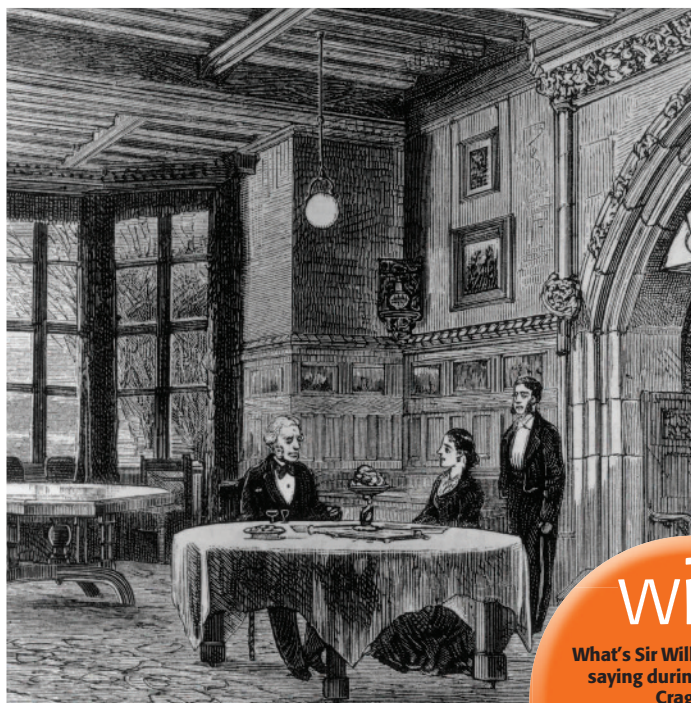


Justin Pollard uncovers the less known side to Sir William Armstrong, the engineer responsible for the invention of the Armstrong gun

the eccentric engineer



win!

What's Sir William Armstrong saying during this meal at Cragside?
The best caption suggestion sent to jherbert@theiet.org by 8 February wins a Kit Micro-tech portable toolkit worth over £165, courtesy of Facom.

OPINIONS ABOUT arms manufacturers tend to fall into one of two camps. Those wielding their products tend to be all in favour of them, while those who find the products pointing at them are less enthusiastic. One thing that both sides would agree on, however, is that armament manufacturers are remarkably innovative and they have made the odd breakthrough that has been of great benefit to humanity – even if accidentally.

This brings me to Sir William Armstrong. Armstrong is probably best known today as founder of one of Britain's most successful armaments companies and the engineer responsible for the invention of the Armstrong gun. Indeed his creation of the first large, rifled artillery pieces – to replace cast-iron cannon – would ensure his fortune, greatly bolster the prospects of the British Empire and result in him becoming the first engineer ever to be ennobled. A grateful government even took out patents on his invention in his name and then prevented their publication so as to ensure foreign powers wouldn't benefit.

Armstrong, though, had not set out to be an armament manufacturer. What really interested him was water, and it had done ever since, on a fishing trip in his youth, he had watched an overshoot waterwheel and marvelled at its inefficiency.

"I was lounging idly about, watching an old water-mill, when it occurred to me what a small part of the power of the water was used in driving the wheel, and then I thought how great would be the force of even a small quantity of water if its energy were only concentrated in one column."

Inspired to create better devices, he invented a water-powered rotary engine and, undeterred when no one took an interest in this, went on to found a business making hydraulic cranes. This was what Armstrong thought his career would be all about – renewable energy.

It would be fair to say that the 19th century was not an era where renewable energy sources were viewed as important – unless you were Armstrong. He was one of the first industrial-

ists to realise that our dependency on coal was using up a finite resource. In his Presidential address to the British Association for the Advancement of Science in 1863 he predicted that Britain would cease to be a coal producing power within 200 years. Coal was "used wastefully and extravagantly in all its applications".

Armstrong was interested in power that would last forever. He suggested that solar energy would one day replace the steam engine and calculated that solar energy falling on an acre of the tropics could usefully produce 4,000 horsepower for nine hours a day – although he didn't have a method for extracting this energy.

What he could harness, however, was water power, and his monument to this would be his own house at Cragside in the Debdon valley. It was a site that he had visited many years before and, taking his first holiday for many

years there he found the air healthful and, more importantly, the waters of the Debdon burn ripe for tapping.

Armstrong dammed the Debdon burn high in the hills, creating a head of water (later greatly added to) that he put to use powering labour-saving devices in his house. There was a hydraulic spit turner, a servants lift and, remarkably, a dishwasher. Leading on from his early interest in electrostatics, Armstrong also harnessed water power to generate electricity making his the first house to benefit from hydro-electric power.

It was this that really made the house a marvel, with its electric dinner gong, fire alarm internal telephone system and electric arc lighting. For Christmas 1880 the whole of the lighting system was then upgraded with the world's first full installation of his friend Joseph Swan's incandescent light-bulb system. One visitor to the house summed up the general view when he said that

Cragside was "the palace of a modern magician."

Armstrong died childless in 1900 and for much of the 20th century his house and his ideas fell into disuse – although his guns did not. With the gifting of Cragside to the National Trust 1977 the house has at least been brought back to its former glory. ■

■ Winner of the caption competition in issue 20 of 2009 is Mark Warren: 'Where am I going to find a CFL to replace this filament?'



This issue's prize is provided by leading tool supplier Facom. 'Kit Micro-tech' is a handy set for any engineer working on IT or office equipment. The hard-wearing case contains five screwdrivers, a torch, a mirror, two pairs of pliers, two blades and a blade handle, a wrench and two pairs of tweezers. For more information on Facom's extensive tool ranges visit www.facom-tools.co.uk

One canny engineer ensured his legacy was lit up like a lighthouse through the ages, writes **Justin Pollard**

the eccentric engineer



win!

What are these divers saying as they retrieve a sunken statue of Ptolemy from Alexandria bay?

Sender of the best caption wins an IET goodie bag. Entries to jherbert@theiet.org by 28 May.

ENGINEERS don't always get the fame they deserve. Take poor old Maurice Koechlin. His were the real brains behind the armature that holds up the Statue of Liberty, but the credits always go to the sculptor Frederic Bartholdi, or perhaps the engineer he chose to help him, Gustave Eiffel. Eiffel of course would later repeat the trick with a certain tower that still bears his name, despite the structural design being, once again, by the diminutive Koechlin.

So the question is posed: how can those who actually build great monuments secure the recognition they deserve? How can they take their rightful place alongside those of the sponsors and politicians whose names tend to smother such constructions? Isambard Kingdom Brunel was lucky to die famous enough for the words 'IK Brunel – Engineer, 1859' to be added in huge steel letters on each end of the Royal Albert Bridge over the Tamar. But only after his death. Most, however, become obscure after shuffling off this mortal coil.

Except one. There is one great historical lesson for engineers everywhere on how to achieve your own slice of immortality, but you have to go back a long way to find it and it does involve a bit of cheating. Ptolemy II was an Egyptian pharaoh with a

problem. His lovely – and relatively new – capital of Alexandria was on an almost totally flat coastline, making the harbour hard to locate from vessels out to sea. Not only that, those ships unwise enough to stray too close to the shore would find themselves in dangerous shoal waters, studded with reefs and sand banks where all but the most skilful might founder. Even with the harbour in sight, the most dangerous reef lay hidden across the entrance itself. Worse still, those unable to take the correct bearing might find themselves wrecked on the shores of the island called Pharos where the notorious inhabitants of the 'Port of Pirates' would easily pick them off.

What Ptolemy really needed then was a lighthouse. The man chosen for the job was Sostratus the Cnidian, whose previous work had included a 'hanging garden' in his home town of Cnidus in Caria and a clubhouse in Delphi where his fellow Cnidians could meet. For Alexandria, he proposed something altogether grander. The great lighthouse was to be constructed in granite and limestone blocks faced with white marble. Its total height would be at least 120m – about the height of a run-of-the-mill skyscraper. Erected on a solid

base, it had three levels. The first was square and housed all the workers needed to fuel and operate the great light; the second was octagonal, decorated with exquisite statuary and where the people of Alexandria might come to enjoy the breath-taking views; the third was circular, crowned with an enormous reflector made of polished brass. Finally, atop this stood a huge bronze statue of Poseidon, god of the sea.

The light was designed to operate both day and night. During the day it was simple enough to just reflect the rays of the sun out to sea, but at night something more was required. For this, a circular shaft ran up the centre of the building, enclosing a spiral staircase that gave access to the higher floors. Up the middle of this could be winched the piles of resinous acacia and tamarisk wood that provided the fuel for a great bonfire whose light was reflected far out to sea each evening by the great mirror. The location for the lighthouse was obvious on the island whose name would come to stand for lighthouses everywhere – Pharos. Here it would be most conspicuous, not least to the wreckers and pirates who called the island home.

The building project took

12 years to complete and was said to have cost Ptolemy about 800 talents, (a talent being 27kg of gold). It was finally finished in the early years of the third century BC but this brought Sostratus his biggest problem. Obviously, the lighthouse, a wonder of the world, would be dedicated to the god and to Ptolemy, the divine Pharaoh who had ordered its construction. But what about him?

According to Lucian of Samosata, Sostratus knew he couldn't compete with Ptolemy, but he also knew his lighthouse was built to last; indeed the Moorish traveller Yusuf Ibn al-Shaikh saw it still functioning in 1165 AD, some 1450 years later. So he carved his own inscription on the building: "Sostratus, son of Dexiphanes the Cnidian, dedicated this to the Saviour Gods, on behalf of all those who sail the seas."

But he then plastered over this and in the plaster wrote a great dedication to Ptolemy, and Ptolemy alone, making the Pharaoh jolly happy. Sostratus was thankfully a patient man as he would have to wait for his fame, but he knew it would come. As the centuries passed, the plaster crumbled, consigning Ptolemy's name to the dust and leaving in its place the name of the monument's true builder, Sostratus the Cnidian – one engineer who was not going to be forgotten. ■

■ Justin Pollard has been shortlisted for the 2010 PPA UK Columnist of the Year award for his Eccentric Engineer column.

■ Winner of the issue 5 caption competition is Tom Blaney with: 'Henry Ford demonstrates the keyless entry system on his latest model: "Simple technology that the common man can understand"'

