Federation of Model Engineering Societies

"One warship to another"

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About twenty years ago I was paying one of my several visits to the Historic Naval Dockyard in Portsmouth, (what a wonderful place to immerse yourself for several days in marine engineering history), and while exploring the beautifully preserved HMS Warrior I had already in mind building a model ship's engine from 'stock' material, i.e. using no castings. My train of thought wandered a bit but continued … 'which man-o-war' was the first to be powered by steam?'

Back at home, research on the internet came up with the name 'Gorgon', a steam frigate, and further reading revealed that the Science Museum housed a model of her engine. I just had to visit! So, a boys' day out was arranged with several pals who had never visited the museum.

I quickly found the model and learned among a mass of other facts in the nearby description that she was launched at Pembroke in 1837. The model was to a scale of 1:24, or half inch to the foot. The cylinders were 64" dia. And 5' 6" stroke. There were very many more details in its construction that I needed to take note of if I were to try to build one.

Back home I rummaged through my brass left-overs and stock bar-ends (many from the much-lamented Leeside Tools in Yapton, remember them?) I might need to buy a few more bits, such as brass hex to make acorn nuts, and certainly dozens of 8 & 10 BA screws but I had nearly all to make a start.

It was apparent that the museum model's scale of 1:24 was too large for the materials I had at hand, so I would need to take a few liberties here and there, but I generally worked at around three eighths to the foot. The liberties I took were to make the finished job *'my interpretation of a ship's engine of the Gorgon type'*

Dimensioned sketches (by no stretch of the imagination could they be called drawings) began to appear on scraps of paper and it was time to cut metal!

Starting with the business end; the power bits, I had decided that the prototype's valve gear couldn't be copied … "*you can't scale nature*!", so I adopted Stephenson's, a type I was familiar with and could design to fit myself. The cylinders, to be clad later with wood, were straightforward boring and turning jobs, mounted as a pair on a sub-base which was in turn carried on a steel foundation plate.

Eccentric straps were roughed out in the mill and parted-off, to be finished by hand filing. I tackled the eight tapered brass columns supporting the steel entablature by making each in three parts, screwed together.

The piston rods are guided by a lever parallel-motion of peculiar design, which became known as 'The Gorgon' type. From two double levers of these motions the pumps are driven.

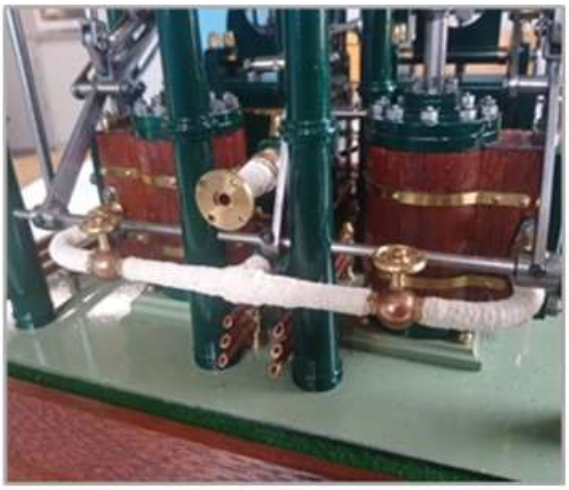
After a few weeks of varied and fascinating work it was time for testing the engines, without the pumps, by connecting an air-line. Oh Joy!! It worked, albeit rather lumpily to begin with. It was to be a much different story later though, as you will read if you have put up with me this far!

Onto the rectangular condensers – no, they are not packed with water tubes as they should be! – they are hollow dummies fabricated with 20-gauge brass plate. (just thick enough to hold a few threads for their many bolts and fittings).

The pumps - of the six, two evacuate air from the condensers, and four are for water. Of these, one circulates cooling sea water within the condensers, two are for returning fresh water to the boilers, and one is for general use – bilge pump, firefighting etc.

Each set of three is driven through a common crosshead to the parallel motion together with vertical guide bars, and carried on a sub-base in similar fashion to the cylinders.

Nearly there, and it was crunch time – back on with the airline with the pumps connected, and gradually increasing pressure. Much hissing from seals and glands, but no movement, not even with a flick of the flywheel. Zilch, nothing!



Disaster, obviously all was too stiff!

But worse was to come! Bear with me once again ... Perhaps the power of steam would get it shifting? No, I always intended for it to be a stand-alone model without boilers so, onto wood butchery with the aim of making a brass-bound case to house an electric motor below the foundation plate. The fascinating motion when moving could then be appreciated.

First stop – Wenban Smith the timber fellas, and a browse through their racks of routed sections and mouldings. I soon spotted just what I needed, mahogany architrave $2^{3}/_{4}$ ins on the long flat. When stood on their short sides, four mitred pieces would give a generous volume for motor/gearbox.

Next of course, glazing. A visit to Brooklands Glass, and following their advice an order placed for panels of 3 mm good quality glass. For the joints I had decided on six mm brass angle (the thin, folded type with no internal corner radius, from B&Q).

Now for a job I was not looking forward to … cutting mitres for the base with only hand tools. After a very unproductive hour or so with a back-saw and mitre box …'orrible results! I gave up! Back to Wenban's and was directed to a workshop manned by two long serving cabinet makers. From my sketch of dimensions and their skill on the precision bench-saw, the job was done in minutes, and at surprisingly low cost.

Now for a method of holding the glass and frame parts strongly together... I discounted aquarium glues which are silicone types, and settled on a UV-light curing anaerobic adhesive from the Loctite range. Magic! Slow curing in dimmer light, but swift when exposed to sunlight. Two glass sides at a time were held together with a variety of plastic sash cramps, angle plates and big rubber bands on a board in my north-facing workshop. Application of the glue to one glass edge gave several minutes adjustment time in that light. Then quickly into bright sunlight. (for longer than was probably needed just to be on the safe side). Brass angles to finish the case – loads more mitres, but much easier in metal!

Throughout the build I had pondered ways to power the model and had added an eighth-dia. vertical drive shaft from the base to the right-hand end of the crankshaft, coupling them with a pair of one-to-one bevel gears. I wanted a low-profile drive with no visible pulleys or chains. In the event it is almost invisible.

For the hidden prime mover, several attempts with combinations of 12-volt motors and gearboxes were knocked up from the 'cuminhandies' bin. All failed through lack of power. Help was to hand though from a fellow club member who kindly offered me a mains voltage motor with integral reducing gear. It was accepted very gratefully!

But yet again, more very bitter disappointment … although all the motion parts were slowly moving correctly, the motor was clearly overloaded and would burn itself out in no time. But it was the little bevel gears driving the crankshaft that failed … first the sound of clicks, accelerating to a buzz as the teeth ground each other into oblivion. All models are a bit stiff initially, but generally 'wear-in'. Why did I have so much friction preventing movement? I thought I had made everything to pretty good standards.

It suddenly occurred to me … "pistons!!" The cylinders and air-pumps added up to a heck of a swept-volume! They had to come out! So, onto a major strip down and reassembly taking many hours. It proved to be well-worth the effort … with new bevel gears fitted, a flick of the power switch and away she went as smoothly as you like.

At last, I had the working model which had been planned as a quick one-off job between major projects taking just a few months. All thanks to a stroll of the decks on board HMS Warrior.

As a footnote; I still have a length of mahogany architrave about 42” long, so if you have, or plan to have a small stationary engine and would like to have the makings of a plinth or base, you only need to ask!