NEWSLETTER March and April 2022

Gentlemen,

Welcome to another very interesting Newsletter. Grab a brew and prepare to be immersed in another damned good read.

It has been mentioned before, but John Arrowsmith's visit is quickly approaching on the 17th May. This is a brilliant opportunity for us to advertise what PEEMS is, and what we do, and probably the best way to target prospective new members.

It is nice that we have welcomed a few new members lately, but it is vital for the Club's future that we attract more. The Committee needs new blood to keep it sharp!

Following on from the initial call for models for display on the day, we want to include all members with regards to exhibiting something.

There are a few 'petrol head' members as well as 'steam heads', so we want to include a bit of a 'mini motor show' in the morning. Anything that is too big, or smelly or noisy for the afternoon in the *Hungate Centre,* will have room at *Croft House*. Cycles to Bentleys, 'Barn Finds' to 'Concours', it doesn't matter. Any interesting machinery to show will be good. There will be a couple of awnings to keep the rain off, in case of the inevitable. If anyone requires transport for anything to display, just ask. Let's all make this a success. Your thoughts and ideas are most welcome.

Ted Fletcher asks if anyone they know has a guillotine for sale, one about 4 foot wide, foot operated, as was used in some schools. Has anyone any experience of the small ones about 450 mm wide which *Warco* and others sell? Please reply to Ted. His contact details are in 'The Members List'.

Jonathan

☐ **Forthcoming Events.**

- **Sunday 1st May. Ellenroad Steam Museum (OL16 4LE)** is due to be in steam. They are holding their 'Spring Classic Car Show' on the same day. Open 11am – 5pm. Admission £5. We will be car sharing. Details are to be confirmed, but if you are not on the emailing list, and want to go, please let me know. *Jonathan*

  Details of the museum are here: https://www.ellenroad.org.uk/
  To return to the newsletter press back arrow at top left of the screen.

- **Wednesday 4th May at 7pm. Club Meeting** back at the **Hungate Centre**. As yet, we're unsure about the Wi-Fi setup in the Centre, so no 'Zoom' is planned. Please come and support us back at the old RVS club. Bring something to show, like a *'Mini Bring and Brag'* or take the mic and tell us a tale like "this is how I knurl without a knurling tool..... (or such like)"! If you bring any 'goodies' (scrap!), books or magazines to dispose of, please be prepared to take them away if they don't find a new home.

- **Tuesday 17th May**: **John Arrowsmith Visit** (see comments above).

- **Wednesday 1st June**: **Club Meeting** at the Hungate Centre. Jon Selby will be talking about *"Ground Effect Vehicles"* and his experience with testing scale models locally.

- **Tuesday June 21st from 10.0am. Workshop Morning**.

- **Wednesday June 22nd A Visit To *Saltburn Miniature Railway.*** Visit arrangements to be confirmed nearer the time. https://www.saltburn-miniature-railway.org.uk/locomotives-rolling-stock

- **Saturday 25th June: Brian and May Stephenson** are hosting a **Garden Party** and have ordered *The Red Arrows* to fly past. Details to be confirmed.

☐ **A Request From Paul Windross For A Hydraulic Trolley Table Or Similar.**

I am finding it's hard to lift heavy parts and wonder if any PEEMS member has a hydraulic trolley table, similar to the one in the photo, to sell.
It needs to be about 300kg hydraulic trolley bench load capacity. *Paul*

Return To The Hungate Centre For PEEMS Meetings From Wednesday 4th May.

PEEMS will be returning to the Hungate Centre (Hungate, Pickering **YO18 7DG**), at the traffic lights in Pickering with the first meeting on Wednesday 4th May. .

PEEMS Annual Dinner At *Walkers Fish Restaurant* Tuesday 29th March 2022

The PEEMS annual dinner at *Walkers Fish Restaurant* was very well attended by PEEMS members, their wives and partners. About sixteen people turned up. The dinner was held at East Ayton at noon, which was convenient both for people travelling from Scarborough, and for those travelling from the environs of Pickering.

The food and the facilities were excellent.

This was the first PEEMS annual dinner since March 2019.

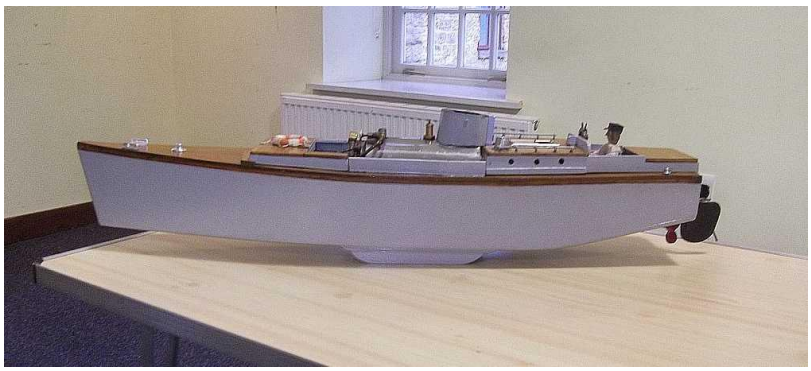
Club Meeting Wednesday April 6th A New Model Steam Launch. Presentation by John Heeley.

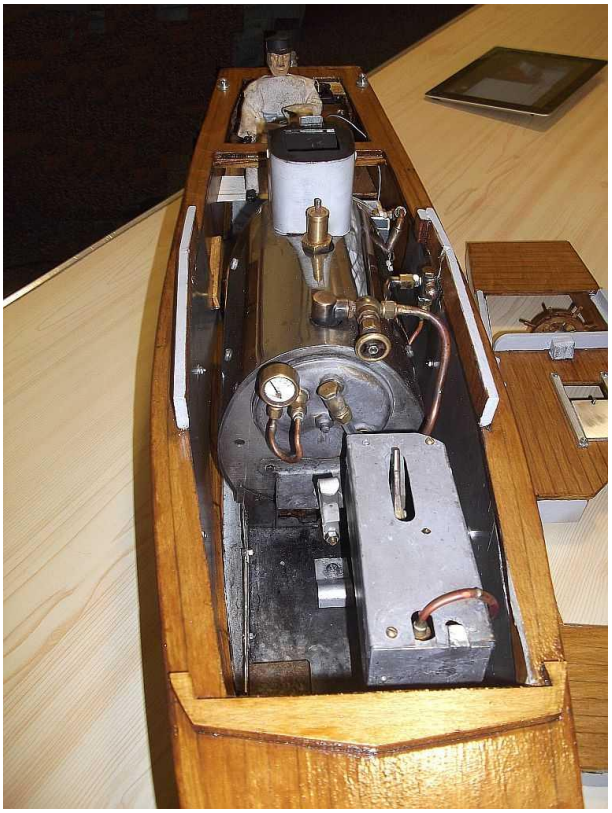
John has given some previous talks about the steam turbines he has built to run in his 4 foot long 10 inch wide model steam launch. They worked perfectly well and the boat operated satisfactorily.

The problem was that the launch was a difficult size to transport in his car, and it was also heavy. He had to cut two inches off its length to shut the back doors of his car.

He therefore decided to make a smaller boat that was easier to transport, and that would fit nicely around the engine unit. John thought that if he could make it as narrow as possible, the reduction in surface area would make it go faster.

The last talk John gave on his scratch build turbine, is included in the December 2021 Newsletter. This also shows photos of the water tank, boiler, fuel tank, turbine and gearbox at that time. These are now fitted in the new launch.





- **Construction**

The way it was made was simple. It consists of two ‘planks’ on each side, which are cut out. There is a block of wood which forms the transom (the vertical section at the rear of the boat). The sides are screwed and glued to the transom. There is a block of wood at the centre of the boat, which is slightly angled at the sides. This is just a former, so it is screwed to the sides not glued. The nose is then bolted in. The next stage was to cut out the lower keel surface. That had to be made in two pieces, as it slopes up at the back. The deck and deck housing were then cut and glued onto the top. It was built in two or three days, most of the time was spent waiting for the glue to set.

The reason for the lower sharp corners of the hull is because the base of the engine is on a flat plane. John wanted the engine to sit as low in the launch as possible. The launch was then painted and varnished. The engine was fitted and the prop shaft was put in.

- **Stability**

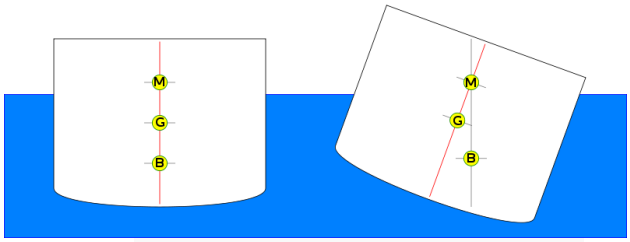
The boat was finally launched in John’s bath. The problem was that it wanted to lay on its side. The horizontal centreline of the boiler, as seen in the photos, is at deck level. The water feed tank for the boiler is set high because the burner needs to move backwards and forwards under it. The turbine is set high because it needs room to drive down to its gearbox. All the weight is high up.

There is something in marine engineering called the *Metacentric Height (GM)* which is a measurement of the initial static static stability of a floating body.

It is calculated as the distance between the centre of **G**ravity and the **M**etacentre. The greater the metacentric height implies greater initial stability against overturning. The metacentric height is the point around which the hull pivots and John wished he had thought about that before he started. He ended up having to install a large lump of mild steel in the hull to get it to sit ‘vaguely’ right.

There are also some weights inside, to counter balance all the ‘offset’ component weights.

Ref Wikipedia:



Ship stability diagram showing *centre of Gravity* (G), *centre of Buoyancy* (B), and *Metacentre* (M) with ship upright and heeled over to one side. As long as the load of a ship remains stable, G is fixed (relative to the ship). For small angles M can also be considered to be fixed, while B moves as the ship heels.

- **Test Sailing At Huddersfield.**

The pond at Huddersfield is rectangular, the size of an olympic swimming pool, and 18 inches deep. A lot of the lads there run high speed electric craft. They can whip up the equivalent of an Atlantic storm. There is also a lot of wind blowing. The launch tends to lean out on a turn, rather than lean in like a speedboat. The only part of the launch that is radio controlled is the rudder.

John has just about managed to make it sail. It is 12½ lbs, there are no bulkheads in it, and if it 'ships' more than half an inch of water it would probably sink. It has already run for four hours at Huddersfield and it hasn't sunk yet.

He has tried to lower the C.G even further by fixing a 20mm metal block under the keel. The boat was to go in the water at 10 o'clock on the following Saturday morning, and John wanted to see how that worked.

- **Further Development**

The long term solution to the problem is to change the dimensions. John wants to saw the launch in half, down its length, and put in a 1¼" wide spacer on both the deck and the keel to make the whole hull wider.

- **The Turbine And Gearbox.**

The turbine unit itself has been a great success. It runs for ten to fifteen minutes each time, and John runs it two or three times every Saturday morning. The only change he has made so far, is a snail shaped outlet for the exhaust steam through the funnel. That change improved things quite a bit.

John is running the burner on methylated spirits.
The lubrication is paraffin with a 5%-10% mix of motor oil.
The boat runs alright on that.

The gears are getting quieter. The sound of the turbine now drowns out the 'gnashing of teeth' that John had before. When cutting gears, John has never gone beyond a rotary table, the 'counting of degrees' and fly cutting with a single point. He's never owned a gear cutter and he's made a lot of gears

They would be nice quiet gears if he could run them in some oil, but he can't. All he can do is run them in a paraffin type light lubricant, so everything tends to be noisy.

The power unit is all on one plane, and is held down with two bolts. The powerplant is usually installed, and the bolts torqued down, whilst the turbine is running on compressed air. John does this because he can then find the best position for maximum prop speed. The torque generated by the turbine unit is completely different to that generated by any other type of steam powerplant, which include slide valve and oscillating engines. John has a piston valve engine which runs well but is not very good at powering a model steam launch.

This turbine unit is excellent for powering the launch, and it's never failed, it has never stopped in the water once, and it always runs until the fire goes out.

John said that he would recommend to anybody making a model of a steamboat, to use a turbine power plant.

They are easy to make. All that is needed is a milling machine and rotary table. John press fits the turbine *Stumpf* wheel on the shaft and then machines the buckets in. The Stumpf wheel in the turbine with its 18 buckets can be seen on page 7 of the December 2021 Newsletter.

Questions and Answers.

Q: With the freely rotating prop and shaft, how do you seal the stern tube?

John: It isn't sealed and it can't be. Normally, with a model boat, the stern tube is filled with grease. That is the standard procedure, and that's all I've done in the past. On this boat, if grease is put in the stern tube, the prop can't run. There is a PTFE disk forming a thrust bearing in the stern tube which provides some sealing, and it doesn't leak much when it is moving. There are some drips in the hull, and there is water in the bilges after a run. There are only little drips once in a while, and it's not going to sink. The waterline at the stern is only 1" below deck level.

The key to turbine machinery is to ensure the prop gear runs very freely. Aircraft turbines can be rotated just with the tip of your finger. When you come down to the scale of model boats, the usual lubricating materials could stop the engine from running. As I've said, the gears were noisy at the beginning and were 'desperate' for some lubrication. However, they are now starting to 'run in', although the backlash is increasing. There is a provision for a 25 thou variation on the centres.

Q: In some of the old *Model Engineer* magazines, I'm talking 1950s or pre-war, there were people experimenting with turbines, for example driving twin shafts with large diameter friction wheels. Those would certainly run quieter than gears.

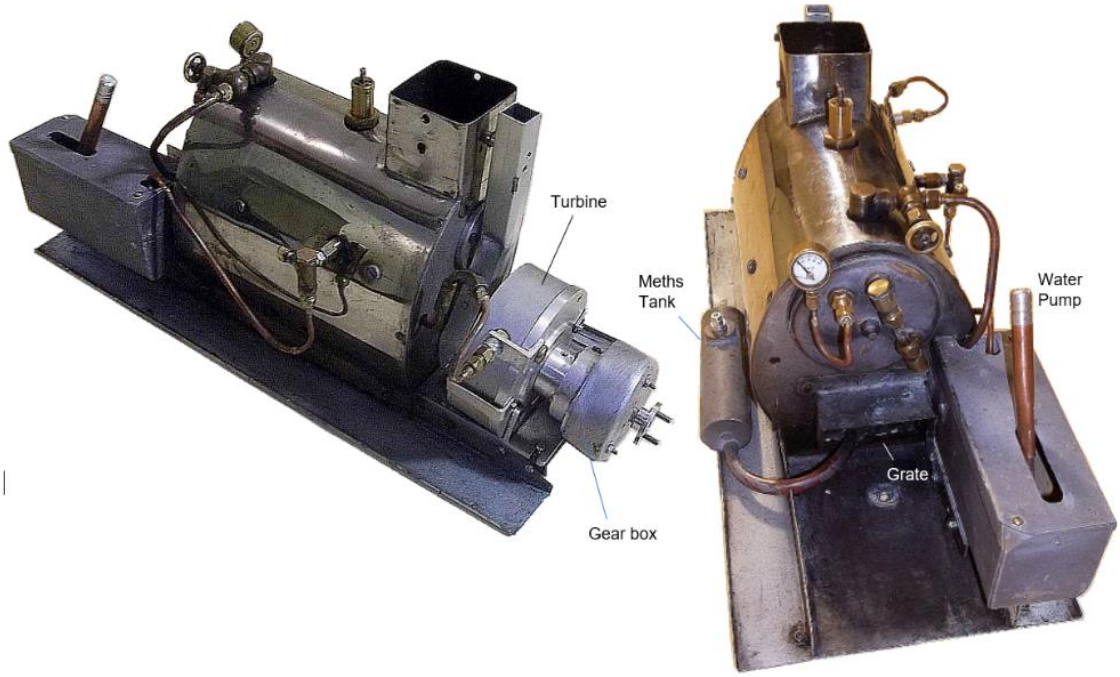
John: There's quite a bit of information out there on turbines, but when you start to go out to exhibitions and model clubs, you never find any. Some people use turbines to drive generators, but I've never found another geared turbine on a boat. I'm not claiming there is anything original about this, because it's that simple, but there doesn't seem to be many people doing this type of thing.

Q: If it gets water in, you have all that free space in the bottom. Why don't you put baffles in? You could then contain any water ingress.

John: There's nowhere to put baffles. The powerplant's in the way. The idea of this design, basically three sides, a top and a bottom, was that there would be a clear space inside it for the boiler, the water tank and the powerplant. I suppose I could seal the bow off. The boat really needs to be made bigger for a powerplant of this weight. The problem is that the horizontal centreline of the boiler is at deck level and that is the heaviest part. Then the water tank to feed the boiler needs to be high so the burner can move in and out under it

As I've said it's very reliable. You run it out on the water until "the note starts to change", and then you can bring it back to the bank. There's loads of time. The turbine never stops on you. When I take it out of the water, it is still running and the prop is still idling around. I stick it on the bench and all I have to do is fill the water feed tank and close the valve. After three minutes there is enough condensed steam in the boiler to create a vacuum, and then it refills the boiler automatically. It will go from the bottom note to the top note on the water gauge glass automatically. There's just enough water in the tank to do it. It's ready to run again. Refill the tank and three minutes later you're back on the water. As can be seen in the photos, there's a hand pump on the tank, but I haven't used it since December.

For Reference: The configuration of the engine components at the time of the December 2021 Club Meeting.



Further Thoughts On Gear Cutting - A Talk By Mel Doran.

- **Introduction.**

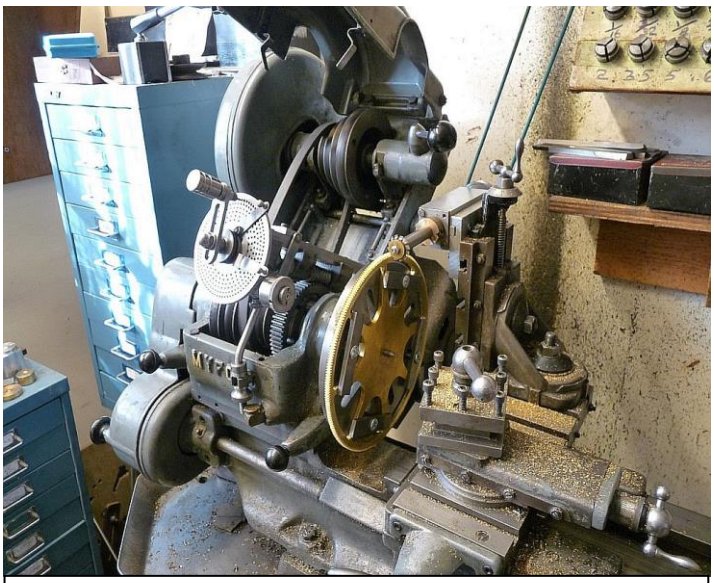
At the first meeting of 2022 in February, Peter Bramley gave PEEMS a very informative talk on 'A Traditional Way Of Cutting Straight Spur Gears' using a Dividing Head on a vertical milling machine.

At this Club evening, Mel Doran gave a follow-on talk about clock gears and also represented Mike Sayers (who couldn't attend) with a further talk about his methods for cutting gears for his model *Delage* engine. Mike has been giving PEEMS step by step talks about the progress of his *Delage* Grand Prix engine project, and these have featured in previous PEEMS newsletters.

- **Part 1 ~ Clock Maker's Techniques.**

Mel began his talk by saying that the clock and watchmaking industry use cycloidal gears which are chosen because they have constant velocity, whereas involute gears don't. Involute gears are better for transmitting power. Power is not needed in clocks.

In the 'old days', all they used was a 'slitting' saw and they just cut straight slits. They then used a 'topping' tool. When the wheel had been 'slitted out' with 'straight teeth', it was then put on centres so it was free to rotate. They then used a tool like a scroll, which is a bit like a worm but sharp, to run around the tops of the teeth in order to round the corners off. Very crude, but that was the way in those days. There are some data sheets at the end of this article.



Vertical slide supporting a milling spindle. The cross slide centres the cutter and the vertical slide puts on the cut to full depth at one pass. The wheel is indexed by the GHT worm working on the bull wheel.

This is Mel's set up. A wheel is being cut for a clock he has designed. It's a 'Large Wheel Clock'. The wheel itself is approximately 8" in diameter, and it has 260 teeth.

This first wheel, with the *Fusee* (the conical pulley with a helical groove around it) on it, is shown below.

It's quite a simple setup. There is an overhead drive, driving a cutter spindle with a 0.75 module cutter. It is a 'form relieved' cutter made by *Thorntons*.

One pass through with the cutter will cut a tooth. The cutter then comes back through again.

There is a *G H Thomas* Dividing Head which is directly working on the bull wheel. The headstock, the bull wheel and the *Thomas* Dividing Head (which has a scroll (worm) which is set into the bull wheel) are being used together.

The bull wheel has 60 teeth (not like the usual Dividing Head which has 40 teeth like Peter's). In some way it's a lot easier for cutting multiple teeth. There's more chance of finding a match with 60 teeth.

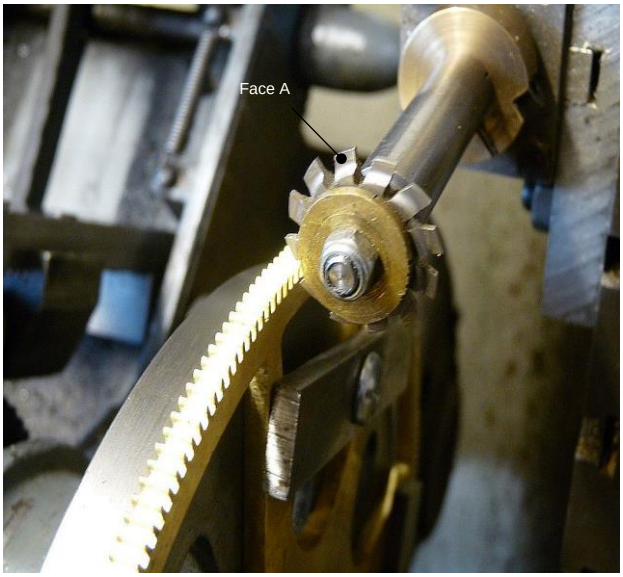
Q: Is there a reason why you are using 260 teeth?

Mel: Yes. The 260 teeth are running into a 10-leaf pinion. This is the 'Intermediate Wheel' which is the driving force.

The *Fusee* drive will give me 14 revs of 260 teeth. If that is running into a 10-leaf pinion, then that is driving 100 teeth into an 8-leaf pinion.

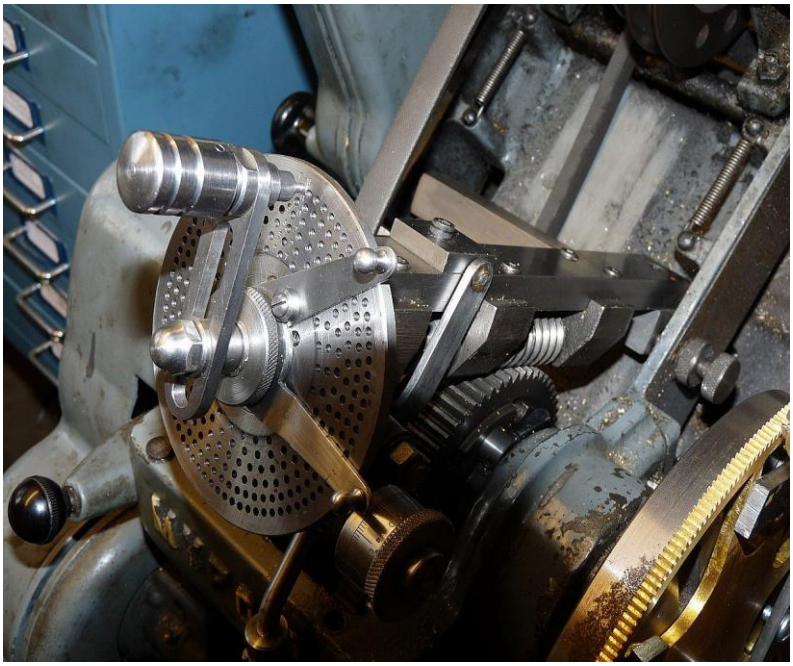
The 8-leaf pinion is driving 144 teeth into a 60-leaf pinion which is the escape wheel.

This setup will give me two weeks running in the clock I've designed. That's why I need so many teeth. Although it's designed for a two week running period, it should have 'a day and a bit' over run with the *Fusee.*



Here is a better view of the *Thomas* Dividing Head. The worm can be seen engaging in the bull wheel. The 'hole plate' and the lever arm can be seen. One revolution moves the bull wheel one tooth so that 60 revs gives 360° rotation of the work piece. To cut 260 teeth, Mel had to find a way to do it with the 'hole plates' he has.

This photo shows the cutter in more detail. The teeth on the cutter are 'form relieved' which means that when it needs sharpening, all that is necessary is to sharpen down face A equally on all the teeth. That makes sure the form of the cutter is maintained. In this photo the wheel is mounted on a face plate.



The 'hole plate' seen in the slide has a 78 circle ring of holes followed by 66,50,42,32 and 27.

If you take 60 teeth as a full revolution of the bull wheel and 60 is divided by 260 the answer is 0.2307692.

Using this setup means that fractions can't be used as it could be with a wheel with less than 60 teeth. Mel had to look at all the 'hole plates' he had, and that's why he ended up with the plate shown with the outer 78 holes. This meant that a sector of 18 holes should be available to give the gap for one tooth:

- 60 revs gives 360° rotation.
- 60 x78 = 4680 holes to pick from for a full 360° turn.
- Mel divided 4680 by 260 which equals 18 holes.
- Mel then set the sectors on the 'hole plate' to 18 holes.

All Mel needed to do then was cut his first slot, move 18 holes and cut the next slot and so on. He set the depth shallow for his first slot (so as not to groove it), got some 'engineer's blue' and smeared it on the outer periphery of the blank. He then cut it through and then moved it 18 holes to the next position and cut that slot. He ended up with a land with bits of 'blue' attached. He then took the vertical slide down 10 thou and cut again, moved back 18 holes and cut again. He did that until he had just cleared the blue.

Once he had done that, he left all the settings alone, and cut around the whole periphery. At the 5th whole turn, the plunger came back to the start position, which confirmed the setup. After another 5 revs around he came back to the start position again. It just worked out that 5 revs and 18 holes worked out right for the 78 hole circle.

Q: When you were doing that first operation cutting the first two gaps, was backlash a problem?

Mel: No. The bull wheel/worm was quite tight, but not so tight it would not turn. It took a bit of adjustment. The arm has a nut with a pinch screw in it. It is threaded and there is another threaded nut. The whole arrangement is pivoted at the back. There is a bar with a 60° conical centre hole drilled in each end. There is a 60° cone peg at one end, and at the other end a threaded adjuster so that it can be fitted it in at the pivoted back, and the screw set through so the two conical holes can be picked up to provide the pivot. It is relatively tight. On the front of the Myford there is a spigot that has to be fitted on. There is an adjustment so that the worm wheel is tight but not too tight against the bull wheel. The arrangement is shown in the upper right photo.

Q: Did you use cardboard covers?

Mel: Yes, I had to cut some corrugated paper and put slots in it. I dropped it at the back to stop all the swarf getting into the headstock pulley system.

Q: Is this the first time you've used this on a big wheel?

Mel: Yes it was.

Q: So this was an experiment for you?

Mel: Yes it was. The spindle you see was shorter than that. The previous spindle had been used on small wheels, and I didn't need the overhang, so I had to make a new arbor. I had to slot it over the old one with a split in the tube and used a clamp with an Allen bolt through it.

At the centre there was a soft number 2 Morse tapered centre. A ¼" spigot was turned on it with a point on the end. Mel did that because he needed to be able to locate the wheel itself on the milling machine, on the rotary table, and he had a ¼" pin on that.

In clockmaking a ¼" pin is a reasonable size for an arbor to fix a wheel onto.

The *Fusee* spindle is a lot bigger than ¼" and the centre hole had to be opened up. The face plate was put on, and the wheel was offered up to see how much the spigot needed turning. The spigot was turned so it was just below the face of the faceplate. A ¼" hole was drilled and reamed in the centre of the wheel, a few holes were drilled where there were going to be gaps formed by the spokes. The wheel was then clamped to the faceplate with 'T' bolts.

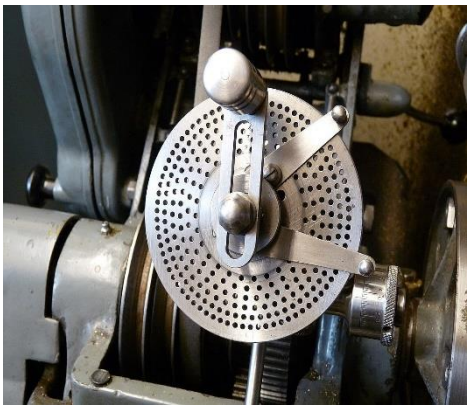
The next stage was to cut the teeth. Once the teeth had been cut, the wheel was removed from the faceplate. The wheel was then placed on the rotary table to cut out the spokes.

The circular shapes at the hub were bored out first. Holes were then drilled at the outer end of the spokes where they meet the inner edge of the wheel rim. A ⅛" slot mill was used to slot out the inner rim, and the spoke edges were then cut out and the wheel was the ready for the next stage.

The *Fusee* then had to be fitted. Now Mel had his ¼" pin, he put the ¼" spigot he had turned on the Morse 2 tapered centre in, as shown on the photo. He then put the wheel on and clamped it in place. He then took off the faceplate by rotating it, and unscrewing it from the Myford nosepiece. The spigot was then knocked out and the faceplate was refitted to the Myford nosepiece, maintaining the concentricity of the workpiece. The wheel was bored out so that the *Fusee* could be fitted on it.

Q: Did you risk distortion on the ring?

Mel: Yes, there was some distortion of the ring. This wheel came out of a sheet of brass. When the tension came out of it, it started to move. I then ended up pressing it in various places to get it back to circular.



This is just another view of the 'holed plate' and the sector arms. As can be seen, the sector arm has a screw in it. The two sector arms can be moved to whatever holes are required and the screw tightened and then it can be swung around.

Here is the "¼ horse" motor with the pulley and a very crude tensioning device. The "¼ horse" motor runs at 1400 rpm.

The pulley system being used in the photo, gives 2500 rpm for cutting brass.

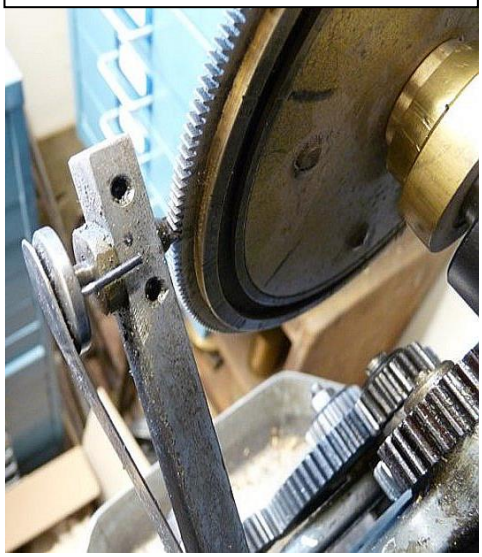
For cutting steel pinions, the little black pulley in the upper centre is used. Other pulleys can be bolted on if required.

It is a very simple system.

Motor drive to the milling spindle showing belt tension arrangement

Direct indexing using a 240 tooth wheel ex 'Clocking In' machine mounted on the Headstock tube. Indexing by spring loaded detent. Simple set up is capable of indexing: 2,3,4,5,6,8,10,12,15,16,20,24,30,40. 48,60,80. and 120.

Detail Of Spring Loaded Detent



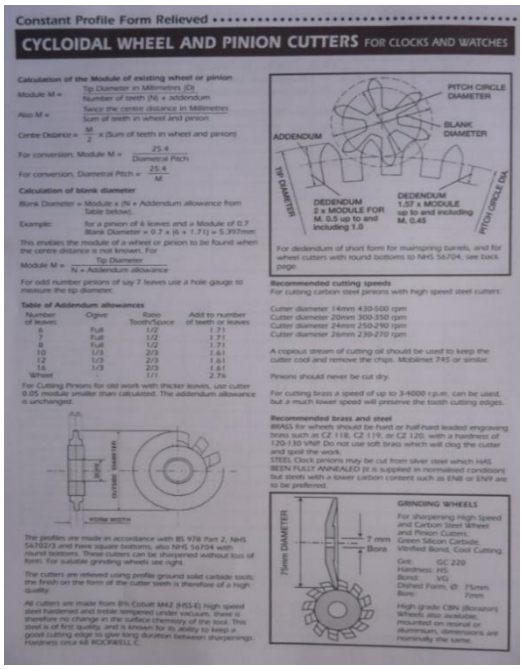
This is a very early system Mel employed before he had a dividing head. He used an ex 'Clocking-In' machine wheel that he managed to salvage. It has 240 teeth. He used that with a clamp to clamp the wheel onto the tube of the headstock.

There were two tapped holes in the Myford that Mel utilised to attach the arm which included a spring loaded detent which picks up on the teeth of the wheel. Mel brought in the wheel which is shown below. It still has a ring of insulation on it and had facilities for a switching arrangement to turn lights on and off. The arm is also shown below. It is just a piece of leaf spring.

Mel used this system for years, even professionally when cutting gears for broken clock parts. The photo shows the index numbers that can be derived from a 240 tooth wheel.

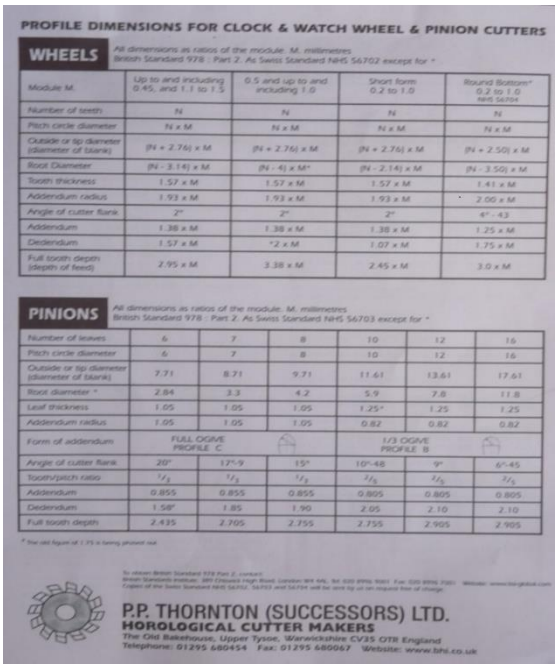
It did virtually everything he wanted. Mel then got more sophisticated and bought the *G H Thomas* Dividing Head in kit form and assembled it. He bought it from *Hemingway Kits*.

Cycloidal Gear Data Sheets



Constant Profile Form Relieved

CYCLOIDAL WHEEL AND PINION CUTTERS FOR CLOCKS AND WATCHES



PROFILE DIMENSIONS FOR CLOCK & WATCH WHEEL & PINION CUTTERS

WHEELS

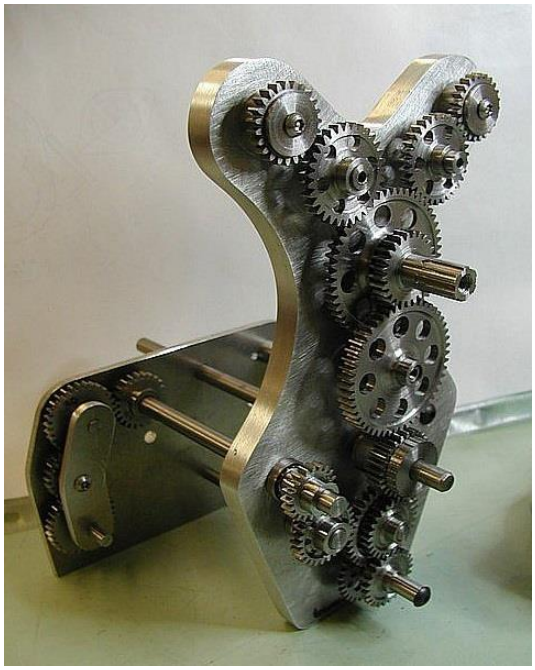
Module M.	Up to and including 0.45, and 1.1 to 1.5	0.5 and up to and including 1.0	Short form 0.2 to 1.0	Round Bottom* 0.2 to 1.0 NHS 56704
Number of teeth	N	N	N	N
Pitch circle diameter	N x M	N x M	N x M	N x M
Outside or tip diameter (diameter of blank)	(N + 2.76) x M	(N + 2.76) x M	(N + 2.76) x M	(N + 2.50) x M
Root Diameter	(N - 3.14) x M	(N - 4) x M*	(N - 2.14) x M	(N - 3.50) x M
Tooth thickness	1.57 x M	1.57 x M	1.57 x M	1.41 x M
Addendum radius	1.93 x M	1.93 x M	1.93 x M	2.00 x M
Angle of cutter flank	2°	2°	2°	4° - 43
Addendum	1.38 x M	1.38 x M	1.38 x M	1.25 x M
Dedendum	1.57 x M	*2 x M	1.07 x M	1.75 x M
Full tooth depth (depth of feed)	2.95 x M	3.38 x M	2.45 x M	3.0 x M

PINIONS

Number of leaves	6	7	8	10	12	16
Pitch circle diameter	6	7	8	10	12	16
Outside or tip diameter (diameter of blank)	7.71	8.71	9.71	11.61	13.61	17.61
Root diameter *	2.64	3.3	4.2	5.9	7.8	11.8
Leaf thickness	1.05	1.05	1.05	1.25*	1.25	1.25
Addendum radius	1.05	1.05	1.05	0.82	0.82	0.82
Form of addendum	FULL OGIVE PROFILE C			1/3 OGIVE PROFILE B		
Angle of cutter flank	20°	17°-9	15°	10°-48	9°	6°-45
Tooth/pitch ratio	1/3	1/3	1/3	2/5	2/5	2/5
Addendum	0.855	0.855	0.855	0.805	0.805	0.805
Dedendum	1.58*	1.85	1.90	2.05	2.10	2.10
Full tooth depth	2.435	2.705	2.755	2.755	2.905	2.905

P.P. THORNTON (SUCCESSORS) LTD.
HOROLOGICAL CUTTER MAKERS
The Old Bakehouse, Upper Tysoe, Warwickshire CV35 0TE England
Telephone: 01295 680454 Fax: 01295 680067 Website: www.bhi.co.uk

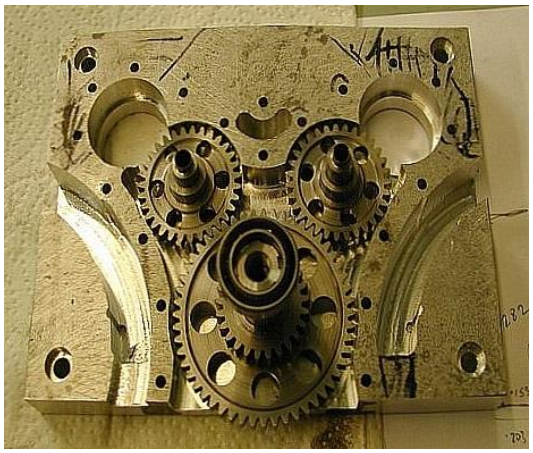
- **Part 2 ~ Using Involute Gears In Model Engineering.** (Mike Sayers)



Module 1 spur gear train for the current Delage Grand Prix engine project.

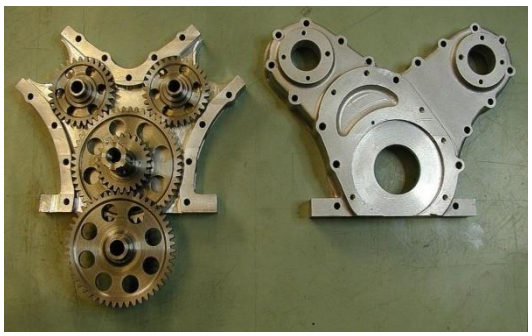
The gears are set up on jig plates to replicate installed positions. Each gear will be supported by a ball race on each side. No adjustment possible.

All the gears have been cut and mounted on the jig plates. This is basically a mockup used to check if the gears function correctly, before being installed in the model.

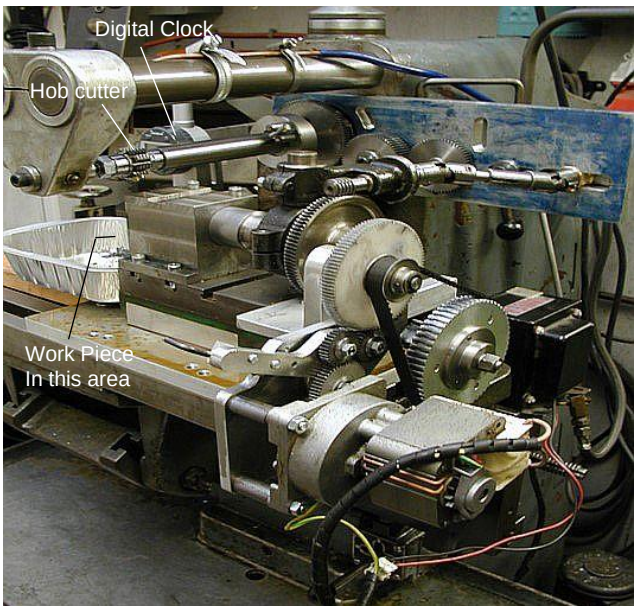


Gear centres in the upper rear timing case being checked after machining ball race housings.

This is the model's upper rear timing case, and three engaged gears have been installed. The ball race housings have been cut in, and the photo shows the timing case in its 'rough form'. The timing case was eventually machined to its 'final form'.as shown next.



Front and rear upper timing cases completed. Gears thankfully running with minimum backlash. No adjustments can be made.



In view of the number of gears required, and of the accuracy needed, it was decided to try and hob them.

The setup, shown in the photo, uses various odd bits of machinery found around the workshop, attached to my old *Shaublin* mill in horizontal mode.

The hob cutter is similar to a worm in that it is spirally cut.

This system automatically indexes.

If you want to cut a gear of a certain ratio you can. You just set the machine up for that gear ratio, start the machine and go away and have a cup of tea while the gear is cut.

The universal joint arm operating the worm onto the gear is there to turn the workpiece so that the hob will cut perfect teeth to the correct ratio.

The next photo shows the view on the work piece.

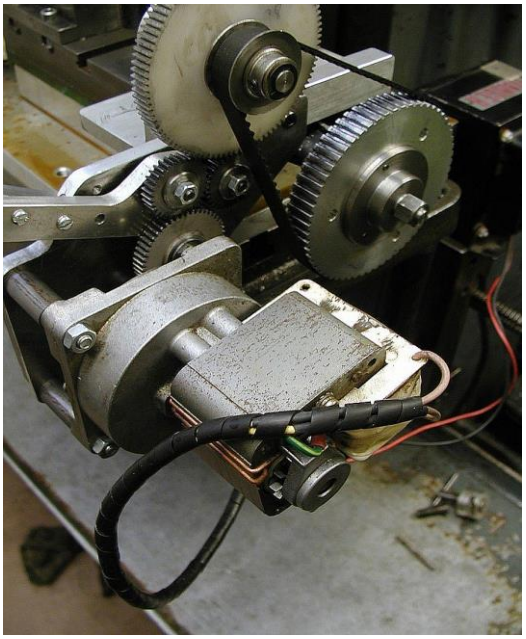
This is a view onto the gear, on the Myford slide, being cut by the hob cutter.

Mike has made a video of the hobb cutter in action it is here:

https://www.youtube.com/watch?v=XkL7u_Daguk

To view video please press on the link.

To return to the newsletter, please press back arrow at the top left handside of the screen.



Because the “X“ traverse needs to approach the gear blank at the helix angle of the gear cutter, it is not possible to use the mill “X” traverse.

This photo shows the independent geared motor drive to the Myford slide that is set to the critical helix angle (always given on the cutter).

The cluster gears give a forward and reverse traverse.

Once all is set up, the process continually indexes the blank to the correct number of teeth as the cutter rotates, and cuts the teeth on auto traverse.

Accurate depth of cut is set on the digital clock seen behind the cutter spindle.

It’s a nonstop, accurate and painless method.

It took two months to make the set up though. To change the tooth number of the required gear, only one gear in the transfer chain needs to be changed, plus one cutter hob will produce gears of any number of teeth.

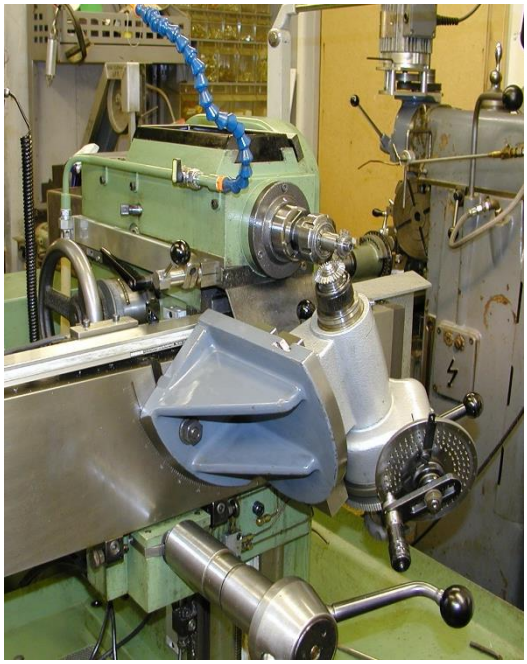
Cutting a bevel gear by the *Brown and Sharpe* three pass process.

In a bevel gear, the width of the gap between the outer teeth is wider than the gap between the inner teeth. That presents a problem in how to cut them. They are usually cut by special milling machines.

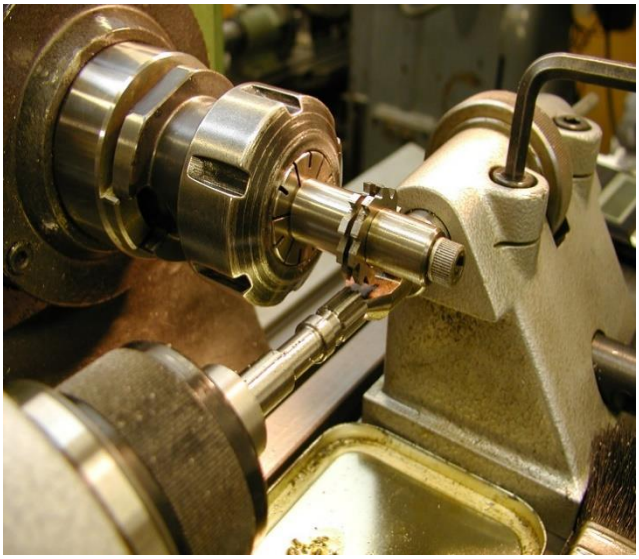
However, *Brown and Sharpe,* during the First World War, devised a method of cutting bevels, not to produce precision bevels, but to produce decent serviceable bevel gears in large quantities all over the world.

Because the gap in the centre was less than the outside, they had to make a special cutter that would cut and finish the slot. To open up the slot towards the outside, one cut would be made down the middle. Then the workpiece would be rotated a few degrees, and the cutter moved slightly. Then a cut would be passed down the edge of one tooth, feathering into the inside and taking more from the outside. The same process was carried out on the other side of the slot along the edge of the adjacent tooth.

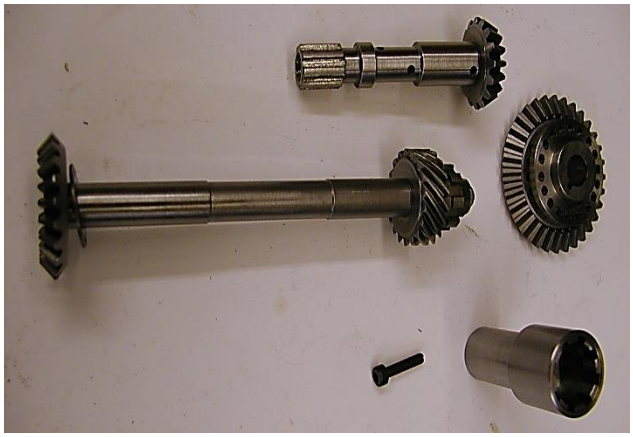
Once the bevel gear had been cut, the finishing process would be a fitter with a file ‘rounding off’. It should be noted however, that if the three pass method has been executed correctly, the ‘finishing process’ with a file will not be necessary.



On a standard mill, the set up on the left would be done flat on the table, with the dividing head spun to the bevel angle, and the cutter spindle would be vertical.



The photograph above right shows that cutting splines employs all the movements of gear cutting. Here the spline width is set by the spacer between the two tandem cutters.



Components for the camshaft vertical drive on the 1/3rd scale 3 litre Bentley.

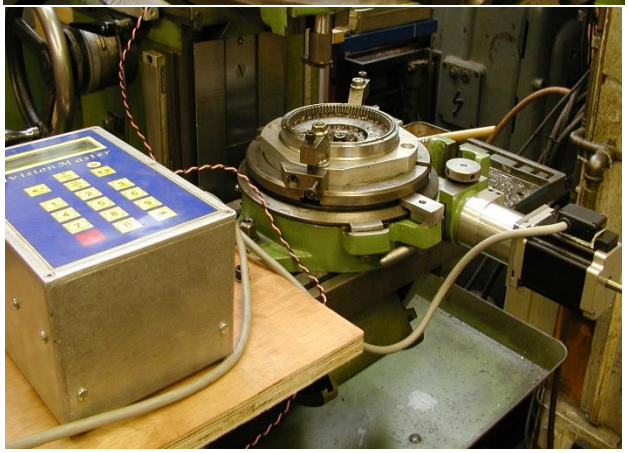
Cutting the cross helical gear is perhaps a tale for the future.

Gears can also be produced by a shaping action.

Here the vertical slotting head is being used with a homemade cutter.

With a blind internal gear of this sort, it is the only way possible.

Well, in my shed anyway!



With all this gear cutting requiring accurate indexing, it was decided to invest in a bit of electronic help.

Set your tooth numbers, press the button at each move and drink your tea.

It does not lose its place when the phone rings. Magic.

All photographs reproduced in this article are with the kind permission of Mel Doran and Mike Sayers

Club Meeting Wednesday 2nd March

Life In The Merchant Navy And Other Sea Faring Tales ~ A Talk by William Burrell.

- **Introduction**

PEEMS has in its ranks some members who have been former seafarers. Some memoirs have been presented in the Newsletter, notably from Jonathan Milner (April 2020) and David Proctor (June/July 2020).

At this Club evening, William gave us a talk about his adventures at sea.

William introduced himself by saying that he was introduced to PEEMS through *'Scarborough Mates'.* Forty years ago, he started building a 5" gauge 2-8-0 *Nigel Gresley,* and because of 'circumstances' didn't get any further. Now he's retired, he thinks he ought to get on with it.

William's talk was going to cover his career, engineering and whatever happened during that period.

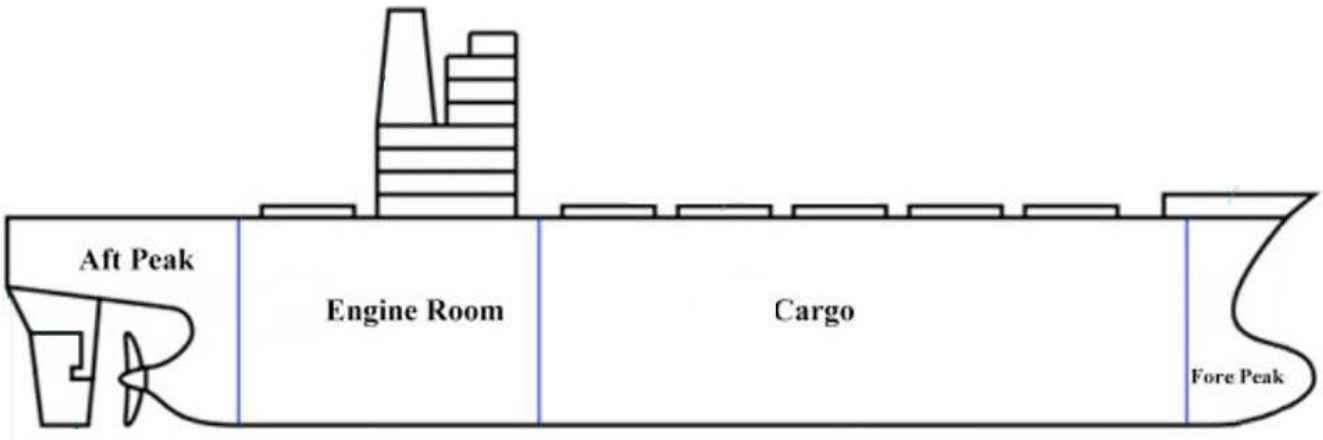
William started by saying that he had originally thought it was a good idea to go away to sea, but found that instead he was initially sent to college for two years, then spent a year 'on the job' as a cadet, followed by a final year at college. He was then 'let loose' as a junior engineer, and slowly 'worked up the ranks'.

The rank system was:

- ***Cadets:*** The 'lowest of the low'. When William was a cadet, he 'knew the lot'. He then passed out as a Junior Engineer.
- **Junior Engineer:** As a Junior Engineer he was 'second on the watch' to The Watchkeeper. He then started realising that he didn't quite know everything. He then got promoted to 4th Engineer.
- **4th Engineer:** The 4th Engineer had his own watch "8 to 12", and he had a Junior Engineer to assist him. This was the system thirty to forty years ago, (it's changed a lot since). William began to realise that even though he was looking after compressors and purifiers, he didn't know as much as he thought he did. He was then promoted to 3rd Engineer.
- **3rd Engineer:** The duty of the 3rd Engineer was to look after the generators and operate on the "graveyard shift" which is "12 to 4". He then realised he didn't know much at all. He was then promoted to 2nd Engineer.
- **2nd Engineer:** This was the next stage before William "got his final ticket". The 2nd Engineer is effectively the "working foreman" of the Engine Room and "all the squad". He then realised he knew even less than before!
- **Chief Engineer:** William was finally promoted to Chief Engineer. He finally realised he knew nothing, however he did have a cadet assisting him!

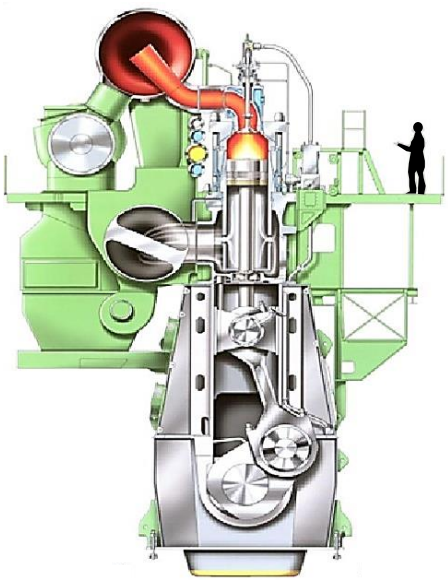
- **Parts Of A Cargo Ship**

This picture shows a basic schematic of a cargo ship



Most of the engineering William was going to talk about occurred in the engine room. He explained the difference between 'bilge' and 'ballast'. Ballast is what is put in the tanks when there is no cargo, in order to weigh the ship down to give it stability. Rocks were used years ago, but sea water is used today. Bilge is the muck, water and oil which used to be on the tank tops. It could be up to a foot deep. Nowadays tanks are 'immaculate'.

- **A Typical Marine Diesel Engine** (*Burmeister and Wain*).



  - 2 Stroke Marine diesel.
  - Slow speed.
  - Direct drive, reversible.
  - Burning heavy fuel oil (360 Centistokes viscosity).

As a marine diesel engineer, William has a “Certificate of Competency” (CoC). What is interesting about the “CoC” is that marine engineering used to be in line with the mining industry in that these were Government issued qualifications, rather than private qualifications. This has all changed, as the qualifications are now private.

As a marine engineer you got the qualifying sea time in, and you did all the examinations including an oral exam. If you passed that, you would be issued with a second ‘ticket’ which allowed you to operate as the 2nd Engineer. A bit more time at sea (usually several years), and you then get issued with a Chief Engineer’s ‘ticket’.

William spent most of his time on large marine diesels** like that shown, before he went on the ferries. The largest piston William worked on was 800mm in diameter.

** To give an idea of the size of these engines, a man is shown in scale.

- **The M.V**. **Bamburgh Castle.**

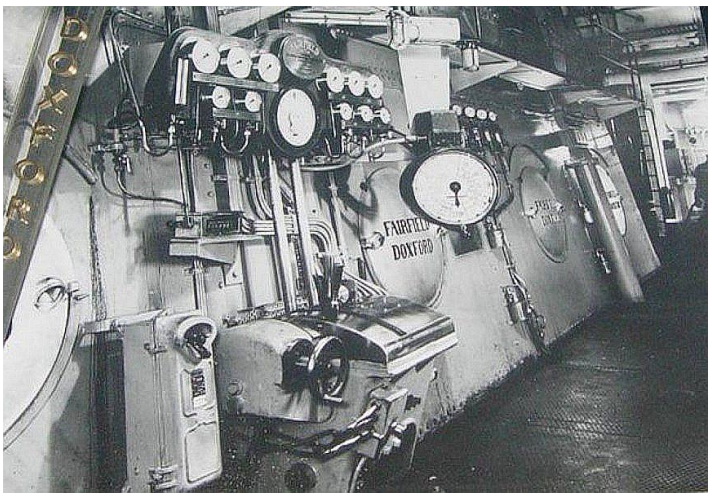
Photo ~ Copyright Chris Howell

This was William’s first ship, which was owned by W.A. Souter & Co. which was a ‘tramping’ outfit. They also had several ore carriers which were half owned by British Steel, and half owned by Souters. This meant that William travelled to some ‘lovely’ places.

In winter they went up to Narvik, then Murmansk and then to Sept-Îles in Canada on the ‘Great Circle’ route. He never understood non-Euclidian geometry before he went on the ‘Great Circle’ in the north Atlantic in winter. The shortest distance between two points, and he didn’t get sea sick.

In summer they went to Nouadhibou in West Africa. Nouadhibou was just sand, and a conveyor belt came out bringing the ore up to the ship. The ore was then taken back to the U.K. to the places where there was steel manufacturing, such as Glasgow, South Shields, Hartlepool, Redcar, Cardiff and Newport.

- **The Doxford Manoeuvring Platform.**



On the *Bamburgh Castle*, the engine was a *Doxford*. It was an LBD (Long Balanced with Diaphragm) *Doxford*. The photo shows the manoeuvring platform (lower centre) with the handles. The engine consisted of ‘opposed pistons’ with the pull-rods coming down and an amazing crankshaft which failed quite often.

On the LB engines, the pistons were water cooled. The method by which everything was oil cooled hadn’t yet been worked out. The crossheads on the LBs were sea water cooled. The pistons would go up and down and there was a swinging link with hoses supplying the pistons.

On the photo, the big dial is the telegraph, whilst the other dials are engine indicators.

There were only two alarms on the ship. One was the jacket water low pressure alarm, and the other was the lube oil low pressure alarm. It didn’t matter because the alarms couldn’t be heard over everything anyway. The company then provided ear muffs to protect peoples hearing!

William reckons he has never served on a ship older than himself.

Ref Wikipedia:This file is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license.

This photo shows the modern control room of a ship. In fact this is a few years old. This control room is not even as sophisticated as the control room of *"The Pride Of Hull"* ferry, which was William's last ship. That control room was computer controlled and was at times difficult to deal with.

Once there was a 'blackout', but the ship got started up. William looked at the computer and did a rough estimate of how many alarms had gone off over one minute. It was 2,000! It just goes to show that a human being couldn't deal with that, it could only be dealt with by a computer.

William said that during his career, starting in the 1970s and finishing in the mid-2010s, he realised how much things were changing.

- **M.V. Longstone.**

Photo ~ Copyright Rick Cox

The *M.V. Longstone* was the first 'proper' ship William sailed on. She had had a fire in the engine room, and she was nearly lost, but they managed to get her going. They had been 'bunkering' diesel oil and a bit of oil got onto the exhaust and that started the fire. The ship was saved, and they got one of the generators working. They were in the *Barclay Curle* shipyard on the Clyde in Glasgow. They sent William and a couple of other cadets up to the ship. The old Glaswegian taxi driver who had been taking cadets to the ships for forty years told William that it was the rustiest ship he had ever seen, and William replied that that was the new company colour scheme ~ bronze!

On the ship, the cadets were put on eight-hour watches just to observe the generator running which was mind numbingly boring. There were six cylinder naturally aspirated '*Nationals*' driving D.C. generators. The electrics were all D.C.

Souters were a great family company that had cadets but a real mixture of crew. There was a very practical Chief Engineer who should have been the 2nd Engineer, whilst the 2nd Engineer was brilliant but couldn't handle people very well, that is, he was not very good. William and the 2nd Engineer once went ashore to a restaurant in Murmansk and the 2nd Engineer could even read the Russian menu.

One day they were putting the *Cochrane* boilers on line. The boilers operated at 110psi. The 2nd Engineer asked William to open the boiler stop, and William was lucky he didn't blow himself out and damage the piping.

On another occasion he asked William to clean the auto clean filter. The lube oil filters they had were 'knife edge' auto clean. They were dual filters for the lube oil system, and consisted of a central vertical rod on which was mounted hundreds of plates with wipers. A handle was turned and the rubbish was wiped from the outside of the plate. William unbolted and lifted off the very heavy top. He then took off the bottom plate and noticed a nut secured by a split pin. He removed the split pin and the nut, and all the hundreds of plates came off. In between each plate were about twenty washers and a wiper. William had to reassemble the lot, and it took him several days. It never really worked properly again.

The lesson here was to "know the competency of your staff", before ordering them to do any work. The 2nd Engineer was brilliant but he didn't know his staff.

The other problem on the ship was vibrations. Sometimes the vibrations were severe. One time they were ballasting. The cargo had been removed and they were pumping water into the tanks to weigh the ship down and give it stability. This was done using big pumps. As the water gets to the end of the tank there would be cavitation and the valves would eventually vibrate shut. When William as a 20 year old, told the 50 year old mate that, he replied that that was rubbish. But valves do vibrate.

When William was studying for his ticket, they were told about the importance of vibration. There was a passenger ship where the passengers were complaining about being sea sick. The vibration expert was sent for, and he set up all his equipment, and couldn't sort out the problem. He eventually sailed with the ship, and spent a sixteen-hour day with his equipment. When he lay down on his mattress, he felt sick straight away. The problem had been that the vibrations in the mattress springs coincided with the natural frequency of the ship, which the increased the amplitude of the vibration, making everyone sick. They threw out all the mattresses and the problem was solved.

- **Cochrane Boiler and Weir Steam Feed Pump**

The *M.V. Longstone* had a *Cochrane* Boiler. The boiler in the photo is all rivetted, whilst the one on the *Longstone* was part rivetted.

When the boiler was built in 1954, they preferred rivets.

The boiler cylinder was rolled as a flat plate and the back seam was rivetted.

The boiler had to be inspected every watch to check that it wasn't leaking.

The *Longstone* also had a *Weir* steam feed pump which was like something out of *The African Queen*, emitting steam from the valve chests, from everywhere. The ancient Yemeni firemen would hit or lever it to get it going. It looked very romantic. However, William learnt how to overhaul it and it went like a sewing machine after that, but it didn't look as romantic.

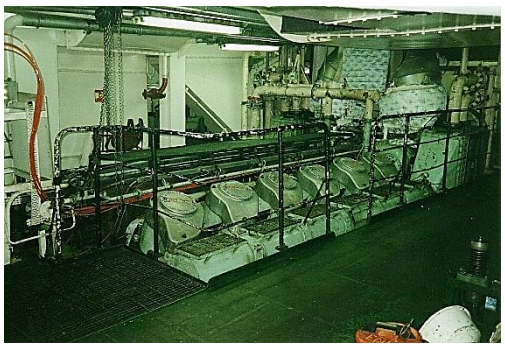
- **M.V. Dunstansburgh Castle**

Photo Copyright Craig Andrews

Williams next ship was the *Dunstanburgh Castle* which was a large ore carrier, which operated between Dunkirk and Brazil. This ship was vastly different to the other ships William had sailed on.

Some of William's photos of the engine room, controls and pumps of another of his ships: *The Pride Of Suffolk*:

Control Room



Pride of Suffolk ~ Main Engine Rocker Covers

Pride of Suffolk ~ Pumps and Motors

The following video shows a modern cargo ship engine room (the *Dunstanburgh Castle* wasn't like this!):

https://www.youtube.com/watch?v=C3tVkWPz3mE

Press on this link to show the video. Press back arrow at top left hand of the screen to return to the newsletter.

The video shows the generators, and identifies all the auxiliary machinery. Typical engine oil purifiers are shown in the second photo at the bottom of the previous page. The working conditions are immaculate.

Centrifugal purifiers are used for the lubricating oil in the main engines. They can be changed over to purify the lubricating oil for the generators, but generally the generator oil is not purified, but replaced when required. There are also purifiers for diesel oil and purifiers for heavy fuel oil.

Q: Have they gone back to clarifiers as well?

William: Yes, it's a bit subtle. Purifiers remove water and solids, whilst clarifiers remove solids and water. The disk arrangement is slightly different between the two. Basically, the idea is like a tank. When oil and water are poured in, the oil will float on top of the water. If the tank is turned on its side and spun around, the oil and water separate out by centripetal force, if everything is working.

- **Bad Weather In Narvik.**

Going back to the *Bamburgh Castle* and its run up to Narvik and Murmansk, William was a cadet when the Hull trawler *FV Gaul* ** was lost. The weather was very bad. On the run up, he was sent up to the galley by the 2nd Engineer to make toast. He went to the cupboard to get something, and he fell backwards as the ship rolled. The cupboard door came open, ripped off its hinges and flew over his head. He made three slices of toast, and when he returned, the 2nd Engineer said "what kept you?".

The weather was so bad the company got a pilot boat out, which was unusual. They came back passing Altafjord, through all the islands, and the scenery was spectacular.

** Details of *FV Gaul* loss are at this site: https://en.wikipedia.org/wiki/FV_Gaul

Press on link to go to the article. Press back arrow at top left hand of the screen to return to the newsletter.

- **Fridges and Freezers.**

Years later William was on a ship where it was the duty of the junior engineers to log everything on the fridges and freezers, including the temperatures, which were in degrees Fahrenheit. No one had spotted that the freezers weren't working.

William asked the first junior "What temperature does water freeze at?". He said "Zero". "Do you know Fahrenheit?". "No".

William asked the second junior "What temperature does water freeze at?". He said "Don't know but it's pretty cold".

William asked the third junior "What temperature does water freeze at?". He said "Am I in trouble for something?".

Fortunately they changed to Centigrade later, which made it easier for people to know when the fridges and the freezers weren't working.

- **Bomb Scare.**

When William finished on the *Bamburgh Castle,* the ship ended up inside the locks at Immingham. Souters were in the process of going bankrupt, and the ship was sold off to the Greeks. William and a few others were on board before the ship went to the Greeks. He was just about to go down on watch duty, when a policeman turned up to say they had received a report that there was a bomb on a ship in the dock. William asked what they should do, and the policeman said that he had finished his shift and it was up to them!

At the time, new piles were being installed, and there was blasting in progress. William was down in the engine room which was below the waterline. Sound travels 4½ times faster in water than in air. William suspected that it was the deck cadet who had been sacked who had been responsible for reporting a bomb, but nothing could be proved. The deck cadet later joined the police force.

- **M.V. British Wasa**

When William came out of his time, he joined the *British Wasa,* which was a bulk carrier that travelled everywhere. He believes this ship was built as reparation for war damage. The large 'goal posts' identify it as a bulk carrier with derrick facilities rather than cranes.

Sometimes, when not properly rigged, they would lower the derrick and bend it, necessitating a sleeved repair.

The *Wasa* had a Chinese crew. This was the first time William had sailed with a Chinese crew, previous crews were British with Yemeni firemen. There were signs all around the accommodation area in Chinese.

People had put translations on the signs such as "You should spend all your time studying to assist the company" etc.etc.

All the axes, which were used for breaking through doors in an emergency, had been removed from all the crew accommodations. You could see why, because one of the crew doors had axe marks in it where there had been an altercation.

The engines on the ship were early version BMWs which had two cam shafts, rather than the singles on the later versions. In those days they hadn't yet worked out the gain-motion clutch. There was a loss-motion clutch, but as the engine was direct-drive reversible, there was also a need for a gain-motion clutch.

A drive was invented with planetary wheels which came out to move the clutch forward, so as the direction was changed, the valve timings were correct. For example, the timing for the exhaust valves maybe correct going backwards, but it also had to be correct for the injector valves going forward.

The engines had multi-spring exhaust valves.

- **Engine Fires**

William has worked with *SD Sulzer* engines which do not have exhaust valves in the cylinder head. Instead they have a 'reed valve' arrangement. Because it is a 2-stroke engine, there are 'scavenging' ports with flap valves which open and close. There is a problem in that they cannot be cleaned thoroughly, because of the small sizes of the various areas. The result was that there were 'scavenge fires' which were fortunately, not too bad. There was CO_2 for extinguishing fires, but the problem was that CO_2 could cool the machinery down too much, so that metal cases and bits and pieces would crack. Halon was better, but that has been banned. Water is even better.

Q: Wouldn't it better to let the fire burn itself out?

William: When I was on *The Pride Of Hull* ferry, there were 'economisers' which circulated thermal oil. If the economisers fail (which they did) there could be real problems. They could run dry or with oil circulating. There was always the danger of a 'hydrogen fire', where the temperatures get so high that the fire feeds itself, with the water splitting into hydrogen, which feeds the fire and oxygen which supports combustion. I have never experienced a 'hydrogen fire' myself, but I've met someone who has and they managed to get the fire out, but I don't know how.

- **M.V. Sheaf Royal**

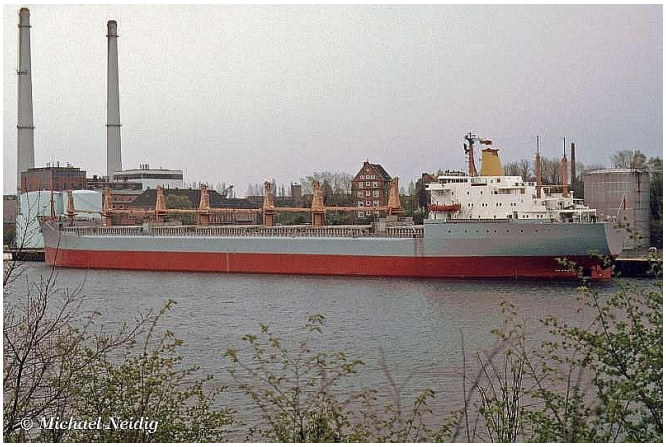


Photo Copyright Michael Neidig

The *Sheaf Royal* is another ship William has worked on. The ship he was on before, the *Sheaf Tyne* had a 'duct keel' (see page 22) which is almost filled with a ballast main tank and a bilge main tank. In dry dock when they wanted to service the valves, they had to cut through the bottom of the hold and the tops of the tanks to get to the valves. William and another engineer spent three hours working the length of the ship, opening and closing the valves by hand.

The *Sheaf Royal* was a lovely ship built in Sweden. For the first time William worked on a ship with a lift. This lift went down to the engine control room. Rumour had it that when it was being built, the shipping company didn't want the lift installed because "our engineers can walk". However, it stayed as the builders said it would cost more to take it out.

The *Sheaf Royal* was a general cargo ship which transported bits and pieces like steel coils and points for the Hong Kong underground, out to the Far East.

When the *Sheaf Royal* was passing down the Red Sea, a tug had hit a mine from one of the various wars in the area, and completely disappeared. The shipping company sent out a telegram to the ship saying "Take All Necessary Precautions".

The charterer had messed up too. The ship's cranes had a *Safe Working Load* of 30 tonnes, but the steel coils varied in weight from 30 tonnes to 32 tonnes.

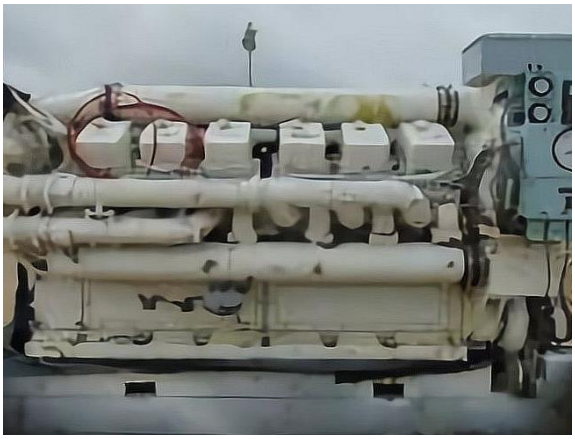
After working on this ship, William returned home and got married.

- **M.V. Sheaf Shield.**

The next ship William served on was the *Sheaf Field.* This was a ship that had been built in the U.K. William reckoned that U.K. had built some very fine ships in the past, but this was not one of them.

The *Sheaf Shield* was a general cargo vessel and when he joined, it was loaded with gold mining equipment and 11,000 bottles of whisky from Glasgow, bound for Venezuela. The ship called in at Dublin and then broke down with *Paxman* generator problems. One of the generators 'wiped a bottom end' only 20 hours after a major overhaul. The other one got so hot the exhaust was transparent! William had never seen that before (there was no lagging). The third generator 'failed to excite.

Photo Copyright John Bage



Paxman Diesel

William has spoken to a number of *Paxman* engineers who said that they were fine until they had been uprated from 1200 rpm to 1500 rpm.

The 2nd Engineer was a brilliant engineer. He was down in the engine room for 72 hours. He found out what was wrong with one of the generators. They were belt driven, and what had happened was that the brush cage had shifted slightly. Nothing could be seen as everything was covered in muck. However, he did get it going. Although he was a brilliant engineer, he couldn't run a team. The ship got into Falmouth and William was able to go home for Christmas.

The ship then set sail again, and broke down again. They had a "riding gang" and extra engineers on board at the time. They got towed into the port of El Ferrol in Spain. This was an "interesting" situation as the cargo was worth a lot more than the value of the ship. They were towed into the port by a big SMIT ocean going tug. According to the *Lloyds Open Form,* when a ship is "rescued" the rescuers can claim "salvage rights" over the cargo. This rule goes back to old Royal Navy days.

When the ship broke down for the second time, all they had was the emergency generator. William was the 4th Engineer, his friend was the junior engineer and the 3rd Engineer was watching. Everything seemed to be going wrong at the same time, and they forgot to check the lube oil of the emergency generator and that failed as well. To get water into the galley they had the use a hand pump, and that broke as well!

The ship used heavy fuel oil which was heated by coils which were steam heated from the boiler. William was 4th Engineer and one of his jobs was to look after the fuel and pump it about, from the double bottom tanks up to a settling tank, from where it was purified and put in the service tank for use. The problem was that the pipes went through the diesel tanks, and the pipes were leaking. It wouldn't have been so bad if the 'pour point' of the heavy fuel oil wasn't 75°F. It was winter in Biscay and the fuel couldn't be pumped.

- **Paxman Engines.**

Paxman engines have already been mentioned, and William said that these engines were usually V12s and were used in *British Rail* locomotives. He said you have to doubt any engine where the manual says the engine needs to be turned upside down to remove the crankshaft.

When William was working "Foreign Flag" for the Iranians as a 2nd Engineer, it was the last day in Dubai, and they were having a quiet drink (during which they were arrested and fined which wasn't William's fault), and when he got back to the ship, the Filipino 3rd Engineer said the *Paxman* was 'break dancing'. They were sailing next day and the ship had a *Paxman* diesel generator and a turbo generator. William started the *Paxman* and it was bouncing all over the place. As seen in the above photo, the *Paxmans* have groups of three cylinder heads. The clearance around the cylinder head nuts was so tight, because when the cylinder head nuts were put on, they had tightened the nuts with chisels. In doing so, they had broken and sheared the studs. That was why the *Paxman* was 'break dancing' at 3 o'clock in the morning.

- **M.V. Solvent Challenger**

Photo Copyright Brian Fisher

This was William's last ship as 3rd Engineer. It was a little chemical tanker. He spent three months during autumn on a trip, and was very sea sick.

The old hands were saying "this is nothing", but William handed his notice in. The company wouldn't accept his resignation and promoted him.

- **M.V. Petrogas 1 .**

Photo Copyright John Shaw

The next ship William sailed on was the Petrogas-1, an old gas tanker running mostly in the Mediterranean and up the Persian Gulf. It had a large MAN diesel engine. Shortly after William arrived, they had to “stop the cargo” for an interesting reason. The ship carried propane and butane. The butane was put in with the propane. Butane has a lower calorific value than propane, and certain countries allowed more in than others. The propane/butane cargo is quite cold.

There is a discharge pipe and a ‘Baker’ return pipe, and the discharge pipe was covered in ice. The ship had some catering supplies delivered by a Spaniard in the middle of summer, and he thought he would lick the ice off the pipe. William doesn’t know what they put in the deck log for “stopping cargo”, but they had to “stop the cargo” and let it defrost.

There was a “riding gang” on and they were working in the bilge keel. They were changing bilge valves. On top of that was 40,000 cubic metres of propane and butane. For that reason they were having to chisel off the nuts on the valves with bronze chisels. It took them ages.

The ship sailed to the Gulf and discharged some propane in Ethiopia. William didn’t think Ethiopia uses much propane, they only wanted 40 cubic metres. However, it took six hours to discharge, and he was ready to start the engines and get off back up the Red Sea. He went up on the deck and there was the Chief Officer looking like he was ready to have a nervous breakdown. They were discharging fuel up hill to some tanks. There was no ‘Baker’ return line (this is Ethiopia), and every valve was leaking. They were splitting the manifold and propane was running down the side of the ship like water and covering the sea. People were walking along the quay smoking, and at that point William decided that if he had to meet his maker he was safer down in the engine room.

It was an old ship. One time William was having a drink with the captain off the coast of Spain. The Spanish were shooting from a fort, over the ship, at a towed target. The captain wasn’t very happy as the last shot was nearer the ship than the target. The captain was told that the engine couldn’t be guaranteed. The captain knew everything and he didn’t stop the engine. When they got to Suez, they were unable to stop and were weaving in and out of the traffic with a cargo of propane on board ~ great fun!

- **Main Engine Maintenance And Diesel Overhaul.**

This is what engineering teams spend most of their time doing, overhauling massive components like this piston.

When William first went to sea, overhauls were sometimes at only 5,000 hours, and the engines needed it. In the following years, guidelines were being followed using maintenance manuals. The overhauls would usually be at 12,000 hours. Pistons would be pulled and joints would be renewed.

William observed that during his career, while in the early days the engineering was ‘of its era’ and breaking down a lot, in the latter years the problems were with sensors, such as the speed monitoring sensors and sometimes the readouts.

When he first went to sea and there was a ‘blackout’, everyone was running about sorting out everything that needed doing. On his last ship, “*The Pride Of Hull*”, if there was a ‘blackout’, the computer ran itself to sort out the problem and reset everything in order using ‘step-in ladder’ programmes. People were then sent to double check if the purifiers and generators were back on line correctly. That’s how engineering has changed over the years.

- **M.V. Stolt Lion.**

Photo Copyright Kevin Blair

The *Stolt Lion* was a 'parcel' tanker. They had the disadvantage that they used to go "Bang" occasionally.

The *Stolt Lion* was a more comfortable ride than the *British Wasa*. The *Stolt Lion* had a small GM compared with the *British Wasa* which when fully loaded had a 4 metre GM. The GM is the difference between the centre of Gravity and the Metacentre (see page 3 for explanation). Merchant Navy ships do not have stabilisers, and when there is a large GM, the ship will roll, stay at an angle and then roll back quickly. These ships are "super stable" but their roll rate is fast. The *British Wasa* could roll to 45°.

On a passenger ship, the architecture is designed so that there is a gentle roll, which these days is reduced further by stabilisers.

- Rudder Repair.

When William joined the *Stolt Lion* it was on charter to *Petrogas* and they were running up and down the coast of Brazil. He was 2nd Engineer and the Chief Engineer asked him to come and hear something in the steering compartment. There was a "donk-donk-donk" sound in time with the rotation of the main engine. The Chief Engineer thought there might be a prop blade missing. They went into the floating dock in Niterol, Rio. When the water went down, all four blades were there. They went into the dry dock and leant against the rudder and there was the "donk-donk-donk" sound. The pintle needed a new bush. A bush was supplied but it had a taper. The Brazilians then welded up the bush in steps and then step machined it down in stages. It took three weeks to machine the bush so it could be fitted to the rudder!

- Safety Valve Check

At the tail end of the period in dry dock they had to "float" the safety valves in the steam boilers. William is a diesel engineer, not a steam engineer, but as 2nd Engineer he was expected to carry out this task. The secondary boiler operated at 12 to 16 bar, whilst the primary operated at 45 bar. He also had to complete this task with a Lloyds surveyor present. One valve was 'gagged' whilst the other valve was floated. The pressure then had to be stepped up gradually. When it went off it was as loud as Concorde!

- "Riding Gang"

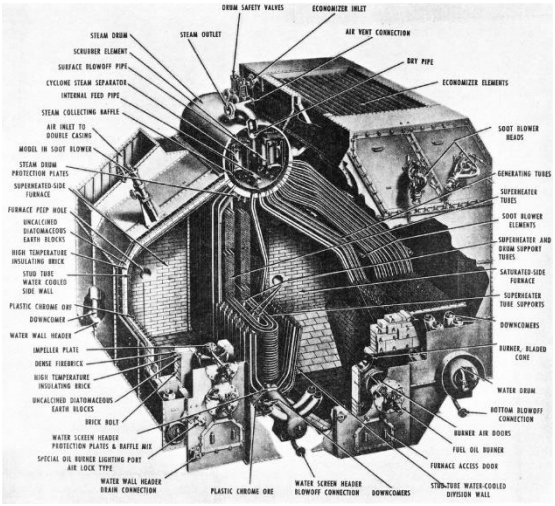
There was a "riding gang" on board. It consisted of four Geordies. They were there to renew the CO_2 lines which were rotten. As a 'parcel' tanker, the *Stolt Lion* had a number of tanks with CO_2 lines going into each. At the time there was no work for them so they went into the engine room to ask William what they could do. William suggested that they help with the crank case doors, which needed their joints renewed, and broken studs replaced. These doors were about 10 ft x 6 ft. William split the squad into two with his team of three and the four Geordies. William took the worst door, and did that and another, whilst the other two did another two doors. After that, they went and helped the Geordies who had been given the easiest doors. That night in the bar, the senior Geordie came and said he couldn't believe it, he felt so embarrassed. He said that they thought themselves 'tough and hard' and really hard working, and William had done two harder jobs than they had. William told them that he and his team were used to it, that they were working in the tropics all the time, they knew where the gear was, and they knew what they were doing. He told them not to feel bad about it and it's "horses for courses".

- Compressor Failure

In the dry dock, they were walking past one of the compressors when the surveyor said the oil gauge had stopped working and it needed to be replaced. William forgot about it and the compressor subsequently 'blew up'. The gauge hadn't stopped working, but what had happened was the motor needed a rewind. It was three phase and 440 volts, and it had been connected up the wrong way. As a compressor it ran fine, except for the oil pump!

The 3rd Engineer was a time served fitter who was to rebuild the compressor. William had some shell bearings, but the bed plate had been damaged. For the task, William needed a mandrel made to the exact size, so they could bed in the bed plate which had been built up with weld. It came covered in a cloth and warm. When William checked its diameter he found it was 1½ thou over, and he was a bit disappointed. However, when it cooled down it was spot on! It had been done by an expert, a time served turner.

- **A Marine Boiler**



This is a typical marine water tube cooled marine boiler.

The *Nigel Gresley* William is building has fire tubes. William hasn't come across fire tubes since the early days on the *Bamburgh Castle* which were a 'real pain' to clean.

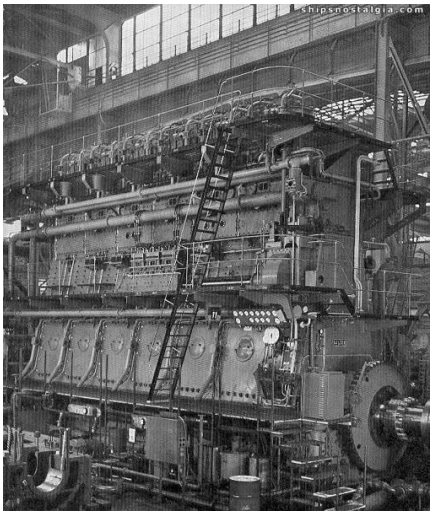
To give an idea of the size of marine diesel engines here is one in a workshop:

- **The Gotaverken Diesel Engine.**

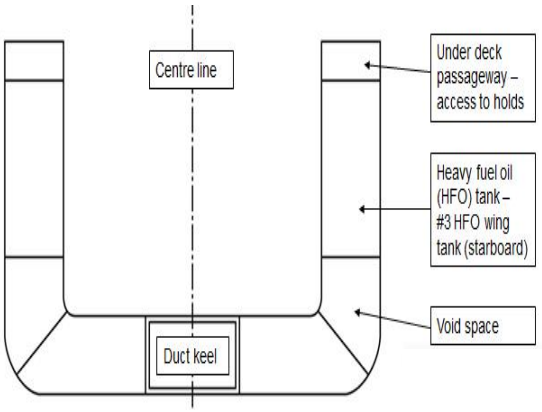
The Gotaverken engine is quite similar to the BMW engine.

It is 2-stroke and the photo gives a good idea of its size.

The crankcase can be seen at the bottom, the fuel pumps and scavenger doors are in the middle, and the cylinder and valves are on the top.



- **Duct Keel**



Vessel Transverse Section

Large Duct Keel

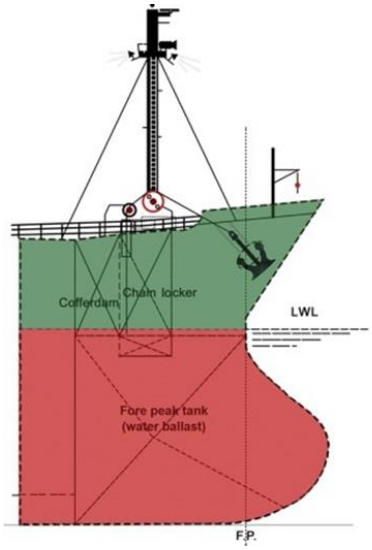
The Duct Keel was described on page 18 with reference to the *Sheaf Tyne.*

- **Bilge Keels**

A bilge keel is a ventral strake used to reduce a ship's tendency to roll. Bilge keels are employed in pairs (one for each side of the ship). Bilge keels increase hydrodynamic resistance to rolling, making the ship roll less.

William said that they found cracks in a bilge keel during an inspection and the options were to weld repair it or remove it all together. They decided on the latter action. They then set sail and were rolling in the Atlantic off the coast of Africa, when another ship sailed past on an even keel.

- **The Ship's Fore Peak.**



Forward Water Ballast Tank Inspection

The bulbous bow just below the waterline, modifies the way the water flows around the hull, and reduces drag thus increasing speed, range, fuel efficiency, and stability.

Large ships with bulbous bows generally have twelve to fifteen per cent better fuel efficiency than similar vessels without them.

A bulbous bow also increases the buoyancy of the forward part and hence reduces the pitching of the ship to a small degree.

Ref: Wikipedia

Bulbous Bow ~ *Pride Of Flanders*

- **William's Last Ship ~ *The Pride Of Hull.***

Photo Copyright www.fincantieri.com

Bridge Control

Photos Copyright Nathan Clark

Engine Room

Tail Shaft

PEEMS would like to thank William for preparing and giving us an excellent talk and thank him for allowing us to use his photographs.

(Please note: The photos reproduced in this article have been taken from the internet, and after a search, the copyright holders have been identified whereas some of the copyright holders could not be found. The photos have been reproduced here under 'fair use' until otherwise informed. In the case where identified copyright holders or others want the photos removed from this article, please contact PEEMS at the e-mail address at the end of this newsletter)

More Speed News From Paul Windross At Elvington

Elvington Monday 14th March 2022 On *Top Speed Test Day*.

It was a sunny day with a tail wind. Not bad for March.

The fastest machine was Jack Frost's *Hayabusa* motorcycle which hit 269mph.

An interesting streamliner machine with a Chinese diesel engine, around 440cc, did over 70mph.

A Lamborghini had some high speed runs as well. *Paul*

Photographs reproduced with the kind permission of Paul Windross

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