NEWSLETTER March/April 2021

Good Day Gents,

We have a packed Newsletter for you this month, but first just a couple of bits of Club news.

It's snowing outside at the moment, but the light is shining brightly at the end of the Covid tunnel.

Club Meetings

Things are looking on track for Club evening meetings to start again on Wednesday 5th May at the Memorial Hall in Pickering.

All current rules and C19 regs will apply. We intend to try and broadcast the first meeting on *Zoom*. It's very much "a suck it and see" trial, but hopefully will be a success and allow those members who are a couple of hundred miles away to join in.

Any practical tips and suggestions you have, that may help us on the night will be appreciated. All are welcome. Please feel free to bring anything of interest along to promote debate, discussion or to ask advice or to brag about. Don't forget two heads are better than one even if they are sheep 'eads.

Club Workshop

The Club workshop re-opened on Monday 12th April. The communal kettle and refreshment facilities will not be in use, so you will need to bring your own flask if required.

The following rules will apply after confirmation of Steps 2 and 3:

1) Prospective users of the workshop shall contact the Workshop Manager (Jonathan Milner), in the first instance, to book dates/times for arriving and departing.
2) Only one person may be indoors in the workshop at any time,
3) The outer door shall be left open,
4) After completion of work, each user shall clean down the machines and work areas, disinfect door handles, machine handles and toilet flushes.

Potential Social Events

Mike Sayers has very kindly offered the use of his garden for us to hold a social get together. Nothing has been finalised yet but it is a lovely gesture and one to certainly look forward to. Thank you.

Richard Llewelyn has kindly suggested a trip to Kelham Island Industrial Museum in Sheffield (link below).

If anyone else has a suggestion for a visit please contact Jonathan.

http://www.simt.co.uk/kelham-island-museum

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Finally…..

We have had some very varied and interesting *Zoom* Club Nights, and "Workshop Mornings". Thanks to all those who took so much time and effort to make it work. A write up is in this Newsletter for those who missed the events as well as all who will enjoy looking at it again.

Stay safe everyone, Jonathan

- **A Comment On L.C.C ## Trams by Ken Hillier.**

I read with much interest the article (Newsletter September/October 2020) about David Hampshire's splendid L.C.C. tram. I was tempted by this kit, but thought my unfinished three year part work (1/12th scale Routemaster Bus) came first.

Like David, I was introduced to London's trams at a very early age (just pre-war), and have been interested ever since.

London's trams never went under the Thames. Perhaps David saw the Northern entrance to the Kingsway Subway where the tracks went:

- underground along Kingsway,
- around the Aldwych,
- emerging from the northern abutment of Waterloo Bridge,
- to join the southern routes along (but not under) the Victoria Embankment.

I think he is mistaken concerning London's old trams going to Calcutta. At the very end (1952), almost all cars were bought by George Cohen, for stripping, overturning, and burning at a specially built scrapyard (tramatorium) at Penhall Road Charlton, close to the Charlton Tram Overhaul Works. This yard was equipped with a Traverser, Overhead Wiring, and a Change Pit (where current collection was changed from conduit collection to overhead for incoming cars). Those cars not equipped for conduit collection were pulled along to their fate.

Those cars not sold to Cohens (almost 100 UCC** cars) were sold to Leeds for reuse, and a small number to Sunderland and preservation. I can find no evidence of ex-London cars going abroad for re-use, at least since the formation of LPTB++ in 1933. That is not to say there were no UK cars in Calcutta. Many British builders exported world-wide with designs similar to those used on British systems.

London County Council.
** Union Construction Company.
++ London Public Transport Board.

Lathes.

Like Peter Bramley, my first lathe was a second-hand Super-Adept in our garden shed, but driven by means of a modified Singer sewing machine treadle. Further lathe work was out of the question for many years, what with digs, National Service, Night School etc. but that is another story.

Ken Hillier

- **Workshop Morning (16th March 2021)**

  PEEMS held a 'Zoom Workshop' on the 16th March. This was very interesting as Mike Sayers and Brian Rees spoke about the trials and tribulations of building scale model engines. These discussions demonstrated the truth that engineering (model or otherwise) is as much about pre-planning and problem solving as it is about producing a successful fully working final product.

- **Brian Rees ~ 24cc Freelance Overhead Head Cam Flat Four I/C Engine (Brenda).**

  Brian is a regular PEEMS exhibitor at The National Model Engineering and Modelling Exhibition at Doncaster, and 2019 was special because at his local Sutton Model Engineering Club (SMEC, Surrey), he was awarded the 'Sir Malcolm Campbell' trophy for his new flat four I/C engine. Sir Malcolm was the first President and this is their highest award. Here it is displayed at the 2019 exhibition:

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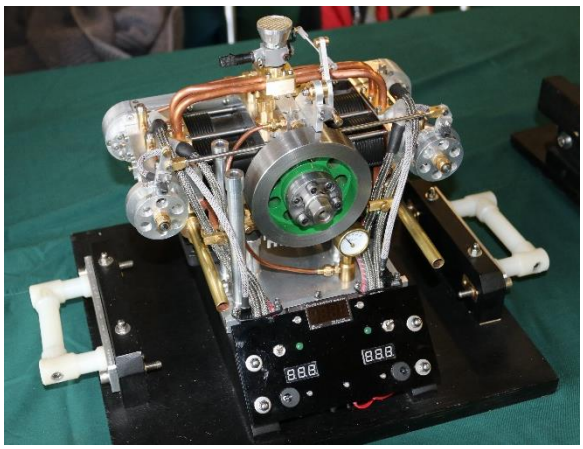
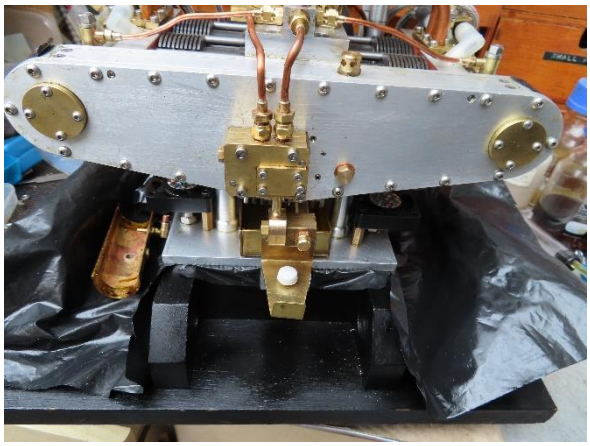




Here is the Flat Four model which was displayed at the Doncaster Model Show. There is a camshaft under those brass bushes and the oil pump is driven off the gears at the front.

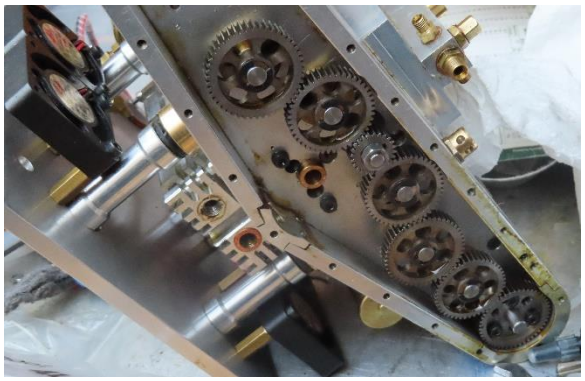
Here it is sitting on a plastic sheet under test and it's leaking like a sieve. There are a lot of pieces screwed together and they're supposed to be sealed.

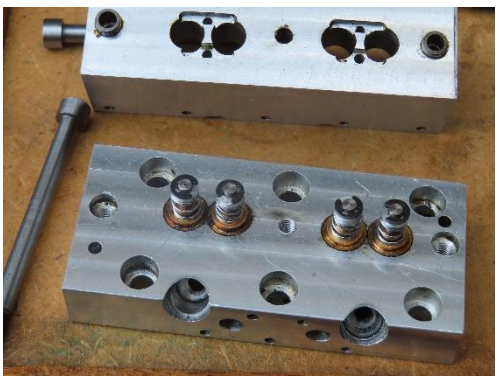
This is the only engine I've made which didn't have any compression to start with. I believe the problem is the valve timing.

Below is the camshaft with three bronze bushes.

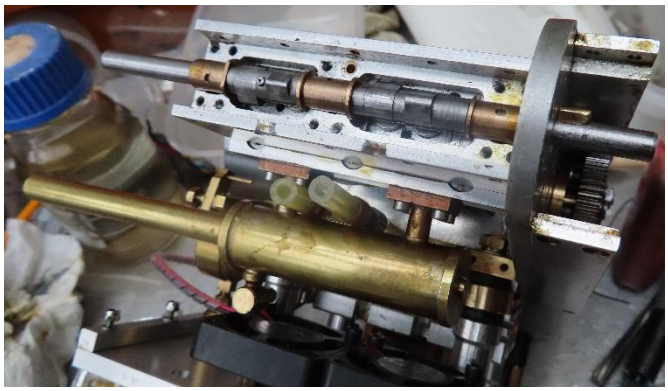
The photograph shows the cam shaft with the cam lobes located between the bronze bushes. The cam lobes are independent of the shaft and are pinned at the relevant degree location with 1.5mm diameter roll pins".

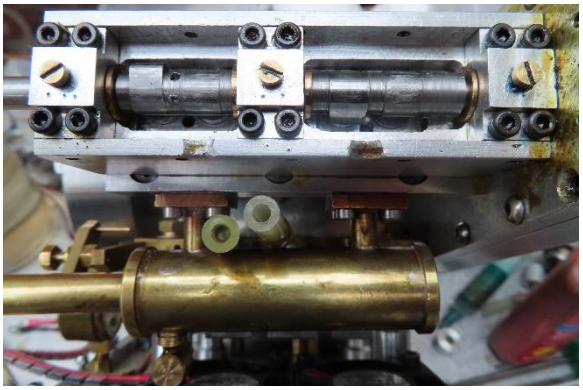
I put a tube into each combustion chamber, blew into it and found that the inlet valves were leaking as well.



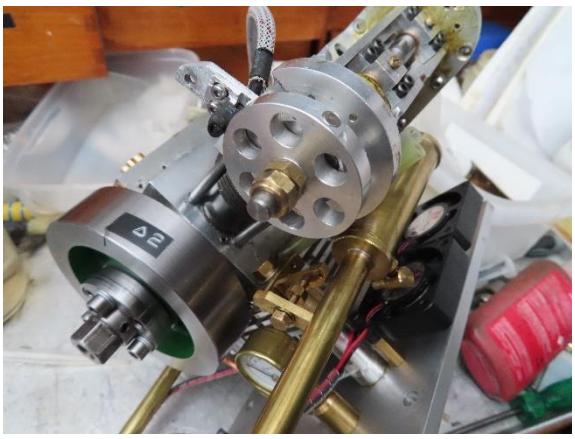


The photo above left is the gear case at the front. One of the problems I thought I may have had was that the cam buckets at the top of valves "hydrauliced" when sealed. In the photo above right, the cam box (at the top) is upside down, and shows the chamber and vent holes, which when sealed to the cylinder head should hopefully stop the "hydraulicing".

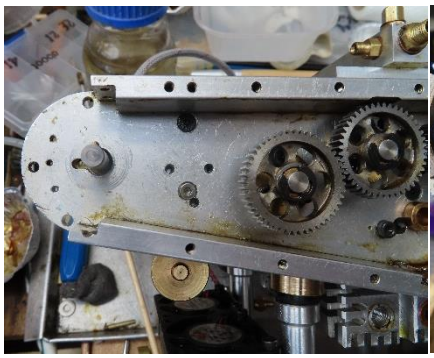


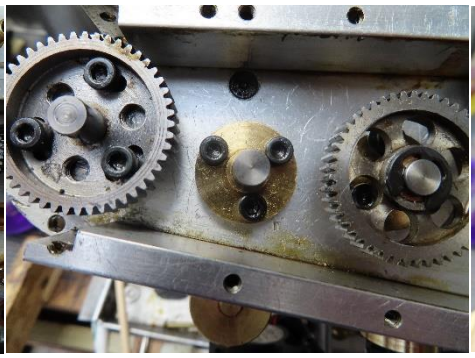


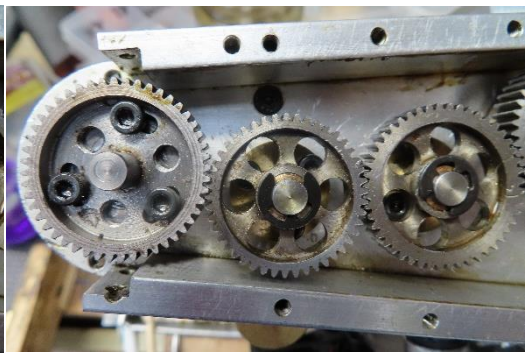
The photos above show the cylinder head on, and the cam shaft layed in. The cam shaft goes through the plate which is at the back of the timing case. The gear in the timing case can be seen on the right. The photo on the right shows the cam caps. The little screws at the top locate each of the bushes in the right position so that the oil feed goes through into the bushes. The two hoses at the bottom go to the drain for the cover that goes on top. That is filled up with oil to the tips into the cam shafts.



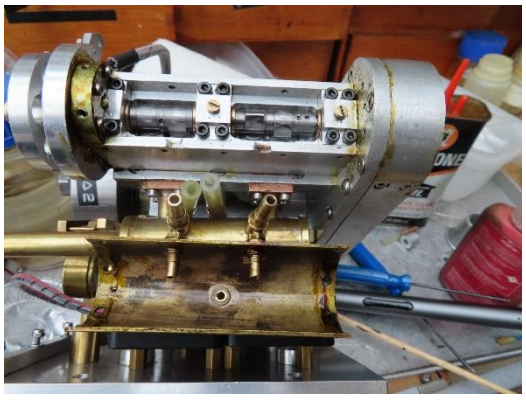
This is down the other end and is the timing end. On the end of it there is a rotor with a magnet and the black pickup. The “nut” on the end of it is a collet which locks it on the shaft in the right position. It is designed to fire every revolution.







To get the cylinder heads off, you have to take the timing case apart, and take the gear off that’s over the top of it as shown in the first photo above. The gear removed is the gear on the end of the camshaft. The slotted holes in the gears allow the gears to be moved around, so they are correct with the timing system. The gears are moved to the best position and then secured with the three screws. All the individual idler gears are held on with brass bases. These brass bases have oversized holes to allow them to float before being secured. The gears are also secured with *E clips*. All the gears were made on the *Sherline* lathe.



The cover at the bottom is upside down, and the outlet pipes are raised. That maintains the oil level in the cover.

Here the cover is pushed into position.

Questions And Answers.

Q: Brian, have you got the compression right?

Brian: I haven't put it together yet. I can't do anything until I've done the other side. I have to take the other side off and do it all over again. Once I put the cylinder head on, I blew into it and I couldn't hear any air coming out. I also put some graphite oil down the bores and that did not disappear immediately.

Postscript: I have now!

Q: Brian, what bore is the barrel?

Brian: It's ⅞" diameter. The whole model is quite compact, because in order to make the crankcase and crank shaft, I was restricted in how big the crank case could be, because I needed to line bore it on my *Sherline* lathe.

Q: On that end timing wheel with the slotted holes, were those bolts going into a plate on the end of the cam shaft?

Brian: Yes, there is a separate plate on the end of the camshaft, on the keyway. When you're doing the timing, which is the inlet timed at 10° before 'top dead centre' (TDC), all the backlash has to be taken out of the gears (not a great deal as it happens). This is done by winding the crankshaft, looking at the degree from TDC, checking the dial gauge, and then pinching it off with one of the screws. I use a magnet on the end of my screwdriver to hold the screws.

Q: What gasket sealant do you use, or is the joint metal to metal ?

Brian: I use *Wellseal.* It's like treacle, but you can thin it with cellulose thinners. It's very sticky and gets everywhere.

Q: I use *ThreeBond* for sealing on motorbike gaskets. It's rubbery and not like silicone which is quite thick. It dismantles well and is very good at stopping leaks. Is the Flat-Four your own design?

Brian: Yes, it's my freelance design, and there are no drawings. I did most of it in my head. The problem came with the cam timing. I made assumptions during build and it didn't work out.

I drew each 180° cycle out with predictions of where the camshaft was going to be, and it turned out that it was going to be 270° after the first one. It's firing every revolution.

You can see the cam buckets in the left hand side of the box. On the right you can see the little 6mm button.

That's how valve clearances are done by an iterative process; by machining the buttons which are put under the cam bucket. The cams are put in, and the caps are put on, and the valve gap is measured. Starting off, the valves are open even when they should be shut. The button is put underneath the cam buckets. The height is adjusted by machining the button in stages until the valve is correct (approx. 4 thou min.). It was a long process. Some of the more modern engines have shims on the top of the valves, but I didn't fancy doing that.

Q: What spark plugs do you use?

Brian: American *Ringfire* sparkplugs. They are very small with a 6mm hex.

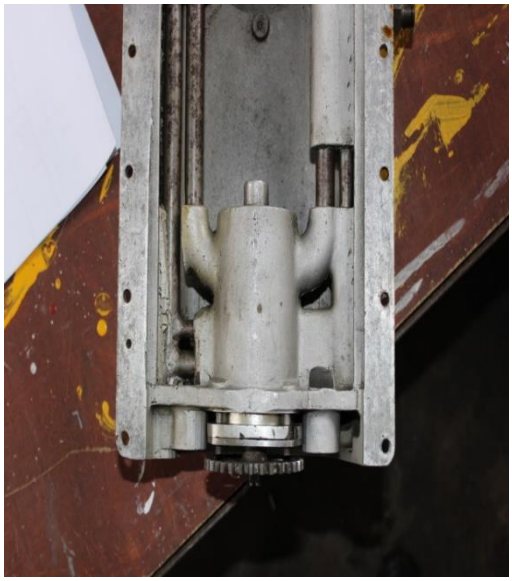
Thanks to Brian for taking the time out to review this article.

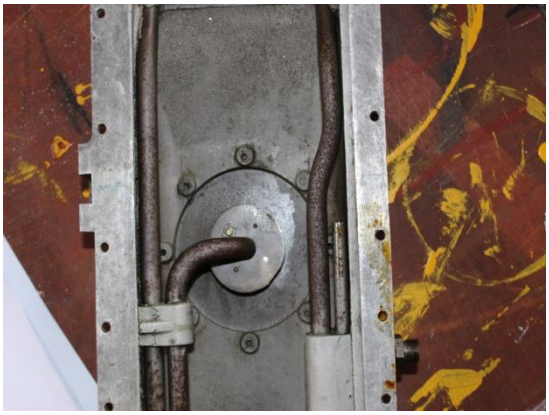
- **Mike Sayers ~ The Delage Progress Report**

The past five months have been spent making the sump and lubrication system for the Delage GP engine.

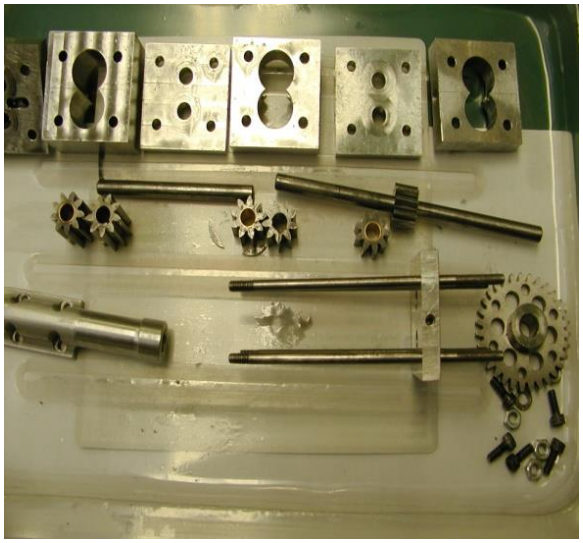
It will have been mentioned before (many many times) that nothing is either straight forward or simple on this project. The sump houses three pumps, two pressure and one scavenge, plus two pressure relief valves. One relief valve regulates a low pressure supply to the camshafts, valve gear and all the spur gear drives and is adjustable; the second provides higher pressure oil to the crankshaft bearings. This valve is not adjustable and relies on a fixed length spring to provide the primary regulation. I spent a tedious couple of days sorting through a large box of assorted springs, testing them on my wife's kitchen scales, in order to find two of the correct diameter and rate. One was kept as a spare. This valve also incorporates a camshaft operated by external rod system which will eventually be connected to the throttle linkage. This will provide a higher oil pressure to the bearings when under high acceleration. This is something I have not seen before in other racing engines.

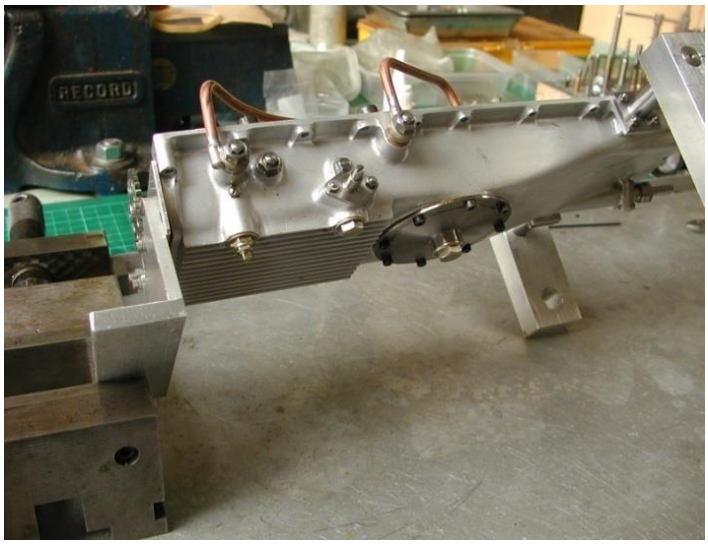
In the full size sump, all the prefabricated steel supply and return oil pipes connecting the pumps to the external flexible hoses, were set in the sand moulds and the molten aluminium poured in around them. The three pumps are a tandem sandwich driven by a common shaft. The outer diameter of the assembly was taper turned, and the whole was drawn into a matching taper bore in the casting, where all the ports were arranged to match each other. Sadly, there was no way that this could be repeated in the model and the method employed will be perhaps the greatest deviation from the prototype when the model is complete.





The pumps have been constructed as a separate detachable assembly. These are bolted to a bulkhead at the front of the sump so that the gear drive is in correct mesh, with the lowest idler gear in the front gear train. Each of the pumps is of the meshed spur gear type. Sizes were scaled from the originals so that outlets from the two pressure pumps emerged in the correct position, on the outside of the sump. This maintains the correct scale appearance. The supply and return pipes were inserted from inside the sump, to emerge through the distinctive triangular flanges at the rear of the "casting".





As all the dimensions were scaled from the original, I had no doubt that all would work in a satisfactory manner. However, because of the order in which the engine has to be assembled, there is no way the sump can be removed without dismantling the supercharger, manifolds and the complete upper and lower timing cases. It is important to ensure that all works properly before final assembly.

I therefore decided to try and test the system.

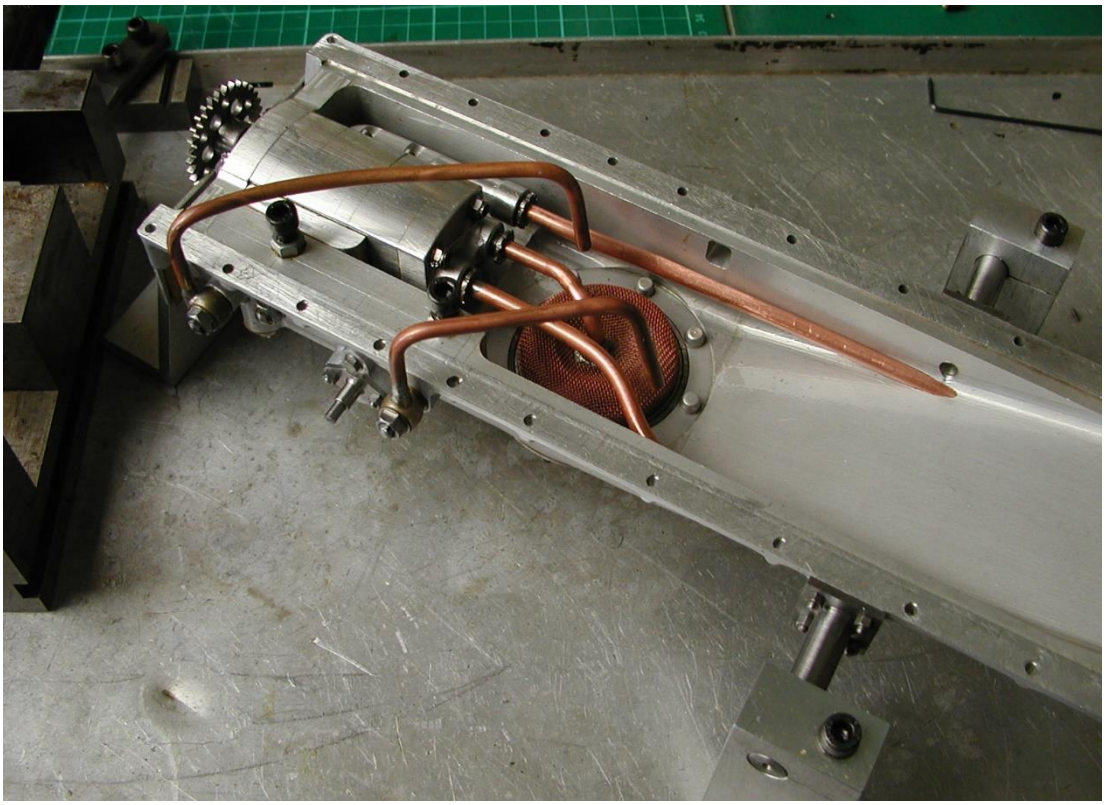
It was important to be sure that the scavenge pump would clear the total delivery from the two pressure pumps back to the oil tank, otherwise the sump would slowly flood.

Also, a trial test would allow the pressure relief valves to be set correctly before trying to run the engine in the far future.

It was also important to ensure that the system would prime itself without external assistance. After final assembly there would be no indication of this problem except no oil pressure, and that could have several causes.

To test these questions, the assembled sump was clamped to the milling machine table, and gear driven from the horizontal arbor. A baked bean can, with copper pipes soldered in top and bottom, served as an oil tank and connected up with neoprene tubes. The mill speed was set to provide a pump speed of 400 rpm, representing its rpm at the engines idle speed, and the bean can/tank filled with SAE30 monograde oil.

After that nothing went to plan!



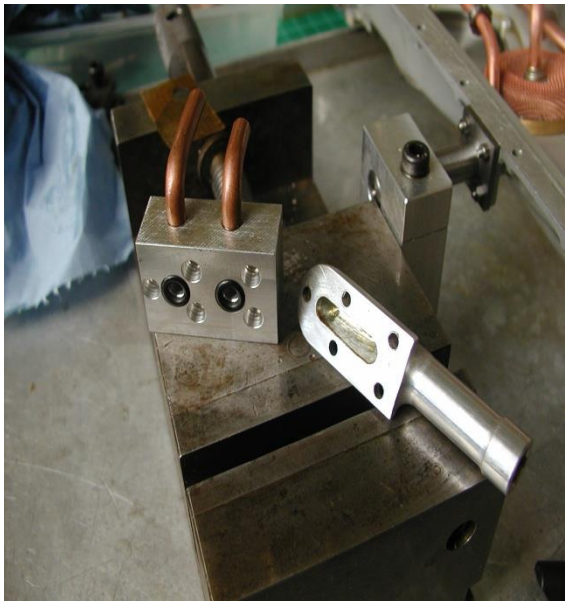
First the system would not prime. Oil had to be injected by pressure oil can, with the drive gear rotated by hand. Not a good beginning.

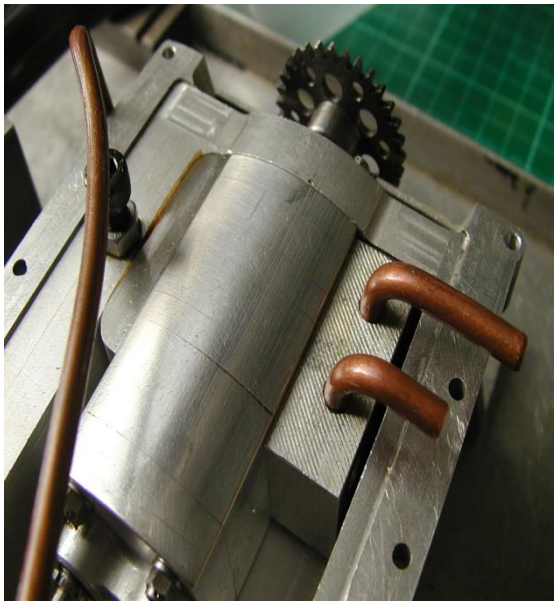
The first thought was that the oil was too thick. Thinning down the oil with WD40 improved things very slightly, but both pumps could not be persuaded to supply together. At higher speeds the flow seemed to reverse in the low pressure pump and appeared to admit air into the suction of the other pump, leading to failure there too.

Two things were suspected. The first that the porting arrangements at the inlet side of the pump bodies was wrong, (confirmed by a reference to a web site on gear pump design), and made worse by the neat little siamesed manifold connecting the inlets of the two pump inlet ports. Suitable alterations were made to the inlet ports, and a temporary twin inlet manifold made up as an experiment.

The design of the full size sump has only two connections to the oil tank, obviously one in and one out. So the single outlet from the bean can was retained, and a tee piece inserted at different distances from the tank to connect to the two inlets on the trial twin entry manifold. It was found that as long as the tee was as close to the tank as possible, the system would work at 400 rpm. Any substantial increase in rpm again showed an apparent reversal of flow in one of the pumps, leading to aeration or cavitation in the other, and eventual failure of both.

Here there was a major pause for thought!





Another search around the internet found a Dutch site containing complete design calculations for spur gear hydraulic pumps. Entering the relevant dimensions of the model pumps revealed that each of the two pumps was trying to pass 1cc per rev, representing a theoretical 800cc at 400rpm. Expecting to pass this quantity through the 3/16" dia. supply pipe from the tank at such a rate seemed to be asking the impossible. I had expected the scale dimensioned pumps to supply much less, and have a much lower efficiency. The theoretical output of the pumps also seemed much more than would be required, though I had no real idea just how much oil the engine would need.

Using the much acclaimed wet finger approach, a guess at 0.5cc per rev sounded sufficient. New pump bodies were machined up, and the gears shortened and keyed to a new drive shaft and idle shaft. Drastically increasing the size of the internal supply pipe to the pumps appeared to be more difficult than it turned out. By upping the diameter to 1/4" o.d., and using the thinnest wall tube available, the cross-sectional area of the bore was doubled. A major improvement. A new inlet manifold was machined up with separate internal ports, and a larger connection to suit the 1/4" diameter supply pipe. The external union connection was also bored out to 1/4" diameter. All this was done without any change to the outside appearance. As a precaution, the short suction pipe from the base of the sump to the scavenge pump was also replaced with a thin wall tube. By doing this, the clearing rate was increased. Bending this thin wall tube required lead filling.

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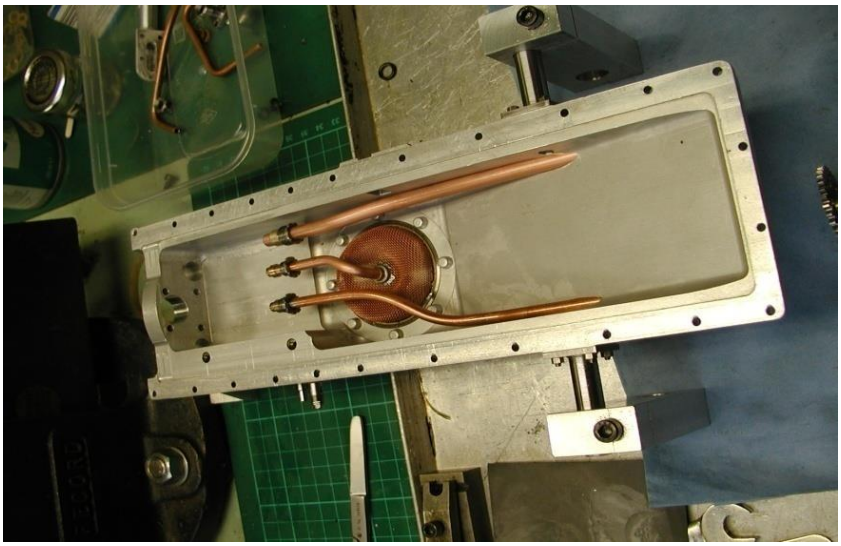
After all this work, and using Castrol GTX 0-30 motor oil, it was a great relief to find that the next test proved a remarkable success. The pumps primed unaided, and both pressure pumps sustained a full supply at all speeds up to 3000 rpm with no aeration in either delivery. The scavenge pump also cleared the contents back to the tank at all speeds, though the oil was a bit slow flowing through the gauze filter. It is possible that when the oil is hot this might improve, but a wider mesh filter gauze has been fitted just in case.

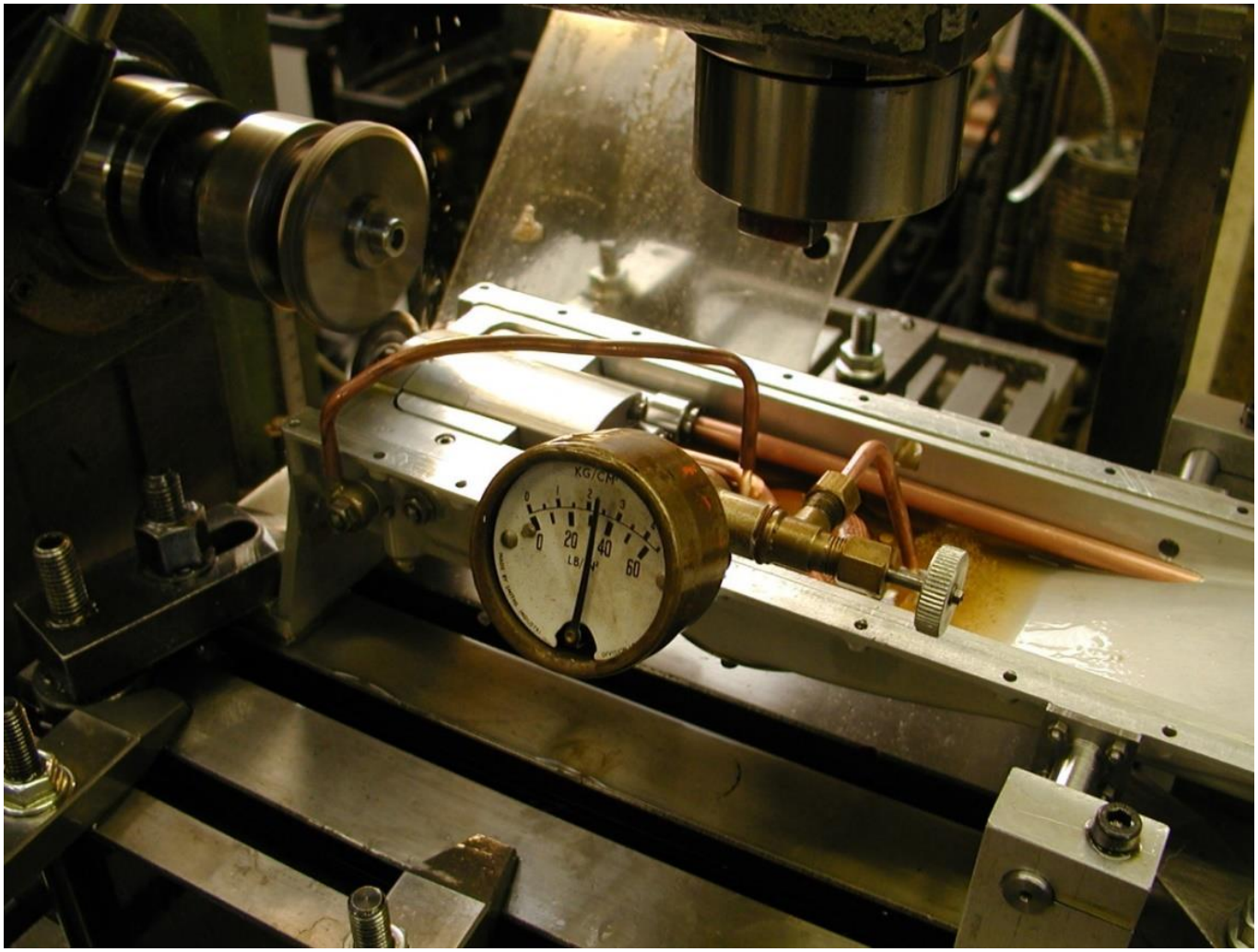


All the above concluded only the first part of the tests!!!

A manifold with a pressure gauge and needle valve restrictor was fitted to the high-pressure pump outlet again, discharging into the open sump. While running the system at various speeds, the restricting valve was closed to check that the relief valve could pass full discharge without the pressure rising to astronomic levels.

Thankfully it regulated oil pressure to 20psi at idle speed, and 45psi at higher rpm. All that messing about with springs was worthwhile. Operating the throttle operated cam lifted the available pressure to 60psi. About as good as could be expected, though it is very unlikely that this pressure increase will be required. I am pleased to have built it into the model, and even more pleased to find that it works.

The pressure gauge etc. was then connected to the low pressure pump outlet, and adjustments made to the spring loading. This gave 10 psi, and again the output was closed off to check that the valve could pass full pump output.



Looking back over the five months work, more than 20% of that time was spent fiddling about trying to make the thing work. There must be a moral there somewhere. Perhaps I should spend more time checking just how much reducing the scale of systems effects their function. Maybe I have just been very lucky with the Bentley models.

It was intended to try and video all this testing, and a tripod for the i-pad was specially purchased for that purpose. It does not show up on the last photo but the oil spray from the drive gears was enormous, and it was thought unwise to risk subjecting my wife's new i-pad to such lubrication. I am still clearing up the remains of the 1½ pints of oil sprayed over myself and the rest of the workshop. Very messy.

Mike Sayers

- **Alan Martin ~ Wood Carvings (Zoom Club Evening On Wednesday March 3rd 2021)**
  - **Background.**

Before he retired in 2006, Alan was looking around for something to occupy himself during retirement, and decided to try model engineering. He bought some equipment and set up a workshop.

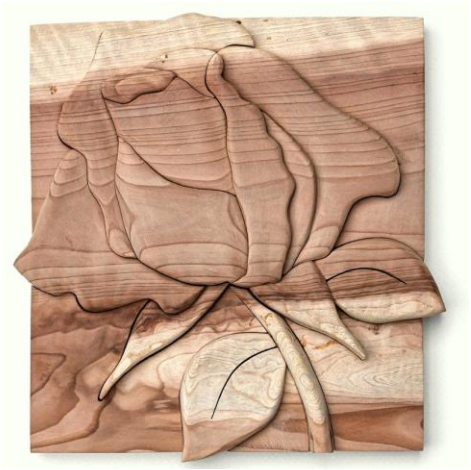
He joined SMEE (Society of Model and Experimental Engineering) and went on some of their courses. He was quite active in SMEE until quite recently. With a small group of people, he set up The Digital Group, and got involved in the building of CNC machines and mills. He was also involved with Mike Kapp building the Wire Eroder which has been shown at various exhibitions and is seen in the following link:

https://www.sm-ee.co.uk/ *After pressing on link please press the back arrow on the top left of page to return to the newsletter*

Alan has had a very interesting time on the experimental side of engineering. About three years ago he decided to change to wood carving. He has always been interested in woodwork, and carving is creative. You're using your hands, it uses very little space and not a lot of equipment. He bought a few magazines, books and videos. He wanted to share his journey in this presentation.

  - **Wood Carving**

As Alan lives on the other side of the Pennines, he showed his carving of the red rose. To be even handed he carved a white rose too.



- **What is involved in creating a carving from a piece of wood?**
  - Your Options: As with model engineering there are a lot of different styles of carving.
  - Wood: You certainly have to understand wood grain patterns and how to deal with them
  - Carving Gouges: Their commissioning, use and maintenance.
  - Different Types Of Wood Holders: These depend on the type of carving attempted, and the stage of the carving process.
  - Basic Techniques: These will be the focus of the presentation.
  - Brief Overview: At the end of the presentation, as an example of carving techniques, Alan presents the last carving he has done, which is a diving kingfisher.

- **Your options for different wood carving styles. What forms can sculptures take?**
  - **Objects created by whittling**: Whittling with a knife is a very old form of carving. People used to make utensils that way and carved walking stick handles. Here are some figures Alan carved for a friend:

- **Objects created by "Relief Carving".** In this type of carving a background is left. These can be seen in churches and cathedrals.


- **Carvings "In The Round".** This is the type of carving Alan enjoys the most. Examples are a tropical fish and a clam shell.


- **Interpretative Carvings:** These are carvings "in the round" where a form is created which lacks detail, but the shape shows what it is. The following are interpretative: a cat carved out of walnut, and a nuthatch. The tropical fish and clamshell above are also interpretative carvings.


- **Realistic Carvings:** Realistic carvings have detail and Alan likes to carve birds. The carving starts with the outline and the details are added. The carving below left is painted and the legs are made separately. Then it has to be mounted for display. Alan carves both interpretative and realistic carvings. Realism can be achieved not only by painting, but also by carving details in the sculpture as with this Kingfisher head.


- **Starting Out**

Most people start by carving simple interpretative subjects and progress to the more complicated realistic carvings as they acquire more skills.

An example is a feather using a wood that is easy to carve. This feather, can be carved with a knife and a 'V' gouge.

The feather is carved from lime wood, and the inkwell turned from walnut.

The carving is then sanded, and bees-wax polish or lacquer is applied.

- **Once you know what sort of carving you want to create:**
  - First of all, get information: It is sensible when starting, to look at carving magazines as quite often there are articles giving step by step instructions to carving straight forward items. Until carving techniques are mastered, it is best to get as much help as possible. Also, pattern books are available, and on-line there are many YouTube Videos to help.
  - Photographs: Look for photographs of the subject. Action photographs show how bodies flex.
  - Existing Objects: Can be used as a model to copy from. Alan carved a hare copying a glass model.
  - References: The more reference material that is gathered the better the chance of achieving a good result. Once you have selected and researched your carving subject, acquire the materials and equipment needed to start your journey into the world of wood carving.

- **Wood.**
  - Alan only carves wood, he doesn't carve in any other material.
  - Wood is a complex material that requires a range of tools to carve it.
  - In carving, the grain structure really needs to be understood. How to work with, against, and diagonally across the grain needs to be learned.
  - Carving is about removing wood in a very controlled way, with, and against the grain. Each of these processes needs a different technique.
  - Removing wood diagonally across the grain uses further techniques.
  - The process of carving is always a mystery as sometimes the grain pattern changes.
  - Carving gouges are in fact just sharp wedges. Inserting a wedge into the wood exerts pressure on either side and fractures the wood fibres ahead of the wedge, sometimes in unexpected ways. If the grain is understood and the correct techniques are used, the required wood is removed but the unexpected can still happen.
  - Wood carvers need to understand this and learn ways to minimise or eliminate this effect and develop the required techniques for removing wood in a controlled way.
  - Almost any wood can be carved with the requisite patience and skills. Alan has only been carving for a few years so is careful what wood he carves with.
  - When starting out it is best to use a wood that is easy to carve, where the grain is reasonably straight, and it is neither hard nor brittle. A few weeks previously Alan started carving an eagle's head out of a piece of oak that he had for 30 years, and that was a mistake. The wood had gone very hard and brittle and was difficult to carve.

- **Selecting The Wood.**

- The common woods used are Lime and Jelutong. Lime is the wood mostly used for realistic carving. Lime is a medium wood, is very straight grained, and the grains tend to be consistent throughout the piece. It can be bought in various thicknesses, in the UK up to 6" thick.
- Other bird wood carvers use Jelutong. Jelutong comes from Malaysia and is grown for its sap. Greater detail can be achieved when carving with lime than with Jelutong.
- Alan has carved using lime, Jelutong, Oak and American Black Walnut. Alan stays away from hard woods as he feels he isn't skilled enough to deal with them.
- When a bit of experience has been gained, and an interpretative figure is to be carved, it is worth searching for a block of wood with a figured grain, that will enhance the finished carving. This can be seen in the carving of the tropical fish (page 11). This was carved from wood from a *Wellingtonia* tree which is a giant Redwood. The wood has a fine grain which lends itself to that carving and enhances it. The grain is also orientated in the right direction to support thin sections. If it had been carved out of lime it wouldn't have been so interesting.

- **Wood Carving Gouges.**
- Gouges are the basic tools for carving. Alan also uses knives, files and sandpaper. When starting out, it's best not to buy a set of gouges: start by using the types of gouges needed for the particular project being worked on. For example, if a relief carving is to be worked on, this will require different tools than are needed to carve signs.

- **London Pattern/Sheffield List Carving Tools**.

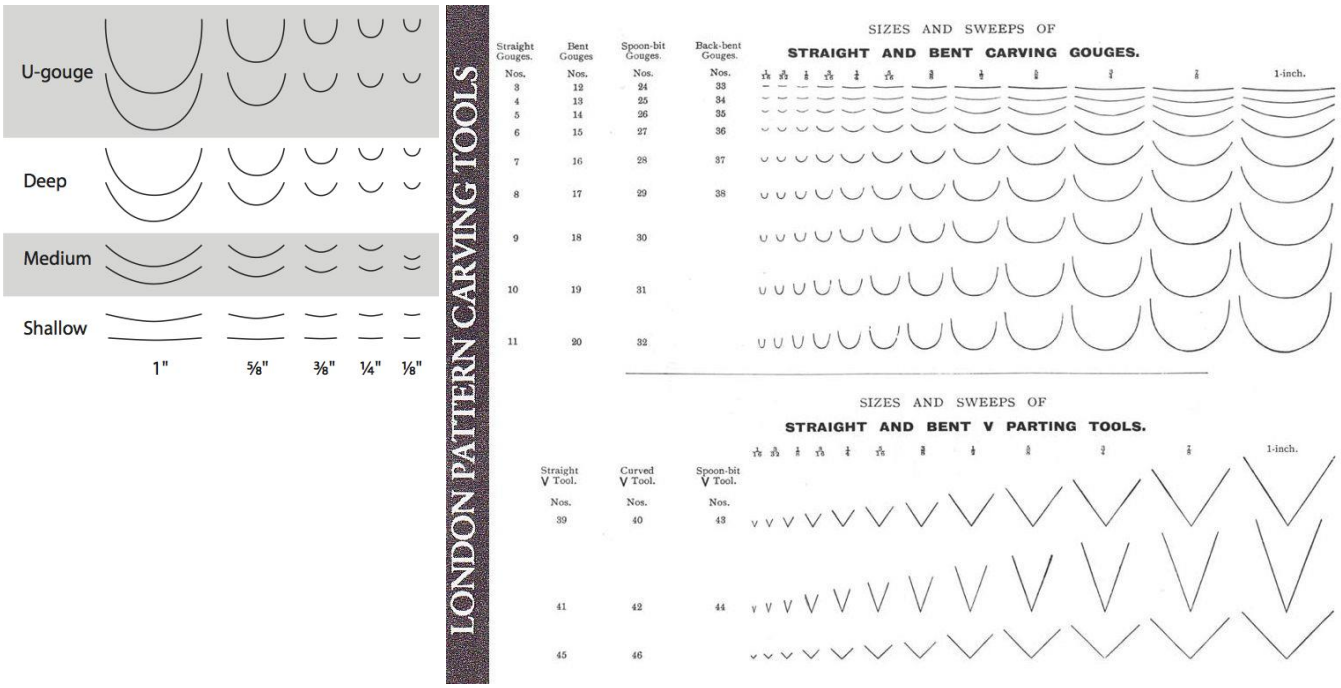
  Carving gouges are defined by two numbers in the London and Sheffield lists.

  They start from number 3 with a very slight curve up to number 11 which is 'U' shaped.

  A gouge is bought by its two numbers, so for example, a No.11 - 1" in Imperial units (and 25mm in Metric) is a U gouge with 1" width between the blade tips.

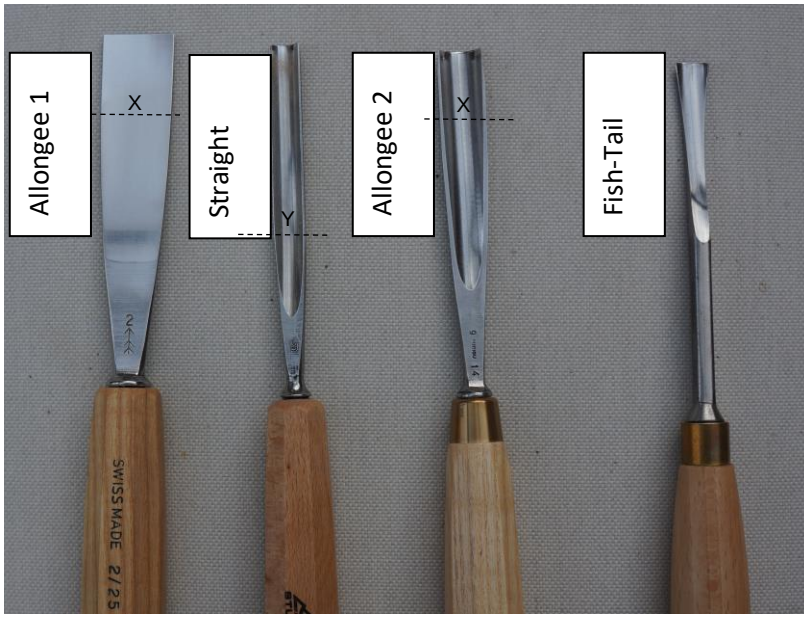
  These are the standards for sizing gouges and are common in America and parts of Europe.

  There is a company in Switzerland called *Pfeil* who are very good gouge makers but have their own numbering system.



In summary, a gouge is bought on its curvature and the width between the tips of the blade.

- **Gouges Are Bought In Different Shapes And Patterns:**



The Allongee is a French pattern.

The Straight gouge is an English pattern and is probably the most common type.

The Fish-Tail's blade end flares out.

The advantage of the Allongee shape is that it is a very robust gouge. If wood is being hit with a mallet, then the Allongee is one of the most robust patterns.

Its downside is that it is heavy, and it also starts to change shape around point X.

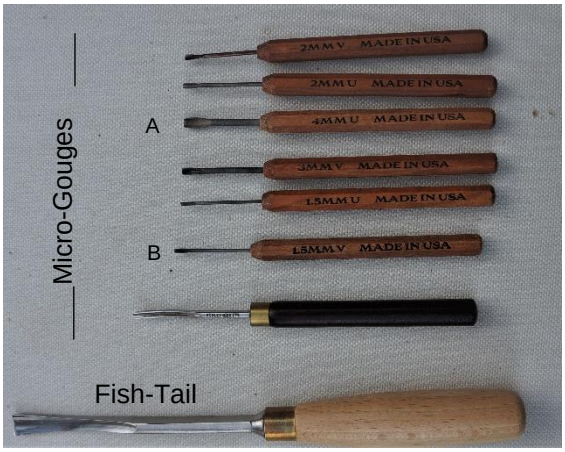
It can be reshaped and ground from X to the blade end, and after further use will have to be thrown away.

The Straight gouge can be ground down to Y.

Fish-Tails can only be ground about two or three times, because after that they will change in width. This is a consequence of them having such a small amount of blade at the end. The advantage of the Fish-Tail is that it is the lightest gouge. If you are carving all day long, you don't want heavy gouges. The other advantage of a Fish-Tail is that the corners can been seen during carving, which doesn't necessarily happen with the other types. The downside is that you throw them away more often.

- **Different Size Gouges Are Available.**

Not only are different styles and patterns available, but different sizes:



The Fish-Tail is between 8" and 9" long.

The others are American Micro-Gouges, and they come in a set, and still use the same numbering system.

A is a 4mm wide 'U' gouge

B is a 1.5mm wide 'V' gouge.

If there is a lot of detail in small carvings, then a range of sizes is required.

- **Commissioning A New Gouge.**

Some people believe gouges are not ready for use when new. They believe the angle they are ground at is generally wrong, and they do not have a bevel on the inside edge. This is slightly controversial, as other people think gouges are ready for use when new, mainly because of the angle they are ground at, and also because they have an outside bevel on them. Alan is in the former camp.

Alan works on his gouges as soon as he gets them. The photo on the left shows the bevel on the gouge when it's taken from the box.

The photo on the right shows the gouge after work has been done on it.

The reason for doing work on the gouge is illustrated by the low handle hold, in the photo, where the left hand is guiding the blade while the force is applied by the right hand. The right hand is used to lower or raise the gouge.

With the angle being so high, the left hand can only just get onto the wood. Over time, that becomes uncomfortable which reduces the amount of control. That is why Alan likes to extend the bevel so the angle of working is reduced. He also puts a small bevel on the inside of the blade.

- **Trade Off**

  Commissioning a new gauge reduces the angle at which the cutting edge cuts the wood. For Alan this gives more control, because he can rest the hand gripping the blade on the surface of the wood.

  The downside is that, in reducing the angle, it thins down the end of the blade. Caution is therefore needed when using the gouge with a mallet for removing hard wood, as the blade becomes vulnerable. Alan has kept some gouges he hasn't thinned down, just for removing hard wood with a mallet.

- **Holding And Controlling The Gouge: Low Hand Hold.**

Powered By The Right Hand Controlled By The Left

Powered By The Left Hand Controlled By The Right

The gouge can only be held like this when it has been commissioned as described above. Pushing with the right hand whilst raising or lowering the angle of the blade, allows the blade to go deeper into the wood. Raising the blade brings it out as it is lowered. The left hand is used to control and guide the blade. This is useful going around curves. It is useful to rest the heel of the hand because if a sweeping cut is required, the heel of the hand acts as a pivot. If two or three cuts are required parallel to each other sweeping the gouge around on the heel of the hand gives consistency.

Whilst pushing with the right hand, when coming near the end of a cut, the left hand is used to push back countering the force of the right hand bringing the carving to a stop when required.

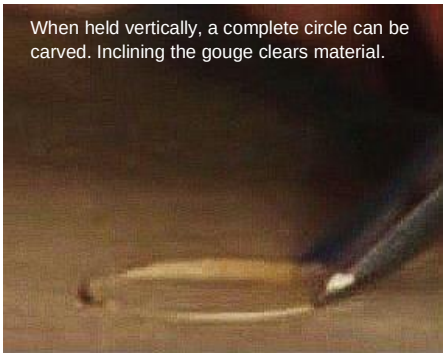
When carving, at some point the direction of the grain will change, sometimes "with the grain" to "against the grain". When this happens, the carving should stop. The wood is then turned around, or the hands changed around. With intricate carvings, it is better to change the hands around. It takes some practice, but where the grain is constantly changing direction, the carving needs to be controlled using either hand as shown above.

- **Holding And Controlling The Gouge: High Hand Hold.**

Held Vertical ~ Powered By The Right Hand And Controlled By The Left

Held At An Angle ~ Powered By The Right Hand And Controlled By The Left

With the high angle hold, the wood is almost being “stabbed”. The right hand is pushing the gouge down from the top. Two fingers of the left hand hold the blade at the bottom. This gives control over the gouge.


When held vertically, a complete circle can be carved. Inclining the gouge clears material.

Because there are gouges with different curves, sometimes outlines of carvings can be made just by pushing into the wood. If a gouge is pressed down vertically, the corner lifted and then turned around and then pressed down again, a perfect circle can be cut out. Depending on the size of the gouge, a different size circle can be cut. Inclining the gouge allows the area to be cleared around it. This is useful when carving eyes. A circle is created and then cleared, and then a dome is created inside the circle.

In Summary: When starting carving, holding the gouge correctly is necessary, and carving is the controlled removal of wood.

- **Knives And Riffler Files.**

Knives are sometimes used for shaping the wood block and for creating some of the details.

Riffler files can also be used for adding detail and for cleaning up parts of the carving. Other important tools are a pencil and eraser, sandpaper of various grades and a mallet.

- **Commissioning A Gouge and Maintaining an Edge.**

The gouge bevel angle is reshaped using coarse stones or a finishing belt. After reshaping, and getting the bevel right, the blade is sharpened using fine stones. Theoretically if the gouge is honed frequently using leather strops to maintain the edge, sharpening only needs to be done once. If the gouge is not honed, it will eventually become blunt, after which honing will not get it right. Then it will have to be resharpened.


Shape: using coarse stones or a linishing belt.
Sharpen: using fine stones


Hone: using leather strops to maintain the edge.

Carving for ten to fifteen minutes and then honing the blade means the blade never needs to be resharpened. Because Alan puts internal bevels on his gouges, he has to hone the internal bevel as well.

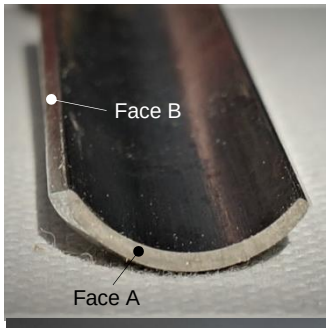
- **Shaping And Sharpening.**

When Alan first started out, he didn’t change the shape of his gouges for three or four months. He had bought some second-hand gouges just to practice changing the shape.

When he started, it took half a day to reshape and resharpen the gouge using Arcata stones.

The gouge in the next photo has very rounded ends. It is essential that it has square ends, otherwise clean cuts cannot be achieved and it doesn’t work if the gouge is being pushed down to create an outline.

There are two problems: the blade is rounded at the end, and it has a very small bevel on it. This means the gouge can't be used.



The first thing to do is to stick it on a grindstone and flatten it off.

A lot of metal has to be removed, so face A is square to face B.

By cutting it back Alan could see the gouge is good and well made, as the thickness is uniform, and curve on it is equal.

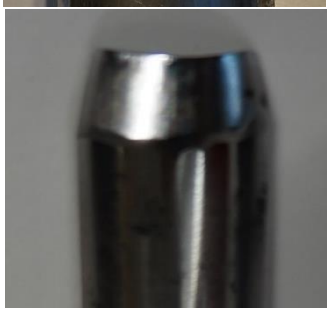
If either of these qualities weren't there, the gouge would have to be thrown away.

Once the edge has been flattened, the next thing to be done is to put a mirror finish on the end, because the next stage is the removal of metal.

A polished edge allows you to see what is happening.

The first thing to do is put on an internal bevel. To do that a stone is used.

Wearing away the metal on the internal edge has to be done evenly, which is indicated by an equal mirrored band on the remaining metal. As metal is removed it can be seen if this is being done evenly.



With the small inside bevel on, the metal is then worked until there is an outside bevel. This takes a long time with stones.

- **Equipment Alan Now Uses For Shaping, Sharpening and Honing Some Of His Gouges.**

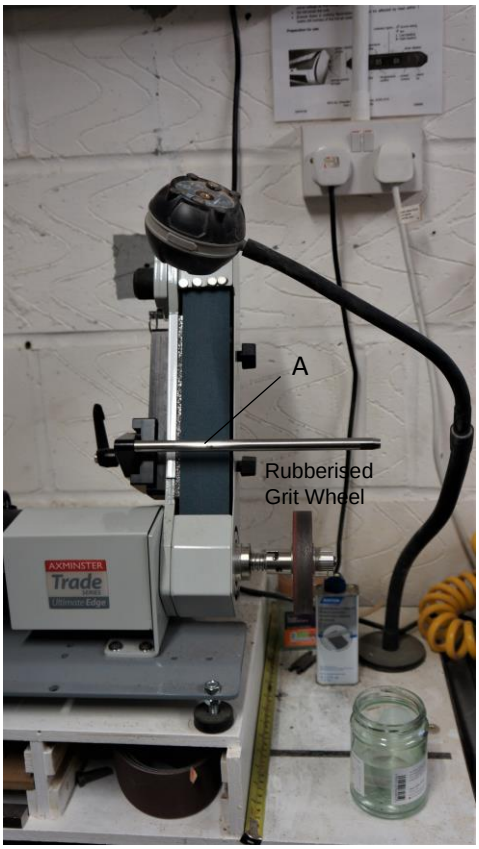
  Alan got a bit tired using stones by hand, so he bought a linisher (see photo on the next page).

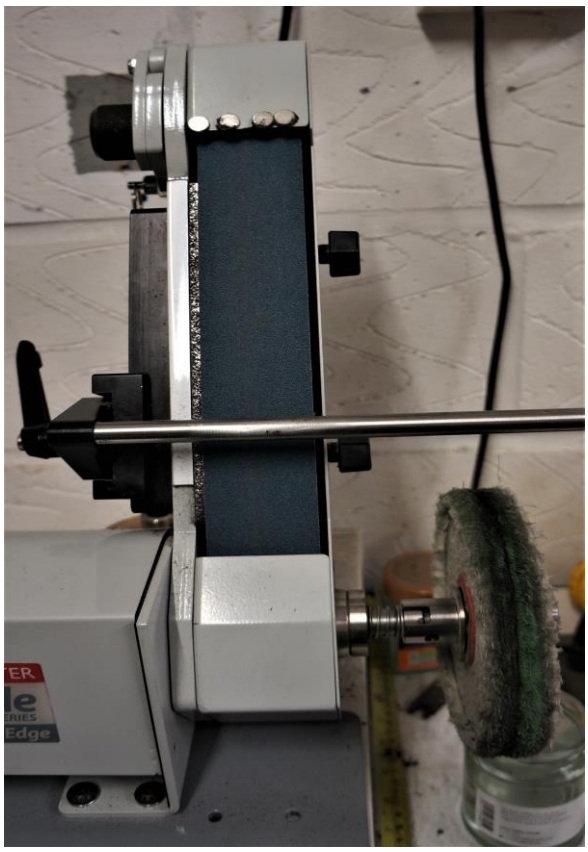
  This linisher runs in both directions. The gouge is rested at A with the handle against it. The bar can be moved in and out or up and down.

  This means an angle can be set against the material of the belt. The belt has a range of grits.

  The system allows various attachments such as a rubberised grit wheel, which is used for sharpening.

  A mop can be put on it for honing. It makes things much quicker.





- **Casting a Shadow.**

One of the techniques when shaping and sharpening is to cast a shadow on the belt.

When the gouge is placed on the material of the belt, for the first time, because the angle is not right, the leading edge of the blade is off the belt. Therefore, the shadow is below the surface.

As the gouge is ground down, a point is reached where the shadow coincides with the edge. At that point where the shadow and the edge coincide, a fine wire burr is seen on the blade edge.

Another good reason for using this technique is when the gouge being worked on it is being rocked from side to side the corner can be seen (top photo). When the gouge is rocked the corners start to coincide with the shadow.

The amount of travel to remove equal amounts of metal can then be gauged.

The polished edge is constantly being watched to make sure it is being ground evenly.

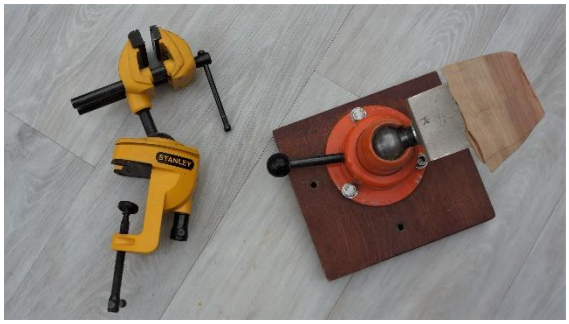
Alan tends to grind the middle more, and then carefully grinds the outer edges.

The mop is then used to hone the outside edge, and the leathers to hone the inside edge.

The shadow technique can be used in conjunction with a rubberised grinding wheel. Note: the grinding wheel MUST run in reverse i.e., away from the tool edge.

- **Work Holding**

  As Alan carves small models in the round, the ‘Stanley’ holder is very useful. It’s on a ball so it can be turned around, and the carving can be positioned whichever way is required. The other holder has a ball on it and it can be fastened to a bench. This was used to carve the tropical fish. The actual holder is a bent piece of aluminium. Alan often uses his Kevlar gloved hands to hold carvings.




  Once a carving is created, it needs to be taken off the holder to put detail on it. Alan tends to use a jeweller’s leather sandbag for this operation. The carving can be held without sustaining damage. Alan also uses other types of holders for carving.

  The owl above is waiting to be painted, and so holes can be drilled in it (and later filled). The holder (shown on the right) is just a hex bar with a wood screw in the top. The owl is tapped in the bottom and it can sit on that.

  It is essential to have a rigid work holder, when a lot of material is removed at the start.

- **We have identified the equipment and wood needed to create our next carving.**
  - What techniques do we need to use to create a carving?
  - Start by selecting a block of wood which has flat top and bottom surfaces parallel to each other with edge surfaces that are at right angles to the top surface.
  - Transfer the outline of the plan and side elevation to the block, and bandsaw away the waste wood.

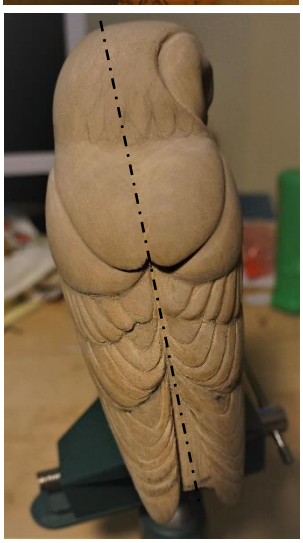
- **Basic Carving Techniques**

When carving a symmetrical object in the round always draw the major features on the four faces of the block.

Here we see the owl in the previous photo after the waste has been band sawed off. This has just got four sides. When carving in the round most objects are symmetrical. As much detail as possible is put onto the block.

Centrelines are marked in (such as down the beak), the high spots are marked in red. The red spot in the middle is where no wood is removed to start with.

Once the carving is started, detail is drawn on the wood as it progresses. As wood is removed the detail is drawn back on.



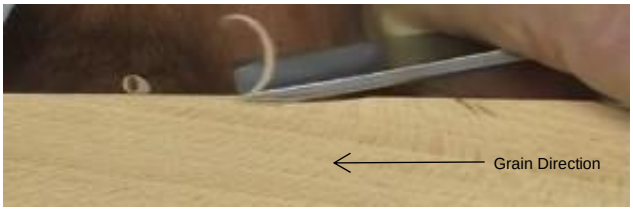

Mark the centrelines, and when removed by carving, put them back in.

There is also a centreline down the symmetrical back of the owl.

Mark the high spots on the carving, i.e., places that are going to have a small amount of wood removed. Centrelines are useful, in helping to maintain symmetry whilst carving. When developing the outline shape (bosting) no wood is removed from the high spots.

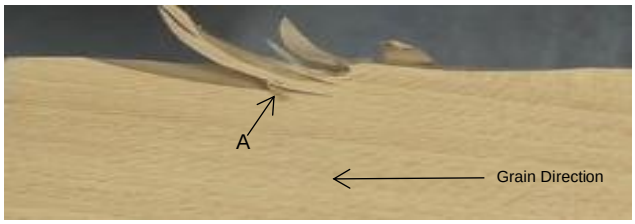
In general, wood is removed either by working away from, or towards the high spots.

- **Techniques For Carving With The Grain**.



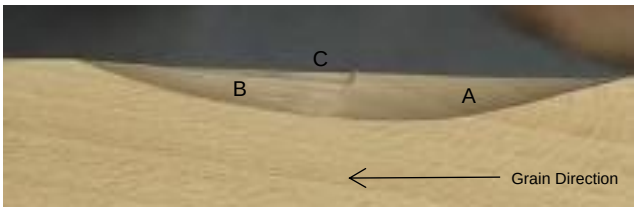
Carving with the grain, the cut will be clean and controlled. A nice cut comes off it when a sharp gouge with a polished finished is used.

The wood needs to be carved with the grain whenever possible.



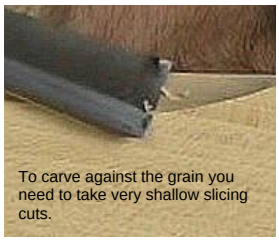
Here the wood has been carved against the grain, the gouge has gone as far as A, but it will be noticed that because it is a wedge, the fibres ahead of it are splitting. There has been a loss of control, and the carving needs to be stopped immediately. Sometimes, though, the carving can't be turned around and there has to be a technique for carving against the grain.

- **Techniques For Carving Against The Grain When The Carving Can't Be Turned Around**.



This photo shows where the wood has been carved with the grain on the right and there is almost a polished finish in region A.

In region B, the carving has started against the grain on the left, with the technique that's going to be explained. It's not a bad finish, but it's a bit rough at C.



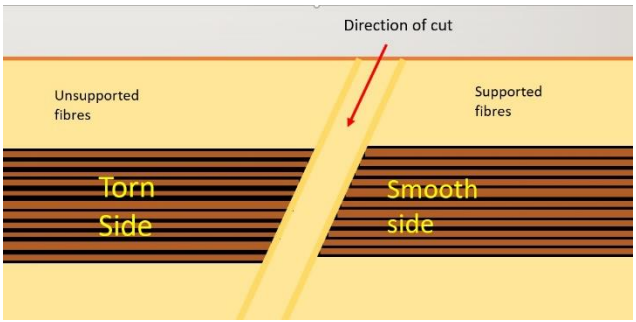
To carve against the grain, a very shallow cut is taken, and instead of pushing the gouge forward and using it as a wedge, the gouge is moved diagonally across, with the sharp edge being used as a knife. The gouge is moved forward slowly with a very shallow cut, but not as a wedge which splits the fibres.

A very sharp gouge is required with a very thin cut.

A variation of this is: instead of moving the gouge diagonally, the gouge can be "rolled" using a bit of the edge. Again, the gouge is being used as a knife.

- **Carving On The Diagonal.**

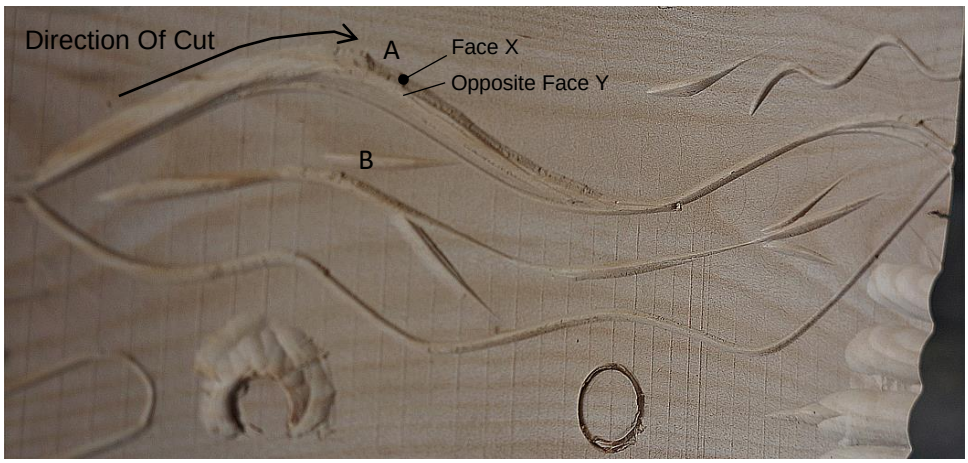
In the following figure, the horizontals represent fibres of wood. The cut will be diagonal, in the direction shown.



On the right-hand side each fibre is supported by the one underneath. On the left-hand side, the fibres are not supported. As the fibres on the right are supported, this results in a smooth surface being achieved. The fibres on the left have reduced support so the surface could be torn.

There has to be a technique to overcome this. If the cut is straight across the fibres, each side will be smooth as the fibres are supporting each other.

- **Eliminating Tear Out On Diagonal Cuts.**

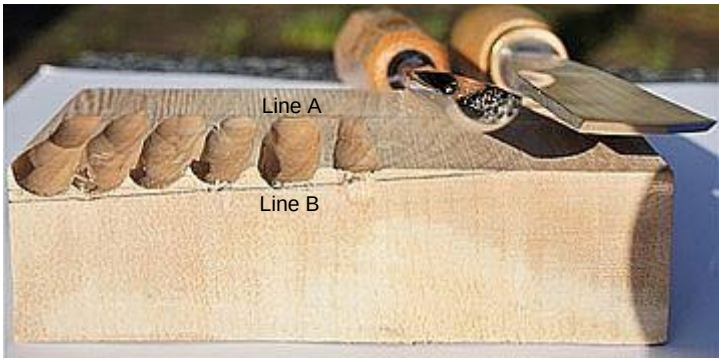


In the previous photo, a ‘V’ carve gouge has been pushed through some wood. In regions A and B, the fibres are not supported and it appears rough on face X (the face Y which can’t be seen is smooth). To overcome this, the cut needs to be shallower than required on face X.

Moving the gouge in the direction shown, wood is only taken out of face X which needs to be smooth. The smooth face Y is left alone. Using this technique, the gouge is cutting where the fibres are supported on both sides. As can be seen on the other areas of the carving, clean cuts are achieved with this technique.

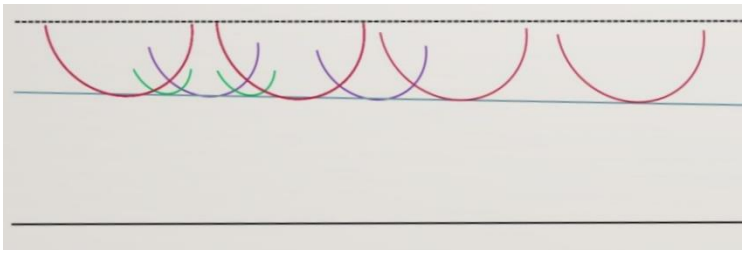
- **Bosting And Removing Wood To Achieve The Required Profile.**

There is generally a need to remove wood from the block that comes off the band saw. The process of achieving the final shape, prior to adding any detail is known as *Bosting*. A flat surface is to be created between lines A and B:

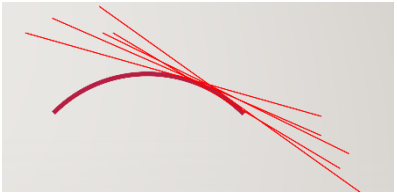


Some channels are cut where the bottom of the channel is on the new surface that is to be created. Sometimes you may not have a line to work to, and carving is being done to a blind spot. A number 3 gouge is then used to take off the waste wood. A reasonably flat surface is achieved that way.

This shown in pictorial form:



It could be that the channels need two or three cuts to get to the new surface line. To remove the waste wood, the number 3 flat gouge is pushed through. Successive cuts are shown, as the waste wood is removed, resulting in a new flat surface. Using a number 11 gouge with a big curve on it, flat surfaces can be created. It has to be done incrementally. The hard part is judging where the new surface needs to be.



A flat gouge can also be used to create external curves, just by moving it around.

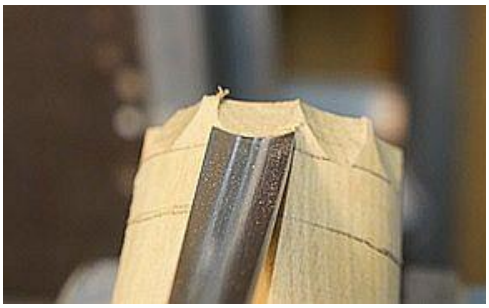
- **Bosting ~ Controlling The Depth Of Cut.**

In the previous example, when there is no surface line how can the channels be cut to the same depth?

Here some channels have been cut, and if the channels are cut to the same width using the same gouge, the channels should be at the same depth within reason. It is a bit more complicated around a curve.

- **Bosting ~ Removing Wood To Achieve The Required Profile.**

  This is an example of the carving of an apple:



First draw a pencil line around indicating the first high point to carve from. Then use a gouge to remove wood by creating channels which run around to the high point on the top.

Mark a new line that represents the high point and continue to carve channels that round over the top. The bottom of the channel is the new surface. As it's on a curve, long and short channels are the result.

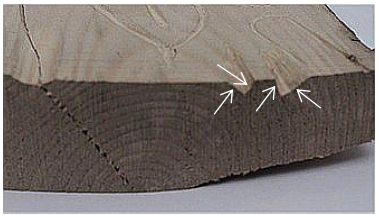
A number 3 gouge (which is flat) is then used to remove wood from the sides of the channel to create the outer surface.

When the bosting is complete, and the shape is as required, the interpretative carving can then be sanded down to remove the tool marks. It can then be polished with bees-wax or lacquered.

For a realistic carving the next process will be the addition of details.

Professional carvers can produce carvings "off the blade".

- **Carving Detail**



Using a 'V' gouge to outline or carve details. Note: when cutting diagonally, both a smooth and torn side is created as discussed previously on page 20. The 'V' gouge can be angled to achieve vertical edges and 'V' sides, as shown in the photo. 'V' gouges can be used in different ways to achieve various results.

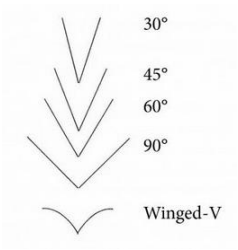
This is a practice wing carved using a 'V' gouge. Here Alan practiced carving the feathers in the wing and tail of the Kingfisher. The gouges can be used in different ways to achieve different results, and the feathers have been carved at different angles to get some life into the carving.

A 'V' gouge is used here to underscore the wings, carve around the tail, and between the wings on the back. The gouge is also used to define the head. The detail is put on using a 'V' carve gouge.

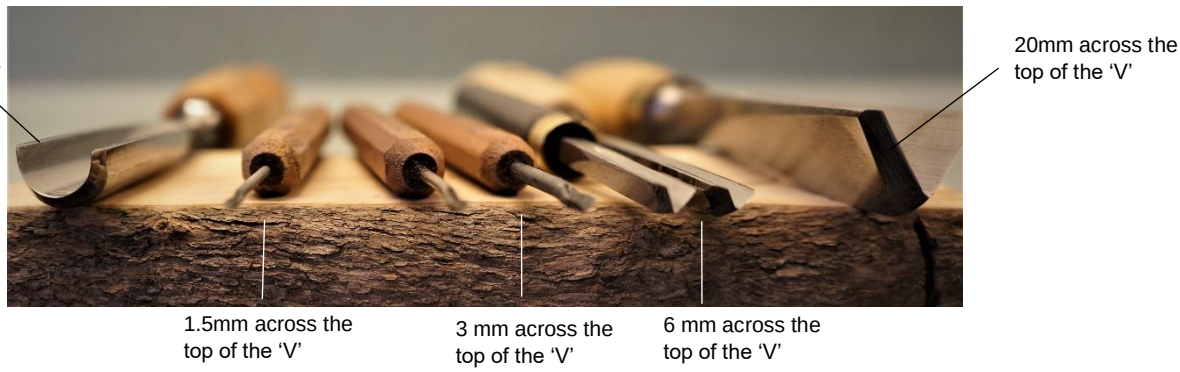
The owl was originally smooth after Alan had finished bosting it, and the wing detail is put on with a ‘V’ carve gouge working from top to bottom. A channel A is carved in at the top, and is then smoothed off. Another channel B is carved in below that and that is smoothed off. Then the outline of the feathers is carved in.

- **V gouges are available with different angles.**

  They can be bought with angles from 30° through to 90° (Alan hasn’t seen a winged ‘V’ gouge yet)



Here is a collection of Alan’s gouges:

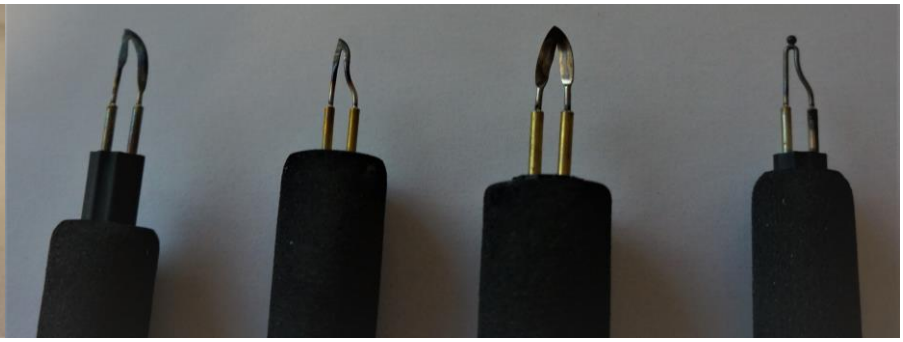


Alan rarely uses a number 11 gouge because they are straight at the sides and then curved and are difficult to reshape

- **Adding Detail And The Use Of Pyrography.**

  Once bosting is completed on interpretative carvings, it just remains to sand out gouge marks and apply a finish. For realistic carvings further detail is added using V gouges, knives and riffler files.

  Greater realism can be achieved through adding fine detail, by the use of pyrography. This burns the detail onto the wood and there are various shapes of blades for doing this.



- **Practice Carving And Burning Feathers.**

Here is some practice pyrography, and referring to the bottom left set of feathers:

When carving birds, the shape of the feather is carved. These feathers are carved on a vertical and lateral slope. This is an example of how not to do it. They look like roofing tiles. Bird's feathers are never regular like this, they are random. They are constantly being rearranged by the wind and the bird; they don't look like Christmas trees. On the right is how feathers actually look. The top feather is where Alan wanted to create more flow and movement into it.

With pyrography, a blade cannot just be placed on a position and moved, as the wood could burn, and charcoal is the result. The blade is very hot when it's placed on the wood, and it loses heat when it is moved.

To get an even burn, the moving blade has to be brought onto the wood, and then kept moving to the next spot. Most of the realistic birds Alan carves, have the feather details carved and burnt in before finishing by painting. It took some practice at carving and burning before achieving anything that approached realism.

- **Carving In The Round and Adding Detail.**



This is a long-tailed tit. The feather areas have been carved on, and the feather details are burnt on by pyrography. Further realism is provided by the glass eyes, and the legs have also to be made. Once this stage is reached, a stiff bristle brush is used to remove any charcoal. Varnish is then applied, so the paint is contained, and then the model is painted. The same process is used to represent fur on animals.

- **Finishing**

Sanding

Pyrography.

Painting: Alan uses paints realistic carvings

Polishing: Alan uses bees wax on interpretative carvings

- **Anything missing?**

Once the techniques have been mastered, the only limitation is a person's creativity, how they see a carving, how to move from a picture in the mind's eye to a carving from a block of wood. The ability to transfer from the mind's eye to the carving comes with practice.

The crucial features are:

- Have very sharp tools,
- Keep them sharp,
- Understand how to deal with grain.

- **Taking A Journey From A Lime Block To A Diving Kingfisher.**




This carving was a challenge for Alan. A professional carver had carved this fifteen years previously. Alan spoke to the carver and said he would like to carve it and was sent a couple of drawings.

- **From Block To Bird.**
  - Source reference material.
  - Determine size and scale. The barn owl shown previously was half scale.
  - Produce plan and elevation drawings.
  - Determine grain orientation and select a block. The kingfisher has a long thin beak, and the grain needs to go in the right direction to support the beak.
  - Transfer plan and elevation drawing to the block.
  - Bandsaw the blank.
  - Rough out the shape.
  - Define the shape and add feather detail.
  - Design and make a stand.

- **Source reference material.**

  It's always worth looking at photographs and pictures. Alan looked on the internet, in the illustrated book of British Birds, and articles in carving magazines. Alan found one in a book which was in a position he wanted to achieve in the carving. The picture had movement with the bird in a dive and its body arching. One trick with carving birds is never to have them looking forwards. The owl has its head off to one side (ref page 19). With photos the number of feathers on a wing can be counted.

- **Design and Scale**

  Alan decided to carve a kingfisher to full size to show feather details. This model was left unpainted with a natural wood finish and was mounted on a modern design stand.

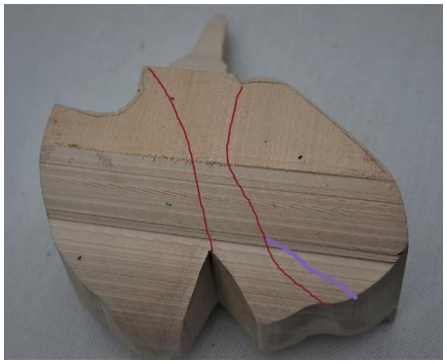
- **Plan and Elevation drawings.**

  Prepare drawings and transfer to the wood block and cut out the blank.

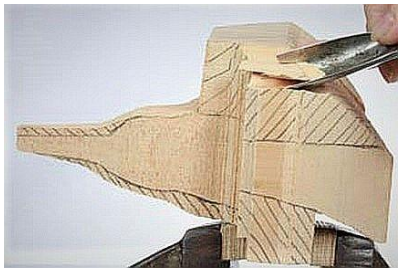
  Here Alan has drawn the elevation drawings on the top and sides of the block. When the plan and elevation is put on the block, in a band saw, the sections have to be taped together again. The side elevations are then cut.



The carving now looks like this and there is a lot of wood to remove. The wings are then marked out. The body sweeps around on a curve and the tail feathers have to be accommodated underneath, as an undercut under the wing.



- **Marking Out, Bosting And Adding Details.**



The areas where wood needs to removed are identified by marking out the details. A pencil is a very important part of the tool kit.

Here the carving is crudely bosted out. The tail area has been undercut under the wing. The body is curving over and down to the tail after bosting.

Alan tends to start by working on the head. If the head goes wrong, he usually abandons the project.

The upright hold was previously described on page 15 to impress a circle. That's how the eye was carved. The inner eye was created with a 4mm gouge and the outer with a 6mm gouge. The rest of the detail was carved with a 'V' carve gouge. There's more work to do on it.

- **Stages Of The Carving.**

Photos 1 to 2: The wings are very thick, the head has been worked on and there is still a lot to do.

Photo 3: The wings have been refined and smoothed off. To put detail on, smooth surfaces are required, so the carving has been bosted down and sanded. The definition feathers have been started.

Photo 4: This is a practice block of the same wood, as a lot of time has already been invested in the model to this point.

Photo 5: Here both wings have been carved.

Photo 6: The tops of the wings have been carved as well as the tail feathers.

Photo 7: The carving is then turned over. Up to this point the model was held in a vice. At this stage, a jeweller's sand bag is used to support the model whilst working on the lower surface.

Photo 8: The lower feathers are being defined. All the feathers shown are undercut.

Photo 9: The feather undercuts are shown. The feathers are quite fragile and delicate and care has to be taken. One of the tricks bird carvers use, particularly if a bird is to be painted, and for a carving where a bird has a long thin beak is to dip it in super glue. The glue is absorbed into the wood and that strengthens it. A glue has to be found which doesn't change the colour of the wood. Here are some more stage photos of the carving: The stand is made by gluing pieces of ¾" ply together, band sawing it, and even sanding it to the two directions of curvature. Here the details under the wing can be seen, as well as the details onto the body. When the bird is flying, the feathers are applied.

Questions And Answers

Q : I was amazed that when you honed a gouge on a leather strop, it didn't have to be sharpened on a stone again.

Alan: That's true, most people don't hone their gouges, and they find it becomes harder and harder work to carve. It's two minutes or less to strop. It's quick to do. I try to strop my gouges, before I put them away.

Q : When you strop the gouge are you moving it at the sharp edge?

Alan: Yes. I stick my elbows in, and I hold the gouge straight at just the right angle to the strop. Then I rock moving the gouge from side to side along the length of the strop. You must have sharp tools to do the work shown in this presentation. You cannot carve against the grain with blunt tools. You can get a good range of grits on modern linishers. You can get down to 1200 grit.

Q: Are the linishing belts diamond impregnated or aluminium?

Alan: There are zircon impregnated belts. I have a mixture of about twelve linishing belts. I use the belts where I can grind metal off in a controlled way without overheating.

Q: It seems to me that it's not just about developing the skills and techniques to remove wood, it's also about having the artistic flair to end up with that Kingfisher, which is magnificent.

Alan: You underestimate what you can do. I have only carved for just over two and a half years. I am only a novice. You just take your time, and have reference material to look at. If you are meticulous about marking your carving as you go, keeping the centrelines, marking the wastages, and the high spots, you can be successful. Always use practice blocks as you proceed. When you are doing realistic carvings, the tricky stuff is after you spent many hours getting there.

Q: Some of the birds you showed had quite delicate legs and feet, how were those made?

Alan: Legs and feet are made using copper wire and brass. The ends of the wires are then shaped into claws which are then brazed on and then epoxy applied. The legs are then attached through holes in the carving. This is the interesting thing about realistic carvings, you have to make a mounting, then shape the legs until the bird is at the right attitude. This is seen in the photo of the bird at the bottom of page 11 where there are holes in the twig through which the spigot goes.

Q: Does the epoxy give the texture?

Alan: You put the epoxy on, but bird's legs are crinkly, so you have to put the definition on to it.

Q: You have a Toolmaker Grinder; how does that compare with the linisher. Is it much quicker?

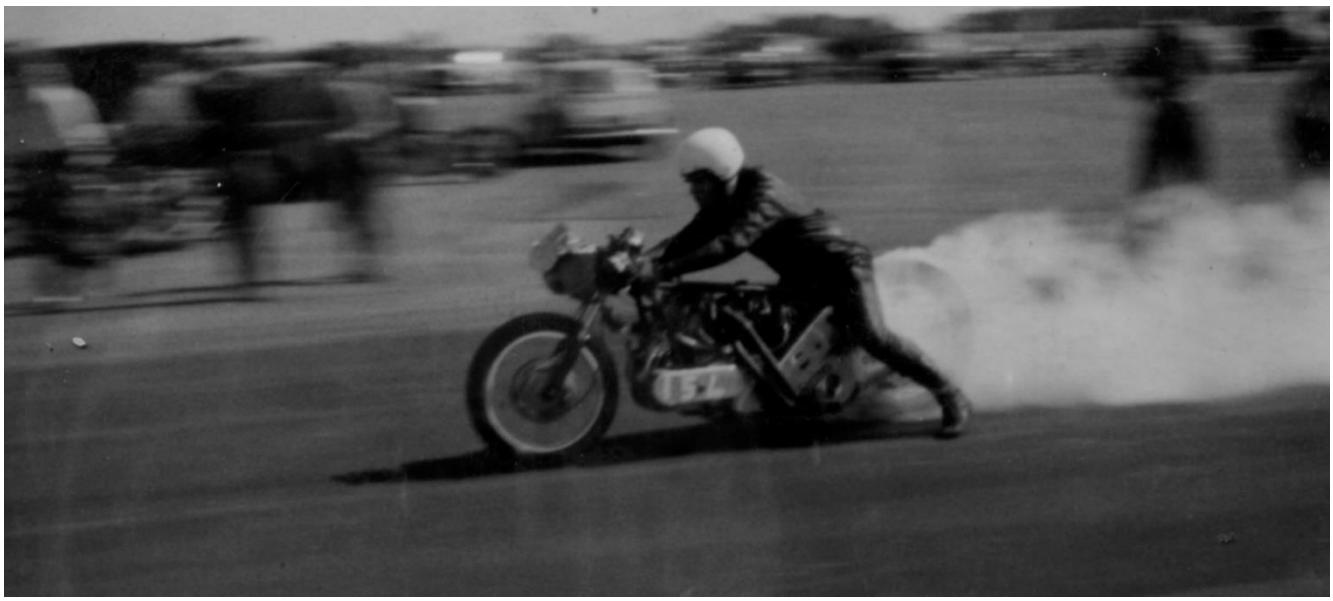
Alan: The linisher is very much quicker and more accurate. I chose a linisher because it has a flat face, whereas the grinder with the 8" wheel presents a curvature to the blade. You have to grind slowly and keep looking at it as the curvature is more pronounced. Also, with the linisher, as I have a number of belt grades, these can be changed very quickly.

Many thanks to Alan for preparing and presenting this excellent masterclass, and for taking time to proof read this article.

…….and finally, some light hearted Yorkshire humour…….

In 1973 I started “smoking” and became addicted; it took a few years to give it up.

The photo shows the extremes of it:



1973 ~ Topcliffe

I was given it on Monday (29th March) when I was officially at the Elvington speed tests.

On a more serious note; as side effects of my medical treatment, I have difficulty walking at times, and thanks to the kindness of my speed family, now I have been supplied with a new speed machine ~ an electric chair for my paddock duties.

Regarding the virus vaccine injections; a certain motorcycle speed friend in Ryedale keeps bringing me “Liquid Vaccine” in cans; it certainly works!

Paul Windross

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