pencil in a simple trammel bar to get the sizes). I then cut out the marked out segment and stuck it to the metal using a Pritt stick or similar. It may be a few thou. out, but the job is not high precision. Using the paper as my guide it was a simple matter to cut out the shape on the jigsaw. A quick deburring job left this piece ready for use once the paper had been peeled off.

Incidentally I have a very useful tool for deburring sheet metal. It is one of those wheeled knife sharpeners sold in good kitchen supply shops. A couple of passes removes the burr and leaves a clean edge. Not too many passes though or it can give a knife edge, which is not the object! Quicker than a file or emery board for this type of work and equally effective.

Centre the block on the rear of the nameplate, by eye is fine, or by rule from the top comers to get the block centred on the plate. Mark the position and put on a couple of dabs of Superglue to secure the job for drilling. Once the Superglue has set mark out and centre pop for 2 x 6BA securing screws, drill tapping size $^3/8$in. deep and countersink. Tap and screw in 2 x 6BA x $^3/8$in. countersunk head screws to secure the plate to the block.

Clean up and paint. I use semi-gloss black for the rear and matt white for the front plate.

Lettering is simple

I use the computer and a suitable font. My choice is Comic Sans Gothic 20 or 22pt Bold Caps. This gives a nice legible face. I have a piece of tracing paper marked out to the size of the nameplate and having set up the legend on the screen I use this to check that it will fit the space available. If needed, I adjust the point size up or down to suit the template. Print out, cut out the typed wording, and stick it onto the face of the nameplate using a Pritt stick or similar. To protect against rain I spray it using an aerosol hair lacquer outdoors. I hate the smell in the workshop. A warm damp cloth laid over the surface will get the paper off easily. I have been known to stick the next legend over the existing one, and then cut around the shape of the plate using a scalpel and cutting matt. (Tell it not in Gath but this was when I had made a mistake and booked two parties in one afternoon. The job was done in the steaming bay and still came out OK).

After a few applications the paint gets a little chipped or scratched. For a one-off job it is easy to touch up the affected areas using typists correcting fluid. Now you see why I went for matt finish paint! (If the rear gets shabby use a felt tip pen to keep the job looking smart).

Variations on the theme

It may be that you wish to run a special event. We recently held a Teddy Bear day, and for this I made up special headboards. The backing is made in the same way and here I used thin plywood for the name board. I found some Teddy pictures of suitable size on an old calendar. (Birthday or Christmas cards often produce suitable images). Using a piece of greaseproof paper (cheaper than tracing paper, I 'borrowed' it from the kitchen), I traced the outline of the selected bear using a soft pencil. I added the nameplate beneath the Ted, using the same method as above, directly onto the greaseproof.

As I was doing two nameplates for this day I scribbled in the wording for both images and sizes at the side of the traced image. I transferred my traced outline onto a piece of plywood using carbon paper and a ball-point pen to go over my pencil outline. Freehand transfer of the curved sections of the nameplate was enough for my needs. I cut around the carbon line on the jigsaw to finish up with an outline Ted and nameplate. I eyeballed for the position of the backing block and stuck it on using superglue. Again, I marked out for 6BA screws and drilled tapping size, and countersunk the holes through the wood. The purist would probably open up to clearance size, I didn't bother, just tapped the holes and set the screws, any thread in the wood soon stripped, leaving the two nice and securely fastened together.

Laying the job face down I painted the reverse side black all over taking care to blacken all edges of the ply. Using a scalpel I carefully cut around the Ted"s outline to remove the image from the card. The image was then stuck onto the ply, using a contact adhesive. For this sort of job apply the paper while the glue is still fresh so that you can slide the image slightly to get the backing and image into alignment. Once dry I gave the nameplate a coat of white matt paint, taking care not to over paint the Teddy image. When this dried I stuck on the name using the contact adhesive. Later, when all was dry I gave the entire job a coat of clear varnish to waterproof the paper. This one will be used once a year so it is worth taking a little trouble over the job. For Easter (our normal track opening) I made up a similar board using a rabbit. The image came from a greeting card. Almost any image is possible. What about a sheaf of corn for harvest time, perhaps a badger or fox for an evening run, or even a mouse for a Disney theme, or any other Disney character. If your image is in a book or something else you don't want to spoil, make a colour photocopy and use that, the choice is endless.

I even have one made from a disc of ply, an offcut from a job where I used a hole saw to cut out a section, the large washer, cleaned up and is occasionally used with just a disc of pre-printed paper stuck on. Beware of breaching copyright if you go for one of the better known railway characters.

Fellow members may grin, but believe me our public love these little embellishments, it somehow makes the railway more personal. Of course if you are artistic you could probably do the whole image yourself. I have considered using a cut-out of the birthday boy or girl's face as the image but so far no-one has supplied a suitable photo for this job.

IN THE NEXT ISSUE

- The club stands at the Model Engineer Exhibition
- Peter Rich on boilers Part 2
- The Gilling Rallies
- Tangyes engines
- Gauge 1 locomotive

Plus all your regular favourites

ON SALE 28 APRIL 2006

Content subject to change

TRACTION ENGINE LAMPS

Tony Webster describes how to make lamps for his Fowler wagon, and other engines.

Photographs of the full-size Fowler wagons show the lamps to be recognizable as Lucas 'King of the Road' oil, or paraffin, lamps. The lamps shown here in one-quarter scale are based on these, and are made from 24 swg brass sheet and 1in. diameter brass tube.

A little tooling is required to press out the parts, and the material for this can be found in the scrap box. Short lengths of bar and thick wall tube will come in handy. For example: the 1in. diameter cap is made by pushing a disk of brass through a 1in. hole with a 7/8ths in. dia. punch. The die, or hole, should have a 1 3/8in. dia. recess to locate the blank centrally and have a smooth radiused entry to the hole. The blank should be annealed before forming and should be pushed right through the die to a clearance diameter, if there is enough length in the off-cut used.

A good vice can be used for pressing if a fly press is not available. A smaller diameter blank is used to close the rear of the lin. dia. tube of the main body. The top cap can have the concentric circles pressed in with opposing diameter ridges in the punch and die. Alternatively, it could be left smooth and shiny.

The saddle, where the vent above and the tank below, are secured to the main body are made from 3/4in. tube, the end of which is offered up to a 7/8in. dia. milling cutter. The resultant concave end is then pressed up to a 1in. dia. steel bar and the other end of the tube is given a clout with a hammer. This splays out the end to fit the body. The tube is now re-chucked and 1/16in. parted off. The bezel is made from 1in. dia. x 3/8in. long brass tube, annealed and pushed up a mandrel which has a hollow curved face out to say 1 1/2in. diameter. The tailstock can be used to do the pushing while the mandrel is still in the chuck. The curved face should be as smooth as possible to help the tube round the curve. It is surprisingly easy. Use the less successful attempts on the rear lamps.

The tank can be made in a similar way. The internal support for the vent is turned from the solid, not forgetting the 1/8in. pip on the end to rivet on the top cap. Drill out the interior to reduce the weight otherwise the lamp will be top heavy. Solder the lower cap onto the step in diameter before rivetting the top cap on. The mounting bracket is made by pushing a 1/4in. square punch into a 1/2 x 5/8in. piece of brass which is supported by a 7/16in. dia hole. This will draw the sides of the blank in to form a waisted shape and form the mounting bracket. There needs to be a 3/16 x 1/8in. vertical hole through both top and bottom of the projection and a 6BA tapped hole right through into the lamp. Do not tap the hole until it is fitted to the bracket. The glass in the Lucas catalogue is shown flat, not bull's eye. The catch for the front bezel is simply 5/32in. wide brass soldered to the bezel and having a hole which clips over a 1/16in. rivet in the side of the body.

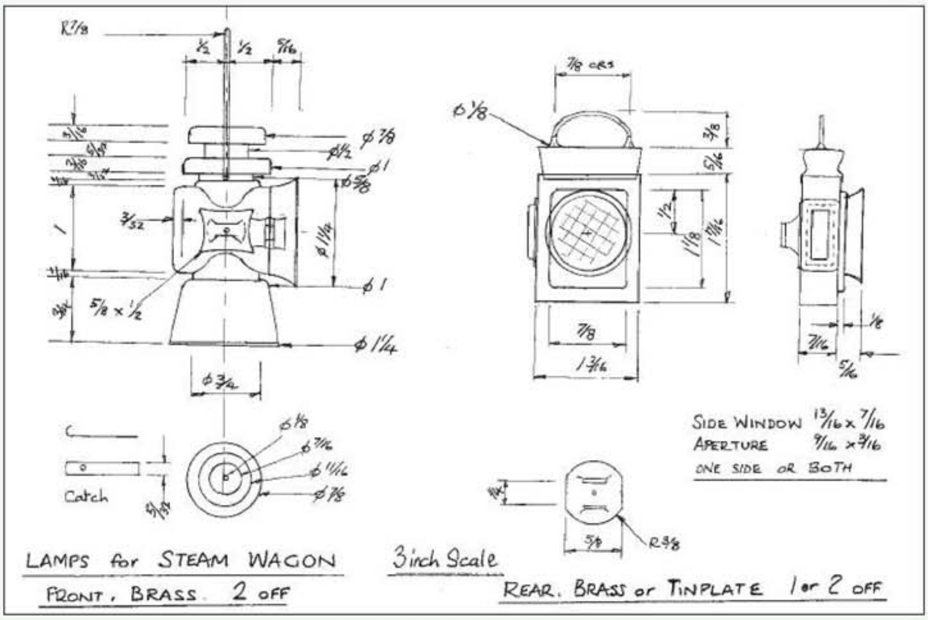
The rear lamps can be made from thin sheet brass or tin-plate. Both can be soft soldered, but tin-plate can go rusty. Carefully mark out the folds in the body with a pencil. Do not use a scriber on tin-plate.

To make the folds, clamp the workpiece between the jaws of a toolmakers clamp, carefully aligned with the pencil line and fold over with your fingers. Any inaccuracy in lining up will be very obvious to the casual observer. If you cut the hole in the front first you should place the clamp on the front and fold the side round the clamp.

The two sides should be worked in mirror image. The seam down the centre of the back is formed by inward 1/16in. flanges butt soldered together. This helps keep the whole box square and is better than one flange in a corner. The bezel is soldered to a door on the front of the box which is hinged down one edge. The hinge is based on a piece of 1/16in. dia tube soldered to the box and holes in the top and bottom flanges of the door.

This continuous flange is made by pushing a square of annealed brass sheet through a square hole, with rounded corners, using a square punch, with rounded corners. Use only sufficient material to form the flanges and it will go quite smoothly. The frames for the side windows use a similar technique but using sufficient material to form the outer flange and allowing for draw, which will waist the sides. Use a red glass cut from a car rear light or reflector. The bracket is based on a disc with an `H' cut in with an Abrafile, the two tabs bent up and a piece of 1/16in brass, soldered in to form the mounting bracket. The bottom has two edges folded up and soldered in. The securing locknut is cut from 1/16in. brass and twisted to make the `ears' to help tighten and lock the 6 BA screw.

They really work.



KEITH'S COLUMN

LILLIAN
A NARROW GAUGE LOCOMOTIVE
for $7\frac{1}{4}$in. gauge

Keith Wilson
discusses the water tanks and also adds some notes on machining the wheels

●*Part XIX continued from page 343 (M.E. 4269, 17 March 2006)*

A couple of years ago I gave some 'duff' about the practice of sometimes 'stepping into a story' and gave a few examples.

It occurred to me a few days ago that a similar sort of thing can happen when you, quite by chance (I wonder?), witness something so amazing that you hardly believe your eyes or ears - as the case may be.

My first one was aural. You will recall the radio program some years ago called *One minute please* or possibly its successor *Just a minute*. One of the actions was having to talk, solo, for one minute on a given subject, without hesitation repetition or deviation, and there was a good timekeeper keeping at least one eye on the 'clock'.

Came a time when Patrick Moore was on the 'hot seat'. He kept going for $3\frac{1}{2}$ minutes, even the timekeeper was misled!

Next one was one of the Davies brothers at snooker. Reds all potted, so he cleared the table. So what? Many can do that. But he did it never moving his feet!!

Another two happened once to me, but I will tell of only one. My club was having a Christmas 'do' in a local pub, complete with bowling alley. A few of the youngsters commandeered this and we all had to have a go, two throws each. The ball was about $\frac{1}{16}$in. less in diameter than the gap between the skittles so missing was all but impossible. Oh yeah? Ball slid at good velocity not hitting a single skittle! Said one member *"Bet you can't do that again"*. Do I have to finish the story? It was the same gap too! I doubt if anyone will feel surprised at my holding up the necessary two fingers!

There was a minor error in my *Cattle Country* write-up. It implies that a 47xx pulled a huge load on the Severn Valley line. Since they were all scrapped before that line was re-opened, no way. It was a King, 6024

Tanks

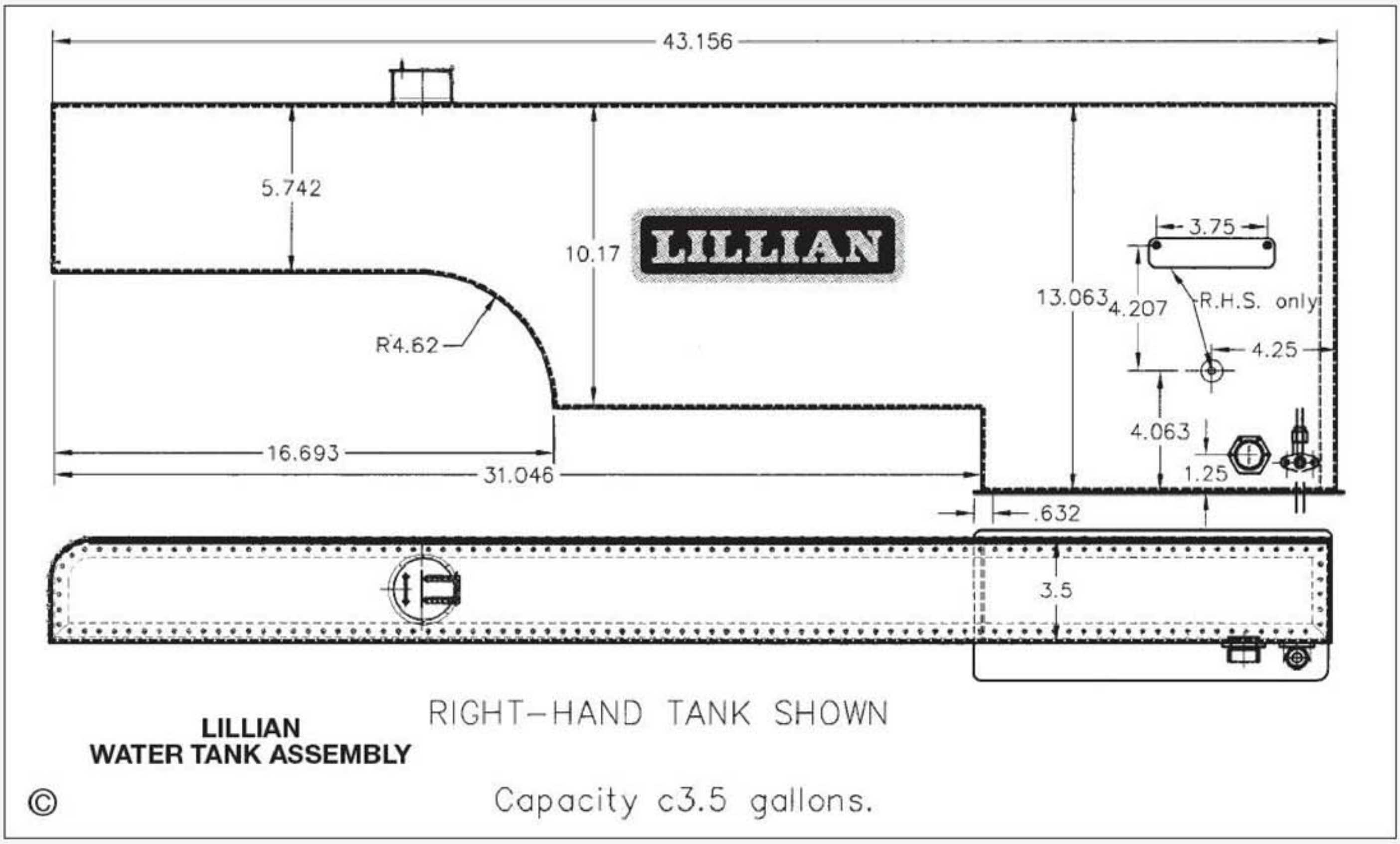
I modestly (oh yeah?) maintain that the best material by far is brass for these needful items. I tried steel in the early years, painting the inside with ordinary paint. It lasted about 1 year. I tried steel again, using this time a special guaranteed waterproof paint. It lasted about 6 months. I tried steel again; having it electroplated it with copper. It lasted about 12 months. I tried brass, it lasts indefinitely. I must make it clear that 'lasted' here means until serious signs of rust were visible.

But why not steel and have it galvanised? I have not tried it, but due to the use of copper rivets and brass angle, I was firmly warned against it. In any case, galvanising would almost certainly have seriously marred the nice neat rivetted finish. So no dice. 'Aloominum' is no use either, it corrodes in water, and being amphoteric it will react with acids and alkalis

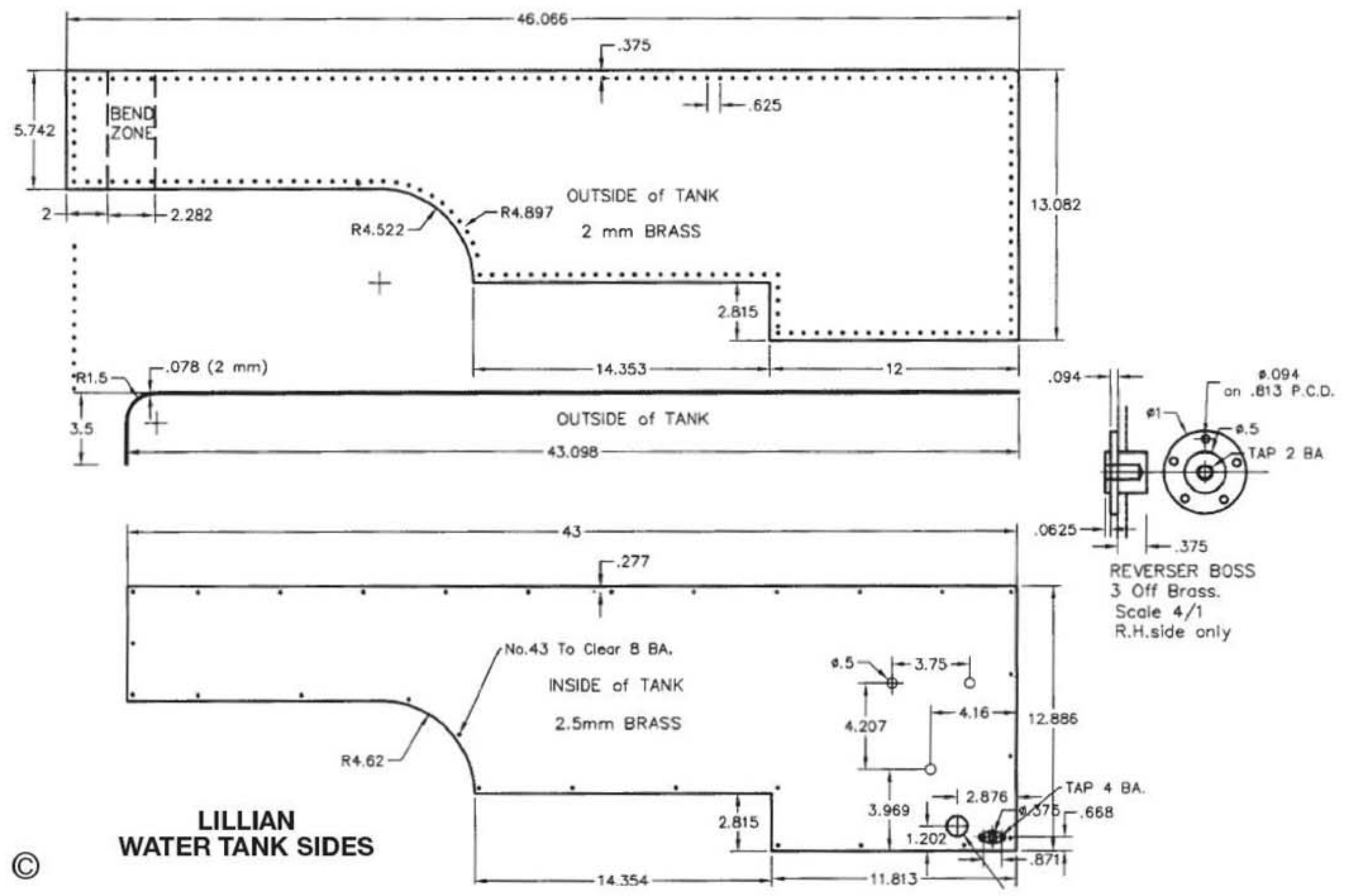
I have used steel on narrow gauge tenders, painting the insides with car underseal. This seems to work well enough (I believe it is largely bitumen) but if any oil or grease gets on it, ruination. And oil or grease is clearly present and distributed fairly freely. Underseal also seems to form a breeding ground for fungi.

The extra cost of brass is not a great deal, and its ease of machining compensates largely for this. Also, caulking of joints can be done with ordinary plumber's solder. There is a snag here, for if the brass is fairly thin it can distort badly under heat. So if you are worried, rivet up everything and then apply Araldite. If the grade chosen is 2010, a small quantity can be mixed up on site. Then apply gentle heat (electric paint stripper recommended, or pinch the wife's hair dryer) and it will flow literally like water. In fact, with the paint stripper you can see waves being generated. And as a bonus, the heat will accelerate the setting of the Araldite. You will soon learn the amount required for any given size of joint.

Drilling all the holes for the rivets is a 'pain in the grass', but it has to be done. There is no true ▶



LILLIAN WATER TANK ASSEMBLY



LILLIAN WATER TANK SIDES

prototype so precise rivet spacings are a matter of choice, but neat equi-spaced rows add much to the final appearance of the locomotive. In fact they can make or mar the job, from the point of view of appearance.

It is possible (probable?) that I have chosen a wrong spacing for the rivets, but I have got to select something, so 3/32in. rivets at 1/2in. spacings is my suggestion, possibly wrong. On looking into this matter a bit further, this spacing would be about 3 1/4in. in full size.

It is strongly recommended that a jig be made, taking great care therewith. Jig-bore if at all possible, and don't make the jig out of too thin material. At least 3/16in. is recommended. If you make it from an 18in. 'length' of 3/4in. wide with the row of holes down the centre line, it is dead easy to clamp this lined up to one edge of the part to be drilled and drill it forthwith.

Some of these tank parts are a bit on the large size (!) so look at the possibility of a hand drill, for it could be a bit tricky to balance on the vertical drilling machine table. On getting to the end of the jig, shift it along and drop a rivet through the end hole into the brass sheet to aid accuracy. Come to think of it, on first set-up drill the two end holes first and bung in a rivet, just pushing it through. Clamps can slip! Whilst on this matter, note that a 10BA bolt will go through a No.51 drill hole, and 7BA through a No.39. This means that jigs etc. can be bolted to the job to be drilled, and later small angles can be fixed in the same way; this of course being much easier than rivetting, which can then take place later. Clamps can slip, and are also a bit heavier than said bolts and nuts (and can get in the way).

Another neat trick in locating the brass angle on the inside of the joint where applicable, clean up a little bit at each end of the angle plus, if it is very long, a bit in the centre. Apply some flux and tack it together, followed by drilling the holes all along. Once a hole is drilled right through, it is not over-easy to correct matters, so the preliminary tacking can be of great value. Tip: Even if you have to do it by hand, countersink the holes in the first-drilled bit just enough to be visible, this will allow closer fitting of rivets. It gets darned monotonous but is firmly recommended. A drill about 3/16in. dia. will suffice, put in by a twist of the fingers.

Bending of the angle is a so-and-so, but heat judiciously applied helps a lot, but watch out for overheating and melting, it can happen easily and blooming quickly. For corners at right angles, mitring two or even three ways at 45 or 30deg. is helpful. It can be done almost instantly on the linisher.

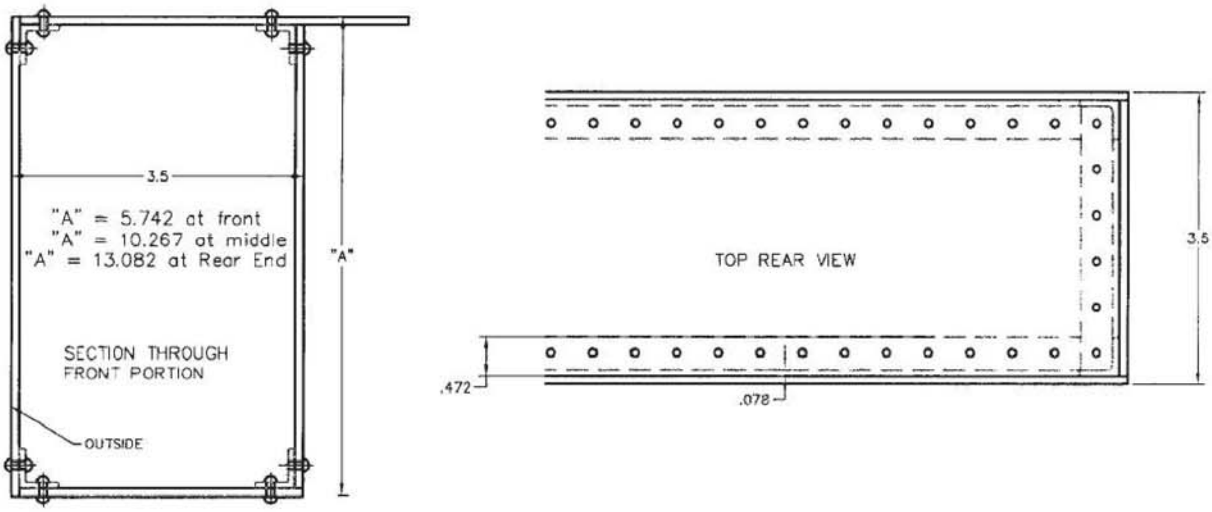
I think it will be reasonably clear that the order in which bits are fitted together can be important. It is one thing to get small rivets properly closed when access is free at both ends, quite another when there is not room enough to swing a hammer - let alone the proverbial cat. In assembling these tanks, it seems better to start with those huge outside bits that are also parts of the cab. They are rather unwieldy, but things might be a little easier if you make a nice neat joint where the tank starts and the cab stops. A straight double line of rivets, vertical, onto a butt strip will meet the case nicely.

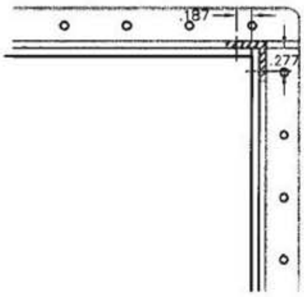
I suggest that the brass angles are fitted (but not yet permanently) first, then the tops and bottoms and ends of the tanks fitted complete with the 'inside' angles. When all the angles match up, then is the time to make them permanent fixtures. This leaves a box-like structure that can be water-tested if desired. The finishing touch is putting on the inside plate of the tanks, this is done with a few 6 or 8BA round head brass screws tapped into the brass angles. About 2in. centres is satisfactory.

The tanks should be 'drawing-room' tight after final caulking; in other words no leaks, although of course a pressure-test is a)impossible and b)unnecessary. The various bushes for valves and pipe work are best soft-soldered in but even better if the flange is made bigger than necessary, for a few rivets around the flange will help. I have had minor troubles in the past with soft-soldered joints of this type; they can do silly things at times.

It may be desirable to have a couple of drain holes with pipes connecting tank top to tank bottom, certainly for *GWRillian*. They are very important in tenders, for you don't really want the space behind the coal guard to drain into the tank, (or slosh about) 'cos it will bring in oodles of muck, grains of coal, and many other undesirable objects, and it is not too easy to get them out again. If they are the right size (wrong size?) they can also nicely choke up injector cones. Admittedly filters should be used upstream of the water control valves, but the less muck the better.

Some folk recommend only one filter, on the tank filler, but there is a minor objection to this. It is that it is difficult to see just how full the tank is/tanks are, 'cos unless it is fixed in permanently people will 'hoick' it out to see the water level when filling. The answer to this is to make it into the shape of a long cylinder, reaching nearly to the bottom of the tank, and if practical, semi-fixed. Thus the water level is easily visible to the operator doing the filling. Now I know that a water height gauge can be mounted on the tank, but 'twill be inside the cab and not easy for the 'filler fellow' to see.





**LILLIAN
WATER TANK DETAILS**

©

Wilson's Words of Wisdom:

Always be careful using words, for you don't know whose mouth they have been in.

Jo Brand.

For builders of *GWRillian* (the Swindonised version of *Lillian*), note that the tank top is a little bit lower than for *Lillian*, for here needs to be a specially shaped beading. The purpose of this beading is to cover the sharp edge that would otherwise be exposed, rather dangerous. It is best if this beading is rivetted as well as being soft-soldered to the tank side.

It is not easy to curve the angle round the filler where it fits into the tank top, but it is highly recommended, for if the solder should give way it is hard to see how it can be re-fixed without damage to paint work. Clearly, it will receive some hard knocks in normal operation. Of course, the appropriate 'angle-ring' could be chewed out of a bit of solid; 'tis up to you.

Wheels

In connection with machining methods, the photograph shews the set-up for finalities on wheels. With the wheels safely mounted on their axles, we have two connected problems. One is to get the axle ends turned near-flush with wheel outer face, t'other is to get the outsides of the wheels running truly. However carefully you may machine wheels, axles etc. on assembly they never seem to match truly. I know that they should, but experience teaches that they don't. So final machining on axles is virtually a must.

The two operations are mutually incompatible. To get the axle ends flush, obviously the centre-hole in the axle ends must be free, and to do the outside diameters plus coning, the centre must be used.

Now I know perfectly well that half-centres can be used (where there is a removed portion on the centre so that the tool can reach right up to the edge of the hole) but you can hardly do that with a revolving centre. So a fixed steady is called for. Because the cannon-type axleboxes are fitted (it is somewhat impossible to remove them!) the main bearings of the axleboxes must be used. Although there is a good rounded portion of the box, it seems better to grip the square end.

Mount one wheel in the chuck, with the steady in place - but not tightened yet - and support the outer end on the tailstock steady to ensure true running of the wheel-axle assembly, and adjust the steady until the axlebox is gripped firmly. Check that the assembly is true by hand-spinning the lot, and then take the axle end down with fairly fine feeds, for look you boyo, the set-up is not as stable as one would like. Make sure that, if not dead flush, that axle-end is proud rather than undercut, for the one looks very nice and t'other looks terrible.

Make the centre a bit deeper if it needs it, and then reverse the axle assembly end-for-end and do t'other end. When all three sets are done, then is the time to finish off the outside diameter of the wheel treads. It is most important that the diameters of all the wheels are identical, although the exact diameter in unimportant. Readers may note that I shew a taper of 3deg. plus and end bevel of 23deg., whereas Martin Evans (*The Model Steam Locomotive*) shows 2deg. and 45deg. respectively. I differ from him in this matter solely because the angles I give are Swenson dictated; I know not if it makes any real difference in our sizes. I believe rail tops have the same 3deg., full size. It makes sense, for then there is a 'homing' tendency for smooth running. Otherwise 'hunting' would take place with rather nasty consequences. The ideal set-up would mean that the flanges would never touch the rails (main-line only)

●*To be continued.*

Using a fixed steady to support the axle assembly during turning of the axle end.

A view of the axle end facing operation in progress.

CLUB CHAT
With Malcolm Stride

UK News

Birmingham SME is the latest society to suffer unwanted attention, this time burglars who seemed to know what they were after and removed the air compressor and bandsaw. The local crime prevention officer has apparently recommended planting pyracantha plants around the boundaries. These are very dense spiky plants and act as a deterrent to intruders. Work has started on four more passenger trucks to the design by Pete Flavell which has been proved over the past year. The society gained second place in the Club Stand Competition at the Midlands Exhibition last October. This was after a couple of planning meetings held in a local hostelry which apparently is *"guaranteed to enhance the results of any meeting."* The newsletter reports that the relocation of the Echills Wood Railway from Stoneleigh to the Kingsbury Water Park is on track thanks to a donation from the SITA trust.

The newsletter of the **Bournemouth DSME** has reached a ripe old age of 25 with the 25th volume being published this year. To mark the occasion, some excerpts from the early volumes are to be published during the year. Finally from Bournemouth, I just could not resist including this wonderful letter which is apparently a genuine response to a letter received by the Inland Revenue from an obviously severely disgruntled taxpayer!

"Dear Mr. XXXX,
I am writing to you to express our thanks for your more than prompt reply to our latest communication, and also to answer some of the points you raise. I will address them, as ever, in order.

Firstly, I must take issue with your description of our last as a "begging letter". *It might perhaps more properly be referred to as a 'tax demand'. This is how we, at the Inland Revenue have always, for reasons of accuracy; traditionally referred to such documents. Secondly, your frustration at our adding to the* "endless stream of crapulent whining and panhandling vomited daily through the letterbox on to the doormat" *has been noted.*

However, whilst I have naturally not seen the other letters to which you refer I would cautiously suggest that their being from "pauper councils, Lombardy pirate banking houses and pissant gas-mongerers" *might indicate that your decision to* "file them next to the toilet in case of emergency" *is at best a little ill-advised. In common with my own organisation, it is unlikely that the senders of these letters do see you as a* "lackwit bumpkin" *or, come to that, a* "sodding charity". *More likely they see you as a citizen of Great Britain, with a responsibility to contribute to the upkeep of the nation as a whole.*

Which brings me to my next point, whilst there may be some spirit of truth in your assertion that the taxes you pay "go to shore up the canker-blighted, toppling folly that is the Public Services", *a moment's rudimentary calculation ought to disabuse you of the notion that the government in any way expects you to* "stump up for the whole damned party" *yourself. The estimates you provide for the Chancellor's disbursement of the funds levied by taxation, whilst colourful, are, in fairness, a little off the mark. Less than you seem to imagine is spent on* "junkets for Bunterish lickspittles" *and* "dancing whores" *whilst far more than you have accounted for is allocated to, for example,* "that box-ticking facade of a university system."

A couple of technical points arising from direct queries:

1. The reason we don't simply write "Muggins" *on the envelope has to do with the vagaries of the postal system;*

2. You can rest assured that "sucking the very marrows of those with nothing else to give" *has never been considered as a practice because even if the Personal Allowance didn't render it irrelevant, the sheer medical logistics involved would make it financially unviable.*

I trust this has helped. In the meantime, whilst I would not in any way wish to influence your decision one way or the other, I ought to point out that even if you did choose to "give the whole foul jamboree up and go and live in India" *you would still owe us the money. Please forward it by Friday.*
Yours Sincerely,
XXXX Customer Relations Inland Revenue"

It's almost worth paying tax just for such a wonderful letter!

Congratulations are due to David Brimacombe of the **Bradford MES** who took the *Hepworth Trophy* for the best model at the annual competition last year. The award was for his fine $7^{1}/4$in. gauge Class 4F 0-6-0 locomotive and tender. Unfortunately space constraints preclude a full list of all the awards. The President raises the question of the merits of a 'first past the post' system, as used at Bradford compared with one based on quality of work such as at the Model Engineer Exhibition. This question has been discussed many times but we would welcome reader's opinions on the subject. The progress on the new carriage sheds has been hampered by wet and heavy soil conditions. The Editor comments that the material left on the surface by the mechanical digger would be ideal for building earth dams or even a boating pool.

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.

APRIL

14-17	**British Columbia SME.** *Easter Meet.* Contact Sean Laurence: (604) 931-1547.
14-16	**Furness MRC.** *FRMC Easter Exhibition.* Contact Colin Burns: 01229 837079.
14-17	**Leighton Buzzard NG Rly.** *Easter Fun.* Enquiries: 01525-373888.
15	**Bedford MES.** *Club Running Day.* Contact Ted Jolliffe: 01234-327791.
15	**Stockholes Farm MR.** *AGM.* Contact Ivan Smith: 01427-872723.
16	**Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
16	**Basingstoke DMES.** *Public Running.* Contact Guy Harding: 01256-844861.
16/17	**Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
16/17	**Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145-441-5085.
16/17	**Cardiff MES.** *Easter Open Days.* Contact Don Norman: 01656-784530.
16/17	**Claymills Pumping Engines.** *Open Days.* Contact B. Eastough: 01283-812501.
16	**Birmingham SME.** *Easter Loco Parade.* Contact John Walker: 01789-266065.
16	**Frimley & Ascot LC.** *Club Running.* Contact Bob Dowman: 01252-835042.
16	**MELSA.** *Easter Sunday Run for Life Line.* Contact Graham Chadbone: 07-4121-4341.
16/17	**Papplewick Pumping Station.** *Steaming Days.* Enquiries: 0115-963-2938.
16	**Peterborough SME.** *Start of Running Season.* Contact Ted Smith: 01775-640719.
16	**Plymouth MSLS.** *Public Running.* Contact John Brooker: 01752-671722.
16	**Reading SME.** *Public Running.* Contact Brian Joslyn: 01491-873393.
16	**Romney Marsh MES.** *'G' Scale Get-together.* Contact John Wimble: 01797-362295.
16	**Rugby MES.** *Public Running.* Contact David Eadon: 01788-576956.
16	**Saffron Walden DSME.** *Running Day (public running after 2pm).* Contact Jack Setterfield: 01843-596822.
16	**St. Albans DMES.** *Puffing Field Morning.* Contact Roy Verden: 01923-220590.
16	**York City & DSME.** *Easter Steaming.* Contact Pat Martindale: 01262-676291.
17	**Frimley & Ascot LC.** *Easter Charity Run.* Contact Bob Dowman: 01252-835042.
17	**Northampton SME.** *Running Day.* Contact Pete Jarman: 01234-708501 (eve).
17	**Stockholes Farm MR.** *Open Day.* Contact Ivan Smith: 01427-872723.
18	**Chesterfield MES.** *Ivan Turner: What is!?* Contact Mike Rhodes: 01623-648676.
18	**Nottingham SMEE.** *Prof. Pete Thomas: The Grange; Design for Manufacture.* Contact Graham Davenport: 0115-8496703.
18	**South Durham SME.** *Afternoon Steam-Up.* Contact B. Owens: 01325-721503.
18	**Peterborough SME.** *Bits & Pieces.* Contact Ted Smith: 01775-640719.
18	**West Wiltshire SME.** *Exhibition Evening.* Contact R. Nev. Boulton: 01380-828101.
19	**Bournemouth DSME.** *Bits & Pieces.* Contact Dave Fynn: 01202-474599.
19	**Bristol SMEE.** *Bob Wade: Ornamental Turners.* Contact Trevor Chambers: 0145-441-5085.
19	**Leeds SMEE.** *Video Evening.* Contact Colin Abrey: 01132-649630.
19	**Maidstone MES (UK).** *Members' Playtime Run.* Contact Martin Parham: 01622-630298.
20	**Isle of Wight MES.** *Meeting.* Contact Les Morgan: 01983-875118.
20	**Reading SME.** *Winter Talk.* Contact Brian Joslyn: 01491-873393.
20	**Rugby MES.** *Doug Hewson: Track & Point Construction.* Contact David Eadon: 01788-576956.
20	**Sutton MEC.** *Chat Night.* Contact Bob Wood: 0208-641-6258.
21	**Canvey R&MEC.** *Quiz Night.* Contact Brian Baker: 01702-512752
21	**North London SME.** *Work in Progress.* Contact David Harris: 01707-326518.
21	**Rochdale SMEE.** *Special Auction: Bert Ashton's Tools.* Contact Mike Foster: 01706-360849.
21	**Romford MEC.** *Wilf Skinner: Gears.* Contact Colin Hunt: 01708-709302.
21	**Steam LS of Victoria.** *Gathering.* Contact Graham Plaskett: (03) 9750-5022.
22	**Canvey R&MEC.** *Members' Running Day.* Contact Brian Baker: 01702-512752.
22	**Chesterfield MES.** *Public Running Day.* Contact Mike Rhodes: 01623-648676.

In Memoriam

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

John (Jock) Anderson M.B.E	*Model Engineers & Live Steamers' Assoc. Maryborough (Aus)*
James Batchelor	*Bradford MES*
Peter Calkin	*Melton Mowbray DSME*
Derrick Crossland	*Coventry MES*
Dennis Mortimer	*Maidstone (UK) MES*

The society is looking forward to celebrating its centenary in 2008 and is considering producing commemorative medallions to mark the occasion. We look forward very much to reporting on the celebrations when they happen. The boating section has been braving the inclement weather during the winter and has had to contend with some choppy water conditions at Bradford Moor.

Bill Ritchie entertained members of **Bristol SMEE** in November with a talk about his experiences as a marine engineer. The talk included several anecdotes including having to sack a ship's master for persistent drinking and discovering that the master had already been sacked three years before for the same offence. He also told the tale of removing half of the bent crankshaft in an engine and coming home *"as a three legged donkey"*. I think that means on three cylinders! David Giles is continuing the interesting series of article on his tether car racing experiences which are made difficult due to the lack of track facilities in this country. In spite of this David has achieved a speed of 208.449kph.

Work on the tunnel at **Chesterfield DMES** is nearing completion and it has some fine brick portals. Other work has been carried out while the track was in possession of the track gang due to the closure of the tunnel. Peter Nixon describes the fabrication of a compound launch engine cylinder block. The block was fabricated in order that the machining could be carried out on Peter's Myford lathe. It is effectively two single cylinder blocks bolted together and each part was machined from the solid making great use of chain drilling to remove excess metal. After about 200 hours work, in addition to a very fine cylinder block, Peter has 36lbs of cast iron swarf! The newsletter contains an interesting fact for all you railway buffs; apparently the Liskeard and Caradon Railway in Cornwall was never licensed to carry passengers. They got round this by charging for luggage, hats and umbrellas and the owners of said objects travelled free!

A good turnout of members enjoyed the Christmas Dinner at **Saffron Walden DSME** in December and had the advantage of a room just for themselves.

Members of the **St. Albans DMES** are celebrating the achievement of member Fred Bearton on his gaining a Gold Medal and the Tom Nevins Trophy for his fine model of a slate quarry crane at the Model Engineer Exhibition. The newsletter has a new Editor in the person of Roger Stephen who has even included a photograph of himself so that members can recognise him. I look forward to receiving Roger's efforts in the future and wish him well in his new role.

Work on the ground level track at **Tyneside SMEE** has been held up due to the wet weather and poor drainage at the site. The bright side is that the soft ground may make it easier to use augers to dig the holes for fence posts. The society had a stand at the model railway exhibition held at Gateshead in November and gained a lot of publicity and hopefully some new members. Ben Pardey took part in the **Stephenson Memorial Miniature Locomotive Trials** in September and was awarded the Stephenson Trophy and the Rocket Trophy for the best placed 5in. gauge entry with his A4 Pacific *Seagull*. The TSMEE Trophy for the runner up and the Vast Shield went to Ken Ellwood of the **West Cumbria Guild of Model Engineers** with his $3^{1}/2$in. gauge 9F Evening Star and the $7^{1}/4$in. Trophy went to Alan Bowron of **Carlisle DMES** with his 0-6-0ST to the *Holmside* design.

Following a 'think tank' session at **Weymouth DSME,** Secretary Nic Ashmore has got his Trevithick engine working. The 'Steam in Miniature' exhibition was a success with 3,000 visitors, some of whom will hopefully become members. Nic found a copy of this column from 1950 with details of the first Annual General Meeting of the society so it is time to think about the 60th anniversary!

No doubt in common with many others, the committee at **Wigan DSME** have spent some time discussing the implications of the new boiler regulations and have a concern with the requirement to inspect all new boilers during construction. They have several members with new boilers built some time ago that have never been inspected or tested because the rest of the locomotive is still under construction. Does this mean that the locomotives cannot be allowed to run because the boiler inspections at the construction stage have not been done? Other clubs views on this situation would be appreciated.

Work during the latter part of last year at **Worthing DSME** has included repainting the track supporting channels on the outer loop, overhauling the portable track and riding cars and fitting the stabilising rail in the loading/unloading area of the station. Members are being exhorted to join the working parties on the basis that they will get free tea and because tea contains high levels of antioxidants this is good for member's health.

22	**Steam LS of Victoria.** *Club Run.* Contact Graham Plaskett: (03) 9750-5022.
23	**Edinburgh SME.** *Start of Season Track Running Day.* Contact Robert McLucke: 01506-655270.
23	**Guildford MES.** *First Members' Running Day.* Contact Dave Longhurst: 01428-605424.
23	**Isle of Wight MES.** *Rally at Broadfields.* Contact Les Morgan: 01983-875118.
23	**Leicester SME.** *Diesel Day.* Contact Raymond Wallis: 0116-285-8824.
23	**MELSA.** *Bracken Ridge.* Contact Graham Chadbone: 07-4121-4341.
23	**York City & DSME.** *Running Day.* Contact Pat Martindale: 01262-676291.
24	**Bedford MES.** *Glue, screw, rivet, braze, weld?* Contact Ted Jolliffe: 01234-327791.
25	**Basingstoke DMES.** *Bits & Pieces.* Contact Guy Harding: 01256-844861.
26	**Hull DSME.** *Table Sale.* Contact Tony Finn: 01482-898434.
29/30	**Leighton Buzzard NG Rly.** *Indian Holiday.* Enquiries: 01525-373888.
29	**MELSA.** *Labour Day Weekend.* Contact Graham Chadbone: 07-4121-4341.
29	**National 2 /2in. Gauge Ass'n.** *Spring Rally at Romney Marsh.* Contact Clive Young: 01233-626455.
29	**National 2 /2in. Gauge Ass'n (Southern Region).** *Spring Rally.* Contact John Cook: 0208-397-3932.
29	**Romney Marsh MES.** *$2^{1}/2$" gauge Association Rally.* Contact John Wimble: 01797-362295.
29	**Tyneside SMEE.** *Track Work Day.* Contact Ian Spencer, 0191-2843438.
29	**Urmston DSME.** *May Day Steam.* Contact A. L. Fussell: 0161-748-0160.
29	**York City & DSME.** *Duckers & Son – Modelling in Miniature.* Contact Pat Martindale: 01262-676291.
30	**Amnerfield Miniature Railway.** *Public Running.* Contact David Jerome: 0118-9700274.
30	**Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
30	**Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145-441-5085.
30	**Claymills Pumping Engines.** *Open Day.* Contact B. Eastough: 01283-812501.
30	**Guildford MES.** *First Public Running.* Contact Dave Longhurst: 01428-605424.
30	**MELSA.** *Sunday in the Park.* Contact Graham Chadbone: 07-4121-4341.
30	**New Jersey Live Steamers, Inc.** *Steam-Up.* Contact Karl Pickles: 718-494-7263.
30	**Rugby MES.** *$2^{1}/2$" Gauge Society Meet.* Contact David Eadon: 01788-576956.
30	**Steam LS of Victoria.** *Working Bee & Barbecue.* Contact Graham Plaskett: (03) 9750-5022.
MAY	
1	**Bedford MES.** *Public Running.* Contact Ted Jolliffe: 01234-327791.
1	**Bristol SMEE.** *Public Running.* Contact Trevor Chambers: 0145-441-5085.
1	**Cardiff MES.** *Steam-Up and Family Day.* Contact Don Norman: 01656-784530.
1	**Claymills Pumping Engines.** *Open Day.* Contact B. Eastough: 01283-812501.
1	**Leighton Buzzard NG Rly.** *Indian Holiday.* Enquiries: 01525-373888.
1	**MELSA.** *Labour Day weekend.* Contact Graham Chadbone: 07-4121-4341.
1	**Northampton SME.** *Public Running.* Contact Pete Jarman: 01234-708501 (eve).
1	**Stockholes Farm MR.** *May Day Running.* Contact Ivan Smith: 01427-872723.
1	**Urmston DSME.** *May Day Steam.* Contact A. L. Fussell: 0161-748-0160.
2	**British Columbia SME.** *Model Contest.* Contact Sean Laurence: (604) 931-1547.
2	**Canvey R&MEC.** *Seen on the Table 2.* Contact Brian Baker: 01702-512752.
2	**North Cornwall MES.** *Meeting & Maintenance Evening.* Contact Ray Reed: 01237-424254.
2	**Peterborough SME.** *Bits & Pieces.* Contact Ted Smith: 01775-640719.
2	**Romney Marsh MES.** *Track Meeting.* Contact John Wimble: 01797-362295.
2	**South Durham SME.** *Meeting.* Contact B. Owens: 01325-721503.
2	**Stamford MES.** *Keith Hansel: Making Fairground Models.* Contact Derek Brown: 01780-753162.
3	**Bradford MES.** *Spring Auction.* Contact John Mills: 01943-467844.
3	**Bristol SMEE.** *Peter Heimann: Introduction to Clock Making for model engineers.* Contact Trevor Chambers: 0145-441-5085.
3	**Leeds SMEE.** *Matthew Read: History of the Royal Observatory.* Contact Colin Abrey: 01132-649630.
4	**South Lakeland MES.** *Meeting.* Contact Adrian Dixon: 01229-869915.
5	**Aylesbury (Vale of) MES.** *Dr. Arthur Tarrant: Isle of Wight Railways.* Contact Andy Rapley: 01296-420750.
5	**Maidstone MES (UK).** *Bits & Pieces and Fish 'n' Chips.* Contact Martin Parham: 01622-630298.
5	**North Norfolk MEC.** *Model Motorbike Engines.* Contact Gordon Ford: 01263-512350.
5	**Nottingham SMEE.** *Graham Davenport: Visit to the 12th Model Engineering & Modelling Exhibition.* Contact Graham Davenport: 0115-8496703.
5	**Portsmouth MES.** *Meeting.* Contact John Warren: 023-9259-5354.
5	**Rochdale SMEE.** *Graham Hardy: The LNWR.* Contact Mike Foster: 01706-360849.
5	**Romford MEC.** *Competition Night.* Contact Colin Hunt: 01708-709302.

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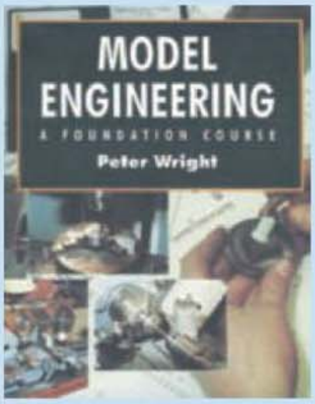

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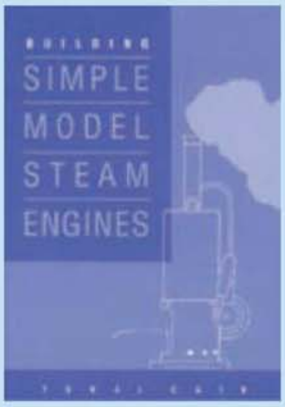

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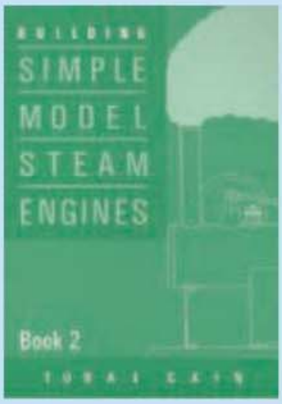

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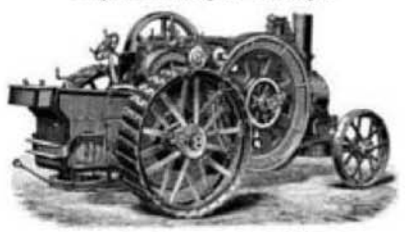

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