A BRIEF HISTORY OF CAVE LIGHTING AT JENOLAN

– David Rowling

Electric cave-lighting, by virtue of its title, requires some form of energy conversion to produce the power required for the light source. At Jenolan this has been achieved over the years by a variety of means, often the result of forward thinking individuals with a goal set in their mind.It is easy to overlook the ingenuity of those earlier pioneers in their fields, overcoming obstacles such as lack of transport, mechanization and funding, plus the rugged mountainous and remote nature of the reserve. The following sets out in chronological order the major energy sources used at Jenolan and the typical control system and lighting source used at that time.

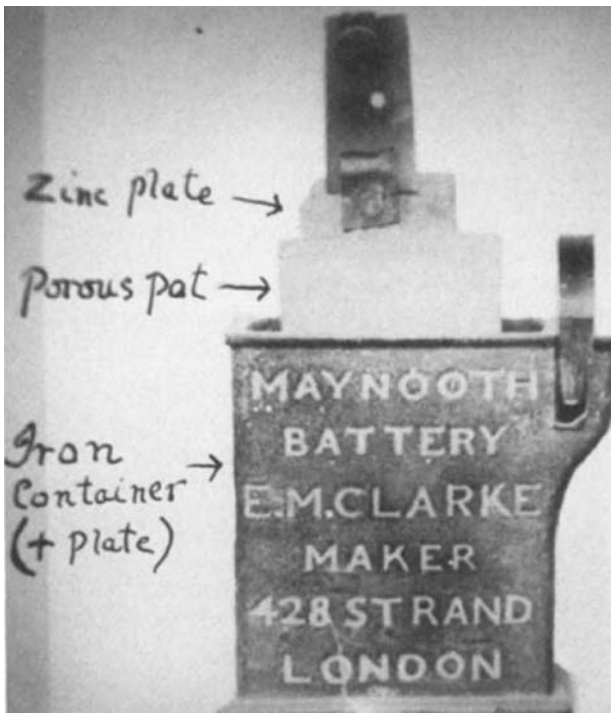


Figure 1. Callun's Iron Zinc Cell.

1880

The Margherita Chamber of the Chifley Cave (then known as the Left Imperial Cave) was illuminated by Lt. Colonel Cracknell on the 22nd July using Swan's 20 candle power carbon filament incandescent light bulbs with the energy supplied from Nicholas J. Callan invented Maynooth zinc acid battery cells invented by Nicholas J. Callan (See Fig 1). These batteries were made with a cast iron outer case, and each set of six cells weighed 96lbs (43.5kg). The whole apparatus including acids and the electric lights weighed in excess of 15 cwts (762 kg) and was carried into the cave. This battery system was primarily used to show how the cave looked with electric lights. This was so successful that for the next seven years the Imperial cave was gradually wired up with permanent lighting in preparation for a non battery form of power. After the chemical energy of the battery had been spent the batteries were left in the cave in a suitable storage location for many years. Cave tours were still conducted by candle light and magnesium flares.

1887

Permanent passage wiring and carbon filament lights were completed in the Imperial Cave. The cabling was achieved by copper conductors routed between porcelain insulators and lead sheathed and cotton insulated copper conductors. The lighting control was by means of brass knife switches. The energy was provided from a wood fired steam driven dynamo (see fig 2) situated in the Grand Arch. Early photographs show the hills around Jenolan denuded of trees, no doubt in part as a consequence of the need for fuel.

To give some relevance to the state of the art nature of this electrical infrastructure for this period, Sydney used gas powered street lights from 1841 to 1904 when the first electric lights were installed at Ultimo.

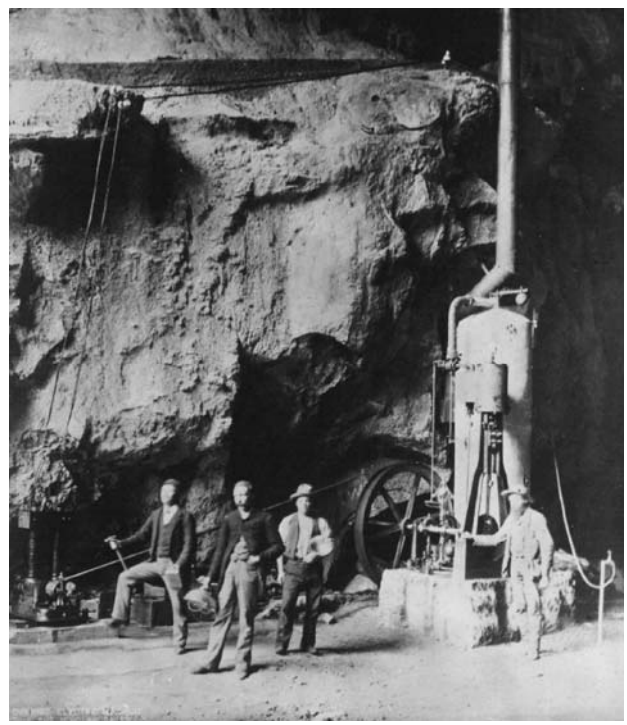


Figure 2. Wood fired steam-driven dynamo in the Grand Arch.

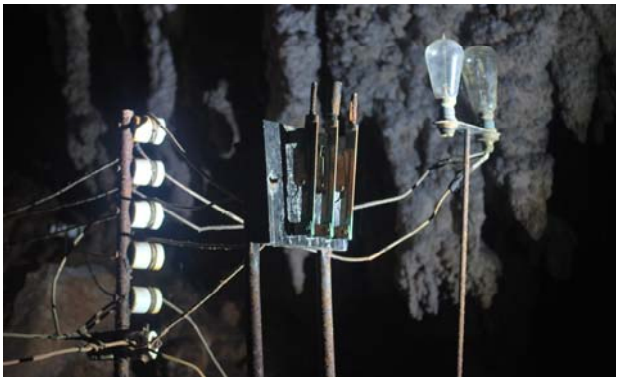
1889

The Lucas Cave received electric lights. Lighting technology had not changed but the energy was now produced from a Leffel wheel hydro electric dynamo constructed downstream. The water was provided via a cast iron penstock downstream from a small weir built to collect water emitted from the Imperial Cave River. This was the first Hydro Electric power in Australia.

This hydro power station made an important jump from the need to log forests for power, to a much more sustainable and cheap resource.

1894

The Leffel wheel dynamo was upgraded in anticipation of the extra power required for the Lucas Cave Electrification.



Old knife switches at Jenolan.

1900

Acetylene lamps were tried but not continued (they were described as "objectionable").

1908

The dam wall was completed (which created the Blue Lake) to supply a more permanent and reliable water source to the Leffel wheel dynamo.

1917

First hydro power station completed at the present site. The water is supplied from 700 metres of steel pipe from the Blue Lake.

1960

Present day Hydro Generator completed – able to produce 55 Kilowatts of electricity.

The major changes to lamp use within new cave lighting projects have been:

1880 incandescent carbon filament.
1915 incandescent tungsten filament.
1990 linear halogen incandescent tungsten filament.
1995 12 Volt Dichroic reflector halogen incandescent.
1998 Fluorescent tubes.
2002 12 Volt Dichroic reflector halogen incandescent with infra red coated bulb. Some coloured LEDs. Compact Fluorescent. 12V Pin Spot.
2006 White LEDs and High Intensity Discharge (HID). (Still using some 12 V Dichroic and pin spots.)
2008 First cave relighting using no incandescent lighting. (LEDs and HID).
2009 First cave relighting using only Weidmuller LEDs.
2010 First use of Weidmuller 36 LED high intensity fitting and Heavy Duty 6 Ring LED

Orient Cave colour touch screen.

The major changes to cave lighting control systems have been:

1887 Brass knife switches.
1915 Bakelite switches.
1982 IP56 switches.
1996 Programmable Logic Controller.
1998 Clipsal C-Bus version 1.
2002 Clipsal C-Bus version 2 with Clipsal Minder scene control.
2006 Clipsal C-Bus version 2 with AMX scene control for light and sound. Cave lighting totally supported by battery backup.
2008 Clipsal C-Bus with Colour touch screen and embedded pascal programming. 24v DC lighting with Weidmuller charged capacitor LED ramping modules.

LED Lighting Distribution Enclose.

CONCLUSION

Jenolan has a proud reputation of continually looking for ways to use technology for the betterment of its visitor experience. In this day and age of sustainability and environmental impact awareness, the continuing search for higher efficiency lighting and better control systems is continually in our sights. The current goal is to reduce our cave lighting electrical load to such an extent that it will become possible to run all the caves off our Hydro electric turbine and thus further reducing our dependency on grid power.