



Instrumental Background

## A New Use for Trainee Priests

Charles Mollan

If you have assets you should surely use them...

Such presumably was the thinking of the Reverend Nicholas Callan, a nineteenth-century professor of natural philosophy at the Pontifical University, St Patrick's College, Maynooth, in Ireland.

Nicholas Callan was the inventor in 1836 of the induction coil (figure 1). This was the essential forerunner of today's step-up/step-down transformers, without which we would not have limitless electricity at our fingertips. He also invented new kinds of batteries. And he produced almighty (enormous) voltages using his experimental coils. What better way to test the intensity of his electricity than to pass it through a trainee priest or two. And he did.

All pioneers in electrical research need sensitive means with which to check currents and voltages. In the mid-nineteenth century trainee priests, who are called seminarians, were encouraged to bow to the authority of their superiors without objection. Callan added the need to the opportunity, and decided to use seminarians as human voltmeters.

Two of his 'volunteer' voltmeters later became Presidents of the University, one progressing further to become Archbishop

of Dublin. William Walsh was rendered unconscious by Callan. Charles Russell wasn't knocked out but he had to "spend time on the infirmary after doses of Callan's high-tension electricity." Their highly successful careers might imply that non-lethal electrocution has great benefit in training clergymen—but nobody has followed up this line of research.

A young student at Maynooth wrote home to his family in 1855 telling them: "We have a priest here from County Louth, Dr. Callan, the Professor of Science, and many are afraid he will blow up the College...but he is a very holy priest." He was also something of a showman.

With the help of the local blacksmith he built an enormous electromagnet. He challenged a team of his experimental seminarians to pull the magnet apart. The pieces, locked together electromagnetically, wouldn't move. "Then the professor plays a little trick. He cuts the current as the team makes a mighty heave: the magnet is no longer active and the members all fall on a heap on the floor, much to the amusement and applause of the onlookers." History doesn't record the feelings (or language) of the stu-

**Fig 1 Left** A giant induction coil built by Nicholas Callan (1799-1864) and preserved at Maynooth in Ireland. It is believed to have nearly 50 kilometres of insulated wire in its secondary coils, and could produce sparks of nearly 40 cm, equivalent to a voltage of 600 000 volts

dent at the bottom of the pile. To further entertain his audience, the Reverend Nicholas carried out the impressive experiment of electrocuting a turkey—an experiment apparently no longer recommended in today's undergraduate laboratories, even at the end of the first term.

Perhaps it was his vow of poverty, or the lack of a suitable market for his device among the farmers in rural Ireland, but Callan did not cash in on the induction coil. He even seems to have missed out on the evident possibility of using his coil as a disciplinary instrument in church-run schools. The entrepreneurial distinction, and the subsequent wealth, went to a contemporary, Heinrich Ruhmkorff (1803-1877), who was born in Hannover but set up an instrument-making business in Paris in 1839. He improved the induction coil in the 1850s, and it became one of the most important electrical instruments (figure 2). Examples are still often called Ruhmkorff coils (much to the disappointment of some Irish citizens). In 1878, just after his death, Heinrich's firm had a turnover of around 200 000 Francs (30 200 euros) and his apparatus was so well known, appearing in all the text books, that he apparently did not need to advertise. Certainly no printed catalogue has survived.

Induction coils, many signed by Ruhmkorff himself, survive in many physics departments. Some are of substantial size and power. And many of us own a Callan coil of our own, if we drive a petrol-powered car. The spark in the internal combustion engine (first demonstrated by Etienne Lenoir in 1860, and taken up by Henry Ford around 1908) is produced by an induction coil.

*Additional information for this article was supplied by Michael Cawley of the Physics Department, Maynooth University, Ireland*

### Further reading

**Charles Mollan & John Upton**

*The Scientific Apparatus of Nicholas Callan and Other Historic Instruments; Maynooth and Dublin (1994)*

**Paolo Brenni** Heinrich Daniel Ruhmkorff (1803-1877) *Bulletin of the Scientific Instrument Society* 41 (June 1994) pages 4 to 8

**Fig 2** A typical 19th-century Ruhmkorff induction coil, from Ganot's *Physics*, Thirteenth Edition (1890) page 921

