# LINK

NEWSLETTER OF THE
COLCHESTER SOCIETY OF MODEL & EXPERIMENTAL ENGINEERS LTD

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*Phot by Editor*

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# Cover Picture

Now for something completely different! Robert Clark entertaining members with a talk about "his other hobby" on 20th January. See page 19.

# Editorial

Welcome to the first edition of LINK for 2012. This is to be a momentous year in the history of our country. We shall be hosting the Olympic Games, celebrating the Diamond Jubilee of our Monarch and, on a slightly less illustrious level, the previous editor of LINK will, by the time you read this, have celebrated his 75th birthday whilst your present editor is about to become an octogenarian!! On the railway front, the National Railway Museum will be staging Railfest 2012, a nine day extravaganza with thirty locomotives including Flying Scotsman, City of Truro and Tornado on display. The event will be by paid admission and will take place from 2nd to 10th June. Admission to the NRM itself will still be free.

How will CSMEE mark such a year? Compared with many other Model Engineering Clubs and Societies our Club is very fortunate both in the facilities enjoyed by members and the level of our bank balance which, in spite of much wringing of hands at the annual financial review, is very healthy compared with many other clubs who struggle to make ends meet. May I dare to suggest that instead of continually thinking of ourselves and our own finances we might mark this year by being a little less introspective and support a charity or two? Our exhibition events provide an ideal opportunity, as do open events at the Club site. Many Clubs hold periodic charity events and raise significant sums of money. Why not CSMEE?

I am anxious to recruit as many reporters as possible from the membership in order that events and visits can be properly recorded in LINK. Although I am able to report many of these events myself I cannot always attend. Furthermore, I think that reporting by various members adds interest as well as enabling us to see the events through different eyes. I am most grateful to those who have helped in this way during the winter season, reporting on the Friday evening talks. There is plenty of scope for more participation, so keep your camera and note book handy during the months ahead!

It is a pleasure to welcome two new by-line names in this edition of LINK. Andrew Becker has written to advise on tool making skills and Eddie Carter entertains with an account of his foray to foreign parts with our Secretary to see what our continental brethren get up to on the model engineering front. What have you been up to? Write and let us all know about your current workshop project, or perhaps you have learned a lesson the hard way and can save the rest of us doing the same. Confession is good for the soul!

Finally, after many years of plugging the idea I am delighted to see that management have decided to continue with the provision of children's birthday parties as a means of boosting the Clubs income. There is no such thing as a free lunch, however, and this extra income comes at the cost of some member's time. Don't let the same people carry the burden all of the time. Although the general running of the parties is the responsibility of the parents half a dozen Club members are needed to run the locomotives and generally oversee activities. Have a word with the Secretary and he will let you know when you can be of help. Apart from providing the children with enjoyment and helping the Club's finances it is an opportunity to play trains!

**Norman Barber**

# From the Chair

At the time of writing it looks as if winter has finally arrived. There are still a few jobs to do this year. One major task is the repair of the retaining walls of the raised track bridge. Water has found its way between the retaining walls and the bridge deck concrete and frozen during the winter months. This has pushed the walls away from the deck. If nothing is done water could wash away the sub base from under the deck and give some major problems.

The Sunday gang has started to put a turnout into the ground level track near the walnut tree so that we can have a connection to the raised track. This will be done with a swing over section on to the raised track using the old sections that were made by Brian Upson. These will be altered to give a much fairer curve so that locos can be transferred from one track to the other. The turnout will be manually controlled and locked with a padlock for safety. The key will kept in the main signal box.

We still have to obtain some ballast to put around the raised track. Jeff Laing and his gang have been putting wooden retaining boards around the embankment sections of this rack to keep the ballast in place.

The boarding on the ground level track level crossing will also have to be replaced as the old ones have started to break up

I will be running some more training sessions for the main signal box this year starting in the spring. If anyone would like to learn how to operate the box please put your name on the list in the Club House.

Now that all the major works on both tracks have been finished it is time to enjoy ourselves and make use of what we have made over the past fourteen years. Yes it really is that long. The Club House was started in April 1997 and work started on the raised track in October of that year.

**Andy Hope**

# Secretary's Report

The Autumn/Winter talks programme is now well on and has, I think, been well received, at least if the number of members in on a Friday Night is anything to go by. So congratulations to all those talented members who gave talks and to the many (usually 40+) who came to support them.

I have even now to think ahead for next year and would welcome suggestions for speakers. I am planning at the moment to invite back Keith from CuP Alloys and Chris MacDonald who has a new talk on a railway theme and has been well received in the past. I hope members will also contribute talks as well but as it is getting increasingly difficult to find speakers and meet their travel expenses we may have to find some other ways to keep ourselves entertained.

We tried this last Christmas having a party rather than a more formal Dinner and I think it was a success. The Speaker, Keith Lovell led us with some singing of Christmas carols which was a bit unexpected but everyone joined in, no doubt put in party mood by the Mulled Wine on offer. The raffle was run with prizes all donated and raised enough for a cheque for £50 to be sent to St Helena Hospice.

Just reverting back to this Winters programme, we have Bob Clarke on 2nd March giving us some instruction on basic first aid, the reason for this being that when a member scraped his head on the signal gantry stopping the blood flow was quite difficult . Bob started by telling me that the dressings used were all the wrong size and couldn't possibly stop the bleeding and as I didn't really understand what he was talking about, it made me realise that a bit of basic training wouldn't come amiss. As we had a Friday evening free, here he comes again!

There has been a general consensus that we continue with the Children's Birthday Parties this year as they really help club finances. First call will be to members wanting to host a party for their grandchildren, so please get in touch with me soon if you want to make a booking. We plan for up to a total of 6 parties. The cost will be £100 for a 2 1/2 hour event with a maximum of 15 children. Where we can, we plan to use the club locos running on the raised track. We hope that, with sufficient volunteers, we will be able to avoid calling on the same members each time. (*See page 10 - Ed.)*

It was great to see Ian Laycock back with the Wednesday gang after a spell in hospital and to report that Mick Wadmore escaped with only bruising from a crash which wrote off his car.

**Jon Mottershaw**

## Treasurers Report

We welcome the following to our Society:-

| | |
|---|---|
| Mac Royce | Full |
| Peter Stephens | Full |
| Ellis Philip | Full |
| Jack Montgomery | Junior |

Membership now stands at 136 including 13 juniors and 1 student, providing all those with subscriptions outstanding renew.

Please note: this will be the last LINK for those of you who do not renew.

**David Cocks**

## Event Organisers Report

Now that the Christmas festive activities are a distant memory, we can start to think about the forth coming running season and related club events.

The following list shows dates for events that are already fixed and are displayed on the calendar in the club house:-

| | | |
|---|---|---|
| Club Steaming days | 1st April, | |
| | 6th May, | |
| | 1st July, | |
| | 11th August | (note - not 1st Sunday of the month) |
| | 6th August | |

Family Days 3rd June
2nd September

All these events start from 10:00hrs and run until whenever you wish to go home. These dates WILL NOT be changed.

GL5 have been invited to come along on the weekend of 29th / 30th September. The running will continue until 21:00hrs - i.e. until after dark. Do come along - the ground level track it is truly impressive in the dark.

At the time of writing I am engaged in talks with North London Society of Model Engineers and the Romney Marsh Model Engineering Society to arrange visits to both of these clubs and for them to visit us during the summer period. Keep a look out on the notice boards for exact dates and times etc.

Finally, volunteers are always needed to help with running any of the above events. If you would like to help please come forward and speak to me. My best wishes for the coming running season.

**Ian Pryke**

## 2012 Exhibition Programme

The Society will once again be exhibiting members' models at the following shows during 2012:-

Langford Museum of Power "Easter Show" on SUNDAY 8th April 2012.

"Aldham Olde Tyme Rallye & Fayre" on SATURDAY and SUNDAY 9th and 10th June 2012.

Fingringhoe "The Five Parishes Summer Show" on SUNDAY 5th August 2012.

"The Great Bentley Show" on SATURDAY 1st September 2012.

In addition to these exhibitions CSMEE will be holding another "Meet the Neighbours Day" at our Lexden site on SUNDAY the 9th September 2012.

Any help you can give with the loan of models and/or stewarding at the above events will be greatly appreciated. Please contact Mick Wadmore by e-mail or phone if you can help.

**Mick Wadmore**

# The Wednesday Wrinklies Report

Today, as I write this report for LINK, is the first day for a long time that no one has had a "steam up" on a Wednesday. The temperature has been down to nearly zero all day, and there was no one mad enough to venture out onto the tracks. It shows that we do have some common sense after all.

Some people were at work outside ,however. Don Black has now finished putting down the small slabs under the steaming bay fences. This will remove the need to strim the grass under the fences, and the mower wheels can be run over the edge of the slabs when the grass is cut. The steaming bays do now look good, neat and tidy. Well done to Don for all his work.

Gordon Ager continues with the reworking of the steps down to the tunnel exit and tidying up of the cutting near the tunnel exit. This also now looks a very professional job. He has been aided by Dave Hammond whilst doing work. Further round the rails Jeff Lang was to be found installing slabs to the cutting side walls. There is now only a short length to do to have slabs from the mouth of the tunnel right up to the entrance bridge. Today Jeff was being assisted by Bob Clarke

I can now report that our locomotive Butch is an operational loco once again. It was given a track test a couple of weeks ago and steamed very well. There are a couple of niggles to sort out, but these do not prevent the locomotive from being declared a good runner. I am grateful for the support that Bev Corkett has given me in getting the locomotive fit for use.

Today,1st February, I started to refurbish the old passenger trolley for use on the ground level track. This is the trolley that was last used for pulling passengers on the portable track when the Club did track bookings at fêtes etc. The wheels all need re-profiling and fitting onto new axles in the bogies. At some time in the distant past someone has attempted to weld the cast iron wheels to the steel axles. This will not work as the materials are not compatible for welding. The bogies are for 7 1/4" gauge, which will give a much improved ride on the ground level track on invitation days. I have a number of photos of this trolley in use on the portable track at fetes, with some of them needing a loco at both ends, pulling and pushing when the ground was not level at the event site.

In the club house Mike Gipson has been doing a good job lotting up the items ready for the club auction. Although there are still two weeks to go, there is a very good selection of for club members to bid for.

The use of the club locomotives was discussed at a recent committee meeting. the I intend to keep a log book of who uses the locos. To have one of them for a private steam up you will be required to sign that you are competent to run the locomotive without supervision. You will also be required to sign that you have the necessary steam and running gear lubricants. We are looking to provide the oils for the club locomotives, and this is to be investigated. The next question is what to do about a blower. The current club owned blower is a hand driven machine, used when there was no power available. The best solution is to have your own. They are easy to make, or you could buy one, although they are not cheap. The driving instruction will use both Butch and Sweet Pea during the coming year. I expect that Andy will also be giving driving instruction using Firefly.

This is the first Link of 2012 and I have totted up my own running mileage for last year. In 2011 I covered 173 miles on my locomotives, mostly on a Wednesday. I have not counted any mileage covered on the club locos for driving instruction. This equates to 865 laps of the raised track. Why not come along and join in on a Wednesday.

**Geoff King**

# How to make a Master Square

## Introduction

The making of any component relies upon some basic fundamental parameters that form the geometry of the item. This geometry relies on a number of constraints - squareness, flatness, parallelism, roundness, cylindricity and angularity. Some or all of which are important in any particular case. In this article I propose to describe a foundation technique that can be applied to producing a truly square component. This *comparative* technique is often used in a tool room environment to generate a reference square. The accuracy of this square will be as precise as you chose to make it. Within +/- 0.001" over the length of the component should be easily attainable. With practice finer limits can be achieved, depending only on the sensitivity of the Dial Test Indicator employed.

## Tools required.

- Dial Test Indicator (DTI) Lever or plunger type.
- DTI comparator stand or magnetic base
- A straight edge *(a parallel or a piece of ground flat stock will work equally well)*
- Surface plate *(your milling or drilling machine table will work equally well).*
- Some G-Clamps
- A suitable angle plate *(or vice if you prefer)*
- Milling machine or lathe *(a surface grinder if you have one)*
- Fly cutter or milling cutter of your choice
- Some random strips or pieces of packing *(to put under the straight edge).*
- Fine file or oil/slip stone to remove burrs and sharp edges

For making a tool similar to that used to illustrate this article a piece of flat bright mild steel bar say 3" x 3" x ½" thick in old money (80mm x 80mm x 12mm) would be suitable.. If you are fortunate enough to have a piece of close grained cast iron of about this size this would be ideal. The sizes are not critical as the objective is to produce a reference square only – i.e the faces have to be at exactly 90 degrees to each other but not to any fixed dimension.

*The" square" does not have to actually be a square! – It's the technique that we are applying that counts.*

I will be using my faithful Dore Westbury vertical milling machine to illustrate the procedure but a lathe could be used to equal effect.

For work holding either a vice or angle plate may be used. The photographs show an angle plate being used for the purpose. If a vice is used be sure that it's base is parallel to the machine table.

Be careful to remove all burrs and sharp edges as the machining progresses.

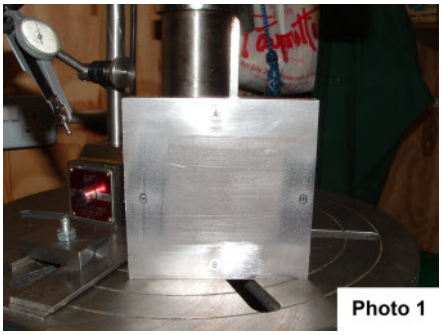


Photo 1

To make things more intelligible we will give the sides of our square identity's "A, B, C & D". Where "A" is opposite "B" and "C" is opposite "D" – see Photo 1.

## The Method

1. Ideally the larger flat side faces should be skimmed to ensure they are parallel. This is not essential as long a datum side is defined. *(Mark your chosen face with felt pen or a letter punch)*

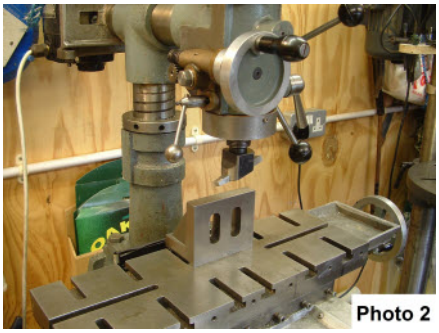


Photo 2

2. Bolt a suitable angle plate to your milling machine table – Photo 2. *(On a lathe the angle plate will need to be aligned to be parallel to the bed or square to the cross-slide with a DTI)* On a vertical milling machine this doesn't have to be exactly parallel to the x-axis.

3. Clamp the material to the angle plate and machine face "A" – Photo 3

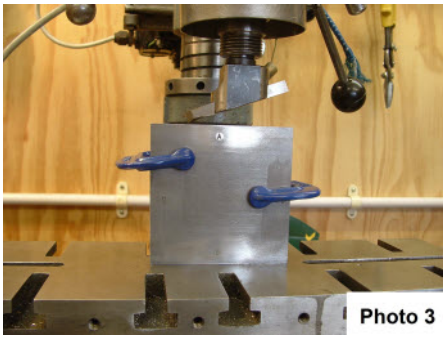


Photo 3

4. Reposition the work with face "A" sitting on the machine table. Clamp and machine face "B" – Photo 4. Face "B" should now be parallel to face "A". This can be checked this using the DTI as shown in Photo - 5.

5. Run the work under the DTI aiming for a comparative DTI indication/reading of zero from end to end. (This first comparative reading is important – *If you don't have a pair of parallel faces from which to start you will be chasing your tail and will never get a reference square.*

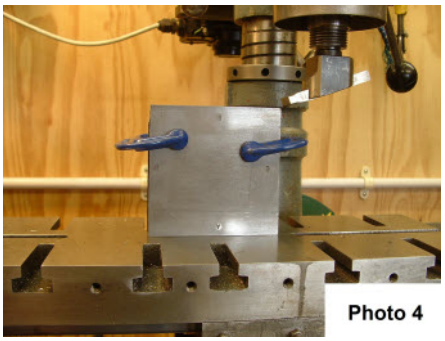


Photo 4

6. Now do exactly the same for faces "C" and "D". Here again the faces must be parallel – *don't worry about squareness at this stage.*

7. You now have a piece of metal with two sets of parallel faces "A – B" and "C – D". These faces/sides will not be square to each other – the plate will be in the form of a rhomboid or diamond. – Photo 6

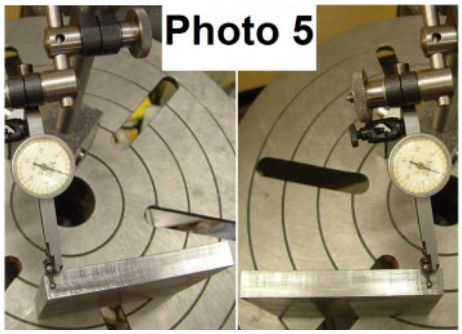


Photo 5

8. Clamp the straight edge with some packing beneath to the surface plate or machine table. *(This packing creates a raised reference edge that prevents any trapped dirt or swarf form producing any false readings on the DTI)* Position the DTI on its stand/mag block behind the straight edge. – Photo 7

9. The next stage is to *"square"* the faces "A" and "B" to the face "C". Stand on face "C" and present face "A" to the straight edge and set the DTI with say a 0.040" loading and then re-set the loaded DTI to Zero. – Photo 8

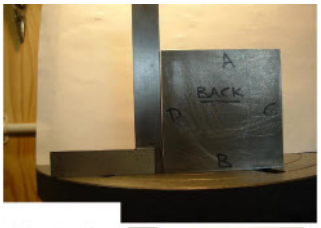
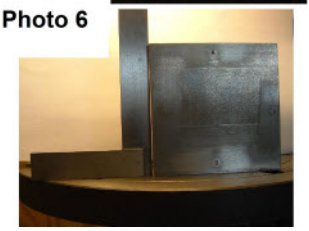



Photo 6



10. Turn the block around (sitting on face "C") and present face "B" to the straight edge. Note the reading will be plus (+) or minus (-) from the zero reading. This difference will be twice the error of *"out of squareness". This was 0.040"when I machined this example.*

11. It is now necessary to correct the *"out of squareness"* by re-machining the "C" face by placing some shims equal to half the "out of squareness" under the minus end of face "D". This was done with a 0.020" feeler gauge for my example – Photo 9. The shim thickness can be checked before machining by placing the shim under the relevant corner and present to the DTI again as in step 11 – the DTI should now read zero.

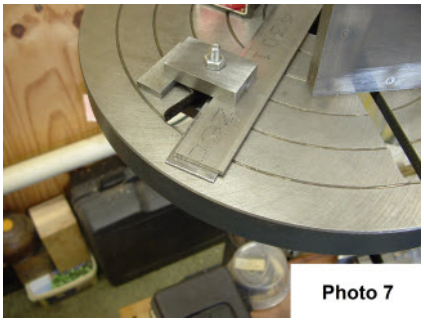


Photo 7

12. Remove from the machine and this time with face "C" on the table present face "A" to the straight edge and zero the DTI. If you have got it right when you present face "B" to the straight edge the reading will be zero or very close to it. *Any difference in DTI reading can be removed by re-shimming with half the difference and re-machining. This happened to my demonstration example where the residual error was 0.004" . .I had to I re-machined with a 0.002"shim. –Photo 10.*

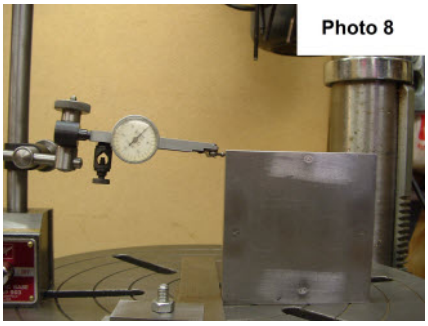


Photo 8

13. Now re-set the block with face "C" on the milling machine table to machine face "D" parallel.

14. Remove from the milling machine and with face "D" on the table present faces "A" and "B" again to the straight edge the DTI should read zero or again close to zero.


Photo 9

15. The important part is to ensure that the pairs of face "A – B" and "C – D" are parallel. This then allows the parallel faces to be squared up to the DTI for *comparative measurement*. In effect the DTI is not reading anything, it is just a reference gauge or fiducial indicator. – Photo 11 shows the DTI with a comparative reading of +/- 0.0005".

16. For comparison – Photo 12 shows a the angle plate used in this article as within 0.0005"

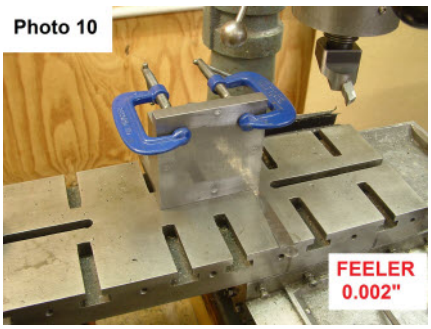



Photo 10

**Notes**

If the requirement is to produce a square component to an exact size then it is best to make it over size and square and then simply machine the parallel but square part down to size.

If a cube is required it is necessary to do all of the above in one plane and then turn through 90° and repeat in this new plane. – You will need to keep your wits about you because it's very easy to become disorientated and the scrap bin beckons!

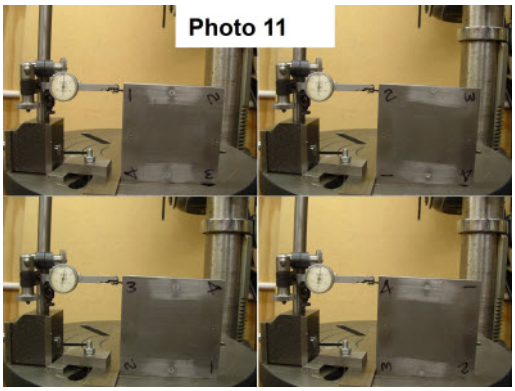


Photo 11

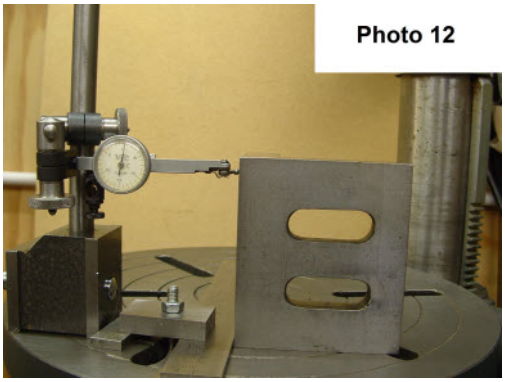


Photo 12

If you have a surface grinder it is often quicker to *"Tip Grind".* This is where a step is ground along 95% of the side thus creating a step that replaces the shim.

**Summary**

I was taught this method as an apprentice fresh from school at sixteen years old and where eventually zero on the DTI became automatic and working between two machines at once!This technique was used regularly on standard cast iron angle plates and box angle plates ranging from 3"x 4"x 5" up to 24"x2 4"x3 6" and larger.

Hopefully you have now produced a reference square that you can use with your DTI and straight edge. This allows you to set your DTI to zero and check other components for comparative *"squareness". – Good Luck!*

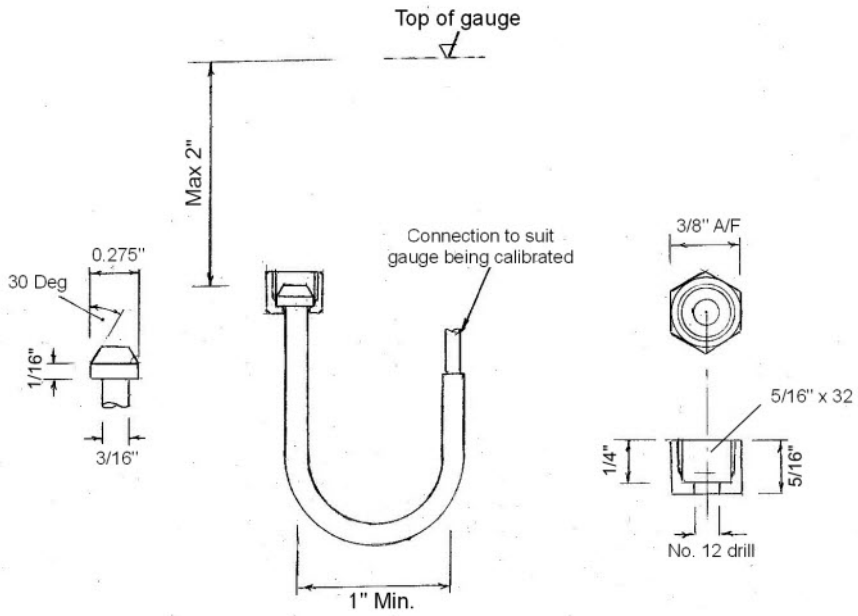
**Andrew Becker**

*Advertisement*

# Pressure Gauge Calibration

In the March 2011 edition of LINK the Boiler Test Team announced that following the acquisition by the Club of an accurate Standard Test Gauge it was intended that in future it would be a requirement for the calibration of boiler pressure gauges to be checked before the annual steam test was carried out. It had been intended that this procedure be implemented from the beginning of 2011 but unfortunately the necessary test rig was not completed in time. This situation has now been rectified and the test equipment, pictured herewith, is now in service. Clearly, it will be necessary to connect the gauge to be calibrated to the rig. Most ¾" and 1" diameter commercial gauges have a 3/16" x 40tpi union connection and the test equipment is fitted with a suitable adaptor. If your pressure gauge has a connection which is different from this it will be necessary to provide a suitable adaptor as shown in the accompanying drawing. It will be the owners responsibility to provide this adaptor when presenting the boiler and gauge for testing. If for some reason you are unable to make this yourself a member of the Boiler Test Team can arrange for a suitable adaptor to be made for you for a nominal charge.

Pressure Gauge Calibration Rig in use testing a 1" diameter gauge




GAUGE ADAPTOR

**The Boiler Inspection Team**

# Jottings from the Workshop by "Artisan"

# Finishing, Painting and Lining- Part 1

At the 2011 "Models Night" Club meeting a member asked when I was going to write about my painting and lining techniques. Although I have had some degree of success in this area I feel poorly qualified to write on the subject and have avoided it since the original question was asked. Being rather hard pressed to think of a subject for "Jottings" for this edition of LINK however, I have decided to "bite the bullet" and pen a few words on the subject of finishing generally.

## Detail Finishing

It is a sad fact that many well built models are spoiled by the lack of attention to the finishing. I refer here not only to the actual painting stage but to the finishing of the basic components, whether they are to be painted or not. It is not uncommon to see file marks left on a hand finished part or machining marks left on milled or turned components which are to be left in the bright condition. There is no excuse for this – it simply requires a little time spent with very fine files and abrasive paper to achieve a blemish free finish. This is not to say that a highly polished finish is required, or even desirable. My own technique is to finish the surfaces of components such as valve gear links and levers by draw filing with a fine file followed by polishing along the length of the part with progressively finer grades of silicon carbide abrasive paper backed with a small stick of wood (Figure 1). For most components finishing with 240 or 400 grit paper will leave a suitable surface appearance. For non ferrous components requiring a polished finish it may be necessary to work down to 1200 or even 1500 grit paper before finishing with a paste polish such as Autosol Autobright.

Figure 1
Finishing a Valve Gear Component

Another aspect of finishing which often does not receive the attention it deserves is the shaping of the ends of links and levers. These are usually formed with a radius around the centre of the hinge pin. The outside of the link does not generally perform a function requiring great precision but if the shape is not formed accurately the appearance is awful! Similarly, if the end of a link is in the form of a fork the location of the slot forming the fork should be accurately located within the width of the end. It may not matter functionally if one cheek of the fork is ten thou wider than the other, but here again, it will look awful. It is well worth while taking great care when setting up to drill the pin holes in the ends of links or mill the slots in fork ends to ensure that they are accurately positioned. A hardened steel filing button makes forming the radius on the end of a link a straight forward operation. The buttons can be made up as the need arises and kept for the next similar job. One soon accumulates a range of such buttons to suit different size pin holes and different radii. I have a watch makers storage case containing twenty small round boxes with transparent lids which is ideal for storing buttons (Figure 2). The use of filing buttons to shape the ends of links is satisfactory for small components with radii of up to about 5/16". For larger components a better result may be

Figure 2
Filing Buttons and Storage

achieved by milling on a rotary table. When finishing links and levers of this type it is important to ensure that the edges are kept flat and square to the adjacent faces. It is all too easy to allow them to become convex and the corners to become rounded as polishing proceeds.

The installation of nuts and bolts is another aspect of finishing which is frequently neglected. It is hardly necessary to mention that if a reasonable representation of prototype practice is to be achieved slotted head screws are out of place in the majority of locations. Standard size hexagon heads also often look out of place and it is worth buying "one size smaller" hexagon bolts and matching nuts in order to achieve reasonable appearance whilst not sacrificing the strength of the fastening. The ends of studs and bolts protruding through nuts should be trimmed to no more than one or one and a half threads showing and the end of the thread should be finished off by doming, not left ragged, as cut. Nothing looks worse than a row of nuts each with a different length of thread protruding – finish them all to the same length.

Holding small components for hand finishing operations sometimes presents a problem. I find that a small tool makers vice and a finger plate are invaluable aids. These tools are held in the ordinary bench vice and provide rigid support and easy access to small parts which would be difficult to hold in an ordinary vice. See Figures 1 and 3.

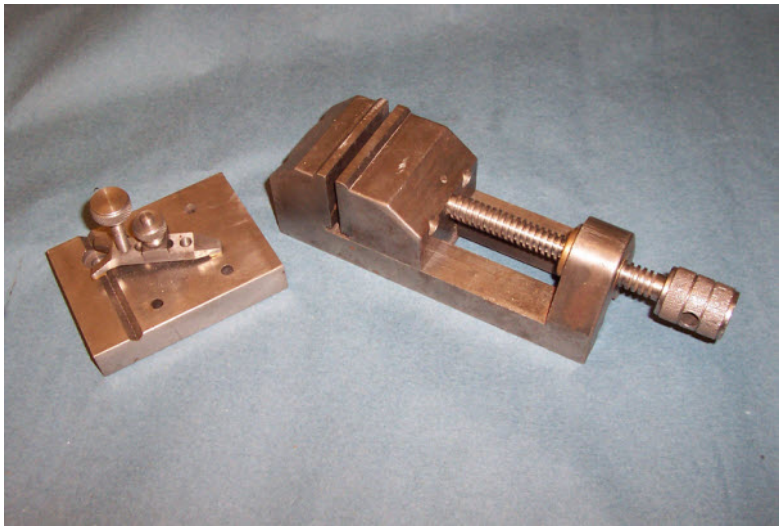


Figure 3
Finger Plate and Toolmakers Vice

These notes highlight a few specific areas where attention to detail makes all the difference to the appearance of a model. There are plenty of other areas – pipe work, for example, which I have referred to in earlier jottings – where a little care and time pays dividends in the appearance of the final product. This has nothing to do with producing true scale models. Anyone embarking along this route will already be aware of the need for scrupulous attention to detail. I have never attempted to build to true scale, but do expect my models to be reasonable representations of prototype engineering practice.

## Painting

A great deal has been written on the subject of painting models and it is unlikely that I shall be able to add anything new. One of the most complete works on the subject is "How (not) to Paint a Locomotive" by Christopher Vine and provides very comprehensive advice and information. Almost too much, in fact. I was speaking to a member of another Club recently who told me that he had been completely put off by the amount of detail in Christopher Vines book. This is unfortunate because the book contains a great deal of very sound advice, but it is necessary for the individual to distil from it that which is relevant to his own requirements. Another useful treatise on the subject is "The Finishing Touch" by Bob Shephard. This book is particularly helpful if air brushing is to be your chosen method of application. It is, however, always useful to know of other peoples experience, so I will describe my own approach to the matter and try to relate some of the lessons that I have learned and what works for me. Painting is not a skill that can be learned from the written word. Furthermore, it is a very personal skill. What works well for one person may be a disaster for another. Only practice will teach you what works for you personally, but other peoples experience provides a good starting point.

Decisions about painting procedures have to be made at a fairly early stage in the building of a model. Some people decide that they will "paint as they go". In other words, component parts are painted as they are made and erected. The problem with this procedure is that it is almost impossible to avoid damage to previously painted parts as more components are added to the assembly. Unless the model is a very simple one it is unlikely that this procedure will result in a satisfactory final result. Other people will build the model completely and test run it in the unpainted condition. This method has the advantage that any snags can be ironed out without danger to the paint finish and is adopted by many locomotive builders. The disadvantage is that adequate cleaning of the components in preparation for painting is difficult. A combination of these methods is, of course, a possibility. My own preference for locomotives and steam powered engines generally is to build the model completely without any painting and test run cold, on compressed air. The model is then completely stripped for cleaning and painting. This method allows mechanical problems to be resolved without damage to paint work but is not, of course, infallible. There is a world of difference between running cold on compressed air and under steam, but I have found it the most satisfactory approach and have not experienced any serious problems. Whichever approach you decide to adopt it is worth bearing in mind a piece of advice given by Christopher Vine in his book, namely "make to paint". In other words, think about the eventual painting of the model throughout the construction stages and where appropriate make the components and in particular, sub assemblies, with ease of painting in mind.

Turning now to the actual painting process, the first and most fundamental lesson to learn is that "good finishes come from underneath". In other words, it does not matter how much effort is put into the actual painting process, if the underlying surface has not been properly prepared that effort will be wasted. Every scratch, dent and imperfection in the base surface will appear magnified once it has been finished with gloss paint. The darker the colour the greater the magnification, gloss black being the most difficult finish with which to achieve perfection. It is not true that these small imperfections will fill with paint and that a little rubbing down will make them disappear. The surface tension of the paint film draws the liquid paint away from scratches and "dinks" and if anything exaggerates them. Small scratches can usually be polished out with abrasive paper, but do not perform this operation on too local an area. You may only be removing a couple of thou of material

but if this is done over too small an area the surface will appear hollow in that area when the final gloss finish is applied. Large hollows can be filled with soft solder and rubbed down to a fair surface. This was, I believe, the technique used to fair imperfections in the body work of Rolls Royce cars. It has the advantage that there is no risk of the filler shrinking. Nor is there any risk of incompatibility between the filler and subsequent paint coatings. If you do intend to use synthetic filers, wait until the surface has been primed before applying the filler. More of this later. Take time over the preparation and seek perfection. You are unlikely to achieve it, but it is worth trying! This brings us to the second fundamental lesson to be learned – don't be in a hurry. This applies to every aspect of finishing our models, and particularly to painting.

Having prepared the job for painting it is decision time again – how is the paint to be applied? There are a number of options. The most obvious and basic method is brush painting, followed by spraying. There are a number of possibilities if spraying is the chosen method. The first and superficially simplest method is to use aerosol cans. The next possibility is spraying using a spray gun, with the air brush as yet another alternative. I have tried all of these methods with varying degrees of success. The achievement of the sort of finish which I expect is very difficult using a brush and I now reserve the use of brushes for touching in details such as bolt heads after final assembly. I have seen superb hand painted finishes and there is no doubt that in the right hands the technique will yield just as good a result as spraying. But not mine!! The aerosol offers the advantage that the paint is ready mixed to the right consistency for spraying and the spray gun is built in. No special equipment is required. The great disadvantage of the aerosol is lack of control. There is no means of adjusting the paint delivery or propellant pressure and I find this quite unacceptable. The only way in which the paint delivery can be controlled is by the speed at which the spray is passed across the job. Paint delivery is usually excessive for small components and for larger areas, such as boiler barrels and tender sides, it is far too easy to apply too much paint with resulting "runs". My own preference is for a small spray gun for most of the parts of a model such as a 5" gauge locomotive and an air brush for small parts. I have sprayed all of a small 3 ½" gauge locomotive with an air brush. Although the result was entirely satisfactory I would not do so again. Because the paint must be very well thinned for use in an air brush I find it difficult to obtain a uniform covering without the risk of runs when spraying large areas. The air brush is, in my opinion, best reserved for small parts and touching in detail such as bolt heads in the final stages of assembly.

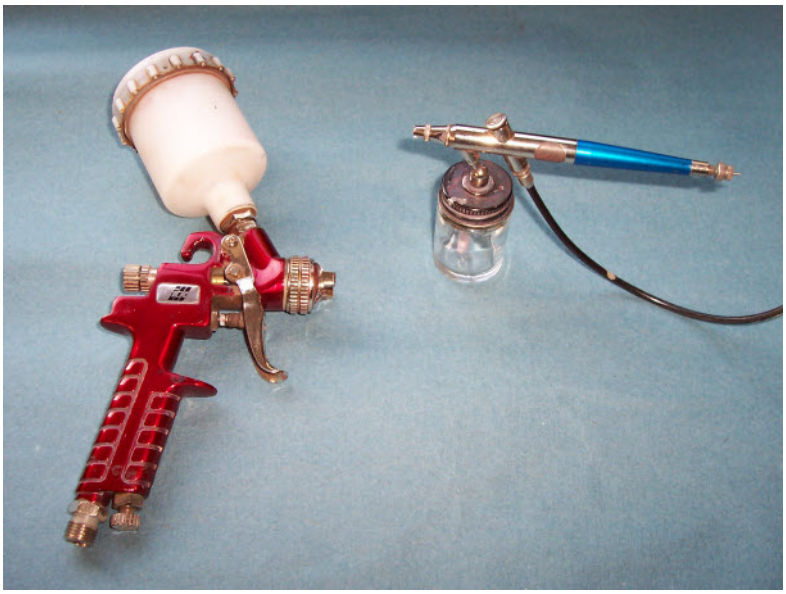


Figure 4
The Authors Spray Gun and Air Brush

The spray gun and air brush which I use are shown in Figure 4. The spray gun is a gravity fed mini gun with a 250 ml cup and provides adjustment for paint flow, air flow and spray profile. For small components I use an unsophisticated bottom fed Badger air brush. There is no benefit in spending

large sums of money on a sophisticated instrument which is intended for high precision artistic work. Such a device would, in fact, be unsuitable for most general model painting. The choice of application method is one which everyone must make for themselves and is best based on experience. Try the various methods yourself to find which suits you and yields the best results, but don't experiment on your models!! If a paint job goes wrong a great deal of work is involved in putting it right, usually involving stripping and starting again. It is worth taking great pains to get the job right first time, so practice on scrap material, not your model. Old tin cans make good practice bases.

Clearly, there is a great deal more to say on the title subject of this article and space will not allow more in this edition of LINK. Next time we will think about the choice of paint, its application and lining.

# Letters to the Editor

Dear Sir,

Trying to sharpen smalls drill bits with some degree of accuracy, especially the smaller number drills, is to say the least difficult. After years of looking for a proprietary jig without success, I recently came to the conclusion that to make one was the only way to overcome this particular task. An article was printed in LINK a year or two back, No19 in 2003 to be exact (how time flies) submitted by Keith Wraight. Following a study of said article and not feeling very confident material from stock (actually the scrap box) was marked out and machined to the drawing aided by Kieth's words and music. The five pieces and two Allen head screws later a jig was assembled and tested. Amazingly it worked first time and with practice has given even better results. I would encourage anyone who finds sharpening tedious to make one of these great gadgets.

*Photos -Graham Austin*

Drill Sharpening Jig Details

The thought did occur that if LINK No. 19 had been distributed electronically would it still be retrievable today some two computers later unless it had been printed out at the time? As I said in a previous letter, how many of us would know what they would require almost 9 years ahead.

Interesting to note also that our Hon Sec was listed as a new member in that same edition.

**Graham Austin**

*Editors note*

*This looks to be a very handy device. Keith has agreed to the re-publishing of his original article in a future edition of LINK*

# Winter Programme Reports

In the absence of a volunteer to organise the winter programme our secretary decided that this year the entertainment should be "home grown" and all talks and events have been carried out by members. This has proved a great success as the following reports record.

## October 14th

The winter programme of talks was launched by Graham Austin with a talk and slide presentation on the rebuilding of Liverpool Street Station. Having spent some six years travelling daily to Liverpool Street from North London in the days of steam I found this a fascinating presentation. The scale of the project and the difficulties that must have presented themselves in keeping the station operational were brought home by the numerous slides Graham showed. One can only speculate on the chaos and inconvenience suffered by commuters during the lengthy rebuild period. The finished station and surrounding buildings were quite unrecognisable to me. A remarkable engineering achievement.

**Editor**

## October 28th

Paul Davies presented the first part of his talk entitled "Airships over Essex", Paul discussed the development and use of airships up to and during the 1914 – 1918 war, covering both the British and German machines. The talk was illustrated with archive photographs showing some of the craft of the time and their untimely end at the hands of the, to us, primitive fixed wing aircraft in use in those early days of flying.

**Geoff King**

## November 11th

Paul Davies delivered the second part of his talk "Airships over Essex", dealing with the development of English and German designs which took place between the wars. Of particular note was the competition between the privately built R100 and the government sponsored R101 to design a commercially viable airships for the transatlantic route to Canada. These developments were doomed to failure, R101 crashing and burning en route to India. Although R100 made one return passage across the Atlantic it was grounded for a considerable time following the crash of R101 and eventually scrapped at the end of 1931

**Geoff King**

## November 25th

There was a good turnout of old and new members for a talk by Norman Barber on the subject of workshop techniques for us to remember and put into practice in their own workshops.

Norman began by explaining his route to editorship of LINK together with ideas for the future. He then set the scene for his presentation by showing a picture of his workshop before moving on to cover the

first of six parts of his presentation, that of jigs and fixtures. The advantages of making jigs to ensure work stability and accuracy was illustrated by excellent photographs as were the five sections to follow. Hints on riveting came next with a method for protecting surrounding surfaces by a cardboard guard. Use of old files to make form tools was thought provoking, involving heat treatment to be covered later as a separate subject. Methods used for wheel quartering and the use of adhesives, proved under test conditions, were presented. Various machining operations including set up for cylinder boring and port machining were described and shown on the screen.

In conclusion Norman explained the structure changes taking place in metals when heating to harden and temper, complete with correct and wrong ways of, and reasons for quenching.

All present then gave lasting applause to show their appreciation for an informative and entertaining evening.

**Graham Austin**

## December 9th

This was the occasion of the annual Quiz and Raffle. The quiz was organised by Bob Taylor and Don Green, who acted as quizmaster. Six teams of three struggled to answer questions on a wide range of subjects from historical events to naming railway stations. Everyone enjoyed the challenge, although the general conclusion was that none of those present should enter for the Brain of Britain contest!

Alan Ilet had organised the raffle again this year. While the results of the quiz were being assessed Alan supervised the draw and distribution a good number of excellent prizes.

**Bob Taylor**

## December 26th - Boxing Day Steam Up

*Phto - Lesley Aldons*

Geoff King with festive headgear drives a Christmas Special

There was a large number of family and friends at this popular annual event. Six locomotives were running providing rides on both the elevated and ground level tracks. As usual there was a big demand for rides by members and their guests, both young and old. Thanks to all the members who ran their locos or helped to run the event.

**Bob Taylor**

## January 6th 2012

Ian Pryke entertained members with an update on his experiments with white metal casting in the home workshop. Ian has been developing his expertise in this field for some time and explained the preparation of the Silicon Rubber moulds, of which he had a good number of samples to show. He explained the procedure for generating the split line in the mould to facilitate removal of the casting in due course. Ian concluded his talk with a demonstration of casting a number of small wagon components including buffer stocks and axle boxes. The picture shows Ian in the process of pouring one of the demonstration castings.

**Editor**

*Photo - Editor*

Ian demonstrates pouring a casting

## January 20th

Bob Clarke entertained the membership with a talk about the history of the Winchester rifle. Bob has obviously studied his subject in great detail and had on show a selection of guns from his collection, many of which he still shoots regularly in competition. During the course of his talk Bob dispelled many of the illusions we may have about the Winchester's place in the history of the Wild West, to say nothing of the lack of authenticity of many of the scenes in Western films. See cover picture.

**Editor**

## January 22nd

This was the occasion of the annual Club pilgrimage the London Model Engineering Exhibition at Alexandra Palace. This year's exhibition was a disappointment to the writer. The trade was well represented although not quite as well as usual. If the main reason for visiting the show was to stock up on workshop material or tooling one would probably have been satisfied. However, although there were some nice models on show the general standard was nowhere near that seen at Sandown Park or the Midland Exhibition.

**Editor**

## February 3rd

Treasurer David Cox made his annual informal presentation of the company accounts to appraise the membership of the organisations financial situation ahead of the preparation of the final accounts for the AGM at the end of April. David predicted that, although he expected another year of deficit for

2012 he anticipated that, providing subscriptions for 2013 were increased in line with inflation and assuming some modest income from holding birthday parties, 2013 would be deficit free. The members present indicated that they would be in favour of recommendations to this effect being placed before the AGM.

**Editor**

## February 17th

This was the occasion of the annual auction, conducted as usual by Hugh Mothersole supported by his team of porters and accountants. Although there were not as many items available as in previous years the offerings did include a very nice Southbend lathe and a small instrument lathe. Both these machines sold for a good price. In all 146 lots came under the hammer. In previous years there have been too many lots to dispose of in one session and a second auction evening has been needed. A second event was scheduled this year for the following week but this was cancelled following the successful disposal of all lots during the first evening.

**Editor**

The remainder of the winter programme is expected to continue as announced in the flyer circulated with the previous edition of LINK except that the talk on "Paxman Archives" by Mike Gipson, scheduled for 30th March will be replaced by this years Model Night. Bring along your current projects to reveal what you are up to now or to show how much (or little!) you have progressed during the last twelve months.

# Driving Experience

Tentative enquiries have been put in hand to arrange a visit to the Bure Valley Railway to enable members to experience driving a 15 inch gauge locomotive hauling a train of three or four coaches "for real". The outing would be for up to twelve members (and wives if they wish to participate). Each participant would have the opportunity to handle the regulator for about three miles. The cost would be approximately £40 per person assuming twelve participants. The event would be scheduled for some time in early spring or in the autumn. If you are interested please contact Geoff King for further details. Whether the outing is organised will depend on the number of members interested and making a commitment.

# A trip to the Echtdamph-Hallentreffen in Karlsruhe, Germany

Late last year Jon, our Secretary and I were having a chat about the Echtdampf-Hallentreffen that was regularly held in southern Germany. We knew that Alex Walford had visited it and he gave positive feedback. Jon and I decided as we are not getting any younger that we would make a positive effort to pay a visit this year.

Investigations found that this year's exhibition was to be held in Karlsruhe. Details were obtained and as we knew that a door to door coach trip including hotel was being arranged by SMEE, Jon sent away for two tickets. All was set, so we thought. At the eleventh hour however a note arrived saying that as the uptake had been low the trip was cancelled!

Don't panic Mr Mainwaring!

We had to action plan 'B'.

We had to find a plan 'B'.

In the end Jon booked budget tickets on Eurostar from Ebbsfleet International to Paris Nord and TGV tickets from Paris Est to Karlsruhe. Paris Nord and Est. are two quite imposing buildings which are being looked after and were quite welcoming. A most pleasant change from the uninviting drabness of Ebbsfleet.

My input was to find a suitable hotel. Searching the internet I found a small hotel within a couple of hundred yards of the Station.

We arrived safely in Karlsruhe and to our delight discovered that there was a shuttle bus that ran from the station to the Messe (exhibition centre).

The even better news was that it was free!

On the Saturday morning, our first full day there, we picked up the shuttle and went to the Messe.

*Phot - Eddie Carter*

General view showing steaming bays

The Exhibition was held in two large halls, both about the size of Ally Pally. The first hall held the trade stands, the small gauge lay-outs, and most importantly the food and drinks area. The second was filled with ground level 127mm (5") and 71/4" gauge tracks, I understand some one and a quarter miles of it, and oh yes, a load of dying Christ-mas trees as decoration.

There were only a couple of English stands at the exhibition, the rest were mainly Ger-man French and also from Luxembourg.

It seemed to me that the 5" scene on the continent was based on bought locomotives and that scratch building was minority inter-est. That is not to say that there were not some very nice scratch built engines, but kit and RTR locomotives seemed to dominate. There were not all that many steam locos on track.

On the ground level there was a continuous procession of locomotives in motion, some of which hauled some quite impressive trains. The longest one hauled 17 wagons, some of these being bogie wagons. One train had a very impressive cupola, the type of wagon used to transport iron or steel in a molten state. This must have been 4 foot long and was supported by 32 wheels on 4 bogies, and it did look scratch built. Another was modelled on a WW2 armoured train.

To add interest a gradient had been built into circuit raising the track some 3 feet and then dropping down to ground level again. As the track was a bit on the oily side there was a large bag of fine sand at the start of the rise, and there was plenty of evidence of drivers digging their heels into the raised floor to assist braking on the descent. If one stood at the descent side of feature you could see the fear in the eyes of the drivers when they realised that there was no braking to be had except for running into the train ahead that had made an impromptu stop just a little way ahead on the flat bit!

*Photo - Eddie Carter*

A 5" Gauge LION at the top of the Elevated Section

There were no signals and the minimum of track marshals.

Jon sought out some GL5 members who were lurking around a predominantly English siding area, and one comment made was that the noise level really got to you by the end of the day. We did not to see any GL5 locos running which suggested fairly limited access to the track. In fact the whole track seemed overloaded with trains.

By the end of the first day we felt we had covered the exhibition pretty comprehensively. We had expected to spend two full days at the Messe but felt that we had seen everything at the end of the one day.

We caught the shuttle bus back to the hotel, had a rest and went out to eat. We went for a typical local delicacy, a Biryani and a Tandoori.

The next day the Sunday, we decided to take advantage of a free day to visit the Auto and Technik Museum at Sinsheim. This was some distance away, at a guess about 40 miles, and we opted to go by the out of town tram service.

The receptionist in the hotel planned a route for us and I so impressed the lady in the Tram ticket office with my command of the German language that she had no hesitation in replying in absolutely perfect English that all three of us could understand. We had to make one change, so it all sounded easy. The fly in the ointment was that we had 4 minutes to change trams and buy a new tickets from the automatic machine. Well even the locals were being defeated by this machine and we stood no chance being behind them in the queue, so of course when we looked up, it was to see our tram disappearing into the distance. One hour and a coffee later we were on our way again, oh the walk to the café and back was cold!

The museum was excellent (world class), the sun came out and warmed us up which was as well as the larger aircraft were displayed outdoors. Inside in several hangers, there were well laid out displays of world class cars, motorcycles, WW2 tanks, planes and so much more.


*Phot - Jon Mottershaw*

Concorde over Sinsheim

On display outside amongst many aircraft there was an Air France Concorde and a Tupolev 144 (the Russian Supersonic transport). Both were fully accessible to visitors via spiral staircases. However, both were some 60 feet off the ground, at the lowest point, and positioned with legs of unequal length under each undercarriage so that the fuselage was at an angle of 30 degrees to the horizontal. We made it up to the cockpit of both aircraft, albeit well out of breath. Such a climb would have been shut down by the H&S fairies in England.

Our journey back to the hotel was uneventful; we had got the hang of the trams now!

The evening meal was taken in a local Bier Keller which preferred to serve the local brew in litre glasses; I just had to put up with it.

On the Monday our journey home was a little broken up as the train from Karlsruhe departed after 1-0pm, and we then had 4 hours to kill in Paris. We spent a lot of that time in a restaurant.

Again it was an uneventful Eurostar run to a bitterly cold Ebbsfleet. This was followed up by the car park barrier number plate recognition system failing to recognise Jon's car licence plate even though the fee had been prepaid. My technical knowledge was quickly brought to bear on the problem (I found the "help button") and we were soon on our way.

Altogether an interesting weekend, and I am glad that I have been once, the cost was fairly high even though we had chosen low cost travel options. The Museum visit on the Sunday ranked at least as high as the Exhibition the day before.

It's a bit humbling to spend a few days in Germany and to see just how well everything is organised with such good quality facilities, and as most will know already, the French TGVs are pretty good too.

**Eddie Carter**

# Indentured

A tale of old time learning in industry

Episode Six

The boy's arrival in the erecting shop began with a short interview conducted by the foreman. He came across as a pleasant sort of man who chose not to treat apprentices as a source of cheap labour, and although approachable, still maintained a rigorous attitude toward shoddy workmanship and indolence.

Subordinate to him was the charge hand – a man of rather less amenable nature--particularly towards youth (sometimes with every justification!). This chap maintained an aloof attitude, and this, combined with an air of superiority did little to enhance his popularity.

In point of fact the erecting shop was organised into a number of 'gangs'; each gang specialised in building a particular engine model and it was the gang leader who undertook most of the functions of a charge hand. They handed out the work and also acted as tutors when required.

Initially the boy was put with a gang headed up by a Mr. Phillips. This group of four -- two adults and two apprentices – were known as the 4BK gang. The 4BK was a 40 BHP engine running at 1500 rpm. Examples could often be seen in the locality driving compressors for pneumatic drills when road works were being carried out. It was very popular with the customers and had been in production for at least twenty years, but times were moving on and a new engine namely the 'L' range was proposed as its replacement. However, although this engine was cheaper to build – and this was reflected in the price – customers were never keen to see the tried and trusted unit replaced. Moreover, as will be related in due course, their natural apprehensions were not entirely without foundation.

The boy's fellow apprentice was called Mike and it was clear that he was well established within the gang. In fact Mr. Phillip's oft repeated instruction was: 'Mike will see you alright'. And so it proved. Eventually the two youths became good pals.

The gang would normally build perhaps half a dozen 4BK engines in a week. The job started with the two boys collecting the crankcases from the machine shop (this engine had the cylinder block and crankcase integral) and taking them to the wash room. This latter was a kind of 'wet room' where all the oil ways and waterways were flushed through with water and then scoured with high pressure steam. This process was effective in removing all traces of swarf and foundry sand from the crankcases. They were then moved to the erecting shop where they were placed on wooden stands. (Dorman's had not at this stage got as far as the rotateable multi-position stands that were to become common in later years).Prior to any assembly work the internals were painted with an aluminium paint intended to alleviate any loose dirt that could possibly have survived the previous process ! After this, assembly could begin in earnest.

The first job was to fit the main bearing shells. Meanwhile a man would be preparing the crankshaft; this meant ensuring that the oilways were clean and then polishing the journals and crank pins using a fine emery cloth backed with a leather strap. (Occasionally a bearing had been found to pick up on test and this treatment was successful in alleviating it).

The next part to be assembled was the oil pump which was retained by five ¼" BSF bolts. The boy had a bad experience here, for having been warned by Mr. Phillips as to how easily they could be

sheared off, he promptly went and broke one. Fortunately, Mike came to his aid with a suitable drill and a 'backwards tap' (sometimes called an 'easy out') and matters were corrected discreetly. Mind, Mr. Phillips was possessed of a remarkable antenna and probably new well what was going on but chose to say nothing.

An unexpected bonus of working in the erecting shop was the frequent passage of young ladies from one end of the shop to the other. It so happened that this shop ran across the full width of the front elevation of the factory; the offices concerned with production being at one end and those linked to design at the other. Thus there was a fairly steady flow of mostly young women in both directions. This situation had not passed unnoticed by the young men who, in keeping with the traditions of their kind, were apt to emit various fatuous noises when a young lady appeared on the horizon. The noises might be called wolf whistles or cat calls. Initially our hero had thought this to be an intriguing diversion from the toil of the day but at length began to feel a bit uneasy about it. He also noticed that Mike didn't indulge in the practice but on the opposite side of the gangway a youth with a Tony Curtiss haircut was a regular exponent .Clearly some of the girls regarded the walk through the shop as equivalent to a gauntlet that they were obliged to run in the course of their duties. Others, however, displayed a very different attitude and positively lapped up the attention that they were receiving from the young men and encouraged it by methods only applicable to the female sex.

Increasingly, as time went on, the 4BK engine was replaced by the 3L model which gave similar power at a lower cost and the gang became well versed at building either type. Perhaps because of this the foreman asked that the boy be lent to another gang for a week or so. This gang did not normally build the 'L' type engine being occupied with a two cylinder unit supplied to Motor Rail at Bedford. This engine was of some interest because it was an old design featuring an injection pump of which only the elements themselves were bought in (from CAV). The pump body, camshaft and governor were all of Dorman's own make. Because of its modest size the gang built these in batches of twelve at a time but now they were to build a batch of five 4L engines and the boy's experience was intended to help familiarise them with the new breed.

It was unfortunate that the leader of this gang – one Harry Moss—was generally disliked – especially by the apprentices. He had a habit of interfering with any job that you were doing and seemed to believe it could only come out well if he bombarded you with continuous advice. This habit was destined to have a humorous outcome shortly.

As the build of the five 4L engines progressed it was necessary to finalise certain details-- for instance there were several options: which side the dipstick went, which side the oil filler went and whether it was to be a pneumatic governor or a mechanical one. Normally these would have been detailed on the build sheet but, given that the engine was a new model, some issues were not yet properly identified. A result of this lethargy was a spate of dipstick tubes being fitted in the wrong position. Because of this, the boy had previously made up a tool to extract the erroneous fitment; nothing special – just a length of studding, a bridge piece and suitably shaped probe to hook around the lower edge of the unwanted tube.

Nonetheless the device was much in demand by all 'L' engine gangs so naturally, when the same problem occurred on the Harry Moss gang the boy simply went to the 4BK area, collected the tool and applied it. In seconds Moss had appeared and started giving the boy instructions as to its use. He felt mortified but protocol prevented him from telling his supposed master where to get off. As it happened all was not lost -when the senior fitter from the 4BK gang came by and for a moment stood watching Moss telling the boy how to use the device. Totally free of inhibition, he said, "For Gord's

sake Harry why don't you sod off and find something useful to do, don't you realise that Ted made the bloody thing in the first place and doesn't need you to tell him about it; and now I'm waiting to use it." (The boy was quite glad of this intervention but disliked the appellation Ted -- preferring to be known as Edward).

Fortunately his time on Moss's gang was nearly up but one day he was miffed to see the girl who worked in the experimental shop walking away down the corridor toward the drawing office. Had he been in his normal place on the 4BK gang she might have stopped by to talk to him. Inwardly he cursed Harry Moss and all his works though, really of course, this was quite unjustified.

In truth, he didn't know her all that well as yet. Once, in torrential rain, he was returning from foundry to pattern shop when he literally bumped into her when making a hasty entry to the building. He apologised for his clumsiness and she commiserated with his being so wet. On this occasion he did manage to elucidate that her name was Julie and she, of course, became aware of his. Besides this they had once found themselves sitting at the same table in the college canteen but the close proximity of others confined the conversation to generalities. However, he was now well aware that this girl impinged on his consciousness in a manner that he had not previously experienced.

Whilst waiting at the dentist a couple of weeks earlier, he had been idly skimming through a magazine which referred to how the hormonal development of a teenager could play havoc with such a youth's emotions. He was musing about this, whilst simultaneously tightening up the dozen nuts on the 'L' engine tappet cover when he was mildly shocked (though delighted) to see her standing beside him. (She had simply returned from the drawing office whence her view point enabled her to notice him.) She enquired as to why he was not in his normal place and he explained. She added that they must have regarded him favourably to have allotted him to such a task. He confessed to not have thought of it in that way. At length she went on her way whereupon the youth of the shop – who had been silent whilst she was there– now broke out into all manner of bawdy noises. He figured that this was just something that he would have to put up with but also knew that deep inside he was pleased with events.

Come the Monday he returned to the 4BK gang – though by now it was more of an 'L' gang building 3, 4 and 5 cylinder variants of that engine. It was also clear that all was not going well. It seemed that the tearing up of bearings was far more frequent on this model than on the 4BK . To say that the management was worried was something of an understatement. But why did it happen at all? Maybe it was the cast iron cranks or could it be the ingress of dirt into the oilways?

On completion of the normal four hour running in period and power test they were having to do a further four hour bearing test. This was followed by a partial strip down before they dare pass the engine on to the customer. This was serious. As ever, when doubt exists, theories abound. Naturally, our hero pondered this issue along with many other people. For a start he did not think that dirt ingress could be the reason. Nonetheless, the chief designer apparently did. (It was unlikely that he'd ever witnessed the cleaning process that was carried out so thoroughly on every engine).

A feature of the 'L' design was a 'cast in' trough that ran nearly the length of the engine from which drillings took the oil into the main bearings. This idea had been introduced as a cost saver. Now it seemed that it was to be abandoned and a system of copper pipes provided to take the oil to the underside of each bearing cap. Despite the extra cost and complication of this pipe work, when it was put to the test it did absolutely nothing to resolve the bearing problem.

The boy decided to approach the issue from a different point of view. It was easy enough for him to arrive at the projected main bearing areas for the 'L' engine and thence to form a ratio between this and the piston area. This figure gave him a notional unit- load for the system as a whole. He was able to deal with other engines in a similar manner and so have a basis for comparison. Clearly the 'L' engine had the most provocative figure of them all with the 4BK as the runner up. Needless to say, the ones with the more modest figures did not tear their bearings up at all whereas the 4BK engine did from time to time.

Of course, he would not dare to take his findings to anyone in authority and besides, the drawing office must have been through all this in the first place. Nonetheless, he did learn from a senior draughtsman – who had proved rather loquacious one night at the pub – that the 'L' bearings had been proportioned using the AEC 9.6 litre as a comparator. The boy felt sure that the AEC did not tear up its bearings but there again it did not have a cast iron crankshaft. The question posed by all this was, whether or not the higher unit loads were causing local deformation of the journal surface. In fact, albeit unnoticed up to now, there was a bit of a clue....

The extraordinary procedure of rubbing each journal with fine emery did undoubtedly improve matters but in the nature of things the thoroughness of the technique varied from one fitter to another. Clearly some were getting better results than others. In the light of this, a microscopic analysis of the surfaces so produced revealed that the final grinding process (in the machine shop) left a series of microscopic ridges on the surface. Some people were successfully removing these and others only partially. In truth the high spots were detaching themselves when the engine was first put on load. Probably with a steel crankshaft it wouldn't have happened. The solution was rapid. With characteristic thrift an old lathe was converted into a lapping machine - so arranged that it could lap all journals and crank pins simultaneously. Dorman's were helped in this by the presence of another firm in Stafford that made grinding wheels and it was they who produced the tailor-made laps for the machine. In operation the machine was faintly comical to watch with arms and legs flailing around all over the place but it did its job well and only a few minutes were needed to treat each crankshaft. Once the machine was in use the bearing problem disappeared completely.

All this was good news as Dorman's had recently secured an order for several hundred '4L' engines to power a series of radar stations across the top of Canada. Each station would possess three such engines and were intended to run for several weeks without human involvement. To this end they had their normal fuel tanks filled with lubricant and this was fed to the engine sump as required by a system of float valves. Other automation took care of coolant temperature and an exhaust pyrometer monitored combustion conditions. If anything was amiss the engine was shut down and one of the others automatically started up. This contract kept the factory busy for many months.

**Paul Davies**

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Articles and reports for the July 2012 edition of LINK should reach the editor by Wednesday 20th June. If being prepared on a computer the preferred format is Microsoft Word for text and jpeg for pictures and drawings. Material may be sent by e-mail as attachments (not as part of the e-mail itself) or provided on DVD. If you are not a computer addict hand written copy is acceptable. If in doubt, give me a call – I am here to help!

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