NEWSLETTER November/December 2020

Comment

This will be the last newsletter for 2020, and the Club will not resume activities* (virtual or otherwise) until Wednesday 3rd February 2021, although it should be remembered that contact is still available through our Member's List if so desired.

We wish all our members and readership a happy Christmas and hopefully, a less restrictive New Year.

**There may be a call for a *Zoom* EGM in early January relating to the future of the railway, see page 5.

The PEEMS 2020 Annual General Meeting (AGM) was held on Wednesday 4th November 2020. In view of the continuing pandemic and consequent restrictions, the Committee had decided to hold a virtual AGM via *Zoom* in order to provide the greatest possibility for members to participate.

In attendance – Ron Baier, Colin Bainbridge, Jim Everett, Nevile Foster, David Hampshire, Paul Hayward, Harold Hulse, Tony Leeming, Jonathan Milner, David Proctor, Mike Sayers, Brian Stephenson, Brian Rees. Total 13.

Apologies for Absence**:** George Gibb.

- **Minutes of AGM held on 6th November 2019:** These were approved as a true record of events. Proposed – Paul Hayward, seconded Jonathan Milner, All in favour.
- **Matters Arising from the Minutes:** There were no matters arising.
- **Welcome by Chairman**: Good evening everyone. Well, if ever there was a typical year to look back on, this certainly was not it. When I stood up at the AGM last November, I was very nervous about speaking in front of people, but looked forward to the challenge. I have learnt to type a lot faster (still very slow), improved my e-mail skills, and enjoyed getting to meet more friends, so I have had a good year.

  Since I wrote a few notes for tonight's meeting, things have changed and we are about to start another lock-down. I would not like to bet that it is only for a short duration. It is no real surprise, and we all have experienced it before, but the days are shorter now and its coming up to Christmas. If anyone starts to feel lonely, or isolated, or a bit fed up please contact or give someone a ring. We are all retired and I am sure, more than happy to talk. Mind you, if someone is about to take the "last tenth thou off", please forgive them for not answering their phone immediately!

  I along with a lot of others, had never heard of *Zoom* at the start of this year, but now here we are making it work for us and allowing a lot more people to join in this year's AGM. If you are wondering why we are having two parts to the meeting it is because, without subscribing to *Zoom* we are allowed 40 minutes free.

- **Chairman's Report.**
  - **That's North Yorkshire TV ~ November 2019.**

    It was a bit of a baptism by fire when the Club was invited to be interviewed by *That's North Yorkshire TV* (*Freeview Channel 7*). I don't think anyone was familiar with the programme except Ted, and I certainly had no experience of TV cameras. I remember about 20 years ago chaperoning my daughter who was an extra in *Heartbeat*, and I was amazed at the number of personnel on site. There were make-up vans, costume vans, food wagons and security, cables trailing all over, and lots of people milling around. This was to be a smaller affair with one young lady and a little camera on a tripod in the Club workshop. David had prepared some excellent notes and a brief history about the Club. Paul Hayward felt at ease with the camera and took the lead. I managed to string a few sentences together, and with a very good turn out from Club Members bringing their own models to show at very short notice, we pulled it off admirably. We braced ourselves for a rush of new member's applications after the programme aired, but up to now nothing happened! I think the *Freeview* channels were in the middle of retuning and it was a stroke of good luck if you saw the programme.

  - **Guest Speakers At Club Meetings At The WRVS**.

    We have had two memorable guest speakers at PEEMS evenings at the WRVS Club during the last twelve months. Pete Smith in December 2019, speaking about his self-built Norton Special motorcycle, and in February, Paul Middleton (aka. Piglet) speaking about the North Yorkshire Moors Railway. The WRVS club was an ideal location for our meetings but sadly closed its doors. We managed to arrange to continue our meetings at the Memorial Hall in Pickering, but we all know what happened next! Although I attended two meetings about

the future of the WRVS Club, and left my email address so I could be updated with any news about the building, I have not heard anything. I don't think we appreciated how convenient the WRVS meeting facility was, until it finished.

- **Club Presentations.**

  We managed two Club presentations, the first at the Mickle Hill Retirement Village in January, and then the *Farmers' Breakfast* at Amotherby in March. Thank you to all who presented a good show of models, and made both occasions a success. Once again, we were not inundated with prospective new members.

- **Doncaster Show 2020.**

  The Doncaster Show in May was called off, but only at the last minute. I think politics and insurance companies were playing games. The Virus caused the cancellation of the rest of our calendar that had been planned for the year. The first non-event was our Annual Dinner that I had arranged to be held at Mickle Hill in March, following on from last year's success.

- **Club Socials**

  Later on, during summer, I was made aware of people missing social contact with each other, so I thought it would be worth trying to arrange a social gathering. I am not familiar with many places that could accommodate an outside meeting for us, and did not really know how many people would turn out, but my sister's pub at North Grimston fitted the bill, and it turned out well. We had two nice gatherings there and it proved a good move.

- **Club Matters.**

  Committee meetings have been held on *Zoom*, and the Club has been ticking over very well all things considered. We were lucky to have been offered some 'bits and pieces' and models that had been left behind after people had passed away. Everything was sought after, and found a good home. A draw for lots was conducted on *Zoom* when normally this would have been done at a Workshop Morning or Club Night.

- **The Railway.**

  The Railway has also been a casualty of the effect the Virus had during summer. Both Ryedale Show and Welburn Hall School visits were called off. We have been having a few discussions about the future of the railway, and David is compiling a report for the committee to discuss. However, before any decisions are made about the Railway's future, facts will be put to members at an Extraordinary General Meeting sometime in early 2021 (probably January ~ see page 5).

- **The Workshop.**

  Again, a big casualty. It is mothballed until we all feel comfortable about using it again.

- **2021.**

  Next year, I cannot predict what will happen. I hope for the best, but prepare to be disappointed. We, the committee have agreed to continue for another year in office and play the cards we get dealt. It is pretty obvious we are unable to arrange any guest speakers or visits very far in advance, but if the opportunity arises, we will do. We recognise the lack of value for money some members have felt this year, and so have decided to reduce next year's subscriptions (2021) for members who renew, to a token £1. Why only £1? Because we need a definitive list of members. This enables us to contact current members only, and to comply with the General Data Protection Regulations (GDPR), as well as for other administrative reasons.

- **E-Mails and Newsletter.**

  This brings up another point: email. The fact you are on *Zoom* almost certainly means you have an e mail account, and so the next comment is aimed at those reading this in the Newsletter. It is so much easier, cheaper and quicker, to inform everyone what is happening. I fully understand if email is not available for you, as long as you accept that you may miss out on news that might be of interest to you that becomes apparent between the Newsletters. Do you have secret email account, or will you consider getting one?

- **Treasurer's Report (David Hampshire).**

The accounts spreadsheet was presented to the club membership. The following comments relate to the items on the spreadsheet.

Despite the difficulty of the Club meeting for most of the financial year to the 31st October 2020, financially the year for the club has been a good one.

- **Subscriptions:** Subscriptions were up on the previous year due to new members joining, and the good attendance at the meetings from December to March, meant that the money taken covered the room rent, teas and biscuits provided, and the food at the AGM.
- **Insurance:** As always, the big expenditure is insurance which I think is excessive in relation to the actual activities of the Club. The Treasurer noted that whilst PEEMS insured itself as a 'Model Engineering Society', there was very little model engineering activity to justify the extra expenditure.
- **Donations:** The donation on the spreadsheet relates to the visit to the Anson Museum we made the previous year. Half of the excess income has been from donations; most of this income was from the sale of equipment given to the Club for resale.
- **Workshop:** There has been little activity in the Workshop.
- **Railway:** Not being able to run the railway has meant that its costs have had to be met from takings from previous years. The cost has been lowered by obtaining a refund from the insurance agent. The closing balance as shown will cover the costs for the coming year but after that, if we are unable to use the railway, the burden will fall on the Club funds.
- **Reserves:** The Club has adequate reserves so I propose that the subscription for the coming year should be a nominal amount under £5. This nominal amount is important so that we know who is covered by the insurance should we be able to undertake any activity in the coming year.
- **Accounts~ General:** The Treasurer recommended that someone else should keep a 'soft copy' of the accounts. Tony Leeming advised that he still had the drop box facility - with the last file from March 2020.

The 2019/20 Accounts were formally presented. Acceptance was proposed by Paul Hayward, seconded by Tony Leeming. All in favour.

- **Statement on the Future of the Railway.**

The PEEMS Railway has not been run in 2020, and will probably not be in 2021 either. The Secretary will undertake to draft a 'Position Paper' setting out the issues and options for the future of the PEEMS deployable railway. This document will be reviewed and amended by the Committee with the recommended option(s) put to the PEEMS Membership at an Extraordinary General Meeting. This is reported on following page 4.

- **Subscriptions**

In view of the lack of meetings and activities in 2020 the committee proposes to charge a 'nominal' subscription of £1 (cash) for existing members. Donations would however be welcome.
New Members subscriptions will remain at as current for 2020/21.
The purpose of the 'nominal' charge is to 'capture' and record those members who are current with PEEMS for insurance and planning purposes.
Proposed by Paul Hayward, seconded by Tony Leeming, All in Favour
Members will be asked to email the Secretary stating their intent to remain in PEEMS and to "promise to pay" the £1 at the next physical meeting they attend. Any member kindly wishing to make a donation in excess of £5 is asked to do so by cheque – payable to PEEMS and sent to the Secretary. Otherwise, donations will be collected with the £1 2020/21 subscription.

- **Election of Officers and Committee.**

Due to the lack of PEEMS activity in 2020, and to simplify the AGM, the 2019/20 Chairman, Officers and Committee are, subject to the caveat following, to remain in post for 2020/21. Mr John Powell tenders his resignation from the Committee and George Gibb, whilst remaining a Committee member, will not participate in meetings until the Workshop reopens. George Gibb's membership of the committee will not therefore count towards the number of members required to achieve a quorum, unless the workshop is open.
Proposed by Paul Hayward, seconded by Tony Leeming. All in Favour
Tony Leeming kindly volunteered to re-join the committee. Proposed by David Proctor, Seconded by Colin Bainbridge. All in favour.
No other nominations for committee membership had been received.

The Officers for 2020/21 are therefore:

Chairman: Jonathan Milner **Vice Chairman**: Paul Hayward **Treasurer**: David Hampshire
Secretary: David Proctor

The Committee for 2020/21 are therefore:

Nevile Foster (Newsletter and Publicity) Colin Bainbridge (Immediate Past Chairman) Peter Bramley
Tony Leeming George Gibb (Workshop liaison): *only when the workshop is open.*

Quorum: With nine officers and committee members a Committee Quorum will therefore be:

- *Six* (based on the ((N/2) +1) rule) with the workshop open and
- *Five* when the workshop is closed, for example due to Covid restrictions.

- **Chairman's Closing Remarks.**

We cannot close this AGM without mentioning that I had the sad task of reporting the deaths of two members in the last 12 months. Brian Mallott and Chris Irvine.

Because of the lack of activity in the Club this year I have decided not to hand out the Chairman's Award. Tony Leeming is happy to keep it polished and dusted for another year. That said I would like to say a big thank you to Nevile for his sterling work producing a first-class Newsletter when we have not had much news to report. Also it is much appreciated when anyone takes the time to send in articles for including in the Newsletter.

Thanks to David Proctor for a lot of hard work he has done behind the scenes. I will admit that he often has to edit my e-mails (at my request), before they are sent out. We all appreciate the commitment that Treasurer David Hampshire has to the Club, especially considering his near-death experience earlier in the year.

Thanks to Mike for allowing us to have had a few workshop mornings and committee meetings before the lock-down. Thanks to all the committee and thanks to all members who make the club such an interesting diverse and friendly group. Stay safe all.

Jonathan Milner

- **Questions and Any Other Business.**

Mike Sayers remarked that as we were making significant use of *Zoom* during the Covid lockdown, should we not invest in a full licence. The Secretary reported that he had been looking at this, but that it was not fully clear how easy it would be to transfer ownership should the need arise. The Secretary also noted that sometimes the forty minute limit on the free version was quite useful in focusing attention in committee meetings.

The possibility of using *Zoom* in the longer term was discussed in the context of using it to stream live speakers to non-local members. The Secretary agreed to experiment with this when physical meetings were allowed once again. A prerequisite would be a solid WIFI connection from Memorial Hall.

- **The PEEMS Railway Viability Study (Executive Summary)**

At the recent AGM it was announced that a detailed study of the future of the PEEMS Railway would be compiled. A draft report was presented to the Committee and the final version accepted at the Zoom Committee Meeting held on 17th November 2020. The final version, 'Future of the PEEMS Railway' Version 1, has been sent out to members.

I'm afraid the report is rather long and detailed, following a formal structure. In general facts are presented and discussed separately from the conclusions deduced, and recommendations made, based on those facts.

To sum up, an executive summary of the report would read something like:

Due to the lack of sufficient willing able bodied PEEMS members it is no longer possible to deploy the Railway a sufficient number of times per year to reliably generate enough revenue to cover its costs.

- It is recommended to formally retire the Railway and, in the first instance, place it in a state of 'Preserved Storage'. It is recommended that 'Preserved Storage' should last no longer than two years and at the end of that period the Railway is either 'Returned to Service' or disposed of.
- If, during Preserved Storage, it becomes commercially advantageous to dispose of the Railway this shall be recommended to members.
- It is recommended that, if possible, the Railway be ultimately disposed of by 'Sale as a Going concern'.

At the November Committee meeting the following resolution was passed unanimously:

"Version C* of the "Future of The PEEMS Railway" be accepted and that the membership be informed of the committee's recommendation to retire the railway, initially storing for up to 2 years prior to likely eventual disposal.

Notwithstanding the two-year storage, members may be recommended by the committee to agree to sell the railway at any commercially advantageous time."

*Version C was the final draft which has now, on ratification by the Committee, become Version 1.

The link is here (please press): Microsoft Word - Version 1 - PEEMS Future of The Railway 201119.docx (wordpress.com)
To return to newsletter please press back arrow at the top left-hand side of the screen.

The Committee's formal recommendation therefore is that the Railway be put into a state of Preserved Storage pending disposal.

Of course, this is just a recommendation, the ultimate decision being made by the members. To that, an Extraordinary General Meeting (EGM) shall be called (date: to be decided, but probably early January 2021), at which members shall formally vote on the recommendation. It is very likely this EGM will be a *Zoom* affair; however, 'digitally deprived' members will be encouraged to participate and express their opinion in some way - possibly by proxy or even postal vote.

An EGM in January is required, as any decision taken then gives time for the adjustment of the society's insurances (the major overhead) before renewal at the end of March.

The date and time of the EGM will be advised in due course.

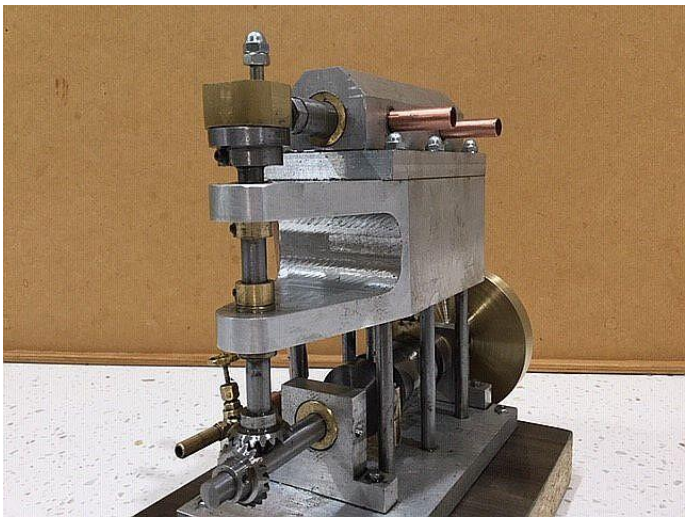
It has to be said that the Railway has been a publicly visible part of PEEMS activities for a couple of years shy of two decades, and its retirement highlights the awkward truths that a) none of us are getting any younger and b) we are not attracting sufficient numbers of younger members.

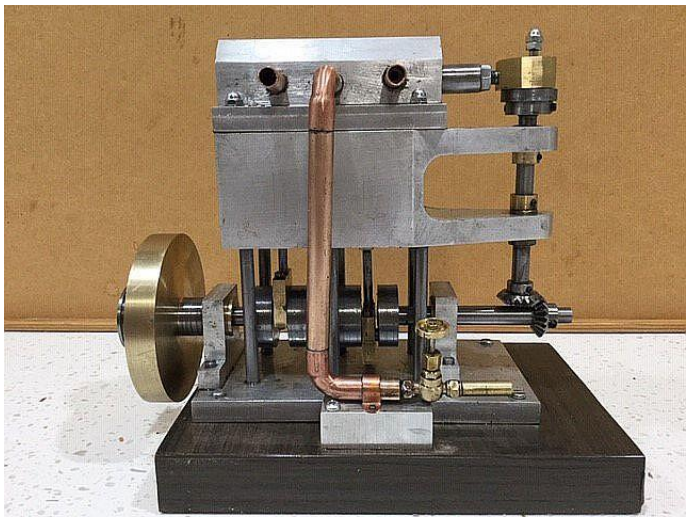
Do feel free to make your opinions on the future of the Railway known to committee members - your views are solicited.

David Proctor

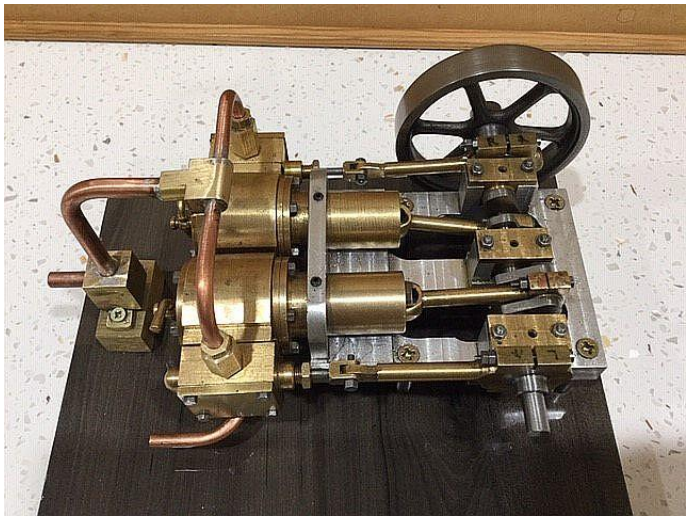
- **Some Models Constructed During 2020's 'Lock-Down' ~ Brian Stephenson.**

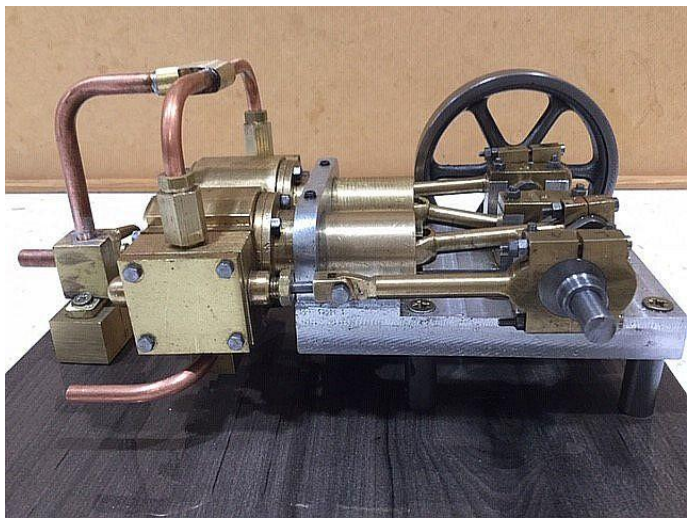
i) High Speed Twin Cylinder Engine (Drawing By Bob Middleton).





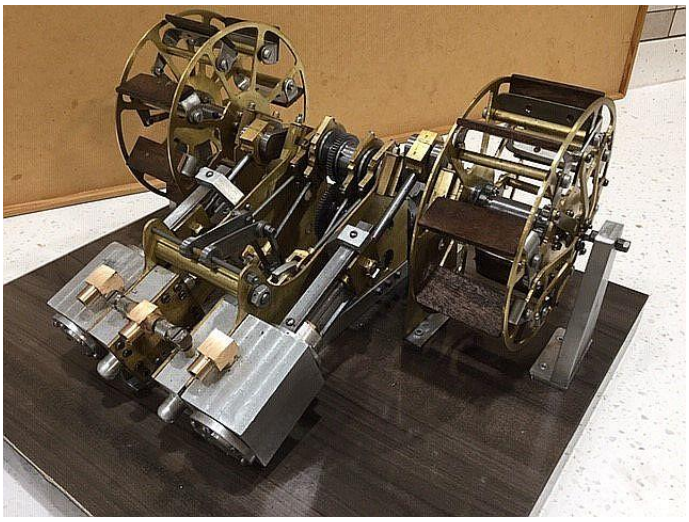
ii) Stuart Turner 'Double 10' Twin Cylinder Horizontal Engine.

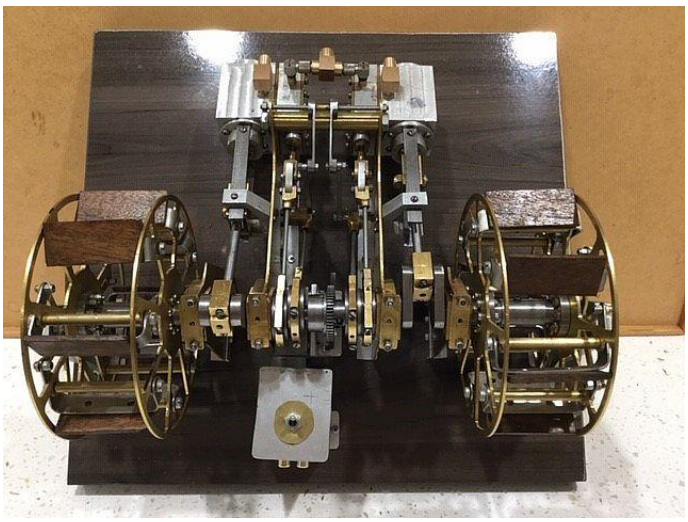




iii) Paddle Steamer Engine and Paddles,

This model is a diagonal paddle engine from drawings by Edgar T. Westbury. The paddles were the most difficult part of the model as sixty four pivot points had to be made for movement. The engine runs really well.





If you want to see these models running please press the link to Brian's website:

MODEL ENGINES BRIAN STEPHENSON - Home Model Engines of Brian Stephenson

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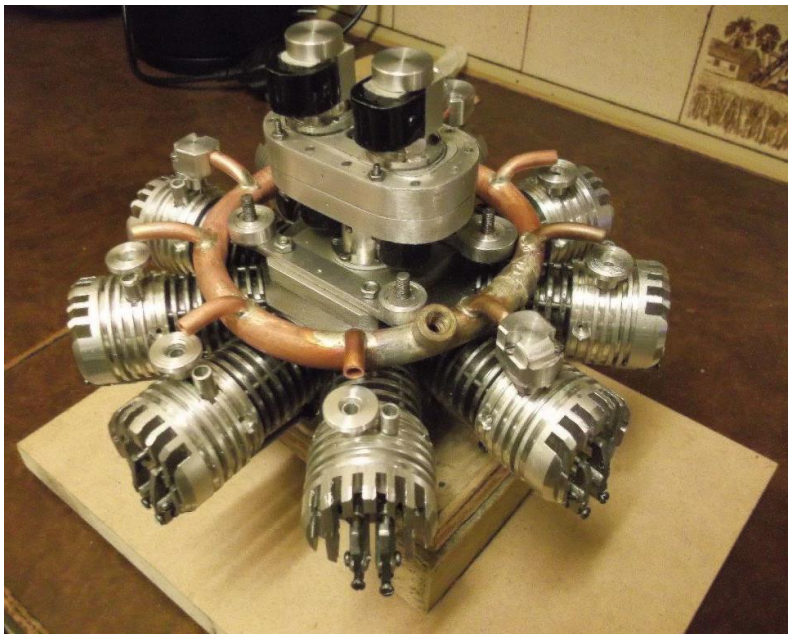
- **A New Aero-Engine Project ~ John Heeley**

In early August I decided to tackle another Aero-Engine Project, but because of present day restrictions I was not able to go out with a camera and tape measure to find an interesting prototype. So 'like Topsy' the model just grew. I call it the T 9, and it's based on a notional development of the Bentley BR2 Rotary Engine, but with nine fixed radial cylinders. The propeller is mounted conventionally on the crankshaft.



Press the link to go to the Bentley BR2 website:

Bentley BR2 Engine History | The Vintage Aviator

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The construction follows BR2 practice, with a steel crankcase and cam housing. The cylinders are held down by four threaded studs, with two valves per cylinder and typical 1920's accessories, driven off a gear case mounted on the rear crankcase cover.

The scale of my model is about 1/5th, giving a diameter of 10" and a capacity of 38cc. This is rather smaller than the Bentley Rotary I built seventeen years ago, but has the same ‘vintage look’.

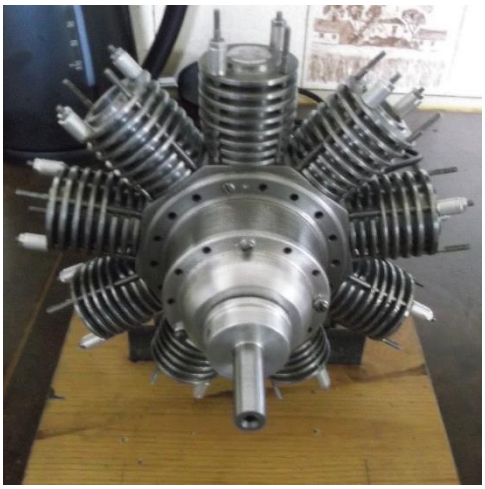
Initially the model is being set up to run on compressed air, with the option to fit a Bentley type geared cam ring at a later date. I know that's cheating, but I do find the prospect of making sub miniature spark plugs, and a working ignition system, rather daunting.

Working just two hours a day, progress has been surprisingly rapid. All design work is done "in the metal," with no drawings, using mostly materials I have in stock.

I make extensive use of jigs and slide gauges to produce multiple components, with very little actual measuring or marking out. This is a technique developed over many years, and so far it works for me; remember if there is not a full-size prototype, you can`t get it wrong.

I have taken photographs once a week to illustrate progress, and I estimate the project will be complete in three to four months. It's not perfect, and will no doubt receive constant tweaks and update's in the future. However, it's not bad considering it started from a pile of rusty metal, and a few bits of aluminium.

John Heeley.



- **Machining "Castings" From Solid ~ Mike Sayers.** A *Zoom* presentation on the 2nd December.

Introduction

The question to start with is: Why would you want to machine "castings"?

Some answers are:

- You are building a project where castings are unavailable.
- You live in Yorkshire and are not prepared to spend the money purchasing them, even though they were available.
- You have no skill or enthusiasm for foundry work.
- Castings may not reach the quality of finish required.

There are several advantages:

- The machinist is in close control of all dimensions.
- There are no problems with inclusions or blowholes.
- There is a consistency of finish.
- The component will be stronger, because the material is stronger.

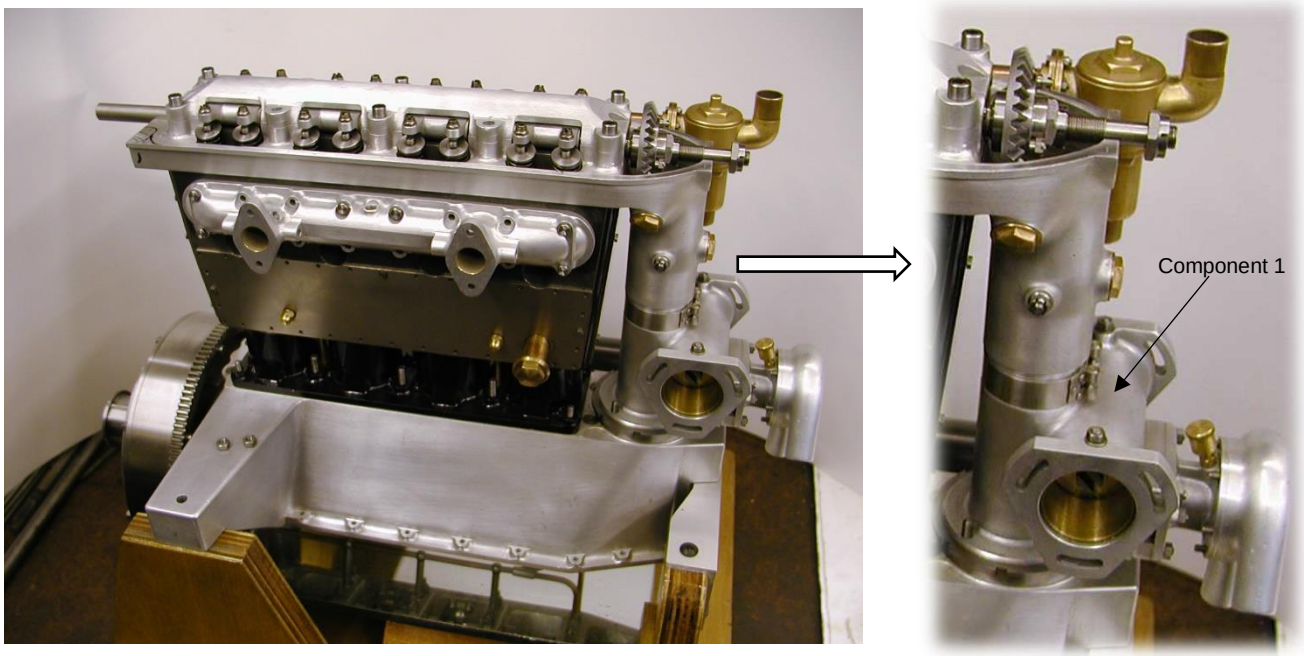
There are also several disadvantages:

- Machinings require time consuming setups.
- A certain amount of tooling is required.
- Machinings sometimes require tedious hand finishing.
- A drastic mistake when close to completion does not improve one's temper.

Illustration Of The Concept Using A 1/3rd Scale Model Of A Bentley Engine.

Mike chose to illustrate the talk with his 1/3rd Scale 3 litre Bentley Engine. He chose three components from the engine as examples to show the way to look at the shape of an original full-scale casting, before starting a scaled version machined from solid.

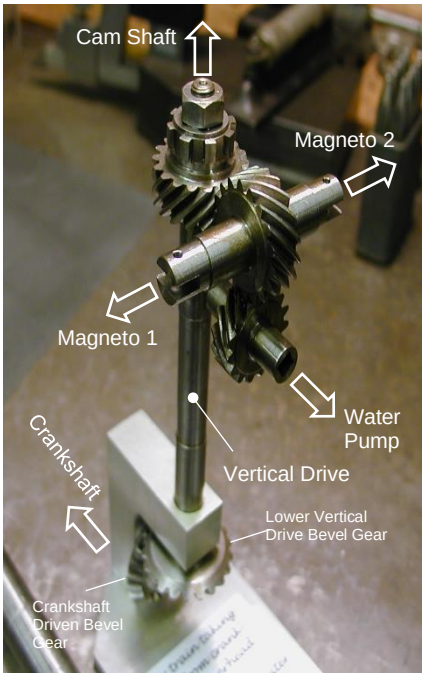
- **Component 1 ~ The Lower Turret Of The 3 Litre Bentley Engine.**



The Turret performs the same function as an accessory drive on an aircraft engine. There is a water pump attached to it as well as two magnetos on either side. Inside, a vertical drive goes up through the Turret to drive the cam shaft at the top.

The pump, magnetos, and the internal drive all function whilst attached to this one casting

These are the gears which operate inside the Lower Turret:



The upper gears are home-made cross helical gears.

The bottom bevel gear is connected onto the end of the crank shaft. This drives the lower vertical drive bevel gear.

The upper vertical shaft cross helical gear drives the magneto helical gear in a ratio 1:1.

The magneto helical gear in turn drives the water pump helical gear below it. This is slightly over-driven being 30% over engine speed.

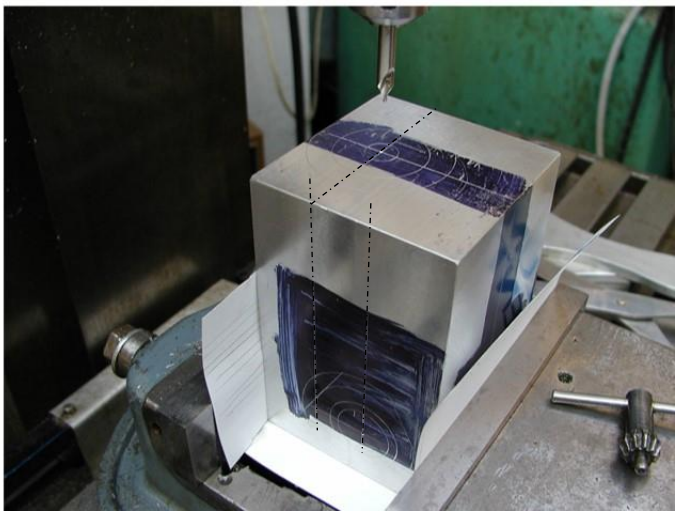
The vertical drive shaft and the two upper shaft centre positions are absolutely critical. The gearing was set up with the best running tolerances, and the shaft centres were measured so that the exact relationship between them was known. These dimensions were then incorporated in the drawing.

This meant that if the bores in the turret are accurately manufactured using the shaft centre dimensions, the gears will fit and run with minimum backlash. If it is too tight, they won't go in.

To create the scale version of the cast turret, this important relationship between the bore centre lines is the starting point.

Here is an original full scale cast Bentley Lower Turret:
The relationship between the vertical and horizontal bores have to be maintained on the scale model.

To start with, a block of metal is required:



The block has been machined to dimensions just over the minimum size to get the scale shape of the casting. All the sides have been machined square and parallel, so if the block is stood in any plane, all the other sides will be upright and 90° to each other. This means that the sides can then be used as setting faces.

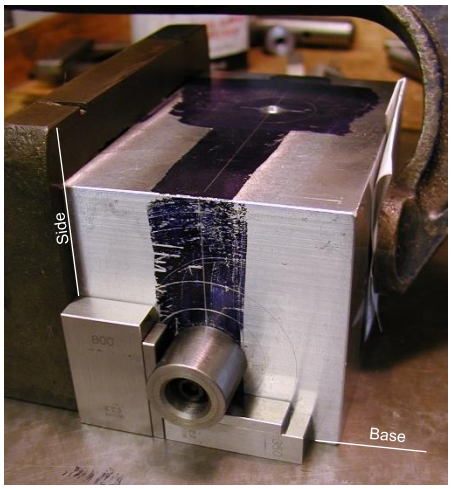
The 'marking out' shown above is the only marking required, to establish a centreline on the top face to give the *approximate* position of the vertical shaft.

The right-hand vertical line on the front face above, is also marked in relation to the vertical line on the left-hand side which aligns to the centreline of the vertical shaft.

There is a similar *approximate* centreline for the water pump marked on the other side.

Eventually these centrelines must be precise. 'Marking out' is not accurate enough.

The next stage is to drill and tap the holes with 2BA or 5mm threads and then attach toolmakers buttons.

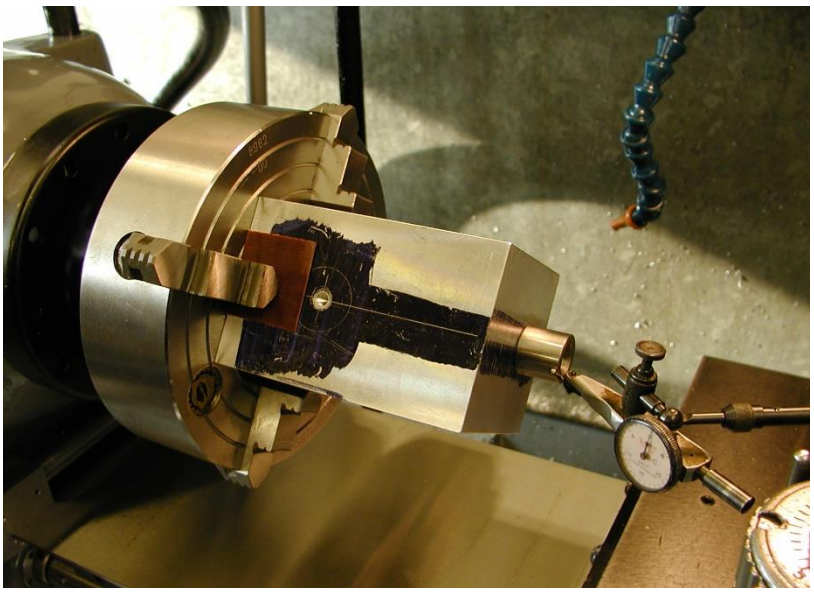


Attaching A Toolmakers Button Using Slip Gauges

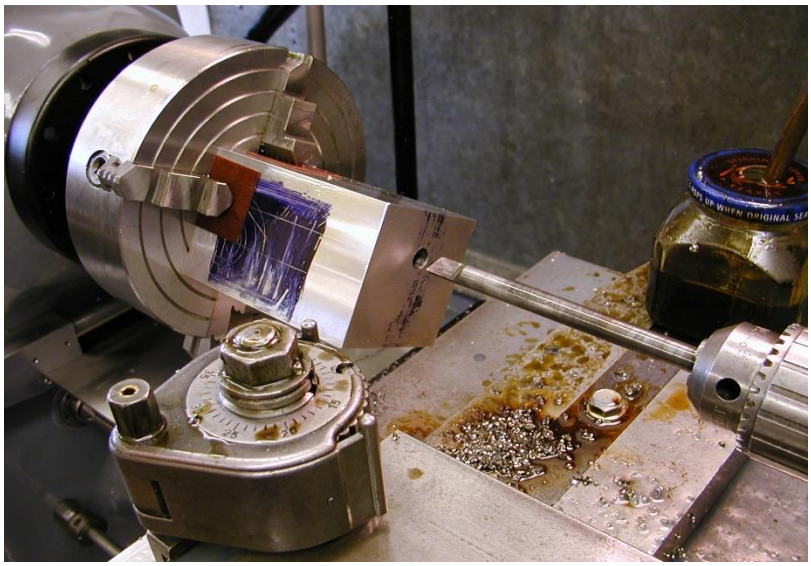
Working from the two reference faces, the base and the side, the button can then be accurately positioned, with its known height from the base and position from the side.

In positioning these buttons, the same reference base and side faces are always used, to produce accurate centrelines.

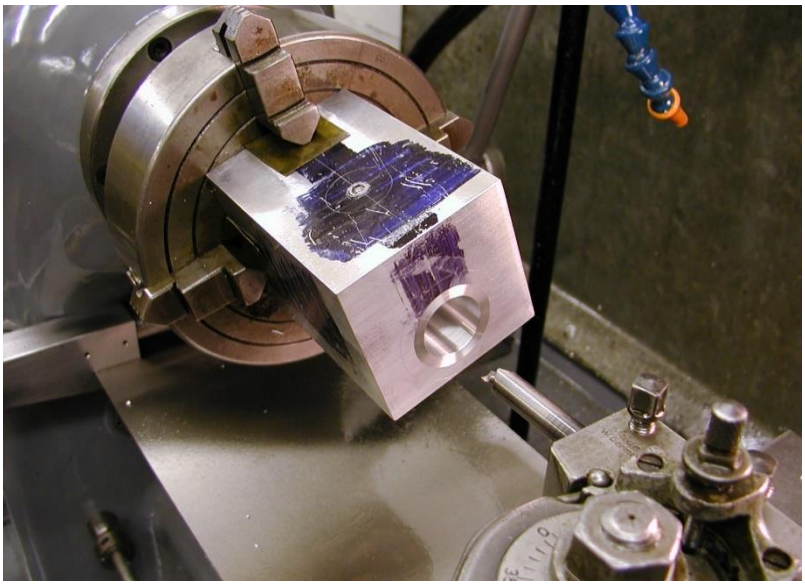
Toolmakers buttons are a bit old fashioned now, but are accurate in positioning bores.



The block is then put in a four-jaw chuck and the button is clocked ‘true’.

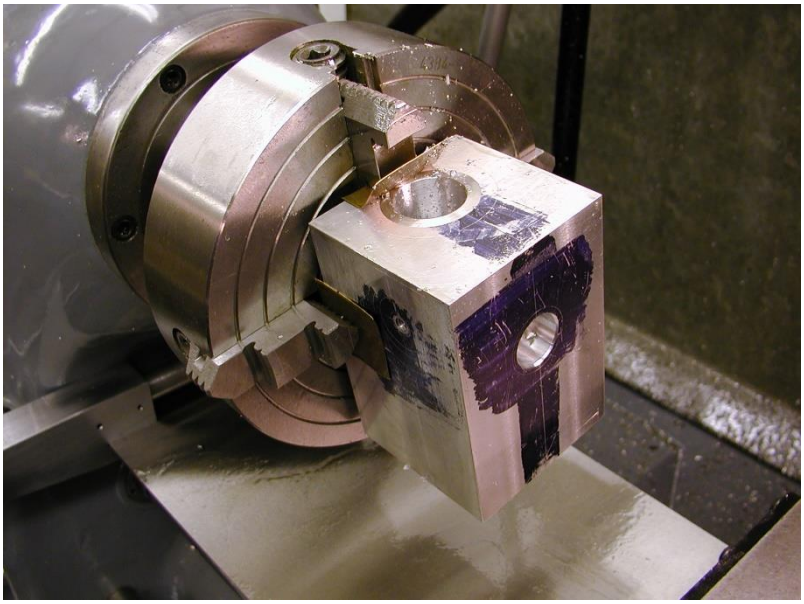


The holes can then be drilled knowing exactly where the bore is.
The first bore to be drilled is the vertical bore which doesn’t go all the way through.
A ‘D’ bit is used to ‘true’ the bore so that when the hole comes out the other end it is in line with the other end.



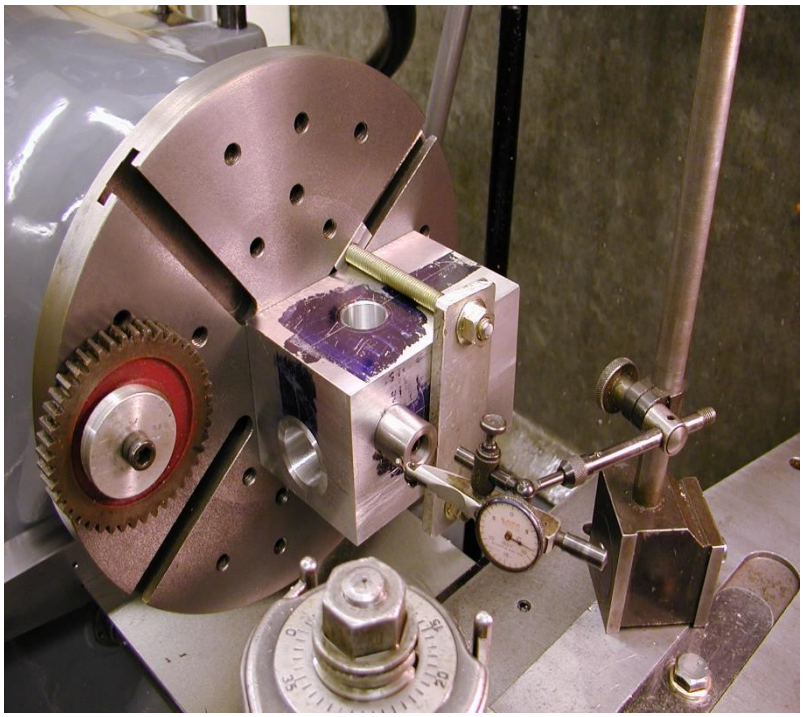
This is the first bore boss part way through.
It doesn’t go all the way through.
It is bored to size and depth

Here, the second bore for the water pump is completed. The process was as before, with the button being clocked true before drilling and boring.



Clocking true the button for the magneto mount. The same thing is done for the magneto mount on the other side.

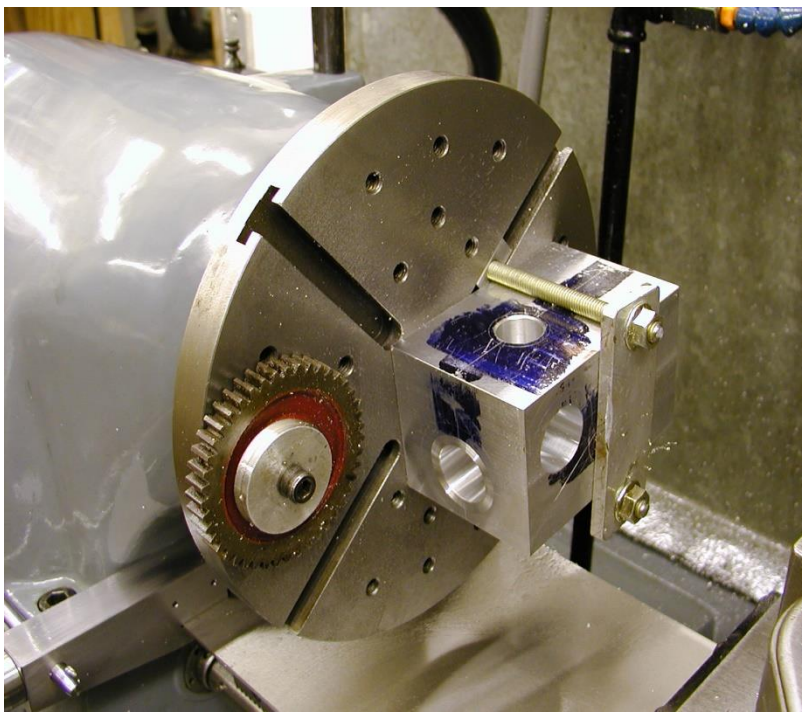
All the buttons have been positioned by the slip gauges from the reference faces as described for the vertical drive bore.



Here there are three intersecting bores, which are in a correct relationship to each other. Having achieved that, these bores then become the datum points and the means of holding the block for all further operations on it.

Every operation on the block from now on is chucked from a bore on an expanding mandrel or some similar means.

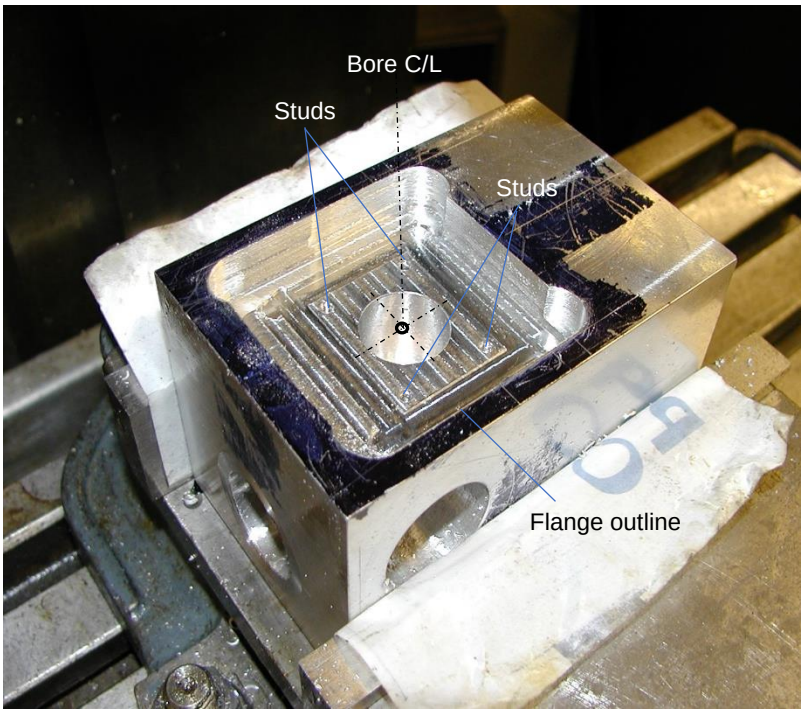
The reason for showing this particular component is that all the datum faces that are used are within the component, which makes it quite easy to follow through with all of the rest of the machining procedures.



The component is now in the milling machine, and the water pump flange face has been machined down to the correct distance from the axis of the vertical drive.

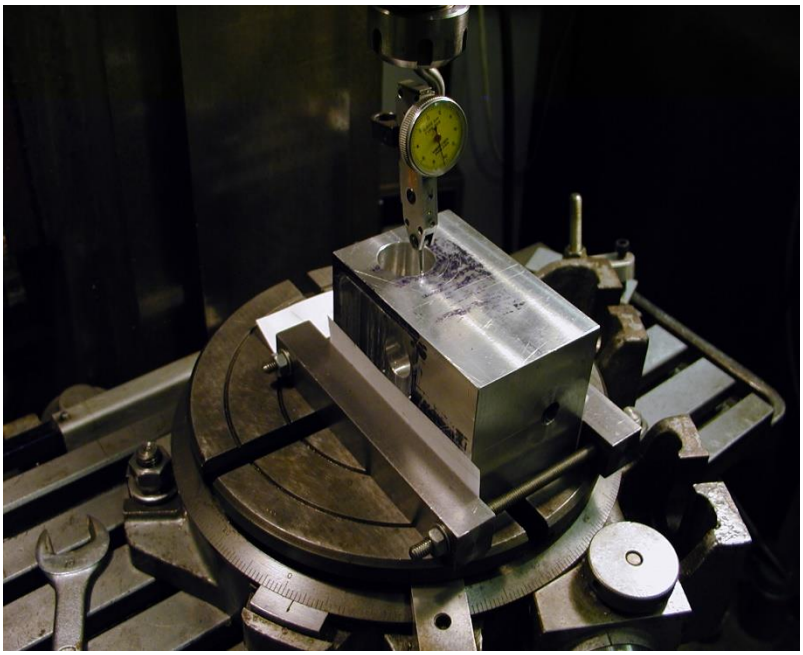
The size of the flange has been outlined and the stud holes have been drilled and tapped, all by co-ordinate measurement from the bore centre which has been clocked up true and the X and Y scales set to zero.

From that co-ordinate at the bore centre, all cutter and drill/tap operations have been carried out without ‘marking out’, but by using the ‘readout’ dimensions from that origin.

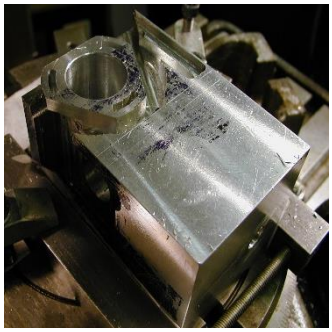


This picture shows the component mounted on the rotary table to profile the magneto mounting flange.

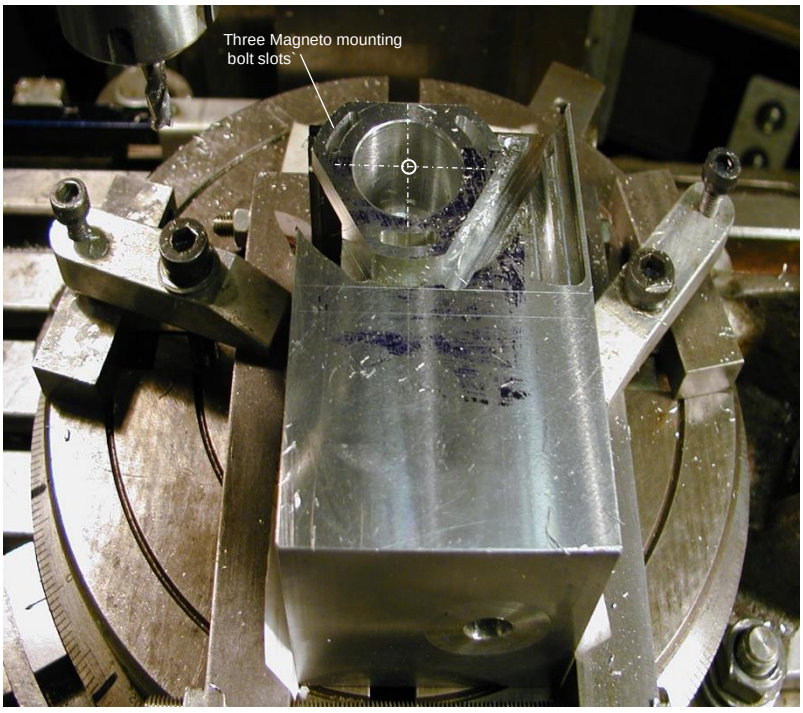
What can’t be seen is a stud, of the bore diameter mounted into the centre hole of the rotary table. The component is positioned onto the stud. Here the bore is being checked for concentricity with the d.t.i. just to make sure all is well.

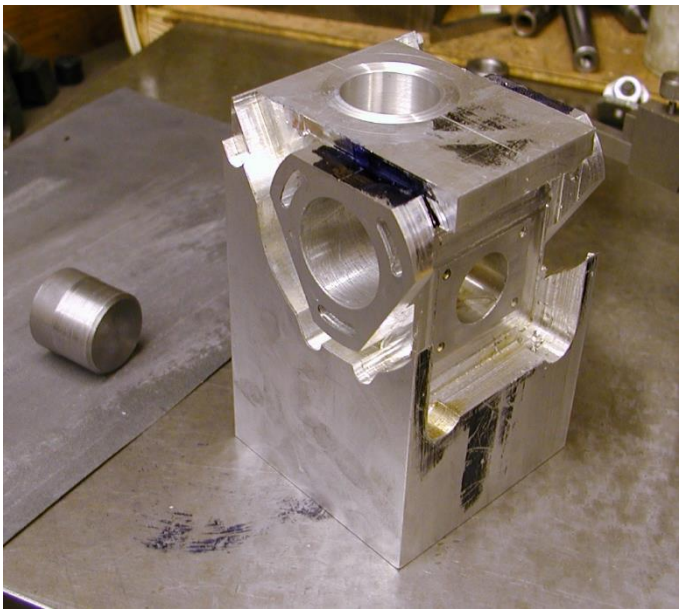


From the bore centre, the whole of the profile of the magneto flange can be done on one setting. The slots for magneto mounting bolts can be machined at the one setting. The slots allowed the magneto to be rotated to adjust the timing.



The component is then turned over and the other Magneto flange profile and mounting bolt slots are machined in the same way

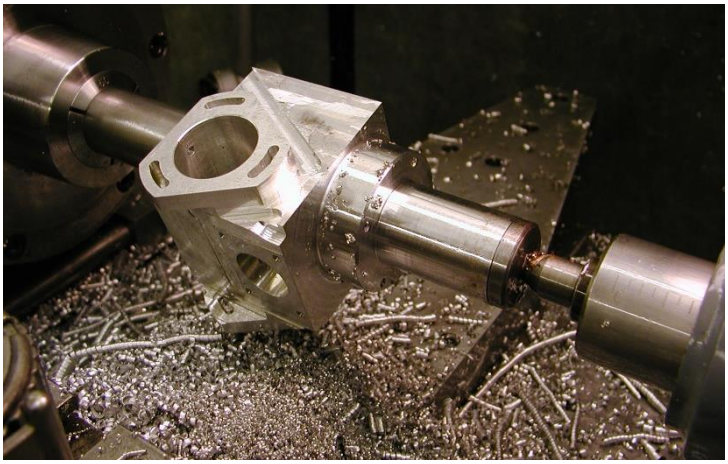


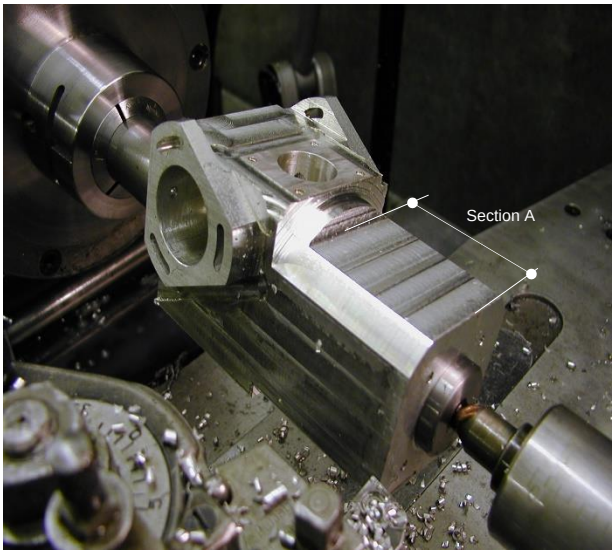


The component is starting to become the required shape. The second photo shows some of the waste that has been milled away.

The component is now in the lathe supported on an expanding mandrel down the top bore and by the tail-stock centre.

Section A is being turned as a stepped diameter.

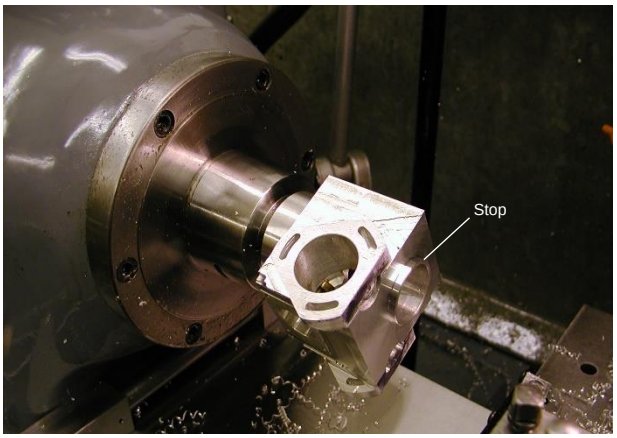




The larger diameter section will eventually be screw cut for a jacking ring which allows the component to be adjusted up and down when mounted.

The smaller diameter has nothing to do with its final dimensions. It is just sized to fit a 1” collet to allow the work to be reversed for further operations on the component as shown.

This allows the top to be machined.

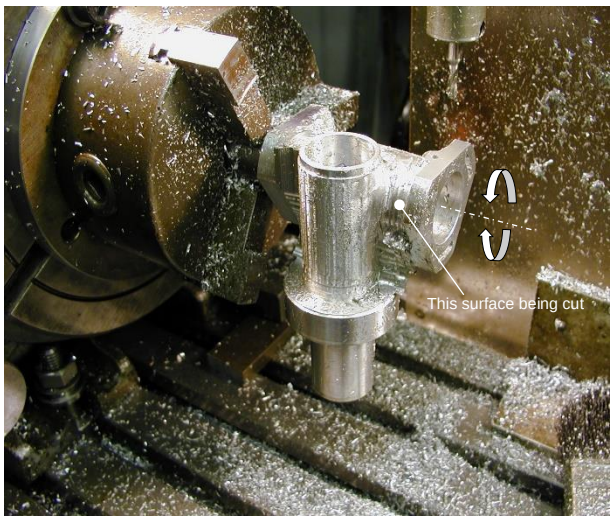


Holding the 1” diameter in the dividing head, the external shape is being machined by rotating under a 4mm ball nosed end mill. The component is rotated by hand during this operation while passing the cutter along its length creating the circular outer shape. Care is taken in not going too far, because there is an intersection with another circular portion at A which is machined to a different diameter.

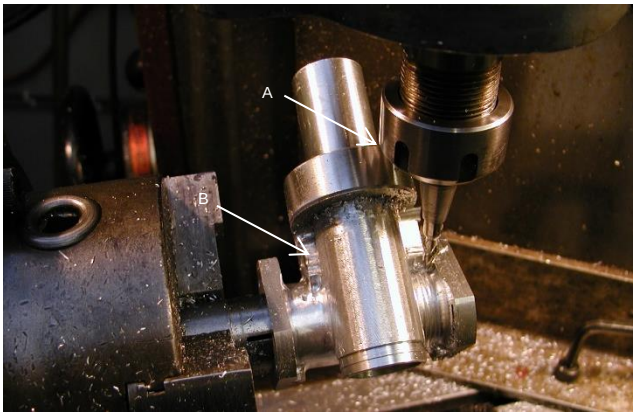
As seen the component consists of intersecting cylinders which makes it quite easy to visualise, easy to hold, and easy to machine.

If you look at any component or casting, the combination of intersecting cylinders can be visualised, and it is that fact that needs to be appreciated before starting any machining. As it is being drawn, the means of holding and machining the component can be visualised. Some of the cylinders may only be part of a cylinder, but they are still there, and the curves have to be produced. The centre-line around which the component needs to be rotated to produce the curves still needs to be known. The previous photo shows the first stage in 'roughing out' the outer surface of this component.

Here the component is mounted on an expanded mandrel this time in the magneto bores, to rough cut the outer surface shown. This is hand rotated as before.

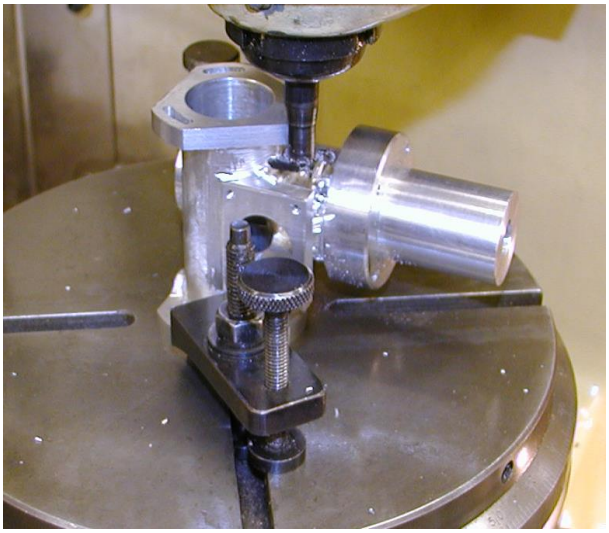


Not every position on the outer surface of the component can be easily reached. The photo below shows work on a difficult area with an extended cutter, but note the interference with the component at A. Also note the excess material marked B which will have to worked on by other means.

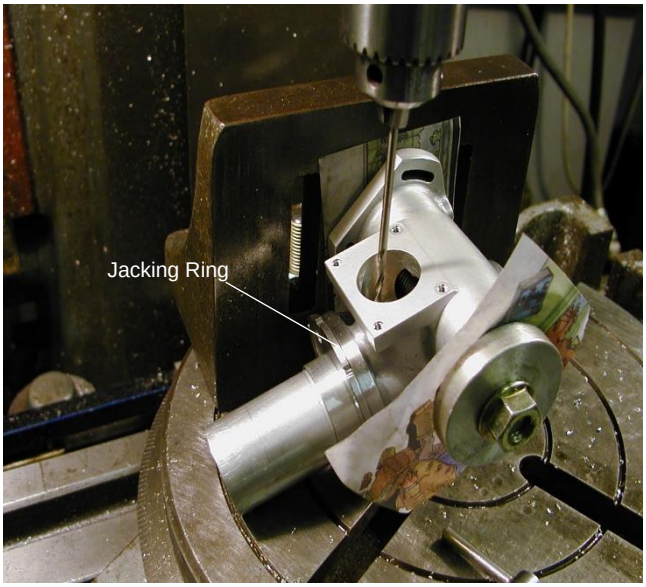


Another setup is required to reach the difficult areas. Note the odd shaped homemade cutter. The component is mounted concentrically on the centring stud of the rotary table and is being rotated around. The cutter is cutting the back of the flange.

This is the limit of the machining on the exterior. It's all down to hand finishing now.

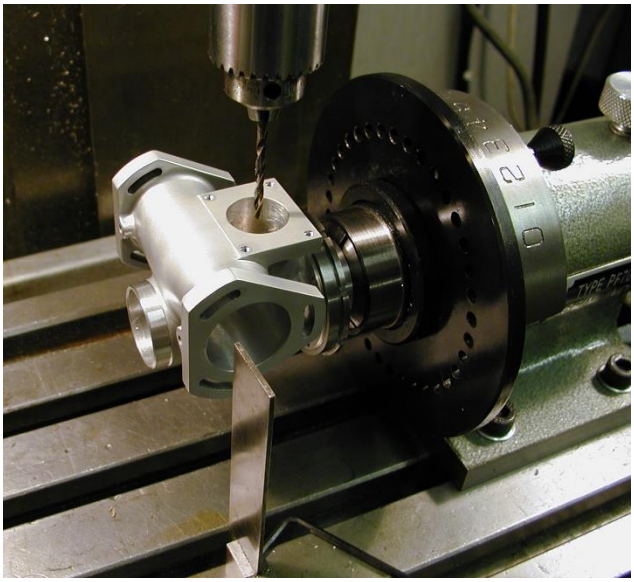


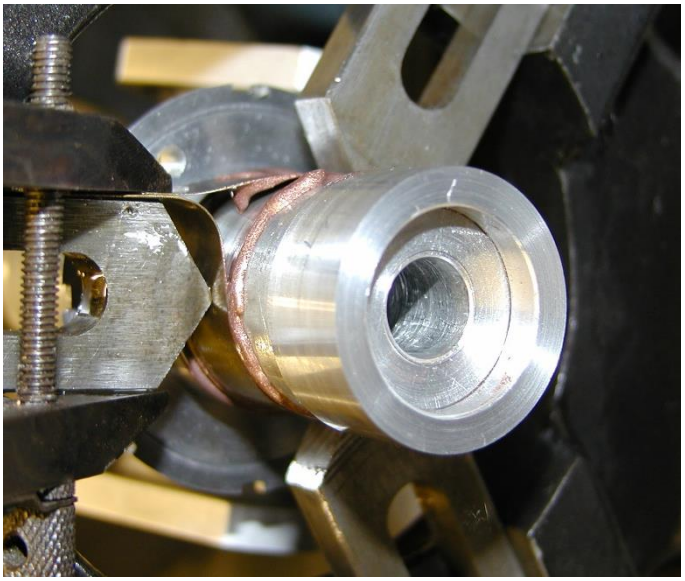
The photos below show the beginning of the hand finishing. Here the component is held in the bore by an expanded mandrel. The external areas are being filed and the radii are being blended. Thank goodness for the mighty Dremel and those cheap diamond coated burrs. The second photo show the component after the first stage finishing. It is adequate for the continuing machining operations



The second photo above shows the jacking ring screwed onto screw threads in order to protect them.

The magneto bore is chucked and the internal drain holes are being drilled for the oil that runs down the vertical shaft lubricating the nest of gears. All the oil that runs out of the cam box at the top, runs down the vertical shaft and finds its way out of the bottom to the sump.





The first photo above shows more internal oil drainage holes being drilled. The component is held in the chuck and it is 'set square' to ensure the holes are drilled correctly. The second photo shows the component in the fixed steady in the lathe in order for the lower ball race seating to be machined. Note the brass shim strip protecting the aluminium component from the steel fingers of the steady.

Here the component is upside down in the chuck having the final drain holes drilled.

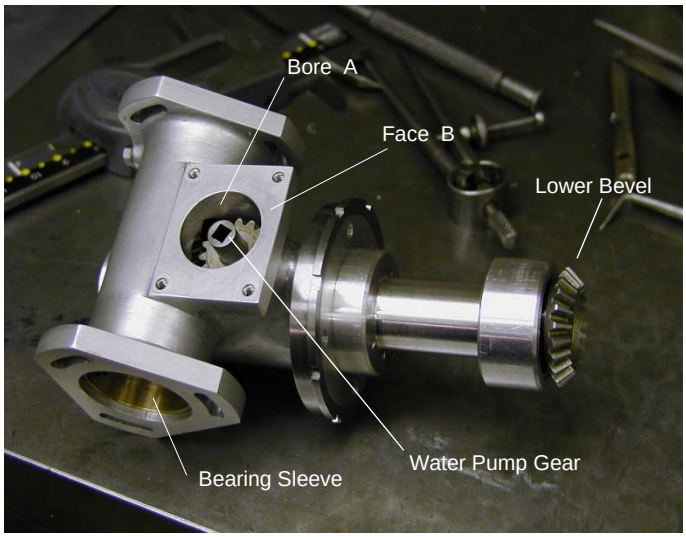
An unsealed open ball race sits inside the bore, seen at the top of the component in the orientation in the photo, and the oil passes through it on its way to the sump.

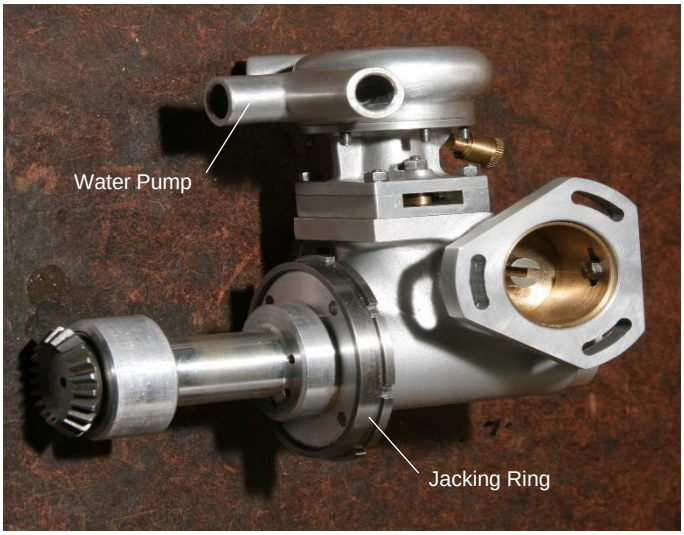
This photo shows the component finished, with the gears assembled in it.

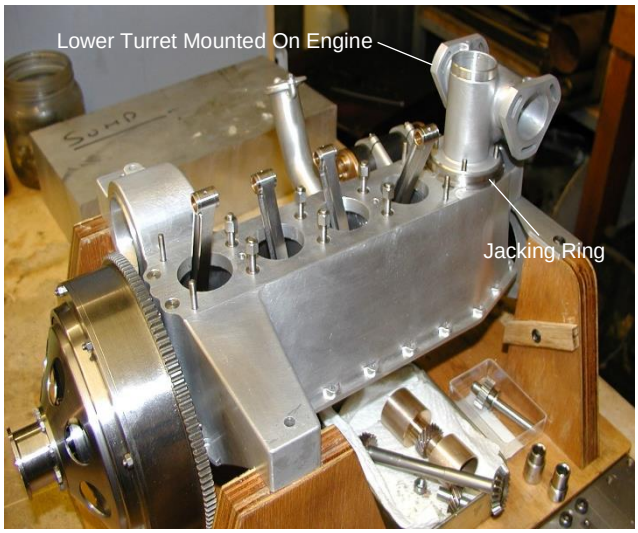
Bearing sleeves, which are just bushes, are installed in the magneto bores and these support the centre gear. A bush has also been pressed into the back of bore A to support the water pump drive gear.

The flange piece that is fitted on flat face C has a bearing in it which supports the front of the shaft. The water pump shaft fits in the square hole

The square hole in the water pump gear wheel has been broached out using a ‘D’ Bit.





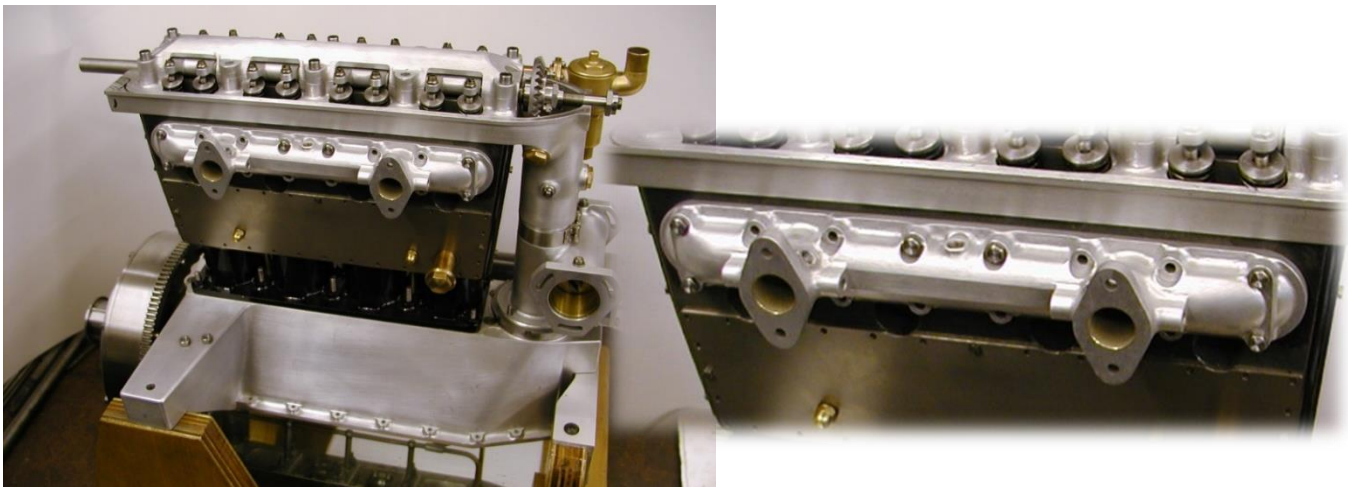


Here the component is assembled with the water pump, and the next photo shows the component mounted on the engine.

As shown previously, the bevel gear at the bottom is driven off the crankshaft bevel drive. Adjusting the jacking ring lifts or lowers the turret assembly to mesh the two bevel gears. This is how it is done on the full-scale engine. The longitudinal movement of the bottom bevel is achieved by shimming the thrust race in the crankshaft and that action moves the whole crankshaft back and forth by a few thou.

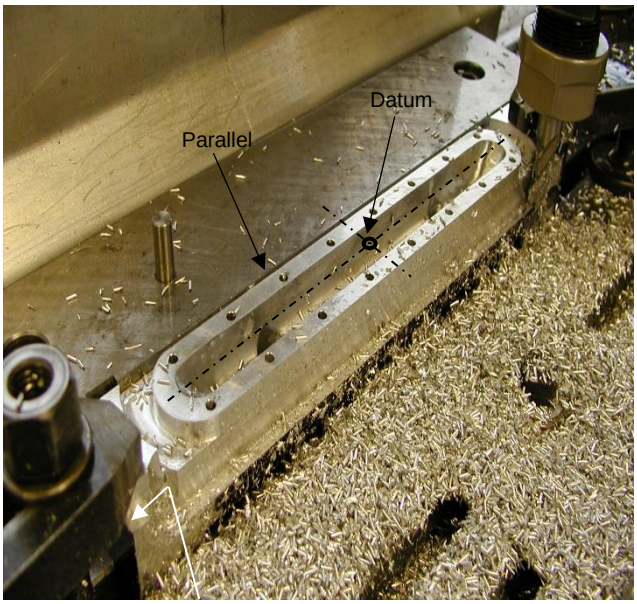
Component 1~ In Conclusion: The Lower Turret (Component 1) was chosen for the talk because all the datum points are within the component, but there are components where the datums that are needed aren’t within the component or are in an awkward position which can’t be used easily. To illustrate this point, we will look at the Manifold (Component 2).

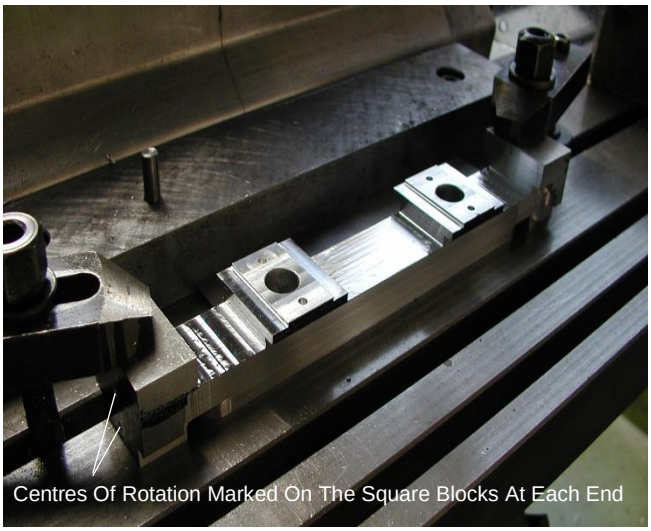
- **Component 2 ~ The Bentley 3 Litre Engine Manifold. Using Datums External To The Component.**

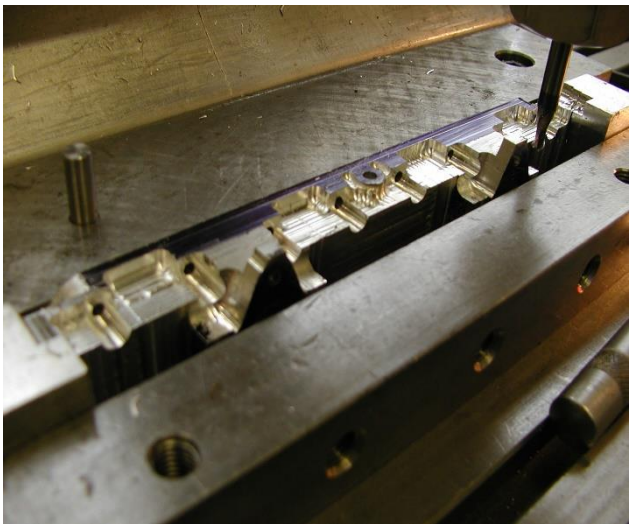


The starting point is again a rectangular block.
The back is machined and set against a parallel, and on an endstop which can't be seen in the photo.

Centrelines are marked on the block, and the X and Y scales on the readout are zeroed to this origin. If all dimensions on the drawing have been prepared using this datum, as long as the end location is maintained and the block set against the fixed parallel, all the holes on each face will be maintained in the correct relationship to each other.





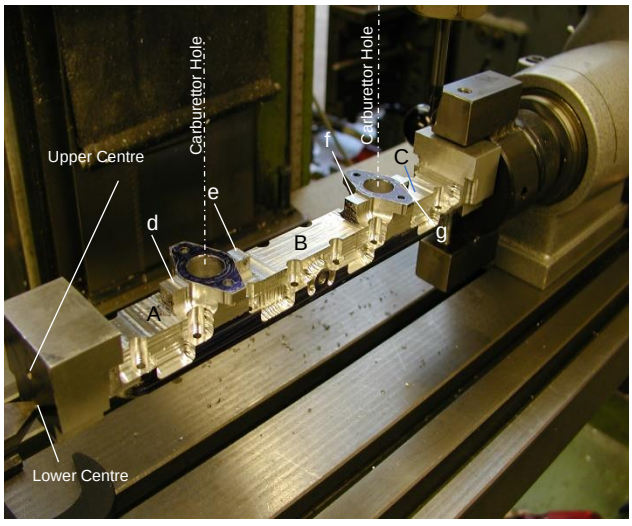


The first photo above shows the component turned over to machine the carburettor flanges. There is no 'marking out'. The holes are in the correct relation to the mounting holes underneath. Note: the large squares left on each end of the preliminary block, allow the job to be set up on any face. With one end set against an end stop, all longitudinal dimensions stay relative to each other on each face. At the end of each square block, centres have been marked in . These are the external datums or centres of rotation for machining the curves on this face. The second photo shows the roughing out of the shape of the top of carburettor bosses the stud bosses, and the priming bosses.

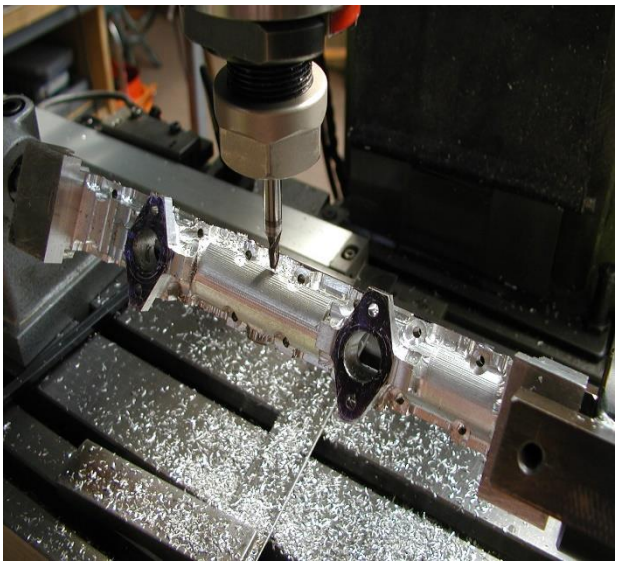
Here the component is mounted in the dividing head on a milling machine, supported on the lower centres predrilled in the end squares, in order to machine the curved outer shapes of the manifold.

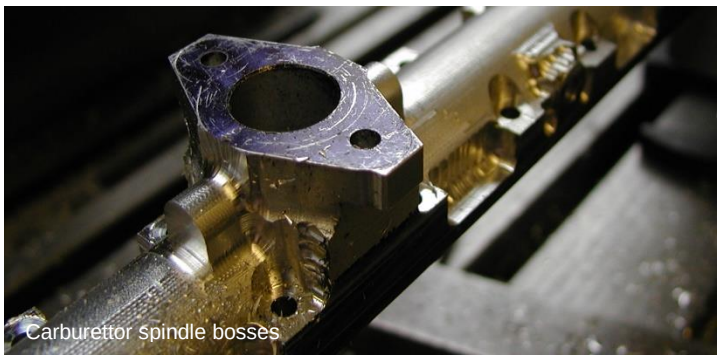
The whole job can be rotated by hand, under a cutter. This centre results in curved shapes at A, B and C.

Moving the centre of rotation to the upper centre allows the curved bosses at d,e,f and g to be machined. These curved bosses are on the axis of the throttle spindle. It may sound strange to have a throttle spindle in a manifold, but that is how the sloper carburettors 3 litre Bentleys work. There are no butterfies in the main part of the carburretor.
The carburettors are bolted to the manifold and their butterflies sit inside the holes, so it is imperative the holes are in line.



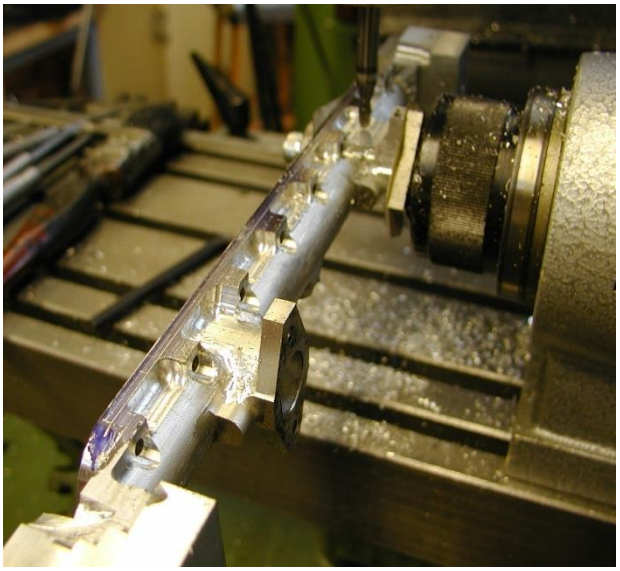
Here the part is being rotated by hand under a 5mm ball ended cutter to produce the outer curves of the manifold. The cutter moves longitudinally along the manifold while it is rotated between the lower centres with square ends. This a procedure that would be difficult without the external datum points (centres) being available.

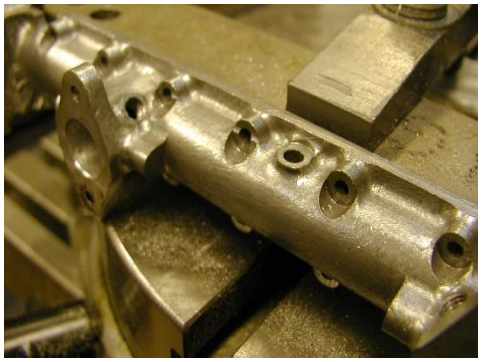




The carburettor butterfly spindle bosses are produced in the same way using the upper datum centres.

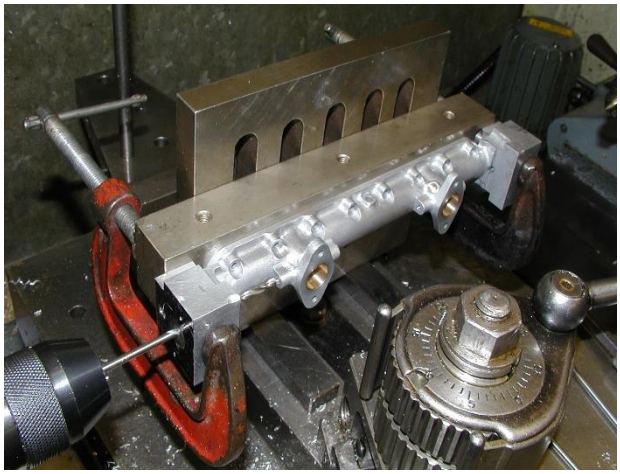
With an expanding mandrel in the inlet bores, the job is partially rotated to produce the short section of curve behind the carburettor manifold flange. Not all of this section is accessible to cut the curve, but most of it is. The technique is to machine as much as possible, and then 'fudge' the rest by hand.





The photo above shows the rough finished part. The question now is, can the 'squares' now be removed? There is another process where the 'square's' datum centres come into their own, and that is for drilling and reaming the carburettor butterfly spindle holes in line.

After being set between centres in the lathe, the manifold is clamped to an angle plate fixed to the cross slide. The upper datum centre (used to machine the curves on the bosses) has been centre drilled to a larger diameter, as the centre cone section is required when the component is reversed for the drilling of the second spindle hole. The drill can use this hole as a support to drill both spindle holes.



As can be seen, the brass sleeves are already installed in the carburettor manifold.

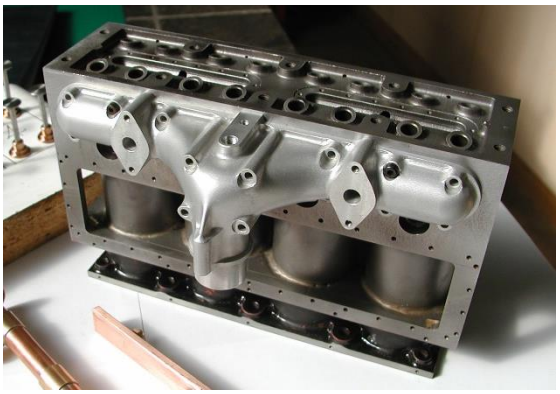
The brass sleeves prevent the aluminium from wearing due to the operation of the butterflies.

This is representative of the full-scale engine.

The 'Square Ends' can now be removed.

Component 2~ In Conclusion: The Manifold (Component 2) was chosen for the talk because it shows that having external references with flat faces for mounting the part when machining peculiarly shaped components, and which contain datum points for the step-by-step machining processes, makes the job so much easier and more accurate. It just requires more forethought at the planning stage of the job.

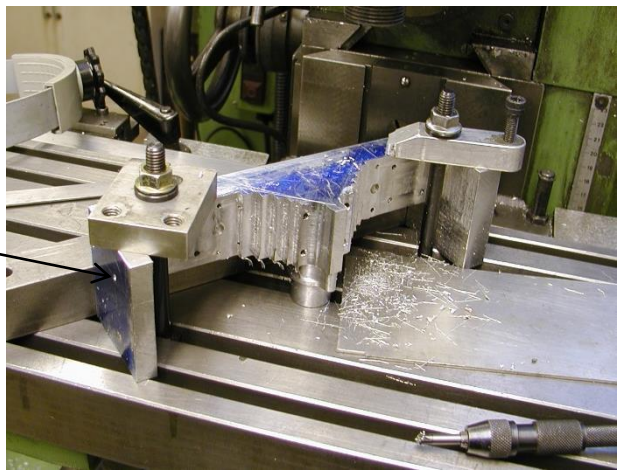
- **Component 3 ~ Manifold From The 1929 Bentley Birkin 4½ Litre Supercharged Engine**



This third component is another manifold, this time off the 4½ Litre supercharged Bentley engine. This is similar to Component 2 in that it requires external data points. These datum points need to be provided before the machining begins.

It can be seen in the photo that the centres of rotation have been marked on the machined excess end blocks

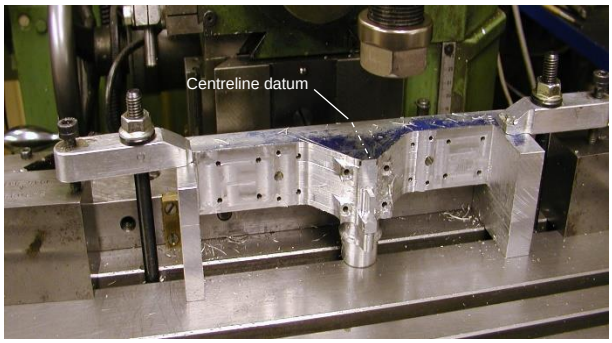
Again, the component's machined back face is set up against a parallel.



The end 'squares' allow both the fixing of external datum points, and the facility to hold a very awkwardly shaped component.

The component is bolted down in such a way, using the end stop and parallel, so that all holes can be co-ordinated to the centre line datum however the component is rotated.

The centre datum can be established with a sharp pointed laser, for example and then all hole datums can then be coordinated from that, without the need for 'marking out'.



All of this requires a lot of work with the drawings beforehand determining coordinates from the centre line datum.

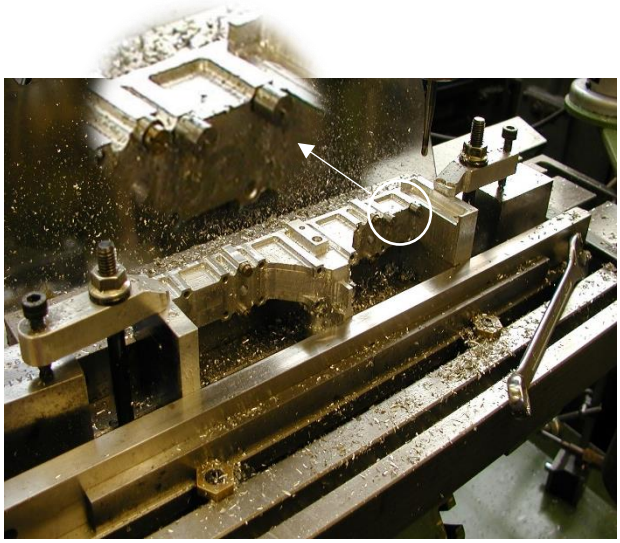
The original Bentley archive drawings were all dimensioned the old-fashioned way. All the drawings had to be redrawn and dimensioned from a machining origin. If you start out correctly, you will finish correctly.

Rough shaping of the curvature on the stud bosses.

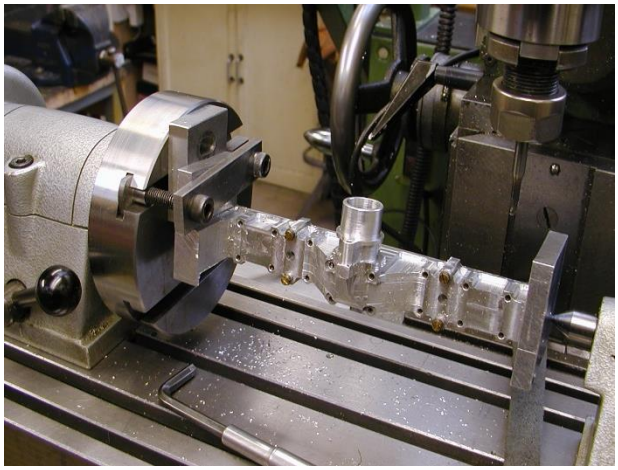
The component is clamped against a parallel and against an end stop, as before. This means that the holes seen on the top face are in the correct positions relative to the first holes drilled on the vertical face

The stud bosses are quite long, so it was decided to use 'guide discs' at the end of each boss, 10 thou larger than the boss circumference. The cutter then passes along each boss guided by the disc at the end, which is similar to using filing buttons.

This is a quick way of creating curvatures rather than rotating the part.



Setting up the component in the dividing head to form the outer curves. The component is rotated about the centres in the ‘square ends’.

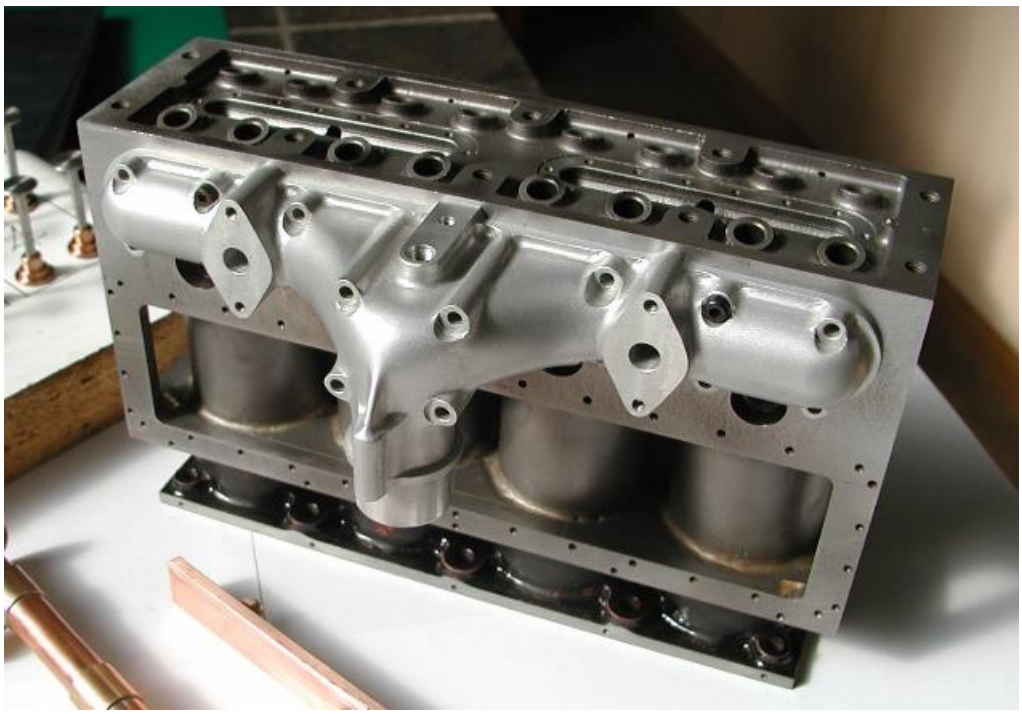


The photo below shows the rough curvature produced after the machining operation.

In the photo on the left, all the outer curves are completed. The flanges are shaped by following guide plates. These are the mounting faces for the two manifold pressure release valves.
Some transitions between curves and other planes can be quite awkward. When two curves join at 90°, the intersection line can normally be judged. In other areas it is more difficult. Usually intersections have to be done by hand.

Hand finishing complete, thank goodness it fits.

The hand finishing is a long and tedious process using burrs. To get into tight spots, files and emery cloth are used. *Scotch Brite* abrasive cloths are also used. When it is a good scratchless unblemished surface, it can be finished by bead blasting. All scratches and blemishes must be removed before bead blasting is considered, as it only gives an even surface like spraying paint. Scratches will still appear through it.



In Conclusion:

Machining complex shapes from solid, if done in a careful and logical way, must always provide a more consistent finish and accurate shape than sand castings.

Only die cast or “lost wax” castings can approach this accuracy and these are uneconomical for “one-offs”.

PEEMS Meeting ~ Pickering Memorial Hall 10th December.

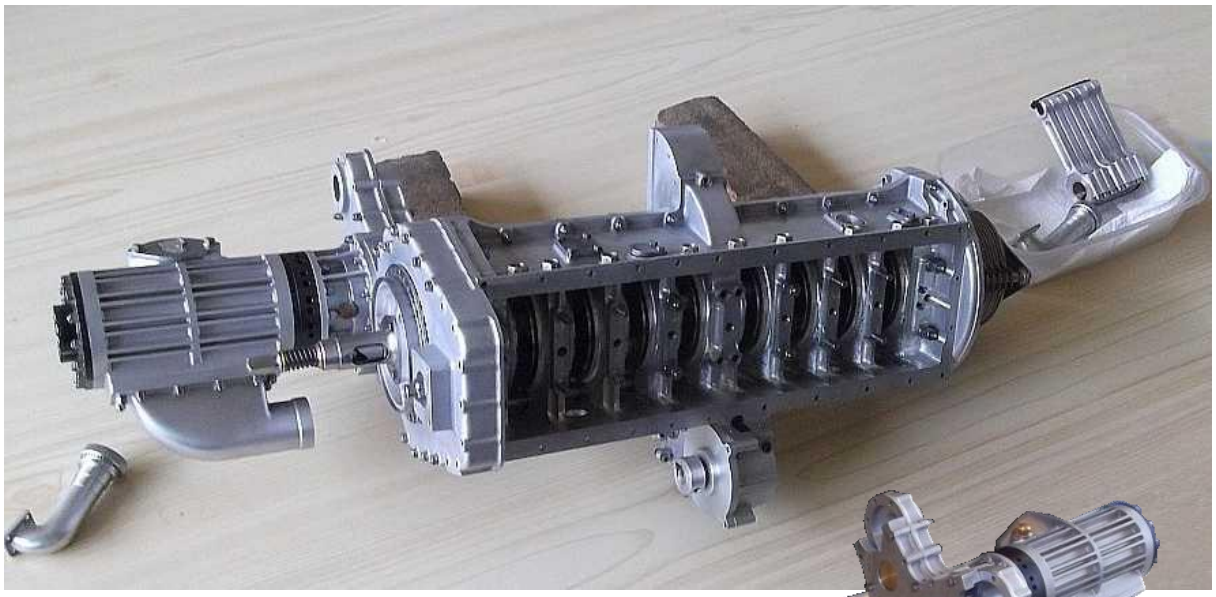
Following on from the previous successful meeting in the Memorial Hall in early October, this was an opportunity for members to once again mix socially in a “Covid Secure” environment.

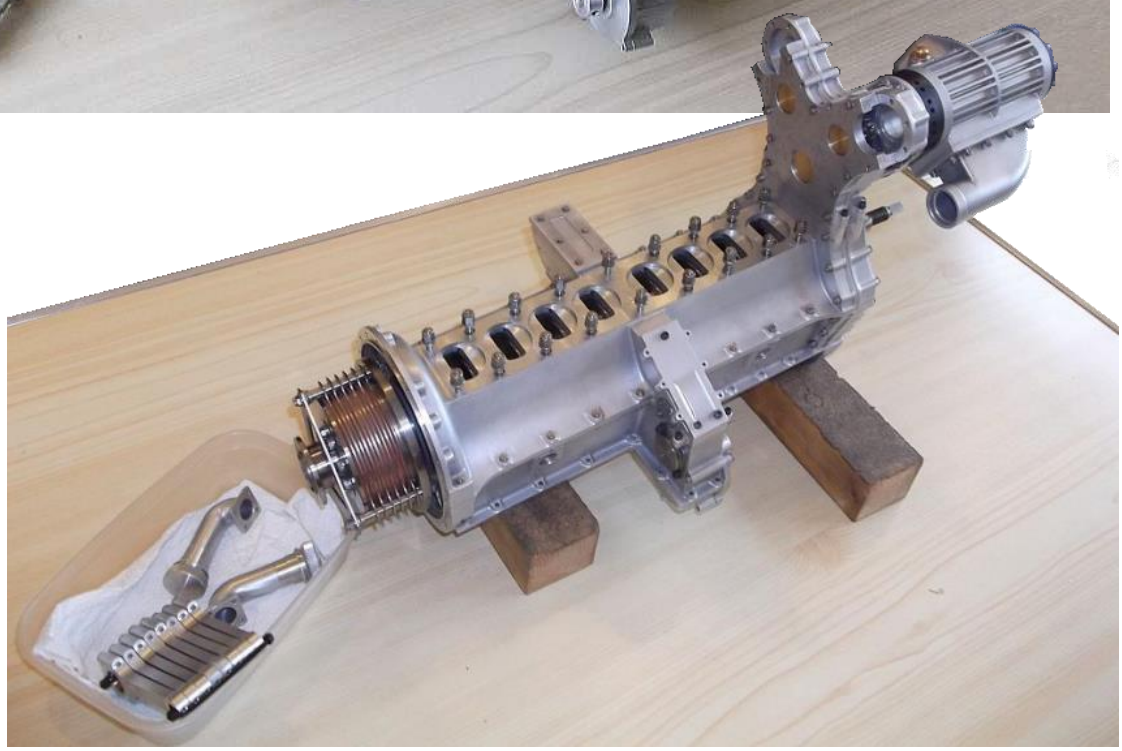
There were eleven attendees and much lively discussion.

Mike Sayers brought along his 1:2.5 scale Delage engine for inspection. The supercharger featured at the “Bring and Brag” in October 2019 and is detailed in the newsletter for that month.

The crankcase, the result of a year’s work at the time, was shown at the club meeting in March this year, and also features in the newsletter of that month. At that club meeting, the supercharger was mounted on the crankcase which included some gearing which worked.

Here we could see all the extra work that had been done and could inspect the finely machined connecting rods.





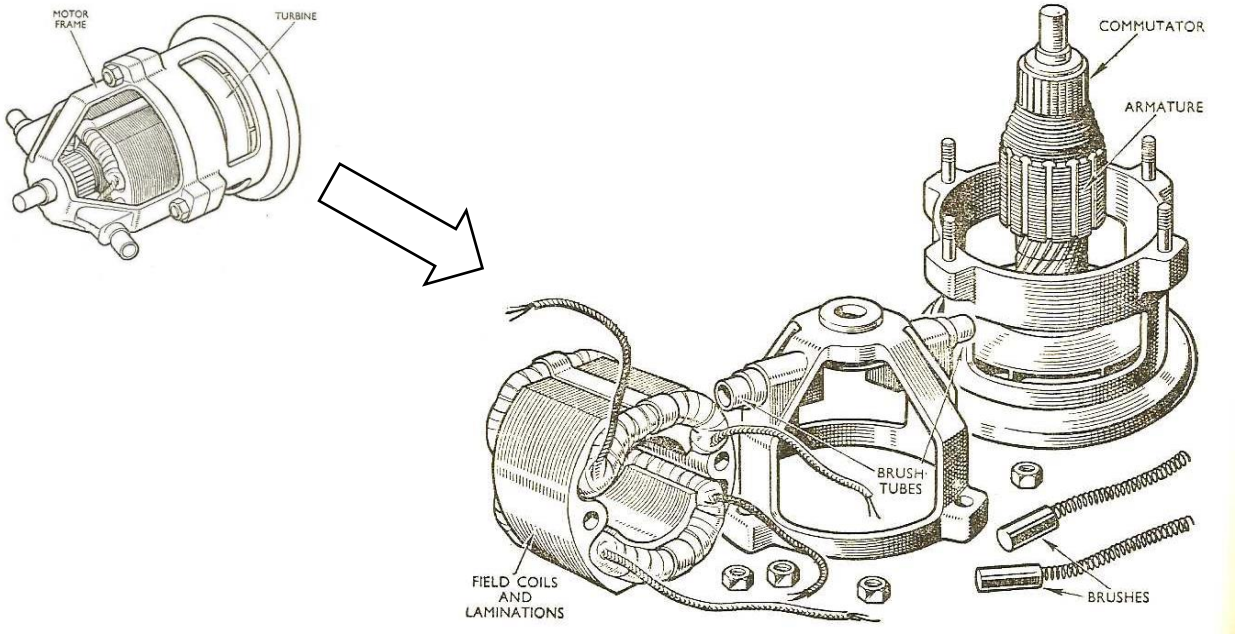
- **Fixing A Faulty Angle Grinder Motor ~ Ted Fletcher**

Almost all home workshops have an angle grinder, and great care should be taken when using one, eyes and hearing protection are essential.

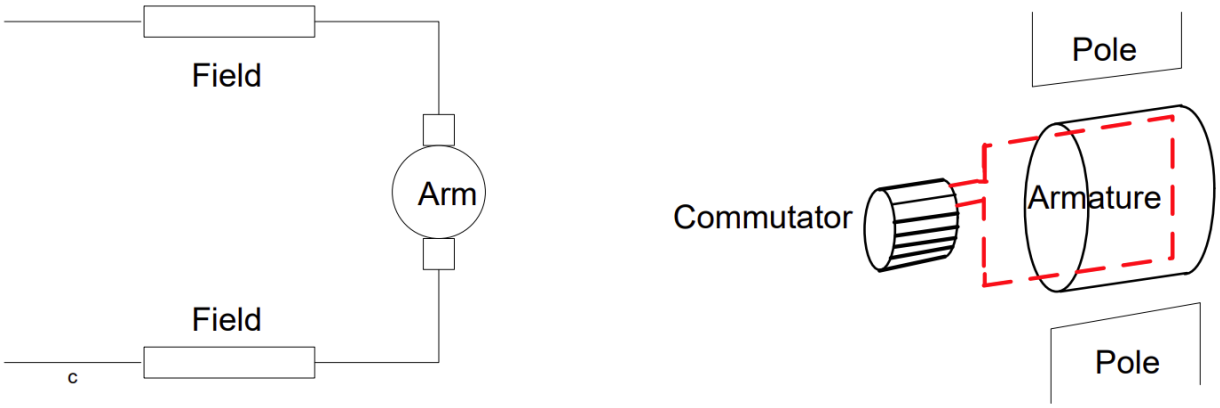
Angle grinders are not precision devices, but are very handy for cutting that awkward damaged nut or cutting a piece of bar or angle iron. I am sure I don't need to explain about the gear box, other than to say they are well made. The killer of angle grinders and electric drills is blunt drills or worn out cutter discs. The motor needs to keep revving fast, to enable the fan to do its job of keeping the motor windings cool. Slowing the motor down by applying too much load is a sure way to kill a good tool.

I had never repaired a drill or angle grinder, and had to replace the field coils due to a 'burnt out' motor. Armatures are the weak point. I'm not sure if armatures or field coils are still available, as the tools are so cheap to buy, thanks to the People's Republic Of China.

Primarily, most of the following is applicable to washing machine motors, vacuum cleaners, food mixers, electric drills, angle grinders and other small motors such as sewing machine motors which hobby workshops so often have in use.



These motors are perhaps the simplest going. They consist of an armature, a pair of field coils, two carbon brushes and a pair of bearings as shown on the left below.



Looking at the diagram on the right, notice how the wire is taken from one commutator segment, round the whole armature and returns to the adjacent segment. Only one wire is shown, but many turns are used before making the final connection.

So how does the commutator and motor work?

When current from the electricity is connected to the armature windings through the commutator, (which acts as a sliding switch), a magnetic field is created. The armature field reacts with the field of the stator, and as the armature

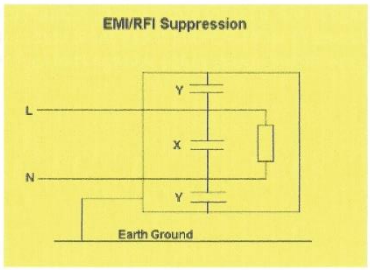
is on a pair of bearings, it rotates. If the armature coils were always connected in the same direction, the armature would turn until the magnetic fields were in the same direction (line up) and then stop.

The commutator is arranged, so that the connections and direction of current are reversed, just at the right time, so maintaining the same direction of rotation. When the motor is connected to AC mains, both the armature and stator fields reverse with each current reversal, therefore the direction of the force resulting from the two fields is not changed. In theory it is possible to reverse direction of rotation on all these series-wound motors, however, some carbon brushes are shaped and have a trailing edge, such that the tip would almost immediately break off, when electricity is applied to the motor. This happens with some wiper motors. That type of thing soon spoils a good motor, and sometimes the motor can be mounted some other way to facilitate a new direction of rotation.

When taking something apart, I suggest you have a note book, pencil and couple of ex margarine tubs standing by to put the screws in. If you have a phone with a camera then take plenty of pictures as you go. Often there are several different types of self-tapping screws used, with different style of screw head just to make things more awkward.

Drills and angle grinders usually have two plastic moulded sides fixed together with self -tapping screws, and they are very often difficult to prise open, some pull apart towards you, others go sideways. No two are the same, even from the same manufacturer. If the grinder has been used to cut concrete or similar material, 10:1 it will be full of dust. DON'T go blowing it out with compressed air, the pressure of the air will force the abrasive dust into the windings and bearings. Use the shop Vac and a clean paint brush, being careful with those armature windings as you go.

In the handle you will see a little yellow square shaped thing, which is the electrical interference suppression filter. These are special capacitors and are marked as such. When an armature is rotating, small sparks occur between the brushes and the commutator, in doing so they create electrical interference. Depending on the manufacturer and quality of the tool, you may find one or two filters in the handle. They are known as 'X' and 'Y' type. 'X' type are connected *Line* to *Neutral*, and 'Y' type *Neutra*l to *Earth*. If you are replacing your filter you MUST get the correct type! Note how yours are connected before removing it, or them, so that your replacement is put back in the correct place. Some filters are an all-in-one package and they have just three wires attached.



EMI or RFI Supression Capacitor Connections

When filters fail, often they give out an unpleasant/obnoxious smell. It doesn't stop the tool working, but they will then give out un-necessary electrical interference. Food mixers are notorious for filter failure. They are the manufacturer's best friend, because then the house wife goes out and buys a new mixer, when all is required is a new filter, for maybe £1.50.

Now with the tool apart and cleaned out, carefully move the brushes up and down checking them for freedom of movement. This is essential. Some brushes have a coiled tension spring attached, others have an 'S' shaped coiled spring which needs to be lifted and secured up before it's possible to get the brush up and out. Using a piece of welding rod, I made a little hook device with a loop on one end to put my thumb in, so that I can use my fingers on the same hand at the same time, to hook up the brush and take it out with the other hand. Sounds complicated but works well. Don't let the spring 'ping' down onto the brush on the return as you might chip the brush. All under control is the way to go!

When you're satisfied with the brush movement, remove one so that you will have clear view of the commutator copper segments. With one hand on the chuck or the disc, slowly rotate the armature, inspecting each segment looking for any sign of a lifted segment or black ones, which indicates overheating.

With ground down and thinned short pieces of broken hacksaw blades, and being extremely careful, clean out the slots between each segment as necessary. Be careful not to scratch the commutator. However, if you have scratched the commutator, or if it is blackened, then using a 200mm or 8" strip of fine grade SAND paper, pass it over the commutator so that the abrasive side is next to the copper segment. Now see-saw it back and forth cleaning up the copper surface as you go. Rotate the motor a bit at a time until all the segments are shiny. DO NOT use emery cloth.

If you think your motor needs its commutator skimming in the lathe because it had a deep and wide groove, then it needs to be done between centres on the lathe. Clamping the armature by the laminations might work but you could be creating a cam which the brushes will be unable to follow at speed, and excessive sparking will take place. When the motor was being manufactured, the only part to be machined between centres was the commutator.

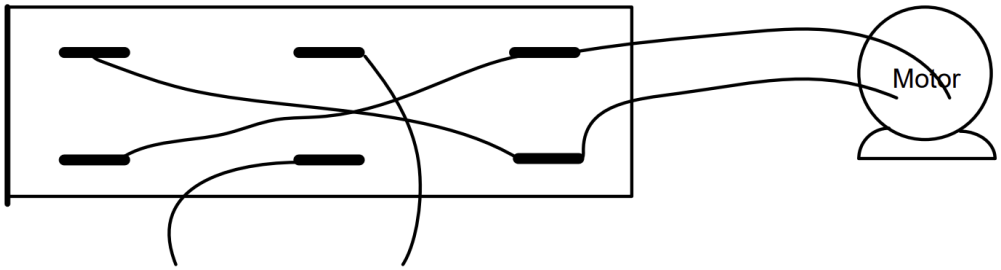
I notice that some starter motors are only centred at one end, and turning the commutator on them can be tricky to get concentricity with shaft. Boxford made a tail stock attachment with bearings, which enabled the lathe owner to fix a rotating chuck at the tail stock end.

Having got the commutator sorted, now check the brush lengths and their ends, which bear upon the commutator segments. The brushes should have a slight curvature on their faces matching that of the curvature of the commutator itself. If you are fitting new brushes, as the existing ones are worn, they will have a square end profile which will need modifying. Use a fine grade sand paper of similar length and grade as before, but this time with the abrasive side upwards. See-saw as before, until the new brushes have taken up the slight curvature matching that of the commutator, and are bedding in. I cannot emphasise just how important bedding in is. it needs to be done with care, otherwise excessive sparking will take place as the motor rotates, which will eventually ruin a good machine motor.

There is nothing we can do about the bearings, as they are usually shrunk onto the armature shaft very close to the commutator itself. There is no chance of getting a 'puller' behind bearing. The only way I have found to remove them is by using a Dremel tool. Rough it may seem but needs must.

It is suggested that the armature is tested with a 500-volt DC insulation tester, one lead to the shaft the other to the commutator. However consider the entire circuit, which is a series one, consisting of two field coils, a pair of brushes and an armature. Most of the voltage appears across the two field coils, with a smaller amount across the armature. I personally use my Megger as described above to test the complete motor. Expect an insulation reading of 1 MΩ or better, and if the grinder or drill has a metal case, then the earth should be 0.1Ω.

Most power tools today are double insulated and use twin core flex, so earthing is not required. As I have a PAT tester, I give the tool a PAT test anyway. Most sewing machine motors are reversible, but it can be a tricky job. Looking at the previous little diagram, it would appear simple just to move over the supply leads, but that won't do the job. You have to move over the connection to the brushes, and in my experience, space is at a premium. If you need forward and reverse, a double pole change over switch with centre OFF is needed, as per the diagram below. Always let the motor become stationary before changing DRO.



Electric supply, connect either way round.

- **Items For Sale ~ Paul Windross**

When we are allowed to be more active after this virus lock down, I have a fair bit of materials, motors etc. to get rid of, for reasonable prices to PEEMS members only.

I bought a load of gauge plate years ago. If a member requires some, let me know the size needed.

I also have a limited amount of aluminium sheet up to about 3/8" thick. Sheets are in various sizes, but the grade is not known. I have been told that these can be welded.

I have a 10-ton ram and pump as well.

When the weather gets better, I will take a picture of all my other bits placed out in the yard.

I have been a hoarder most of my life.

I am not sure about driving, so all the above will have to be collected from my address in York.

My contact details are on the Members List

Paul