NEWSLETTER April 2019

FORTHCOMING EVENTS

May

Club Meeting: Wednesday 1st May - **Arrangements for Doncaster Model Engineering Exhibition including Stewarding, And Model Presentations** (Mini 'Bring and Brag')

Doncaster Show:

Wednesday 8th May: Load vehicles for show.

Thursday 9th May: Doncaster set-up day (arrive 10.00 am).

Friday, Saturday, Sunday 10/11/12th – Doncaster Show.

Workshop Morning: Tuesday May 21st 10-12 noon.

June

Club Meeting: Wednesday 5th June - **The Marshall Tractor: A slide show by Bridget Laycock.**

Workshop Morning: Tuesday 18th June 10-12noon

Club Visit to Welburn Hall School: Tuesday 25th June

CLUB MEETING: Wednesday 3rd April

- **Introduction.**

Chairman Colin Bainbridge welcomed a number of visitors to the club meeting. He then ran through the following items of business:

- **Calendar Of Lectures for '*The Rolls Royce Heritage Trust'.***
  The *RR Heritage Trust* is based in Derby. If anyone would like to go to any of the lectures please contact Mike Sayers. The calendar of lectures is shown at the end of page 3.
- **Annual Club Dinner**
  Since the club last met there has been the annual club dinner which was a great success. Thirty five members and wives attended. Thanks were given once again to George Gibbs and John Powell for arranging everything at *Mickle Hill*. Thanks also to Jim Everett for running the raffle for the evening.
- **The Workshop.**
  The workshop is in the process of being tidied, and stock was available for disposal. Some stock was on display on the evening. Members should have received an e-mail, with details of items for sale other than the items on display. John and George are the contacts for the items for sale. Anything not sold on the evening was available for purchase at the workshop meeting on Tuesday 16th April. Any stock outstanding after the workshop morning will go for recycling, as it is now surplus to requirements and PEEMS needs the space.
- **Club Visits**

  i) **A Visit To Ivan Shaw's Workshop On Wednesday 17th April To View '*The Merlin'* Personal Aircraft**:
  As of the issue of this newsletter this visit will have taken place, and the report is written up in this newsletter.

  ii) ***The Unison Pipe Bending Company* and *North Sea Winches*.**
  Both these companies are located in the Eastfield Industrial Estate, near Scarborough. The club is still waiting for confirmation of the *Unison* visit. The visit will be in June. Because these two visits are in the same location, they can each be visited each side of a lunchtime 'get together'. There is a good fish and chip restaurant near the local *Morrison* supermarket.

- **School Visits.**

  i) *Welburn Hall School*.
  Mike is standing aside for any organising this year for personal reasons and Tony Leeming will be coordinating the *Welburn Hall School* visit.

  An update of the *Welburn Hall School* event will be given at the May club meeting. Tony and Colin will be visiting the school to finalise arrangements. The current date set for this visit is Tuesday 25th June. The plan is to run the railway there, and to have both Charles Hill's and Mark Angus' traction engines running

  ii) Alne School.
  Colin Bainbridge and David Proctor will be organising the *Alne School* event.
  This date is set for Wednesday 10th July. David and Colin had a meeting with the head teacher and the science teacher. The format will be as for *Amotherby School's* 'Science Week'. PEEMS will provide volunteers to staff four classrooms within the school.
  The teachers will divide the school up into mixed age groups (for this event the age range is 8 to 11). The groups will then be circulated through the four rooms. There will be demonstrations of various aspects of science, for example, a harmonograph, a can crushing demonstration, and an orrery. There will also be a *Wimshurst* machine, an electronics demonstration, steam engines, hot air engines and a general mechanics demonstration. Each session will last approximately 45 minutes.
  The highlight of the day will be that the children will be encouraged to build a small plastic rocket under PEEMS supervision, which will be launched in a competition to see which one will go the furthest.
  The whole event takes about a day. The teachers are happy that the format used for the *Amotherby School* 'Science Week' is what they want for their day.
  A minimum of eight PEEMS members will be required for the day, but it will be better with more members. Updates will be featured in the newsletter.

- **The Doncaster Show**

  The Doncaster show will be discussed in more detail at the May club meeting. Arrangements for stewarding will be finalised. The call has already gone out for models for the show. The initial response was 'a bit muted'.
  At the last meeting in March it was decided to keep the applications open up to the April meeting. By then the information really does need to be collated and submitted on Form B.
  David Proctor said that a number of entries had been received on the evening of the meeting, which will give a decent display. Sixty different entries have been received from thirteen different exhibitors. Based on the sizes given, that represents a 28ft display, so the number of exhibits has significantly increased, which is good. This means that with Mike Sayers' model *4½ litre Bentley Engine*, display boards and accessories, on the central display table, the surrounding PEEMS stand should provide a good overall model display.

  Colin has asked that people submitting models, be responsible for getting their own exhibits to the event. Whilst the logistics of setting up and moving the stand were discussed at the last committee meeting, it came to light that if the club offered to take exhibits for those who can't take them directly, there is a 'grey area' regarding insurance coverage whilst in transit. The models are covered by insurance at the show itself. This has been looked into.

  Therefore:

  a) If members are going to take their own models to the show, that is fine, as arrangements will have been made for insurance.
  b) If a member doesn't already have model insurance, but would like to have their model covered by PEEMS insurance during the period of transportation, the rules state this can be added to the club insurance with a 'nominal fee paid to the club'. However, the club is not anticipating making any charge to PEEMS members, and it has been decided that the club will pay any additional premium. It should be noted that if a member wants to take advantage of this coverage, that the club needs to have the details of the model.
     By the time of the April meeting it was reported that this had already been done.
  c) David said that the show organisers have said late entries may not be accepted. *Form B* must be submitted by Friday 5th April. After that it is too late.

     Mike Sayers is still happy to receive models, at *Croft House* but only on the day before transport to the show, which is Wednesday 8th May. Wednesday is the day the vehicles are loaded. They are transported to Doncaster on the Thursday for the setup. The first day of the show is Friday.

     David said there needs to be a roster of names of those who could attend the 'setup' on the Thursday and on the Sunday for the 'teardown'. A show of hands was taken to see who would be available for 'setup' and 'teardown'.

     Colin also said that there would have to be a roster of stewards for Friday, Saturday and Sunday. Each steward does not have to attend all three days. David has agreed to set up a roster for the stewards. There was a request that potential stewards made themselves known to either Colin or David at the meeting.

- **Scarborough TEC College Workshops**.

  Ted Fletcher had informed Colin that Scarborough TEC college have just created new workshops, which will be potentially very good for the local industries, and possibly for PEEMS.
  Scarborough TEC are now establishing several new workshops for apprentices and students. Ted and Brian Stephenson attended the Scarborough TEC open evening and came away very impressed.
  There were nine brand new lathes plus some older ones. There are two new milling machines, and they still have *Bridgeport* vertical milling machines and a horizontal one. There are a lot of new benches and a spacious workshop. There are also sheet working machines, lots of welding booths (Tig and Mig), and also bending machines.
  The principal is quite keen to attract model engineers back to the college workshops. Ted would like to set up a regular Tuesday evening Model Engineers' session. There will be no tuition and attendees will have to work the machines themselves. Currently Ted has about fifteen people interested in setting this up. He doesn't yet know what the cost will be, and how many evenings will be available.
  There is another open day on a Saturday morning in two months time.

- **A Note From Paul Windross Reporting From Elvington Airfield**

  This arrived at Elvington on Tuesday 19th March when I was having a nostalgic run down the runway.
  The notes and picture are from *Straightliners News Channel:*
  ***Robocar* - the future of Formula 1 - no driver / cockpit?**
  We recently organised the timing for *Roborace's* autonomous *Robocar's* Guinness World Record land speed attempt at Elvington Airfield, North Yorkshire. It was hitting 280kph+. This event is another illustration of the high quality timing equipment and set up we use. Is this the future of Formula 1 - what do you think?

  https://www.facebook.com/roborace/videos/1015529325324043/

Photo copyright 'Roborace'

- **Bob Russell**
  The club received the sad news that one of our members, Bob Russell has passed away. Bob was an active member and benefactor to the club and will be missed. PEEMS would like to extend our sympathy and condolences to Bob's family at this sad time.

ROLLS ROYCE Lectures At Derby.

For all Derby lectures:

Start: **17:15 hours**
Location: **Derby**
Address: **LDC, Wilmore Road, DE24 9BD**

5th June: **President's Evening: Simon Henley**, President, Royal Aeronautical Society.

18th September : **Ray Dorey Memorial Lecture: *ACCEL – Accelerating the Electrification of Flight.***
Mattheu Parr ACCEL Programme Manager

23rd October: **Roy Heathcote Memorial Lecture*: *Folland Gnat Display Team.***
Oliver Wheeldon Pilot Gnat Display Team.

6th November: **End of Year Lecture* *Rolls Royce - Flying Test Bed.***
Captn. Mark T Lewis, Rolls Royce Chief Test Pilot

**These lectures are subject to change; please check the heritage trust website for updates.*

For a full range of Rolls Royce Lectures, and online booking, the website is:

https://www.rolls-royce.com/about/heritage-trust/heritage-trust-events.aspx

Club Meeting Wednesday 3rd April
The Restoration of a *Tom Senior* Mill and a Half Scale *Gardner* Engine Build. Projects Carried Out By Tony Simons.

Introduction

Tony introduced himself and said he was a retired 'Learning Manager' from the *National Railway Museum* (*NRM*). He worked there for about seven years. He is also the retired 'Head Of Engineering' at *York College*. He put eight new *Boxford 330s* into *York College* before retiring. These replaced some ancient *Harrison M300s*. When compared, the Harrison M300s look very similar to the Boxford 330s. This is because the chief designer at *Harrisons* moved to *Boxford*. When the top is removed from a Boxford, it looks very much like a Harrison. Brand new *Boxfords* are still made in the UK. *York College* like *Scarborough TEC*, is gearing up for a more practical engineering educational future.

Tony is on his sixth retirement now! He's now a part time tutor of engineering at *York College*, teaching *Network Rail* and *Siemens* apprentices. The eldest apprentice is 40!

Tony is also a member of the *North East Club For Pre-War Austins* where he knows Jim Everett, and he was the chairman until last October. In addition, Bob Polley also managed to offload the secretary's job for *York Model Engineers* on to him at Christmas.

Richard Gibbon (Chief Mechanical Engineer at the *NRM*) and Tony wrote the *BESTT (Boiler and Engineering Skills Training Trust)* syllabus for boiler repairs. This is the syllabus that has been taught. Sixteen trainees have been put through a lottery funded scheme (£500,000) to teach them boiler repairs. These trainees are from all over the country. They represent, for example the *NYMR*, the *Keighley and Worth Valley Railway*, the *Bluebell Railway* etc. This course was so successful that the lottery gave another £500,000 to teach another sixteen trainees.

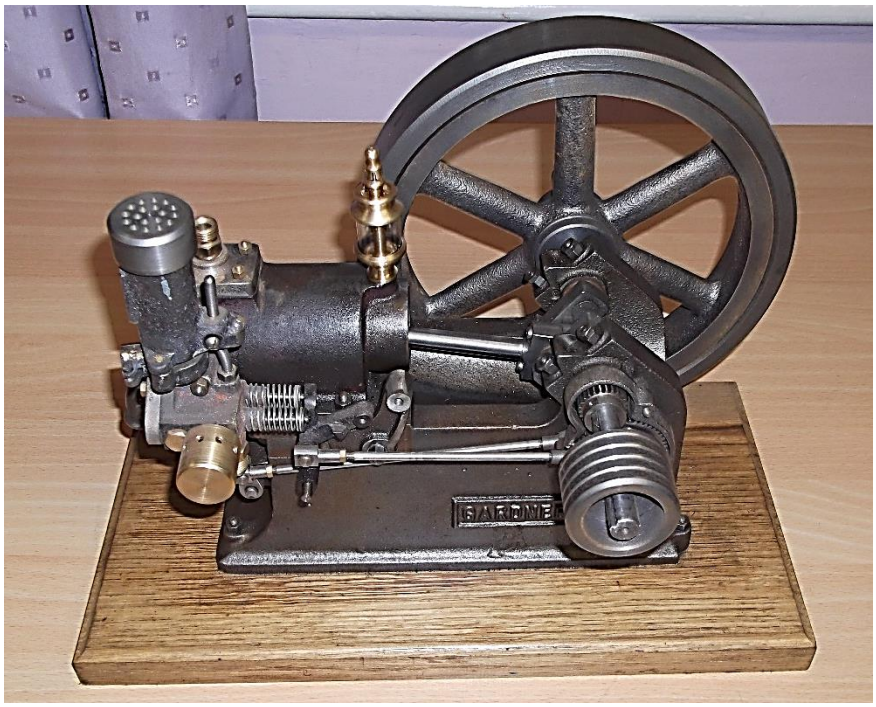
Richard and Tony wrote the syllabus for the *'Mechanical Maintenance Of Steam Locomotives'* course. Currently there are people from the *NYMR*, the *NRM*, (helping with *Sir Nigel Gresley's* overhaul), the *Keighley and Worth Valley Railway*, and the *Kent and East Sussex Railway*. In September the course starts again with another eight trainees, so in the four year period there have been thirty two people trained in heritage steam. Tony was also the assessor on the courses.

Tony started early in engineering, at six years old he was polishing a *Rover* car, and he still is.

The *Tom Senior Milling Machine* Restoration.

When Tony retired from *York College,* he never bothered with machine tools at home, as they were always available at the college. These were machines such as *CNC (Computer Numerical Control) machines*, *Bridgeports*, *Colchester Mastiffs* etc. Tony then bought a *Tom Senior Mill* from the *North Riding Education Committee.* It had been installed in the *Joseph Rowntree School*. *Joseph Rowntree* built a new school in 2008, and disposed of the *Tom Senior Mill*, which needed overhauling. At the same time Tony wanted to build a *Gardner Engine*.

He brought in the completed ½ scale model to display:



Before he could build the *Gardner*, he needed to overhaul the *Tom Senior*.

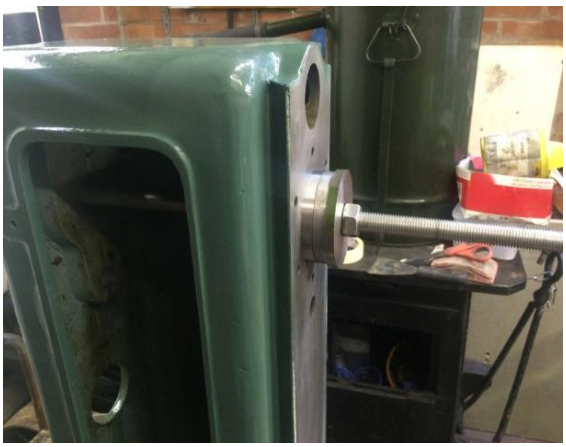
First Tony had to shovel solidified coolant out of the bottom of the sump. *Tom Seniors* were originally painted a shade of green as shown on the column below. Also shown was the state of the headstock bearings which had a lot of rust and corrosion, probably from the coolant in the system:

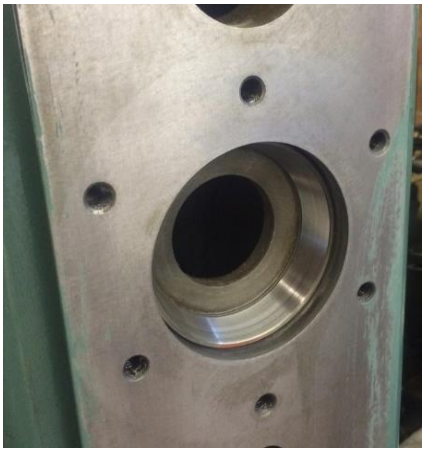
He decided to put new bearings in. The bearings on the *Tom Senior* don't need to be high precision, so Tony just replaced them with quality bearings. Being in a school, the *Tom Senior* had been abused, and shown below was the state of the worm and gear for the power feed. The shape of the teeth had gone. There are no spares, as *Tom Senior* changed the design of the bed and power feed in the 1960s. Tony's mill is an early version.

This is the 'Knee':

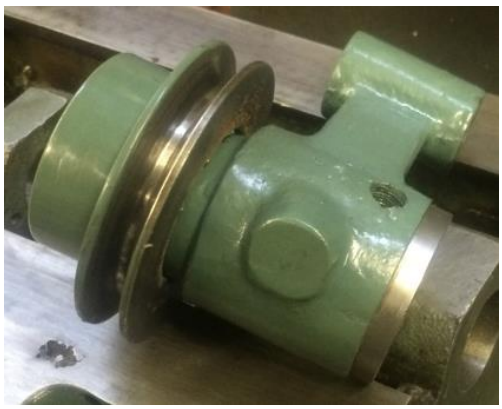
When Tony stripped the paint off it, he got down to the green and found the casting was full of a bitumen type filler. This was done at the factory. Tony doesn't know what the filler is but it looks like bitumen. It can't be rubbed down as it immediately clogs the paper. This type of filler was found all over the machine. 'The Knee' is now painted *Tom Senior Green*, as shown above.

This is the race being fitted into the head. Considering it was in a school it is in remarkably good condition. Tony took the opportunity to put a new drive belt on it. You have to take the spindle out to put on the new belt.





This is the ‘Suds Pump’:

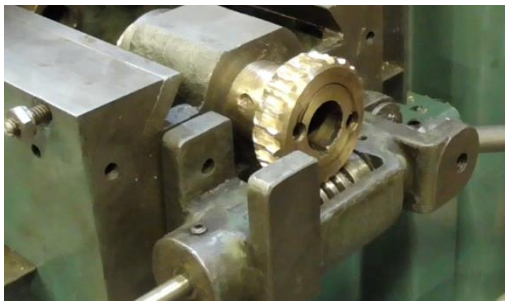


Looking in the parts catalogue for the *Tom Senior*, the pump has a spring ball valve, which acts as a pressure relief valve, so that when the tap is turned off on the coolant, the test coolant runs down to the sump where it ‘blows off’. However, as can be seen on Tony’s pump, the casting has never been drilled for the relief valve. This means that when you turn the coolant tap off ‘it could blow the pipes’. The pump will need to be modified to fit the pressure relief valve.

Here the ‘Knuckle Head’ is on and the ‘Knee’ is back on.

The Mill is three phase, so an inverter was fitted. The motor couldn’t be swapped from star to delta easily as there weren’t any of the links that are normally used. Tony had to go inside, find the star points and separate them and bring them out. Although there are no swappable links, it can be done, and it worked a treat.

The badly chewed worm and gear were remade. The silver steel blank was ‘roughed out’ and then the new worm gear was cut on a Harrison 300. As can be seen below, the head is tipped over at an angle. It is not cutting parallel to the axis, but at the same lead angle as the worm. The worm gear was then hardened and tempered to be used as a cutting tool for the gear. The gear is phosphor bronze. First the blank was turned with an involute tooth cutter. The gear was just ‘gashed’ roughly using the *Tom Senior* to give the profile of the threads. Tony knew how many teeth there were and used a *‘Tom Senior Dividing Head’*. He then assembled the gear on the tool post spindle on the lathe, with the hardened and tempered worm cutting tool. The gear was cut as it rotated, until the cutter got to the right depth, and bottomed out at the core diameter.



The gear was then ‘*Loctited’* and screwed in position, and tested in conjunction with the worm gear installed in the machine. Tony has full power-feed back now. The later machines had the gear running in an oil bath, but on these earlier versions, oil has to be squirted in through a hole. The power-feeds on the *Tom Senior Mills* are only one way.

A *Tom Senior Rotary Table* was sourced on E-Bay for £40. Normally these go for six times that price. The *Tom Senior Rotary Tables* are unique as they are low profile, and one of the big disadvantages of the *Tom Senior* is that there is very little distance between the ‘Knee’ and the cutter.

This is the Mill with a *Tom Senior 'S' Type Vertical Head*. It fits onto where the horizontal arbour goes.
The advantage of that is when you are using the *'Travel Quill'* and the *'S' Head*, the main motor doesn't have to be run. Because it is now on an inverter drive, the main motor can be run, and as there are variable speeds for the table feed, the table feed can be reversed. As long as the *'S' Head* is used, the table can be controlled as well.
Here is the *'S' Head.* It is a number 2 Morse Taper.

Digital Read Out (DRO) EMS - I Ltd .

Head Unit Mounted

RPM Sensor

As stated before, the disadvantage of the *Tom Senior* is the lack of space above the table and also table travel backwards and forwards. A glass scale can't be put on the front easily because of the space (although some people have done it). If you put it at the back, you lose 25mm of travel in 140mm, which is a high percentage. This is why Tony chose a DRO. One of the advantages of the DRO is that it came with a RPM sensor. Tony made a bracket and fitted the RPM sensor to the main spindle, which means he can now calculate his table feed rates, which is another bonus.

The *Read Head* is very small and it reads a magnetic tape which is 2mm thick, so just 2mm of travel is lost. A stainless steel capping strip prevents filings attaching to the magnetic tape. The *Read Head* is 1¼" long. The magnetic tape readers are less fussy than the glass scales, and are more forgiving. If it is within the parameters, it goes green, if it getting close it goes amber and if it is out it goes red. It self tests all the time. Tony put it on the "Knee" rather than the "Quill", because the mill tends to be used in the horizontal mode.

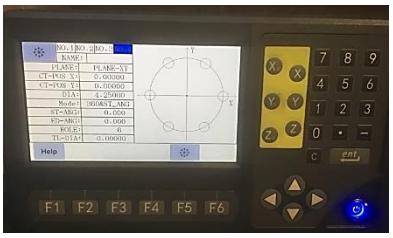
Magnetic Tape Mounted.
The Tape Is Self Adhesive On One Side.

X Read Head And Magnetic Tape

X Read Head and Z Scale

Z Axis Complete

The *Head Unit* has the X,Y and Z scales (it has imperial and metric units and a calculator). It draws PCDs (Pitch Circle Diameters) which makes life easier. It also does radius functions, so the end of bars can be radiused. This saves all the 'chatter' and hassle a rotary table gives you.



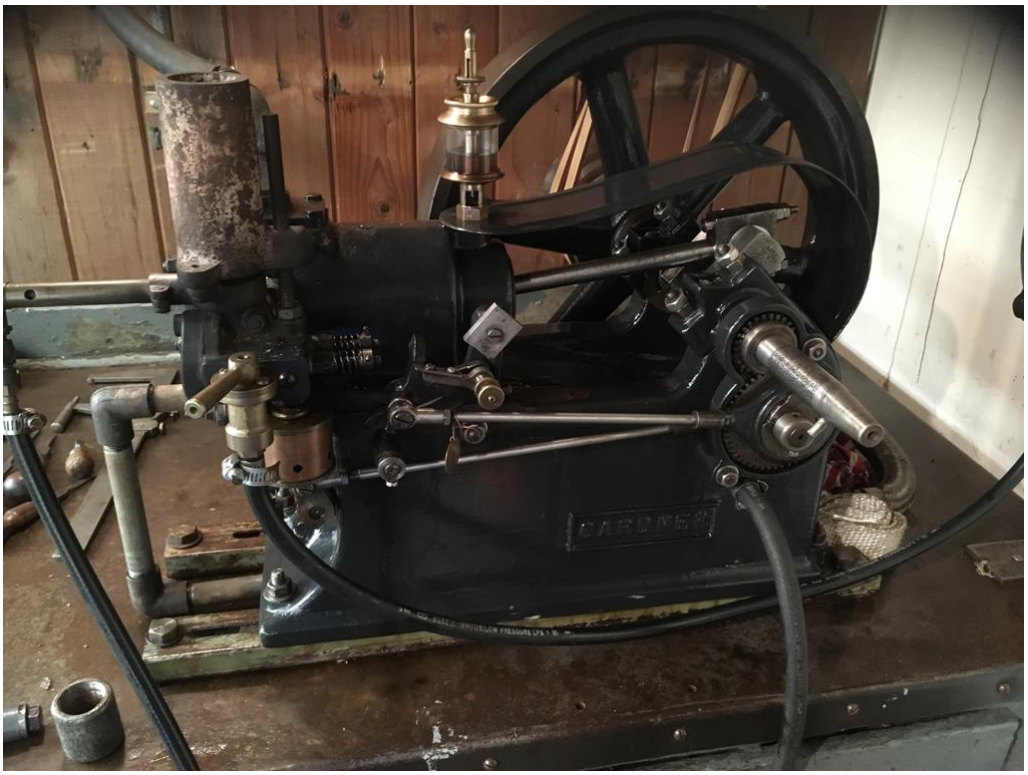
PCD functions were used to make the exhaust cap for the half scale *Gardner* engine. Up to four programmes can be saved. The outer holes were drilled first and then the inner holes with a different start angle. The whole operation took about ten minutes.



The rocker pivot for the *Gardner* engine is adjustable and at an angle (ie. not just a hole), so it is a curved slot. This was done by drilling a series of holes programmed into the *Head Unit*, to give the curved slot which took minutes.

The Half Scale *Gardner* Type 'O' Engine.

The engine is a *'hot tube'* engine. The castings were bought from the *Anson Museum*. The engine the scale model was modelled on, is shown below. It came out of the *Gardner's* workshop, and it powered *Gardner's* old lathe. Tony bought some of the castings. It wasn't a full set and there's bits missing.

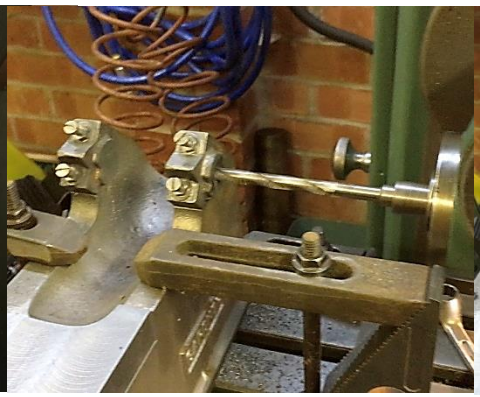


The *'Knuckle Head'* is over at 45°, milling the main bearing faces on the bed of the *Tom Senior.*

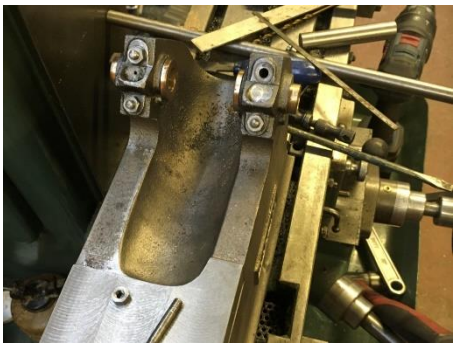


The *Axminster* milling machine was used as a precision drill. Because Tony didn't have the *Tom Senior 'S' Head* at that point, he used the *Axminster* to drill the bolt holes, for the bolts that hold the main bearings. The main bearing caps were first glued on with *Loctite*, already having been drilled, and then the holes were drilled all the way through with 2 BAs.

Back on the *Tom Senior*, the caps are held on with longer bolts and locknuts to hold them in place, whilst facing off the inside of the bearing caps:

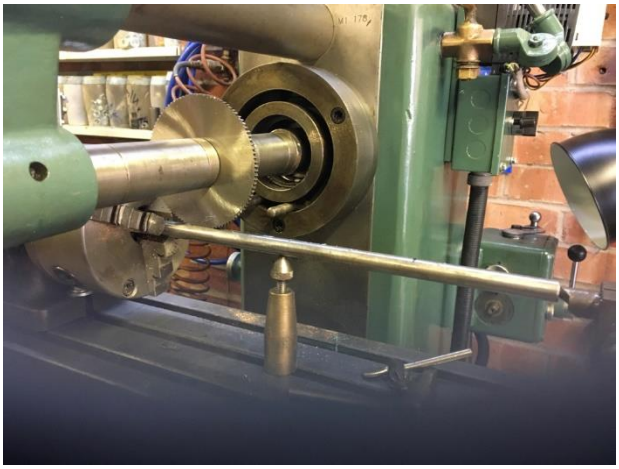




The *Knuckle Head* on the *Tom Senior*, was turned over at 90°, and was used to drill through the main bearings. Then a reamer was put through, using a revolving centre on the *Knuckle Head* and a centre drilled reamer back end. The reamer was then turned with a spanner.



The Bearing Assembly

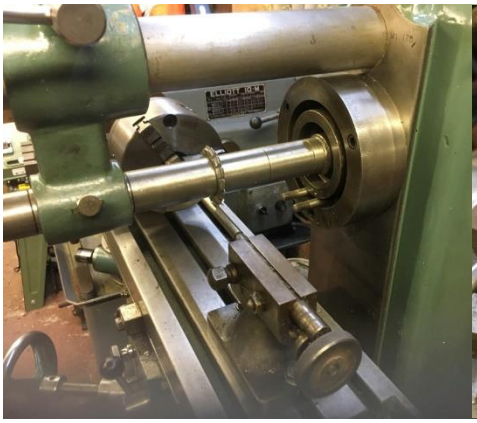
Next the crankshaft was made with the *Tom Senior* in the horizontal mode with the cutting saw.
Before getting the DRO, Tony used the rotary table to machine radii on the ends of the crank webs.

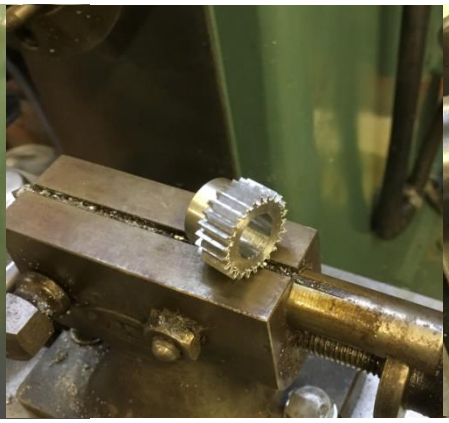


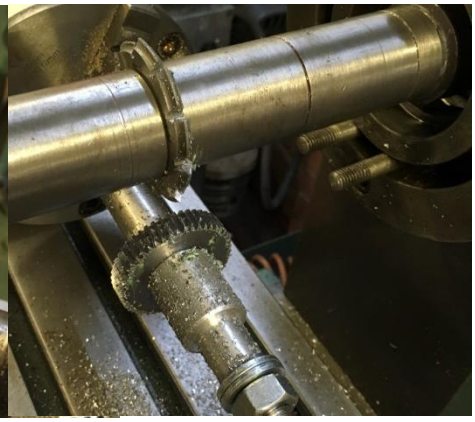

Here is the crank assembled:

This is the flywheel on the Harrison 300, and the keyway broached into the flywheel.

Here, the timing gears are being cut. This is the beauty of the *Tom Senior*, it can be used in horizontal mode with a dividing head. The next photos show the pinion and the gear itself being turned on a mandrel with the dividing head.

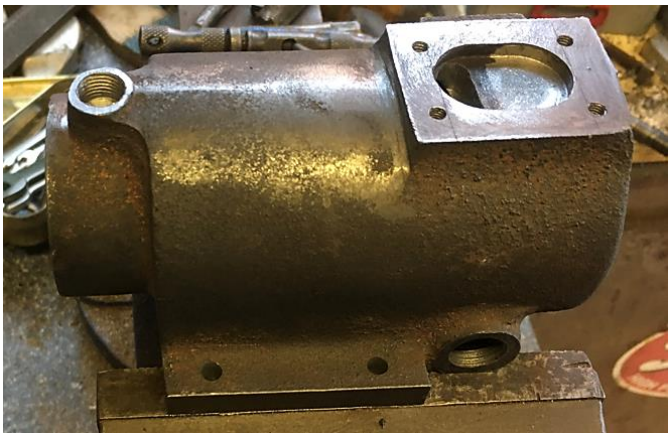


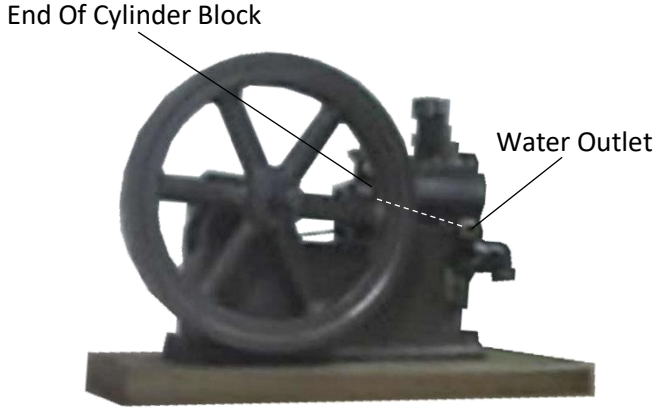




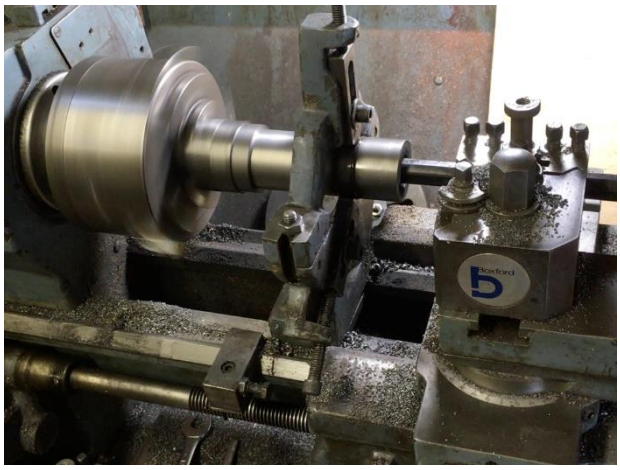
Boring the cylinder block in the Harrison with the four jaw. A liner goes into the cylinder with a water space, so the liner only fits at the front and back. The next photo shows the other end being bored.

The cylinder block is shown on the bench. What was a nightmare was trying to get the water passage through before the liner was put in. The hole had to be drilled from the end of the cylinder block to meet up with the water outlet. This required the hole to be drilled at an angle to avoid the bore. The operation required a careful eye but was successful.

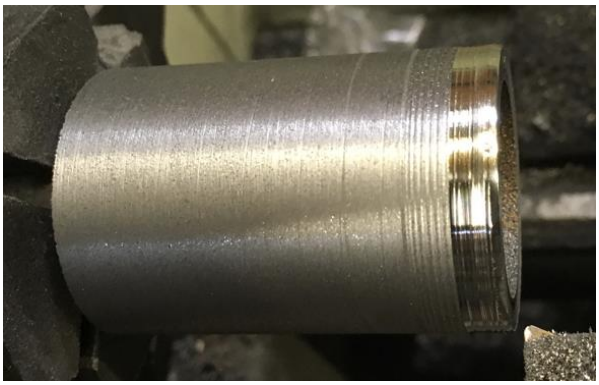




Once the liner is in, the hole can't be drilled. Shown below is the cast iron liner being turned and bored on the 5" *Boxford AUD* lathe (1968). *Boxfords* were 4½" prior to that. *Boxford* was part of the '*600 Group'* which went under. *Boxford*, however was profitable and continued, but the license said that they couldn't build a lathe greater than 4½". As soon as the license expired after 25 years, they altered the castings to make a 5" lathe. The lathe is very accurate.

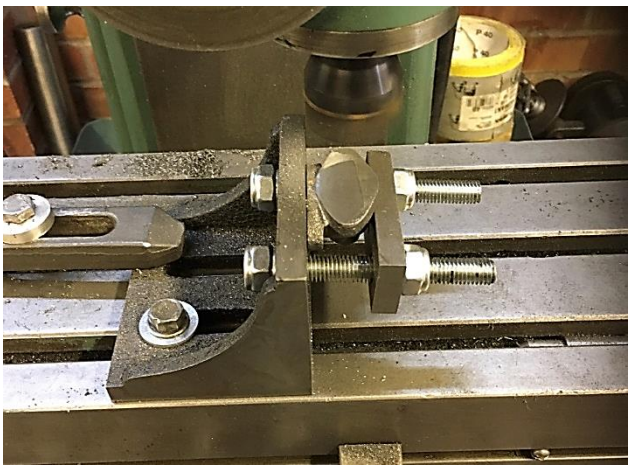


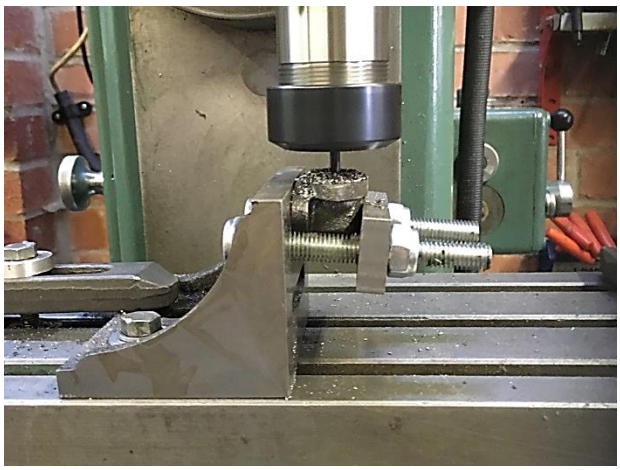
The piston was manufactured from a 'chilled casting'. It took the tips off the carbide as it was so bad. However, Tony managed to get through it with just 2 thou to spare. The only alternative was to shorten the piston which wasn't desirable. Also shown is the completed piston with its cast iron rings.



The cylinder block, liner and piston assembled on the bench:

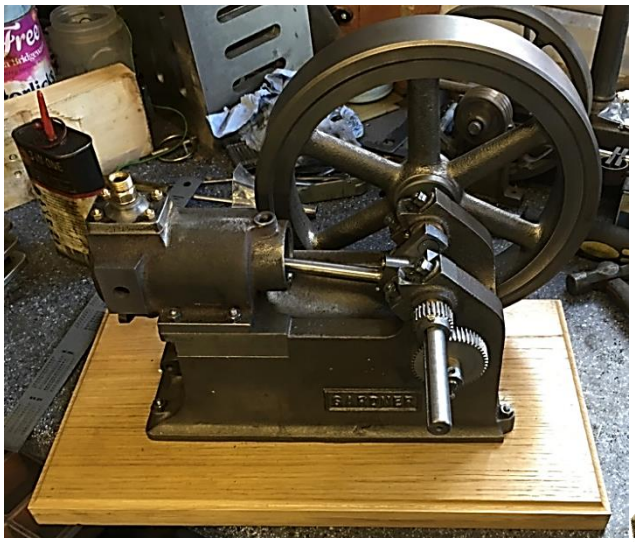
Here is the *Tom Senior* setup to work on the exhaust valve casting. Then the casting is bored out. At the bottom is the valve seat, recessed at 45° to take the valve.

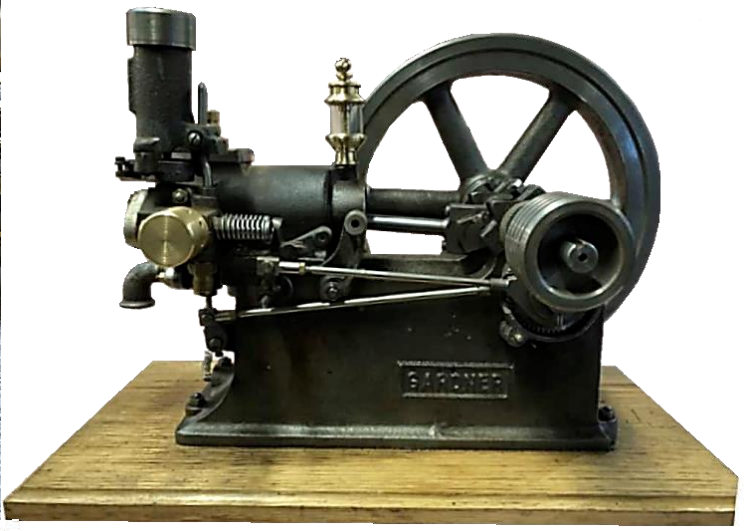


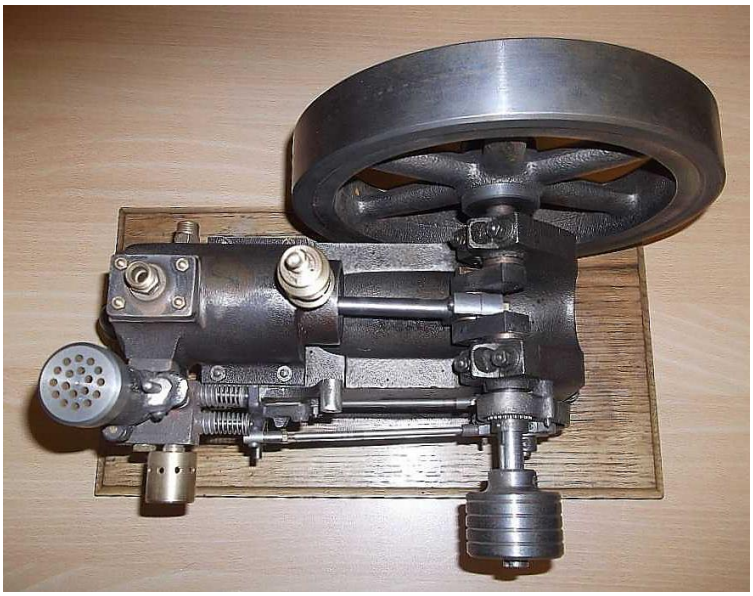


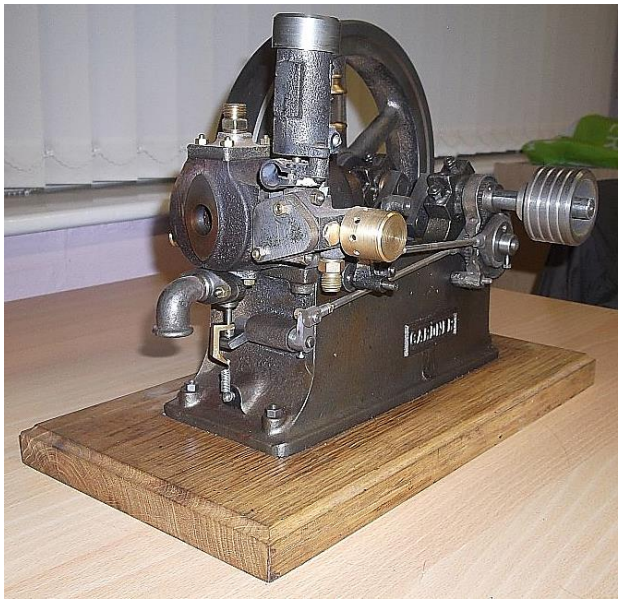
Here is the conrod, before it was bored out on the *Tom Senior*. The last job done was the oiler. Tony got the drawings from a PEEMS member he met at the Doncaster Show last year. He then built the oiler from the drawings. It looks identical to the oiler on the actual engine.

Some more photos of the *Gardner* engine model in assembly and complete:









The Anson Museum: In conclusion to this part of the talk, Tony said that the time to visit the Anson Museum is either the 'Clocks Back' weekend or the 'Clocks Forward' weekend. The next weekend is the 'Clocks Back' weekend in October. Everything will be running, including stationary engines, and a compound mill steam engine. There is a section of the museum devoted to *Gardner* engines, and traces the history from the earliest to the later versions. The Anson Museum is in Stockport.

'*wetwheels*' Yorkshire

Tony is involved with *'wetwheels'* Yorkshire which is a very worthwhile charity. The original *'wetwheels'* Solent was set up by Geoff Holt MBE, who is a veteran of the Gulf War where he lost the use of his legs. He set up the charity to take physically and mentally disabled children out to sea using this boat.
It can take two wheelchairs and seven disabled people. It has full remote 'dual' control, so the children can experience steering the boat using the wheel.

The boat is normally moored off Whitby (it came last year) and is harboured at Scarborough during Winter. Princess Anne came and named the boat and Tony was lucky to be invited to the occasion.

Tony got involved with *'wetwheels*' through his involvement with Peter Richardson, the Director of *'wetwheels'* Yorkshire, who asked him to build a 'catamaran' to represent *'wetwheels'* in the York 'Micklegate Soap-Box Challenge'. Using two canoes, some Fiat 'space saver' wheels from York College, brake discs from a scooter, and other components, the soapbox was completed. To qualify for entry, the sharp front end of the canoes had to be modified.

Thanks and acknowledgements To Tony Simons for giving a very interesting talk, proof reading this article and giving permission for the photographs to be used in the newsletter

PEEMS Visit To Ivan Shaw's Workshop And The "Merlin Aircraft" On April 17th.

PEEMS members and visitors made their long awaited visit to Ivan Shaw's workshop to view the "Merlin" personal aircraft, which Ivan designed and built from scratch. Ivan had given a talk to the club about the "Merlin" personal aircraft in September 2018, and showed how the ergonomics were defined, the moulds manufactured and components designed and manufactured within this small space. On this visit people were able to see the aircraft, touch it and ask questions.

Ivan had expected the aircraft to be finished by this stage, (it's been a six year project so far), but engineering being engineering there was still some work to do. The electrics were currently being fitted by a professional, who needed his Easter holidays. However, there was still sufficient on view to allow a good inspection. The fuselage including engine and spinner were on view and the wings and tailplane were set aside for individual inspection.

Members were able to contemplate what can be achieved in a workshop converted from a double garage, including the ingenious hot box used to process the carbon fibre components under 1 bar vacuum and 85°C temperature.

It was also a good demonstration of how the aircraft can be stored in a single garage, thus saving a lot of money in hangarage fees.

Ivan had expected people would turn up, have a cup of tea then leave within half an hour, but such was the interest that there were still discussions going on two hours later.

PEEMS would like to thank Ivan and Judith Shaw for their hospitality and patience, and for the provision of teas and coffees to all the visitors.

Progress on the aircraft will be reported in the PEEMS newsletter, and perhaps there will be another visit when the aircraft has finished its flight trials.

NEWCOMEN SOCIETY LECTURES:

South Yorkshire Branch of the Newcomen Society

Monday 29th April 2019 - Steam below sea - the Royal Navy K Class steam turbine submarines of WW1.

A reminder that our last meeting before the summer break is on Monday 29th April when Chris Hodrien, will talk on:- Steam below sea - the Royal Navy K Class steam turbine submarines of WW1. Chris's talk will outline the development and subsequently disastrous career of the 18 K-Class submarines. Originally designed in 1913 by the Royal Navy to be large fast steam-powered submarines that could act in support of the battle fleet, the K-class submarines suffered numerous operational difficulties. Of the 18 submarines in the class, six sank, one twice, with significant loss of life. In contrast only one engaged an enemy vessel and after the torpedo failed to explode had a narrow escape. Whilst most of the K-Class were scrapped in the 1920's one K26 survived being broken up until 1936.

Chris Hodrien is a Chemical Engineer who spent much of his career in R&D activities with British Gas and Advantica plc. In retirement, Chris is Technical Adviser, to the International Stationary Steam Engine Society.

As usual, the meeting will be at Kelham Island Industrial Museum starting at 6:30 pm. Tea and coffee will be available from 6:00 pm and we look forward to welcoming you to what we hope will be an interesting talk and discussion.

Meetings are free and open to all and there is no need to book seats in advance, however, if you will be attending as a group and wish to sit together please let me know and I will reserve a block of seats for you.

We look forward to seeing you. John Suter Meeting Secretary, Newcomen Society South Yorkshire.
meetings.syorks@newcomen.com

Forthcoming Events and Meetings

April 2019 - *Joseph Bamah 1749-1814*
An exhibition at the Hawley Collection of Joseph Bramah development of the "unpickable" lock, the hydraulic press, fire engine, water closet and much more.

Tuesday 5th November 2019 A Symposium: **'***Precision: Bramah and Maudslay to Advanced Manufacture*
10:00am – 4:00pm
Kelham Island Industrial Museum
Ticket £25 including buffet lunch and coffee. Tickets must be pre-booked
Entry to the Bramah Exhibition is included in the price

Programme

10:00	Registration and Coffee	
10:30	*Introduction*	Keith Crawshaw
10:45	*Joseph Bramah*	John Bramah
11:45	*Henry Maudslay*	Richard Maudsley
12:45	Buffet Lunch and Conducted Tour of Bramah Exhibition	
13:45	*A History of Interchangeable Manufacture and Precision Engineering*	David Eaton
14:45	Coffee Break	
15:00	Modern High Value Added Manufacture	AESSEAL
16:00	Closing Remarks	Jonathan Aylen

To book a place either go to Eventbrite website at:- www.eventbrite.co.uk and search for *Bramah* under the Sheffield events or go directly to:
https://www.eventbrite.co.uk/e/precision-bramah-and-maudslay-to-advanced-manufacture tickets-59949878701

Forthcoming Meetings
South Yorkshire Industrial History Society Meetings
Members would be welcome at meetings held by the SYIHS
Sheffield programme
Sheffield meetings are held at Kelham Island Museum and will begin at 7.30 pm. For further details please contact Derek Bayliss (tel. 0114 230 7693, email v.bayliss@btinternet.com)

Monday 20th May Graham Hague - *The Sheffield Canal (1819-2019) and its connections*

Contact:
If you would like to contribute to the Newsletter, the contact is:
Nevile Foster Tel 01751 474137 or e-mail nevf123@outlook.com