

Telecommunication Cables Across Bass Strait

by Lloyd Butler VK5BR

Introduction

Today, we take our communications for granted. We can talk to another on the other side of the world using a telephone. We can watch a TV picture of an activity going on live on the other side of the world. But it was not until 1859 that the first undersea telegraph cable was laid across Bass Strait and telegraph communication, other than radio, was established between Victoria and Tasmania. The physical landline based communications of that era was morse code via the manual telegraph and later the teletype machine. It was not until 1936 that a Victorian and a Tasmanian could talk together using a telephone and the first cable, with coaxial signal bearer, was laid combined with an electron tube based carrier telephone system.

Between 1859 and 1936 seven undersea communication cables were laid on the sea floor between the Victoria and Tasmania. The passage through Bass Strait seems to be renowned for rugged seas. Its sea floor has regions which chafe the cables resulting in cable failures leading to numerous system replacements. A further two optical fibre cored cables were added to the list in 1995 and 2003.

There is quite a bit to be found on the Internet about the cable laying ships and their undersea cable laying around the world, including an article on the cable link to Tasmania written in 1936 by author A B Haines (ref 2). Also there is a quite detailed article in the September 2013 issue of OTN on tele-communication over Bass Strait, including particular discussion about the radio based links terminal in Stanley. (ref 6).

The First Telegraph Cable laid across Bass Strait

John Hutchison Blackwood, shipowner and pastoralist, born on 28 December 1827 at Dowhill, near Kirkoswald, Ayrshire, Scotland, migrated to Melbourne, arriving on 21 August 1852. In 1853 he entered a shipping partnership with Captain James McMeckan, and formed the company McMeckan, Blackwood & Co, conducting an agency for ships. In 1858 the firm built its first steamer, Omeo, which brought the submarine telegraph cable for the Cape Otway-Tasmania connection on her maiden voyage from England. The Omeo was engaged to lay the first telegraph undersea cable between Victoria and Tasmania and this was completed in 1859. The telegraph cable was laid under Bass Strait from Cape Otway to King Island, by land across King Island and then under sea again to Circular Head in Tasmania, a distance of around 150 miles. The "OTN" article (Ref 6) stated that a ship named "Victoria" was also involved in the 1859 cable laying project. (Ref 7).

The original submarine cable experienced many early problems with repeated cable breaks. The cable suffered from chafing due to the shoals and rocks on the sea bed around King Island, as well as damage from ships anchors. The first fault occurred only three weeks after the cable was brought into use. The circuit completely failed after 18 months and the service was finally abandoned on 24 January 1861.

The cross section of the undersea cable from Cape Otway in 1859 is assumed to be similar to that illustrated for the cable between England and Belgium. As given in Reference 3, this cable was 54 miles long and the four conductors at the centre (for two circuits) were each made up of 7 strands of 20 lbs per mile copper wire, with a resistance of 6.4 ohms per mile and the whole cable weighed 140 lbs per mile. Each of these conductors were coated with gutta-percha and Chatterton compound, and then formed round a core and made cylindrical with tarred hemp. Over this was a layer of ozokerited cotton tape, on which was wound brass tape, as protection against the teredo, a submarine animal. Over this was ozokerited cotton tape, then tanned Russian hemp, over which was wound an armour of 36 galvanised iron wires, each 0.28 inch diameter, coated with gas tar. The whole was covered with two windings of tarred hemp.

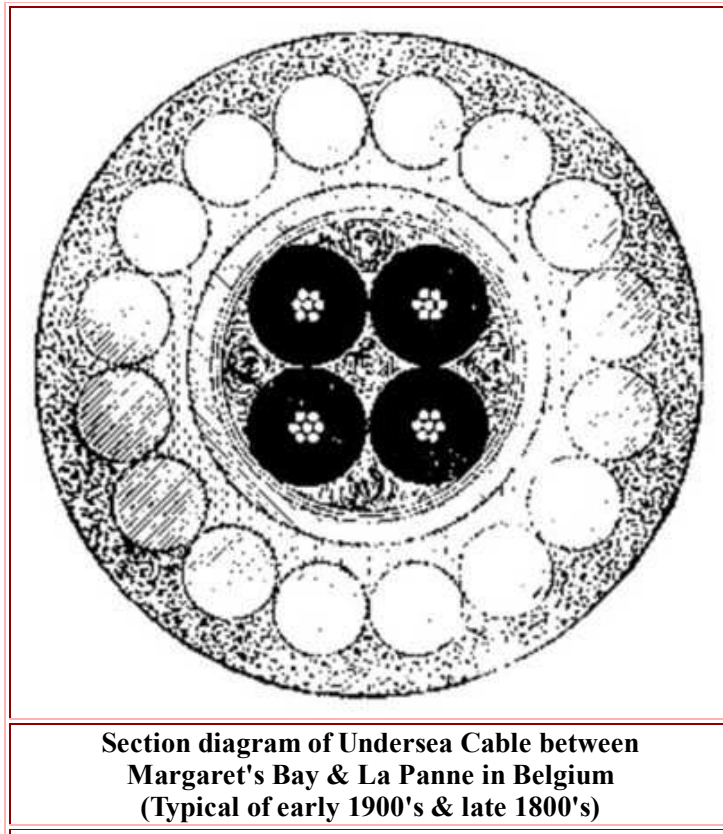
The capacity to earth per conductor was rated at not more than 0.275 microfarads per mile and the insulation resistance not less than 500 Megohms. The total resistance of each conductor at 46'5" F. of this cable measured as 331.4 ohms, and the capacity to earth 12.617 microfarads.

Gutta-percha refers to the trees which produce sap from which rigid natural latex is made. Like shellac, it has thermo-plastic and high dielectric properties. It served as the insulating material for early undersea telegraph cables, including the first transatlantic telegraph cable. (Since about 1930, polyethylene has supplanted gutta-percha as an electrical insulator). The material gutta-percha was a major constituent of Chatterton's compound used as an insulating sealant for telegraph and other electrical cables. The compound was patented in 1859 by John Chatterton and Willoughby Smith.

Ozokerite or ozocerite, in past years referred to as earthwax, is a naturally occurring odoriferous mineral wax or paraffin found in many localities. A wax-like fossil resin, it has been used for making candles and insulating.

Hemp was one of the first plants to be spun into usable fiber some 10,000 years ago. Hemp is a variety of the Cannabis sativa plant species that is grown specifically for many industrial uses such as rope .

Some references show an undersea telegraph cable linking Stanley with Low Head. This was probably laid when the first Bass Strait cable was laid between Cape Otway and Stanley via King Island in 1859. Following this, in 1969 the first cable from Cape Schanck was laid to Low Head and this would have closed a telegraph loop around Cape Otway, King Island, Stanley, Low Head/Tamar, and Cape Schanck.



The Cable Route Cape Schanck to Tasmania

By 1869, the new undersea cable had been installed by the Teletype Construction and Maintenance Company using the ship "CS Investigator" and laid between Cape Schanck on the Victorian coast and Low Head, near Georgetown, on the north coast of Tasmania, a distance of around 170 miles.

The cable was operated by the Victorian and Tasmanian Submarine Cable Co. After Federation in 1901, the Commonwealth Government took over the responsibility for communications, establishing the Post Master General's Department (PMG) which took over the operation when the company's licence ran out in 1909.

The Investigator is a screw steamer, of 569 tons register, about 200 feet long and 28 ft breadth of beam, with a carrying capacity of 900 tons. Her engines are inverted cylinders, and placed well aft, so that the hold is clear for stowage.

The cable was formed with a copper conductor composed of seven strands of wire, coated with Chatterton's gutta percha compound. The conductor proper was about a quarter of an inch in diameter, and was surrounded by a shell of prepared oakum. This inside core was protected by an outside covering, on which the strain rests, and which was composed of 10 strands of galvanised iron wire. The whole assembly formed a cable varying from four and three-quarter inches in circumference at the shore ends to two and a half inches in the other parts. On the ship deck, it lay in a huge mass, piled up coil upon coil,

According to a newspaper report in April 1869, the cable would be feed out from the deck of the ship under the supervision of an electrician and engineer, who had been appointed by the company to conduct the operations. As soon as the vessel was ready, she would proceed to Cape Schanck to install the Victorian end. Wind and weather permitting, she would then steam slowly towards the Tasmanian shore, leaving behind her the gradually lengthening trail of cable. The point to which she would bend her course was near the mouth of the Tamar, where she would be accompanied on the rest of voyage by the s.s. Pharos, under a Royal Navy navigating-lieutenant..

Operating the telegraph was an important local activity, which required the building of a Government Telegraph Office, a substantial stone and brick operations house with operational staff. It was built half way up the cliff and known as Happy Valley.

A plaque dedicated to the cable laying event was unveiled in 1993 by the Shire President with the following inscription:

The plaque commemorates the laying of the Submarine Telegraph Cable across Bass Strait and was unveiled by Shire President Cr Alfred Bell on 1st May 1993.



**Flinders Cable Station Monument at Cape Schanck
with Flinders Jetty in background**

On the 19th April 1969, the cable laying vessels "Investigator " and "Pharos" began the journey across the strait to Low Head Tasmania. On 1st May the Governor of Tasmania Mr Charles Du Cane and the Governor of Victoria Sir Henry Manners-Sutton exchanged Morse Code Greetings.

The cable was connected to a hut on the beach near the Flinders jetty which received the morse code. A messenger would then proceed by a path up the cliff via "Happy Valley" (The staff house half way up the cliff where messages were decoded) and then on foot to the mainland terminal of the Eastern Extension Company at the top of the cliff where the bluestone foundations are still visible.

Messages were telegraphed to Melbourne and overland to Darwin where they again went by undersea cable to the rest of the world.

A jetty and cargo shed was built in 1870 to provide improved transport connections to Flinders. Road Access was also upgraded, especially to Cape Schanck, where the cable that came ashore at Flinders was linked to the cable connected to the Government Telegraph Office in Melbourne.

Advanced technology enabled a repeater station to be built on the beach in 1892, allowing messages to be received at the new staff house on the Hastings Road. The new staff house was used for the training of telegraphists. The old staff house, Happy Valley, was then used by the Port Authority to house the lighthouse caretaker, Mr Cotton.

Between 1869 and 1901, a number of additional undersea telegraph cables were laid from Cape Schanck using the new cable laying ship Faraday 1 and following the route of the first cable to Low Head, laid in 1869. In 1885 the first cable was duplicated by another. By 1889, the PMG were in charge of telegraph operations and they had added a further cable to the cable route. (This cable may have been used to replace the one originally installed in 1869). In 1909 two cables, the one originally installed in 1869 (or its replacement) and the one installed in 1885, were recovered and redeployed during World War II in the north of Australia. (Information on this paragraph turned out to be a bit confusing as some of the information obtained from different reports was bit contradictory).

The remaining operational telegraph cables from Cape Schanck, stayed in use until 1936 when they were replaced by another undersea cable, carrying both telephone and telegraph channels, and using the earlier route via King Island but terminal in Victoria at Apollo Bay.

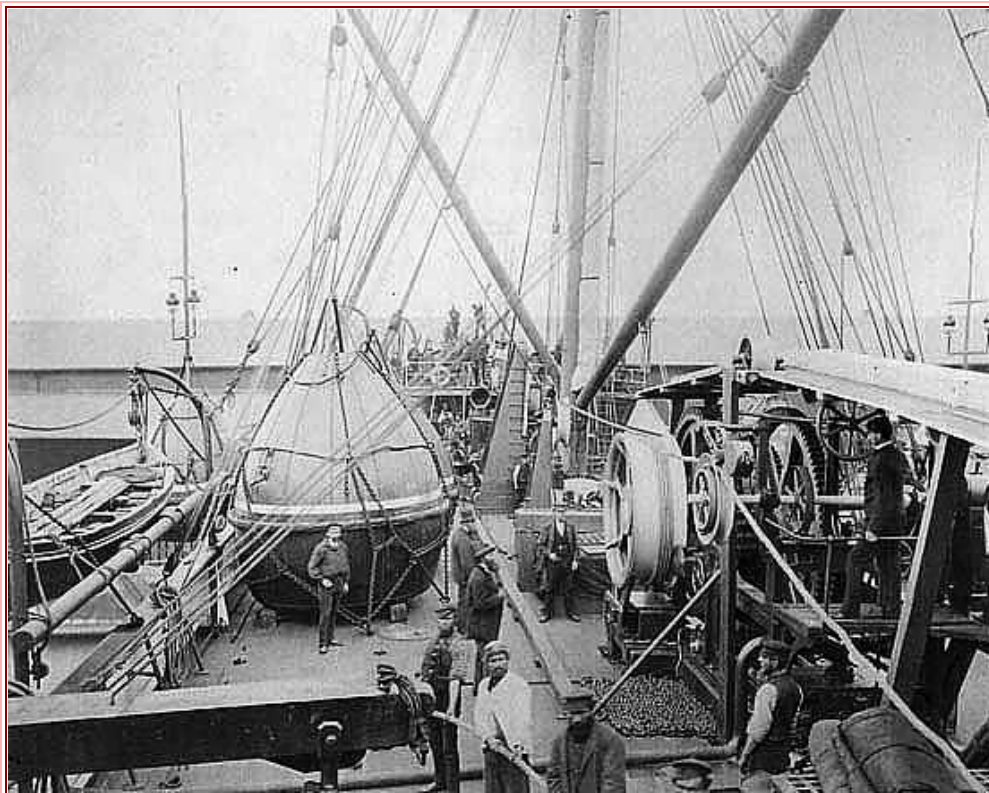
The Cable Laying Ships "Faraday"

William Siemens, for Siemens Brothers, had found chartered vessels totally unsuitable for cable laying and came up with some new ideas for the cable laying ship. Two of these ideas were twin screws and a bow rudder. Another was the swivelling bow and stern sheaves which prevented the cable from riding up the side of the sheave when ship and cable were not in a straight line. The two funnels were placed at the sides to give space at the centre of the deck and the bow and stern were of similar design, giving space for the cable operation fore and aft.

As a result of this, the steamship "Faraday" (later referenced to as Faraday 1) was purpose-built for undersea cable laying with these ideas, at the shipyard of C. Mitchell & Company at Newcastle-Upon-Tyne in the United Kingdom. It was launched in 1874 and had a length of 360.38 ft, a breadth 52.25 ft, a depth 39.6 ft, and had a Gross weight of 5052 tons. The deck was laid out to allow easy access for the cable to run out either way, fore or aft and as designed, the vessel had quite a unique appearance.

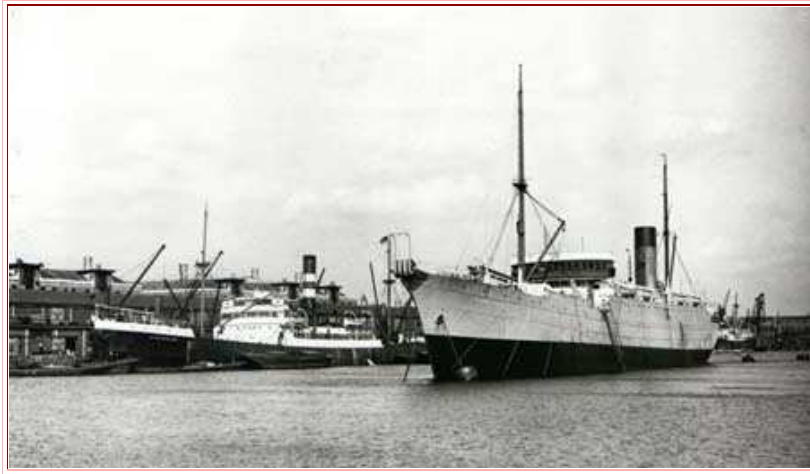


The Cable Laying Ship "Faraday 1"



Cable Laying, on Deck of Faraday 1

There were two cable laying ships called "Faraday". Faraday 1 was used for undersea cable laid around the world including the Cape Schanck route. Faraday 1 operated in laying undersea cable until 1924 when she was sold and used as a coal hulk. The second Faraday 2 was built in 1923 at Palmers Shipbuilding and Iron Co Ltd at Helburn-on-Tyne. This was used to lay the newer Telegraphh/Telephone cable to Tasmania in 1936.



Cable Layer Faraday 2

A new underwater cable in 1936

In the early 1930's, the idea of a new modern cable link was considered. Around 1935, passenger/freight vessel "Teroona", fitted with sonar depth sounding equipment, was used in selecting the most suitable route for the new cable. In 1936 the new undersea communications cable was laid via King Island to Tasmania. In Victoria, it terminated at Apollo Bay instead of Cape Otway and in Tasmania, it terminated at Perkins Bay (Stanley). Now into the era of carrier telephone technology, the cable link carried telephone channels, as well as telegraph, and three carrier telephone repeaters were now part of the technology.

The Repeater Stations were erected at Apollo Bay, Naracoopa (King Island) & Perkin's Bay (Stanley). The system provided for 5 simultaneous voice frequency telephone channels, 14 simultaneous telegraph channels (including teletype) and a wide bandwidth broadcast circuit. Telephone circuits at speech frequencies were heterodyned to higher frequency single sideband components which operated in both directions. This was to be the longest cable of its kind and the most modern in the world. The eyes of all communication authorities, as well as the engineering world, were on Australia as the task was commenced.

The early telegraph circuit to Tasmania via Cape Otway in 1859 was connected into Cape Otway from Melbourne via an overhead open wire line, running right along the coast, passing Apollo Bay and Lorne. For the new 1936 circuit, a completely new single pair pole-route was made through the rugged forest country which lies between Birregurra and Forrest, whilst an existing route from Forrest to Apollo Bay was specially treated and cleared of dangerous timber to improve its reliability.

Before laying the undersea cable, the Faraday laid buoys over the selected route between Apollo Bay and King Island. To determine the route, assistance was rendered by the vessel Taroona, which charted the sea-bed of the Strait with the vessel's techometer sounding device, so that sections of the sea bottom, which might cause damage to the cable, were detected and avoided.

A sample section of the undersea cable is illustrated in the memento photo and the form of the cable is further shown in the photos of the cable termination box and the termination within it at Apollo Bay. As a protection against the boring operations of the sea-worm known as the 'teredo', a copper tape is wound continuously round the cable. In the past, the damaging activities of the teredo had been good reason for sheathing wooden sailing ships with copper below water-level. This sea-worm's appetite for insulating material was just as avid as it was for the timber in the hulls of the old ships..

The amount of steel armouring for protection of the cable (from such as abrasive rocks and fouling from ships' anchors) varied depending on the depth to which the cable was laid. The shore ends were armoured with sixteen steel wires, each about one-third of an inch in diameter, together with a further sixteen wires, each approximately one-fifth of an inch in diameter. Where the cable was laid in water of a depth of from five to twenty-five fathoms, the armouring consisted of eleven wires, each a little over a quarter of an inch in diameter. For the main portion of the cable, mainly in depths greater than twenty-five fathoms, the cables were protected with sixteen one-fifth-inch diameter wires.

As can be seen in the cable section memento photo and in the cable termination photos at Apollo Bay, the signal bearer was of coaxial form. This was the second coaxial submarine cable with coaxial signal bearer to be installed in the world. (In some references, there seemed to be a claim that it was actually the first)



Cable Termination Cabinet, Apollo Bay



Cable Termination



**Section of shore end Cable of 1936
Memento of Work done by
Fisheries Research Vessel "Warreen" in 1938**

Cable break in 1938

An interesting addendum to the A B Haines report on the 1936 cable installation (Ref 3), was a breakage of the cable in 1938 near King Island. The Australian Fisheries research vessel Warreen was called in to assist. The Warreen had been fitted by Amalgamated Wireless (AWA) with a

graph recording echometer or depth sounding device, and by arrangement with the fisheries section of the Council for Scientific and Industrial Research, the vessel was despatched to Bass Strait.

The echometer, which was introduced to the Australian mercantile marine by AWA, is usually installed in the chart room. It includes an appliance fitted upon the ship's hull to transmit a sound to the bottom of the sea. In operation, the echo is received by a radio device, and the time taken for the sound to return is automatically converted to indicate the depth of water in fathoms. It is invaluable for a trawling fleet, as it enables the skipper to locate the most suitable depths, and, in addition, gives warning of any projections from the sea bed that might damage the trawling gear.

For three days at the location of the break, the captain and wireless operator of the Warren made graphs of the depths. These revealed that the sea bottom was covered with ledges of ragged-edged rocks which were responsible for the severing of the cable. This information enabled the repaired cable to be relayed on an alternative route to avoid the rocks.

The Radio Links

During the early 1930's, whilst this era of the underwater carrier telephone link was in progress, the PMG staff were also experimenting with Bass Strait VHF radio telephone links, initially between Tanybryn (Near Apollo Bay) and Stanley. Experiments were also carried out between Mt Oberon in Wilsons Promontory via Flinders Island to Tasmania. The Tanybryn to Stanley VHF link was eventually put in service in 1940, providing 12 new telephone channels, standby for the 1936 Apollo Bay to Stanbryn carrier telephone link, including additional channel redundancy. Detail of these experiments and the radio equipment installed are described in great detail by Winston Nickols VK7EM in an article headed by "The Green House", and published in OTN, September 2013 (Ref.6). The Green House was the building in Stanley which housed the carrier telephone terminal and the radio telephone transmitters and receivers. Its equipment operated until mid 1966 when the radio link closed down. Repainted grey, the building became the Nut Rock Cafe, Kiosk and Souvenir shop.

A microwave link was established in 1966 between Mt. Oberon, in Wilson's Promontory, and Launceston with a capacity of 600 voice circuits. The cable originally installed in 1936, via King Island to Stanley, was taken out of service in 1967 as the communications system became more reliant upon the microwave link, satellites and a new optic fibre optic cable that was laid in June 2003 by Telstra. The new optic fibre cable serviced Stanley and the rest of Tasmania to enable access to the modern day telephone and broadband Internet systems. The first undersea optic fibre cable across the Bass Strait was actually laid in 1995 from the Boat Harbour location of Yaringa in Victoria to Stanley. It had a capacity of 622 voice circuits.

No longer required for the undersea carrier telephone link, the building which previously housed the undersea cable termination at Apollo Bay is now a museum.

The Optical Fibre Links

The updated fibre cable of 2003 was routed from Inverlock, Victoria to Stanley. The key technology supplier for this Bass Strait 2 project, was Alcatel, who completed the 242 km of submarine optical fibre cable between Inverloch and Stanley. Once completed, the second cable replaced the link, installed in 1995 as the main back-up technology for the earlier operational circuits. The new cable could carry more than 10 Gbps of data, equivalent to more than 125,000 telephone speech circuits and provide much redundant capacity . ,

To bury the high fibre count cable, the contractor Alcatel used a 5m high and 11m long device. This device was towed behind the vessel and guided by telemetry technology. Alcatel's Submarine Network division's Ill de Batz ship was the operations hub for the marine installation. The purpose-built vessel, which managed the cable laying, had 17000 kW of power, housing a range of core navigation and marine satellite communication systems. It could carry up to 3300 cubic metres of cable, weighing up to 5500 tonnes.

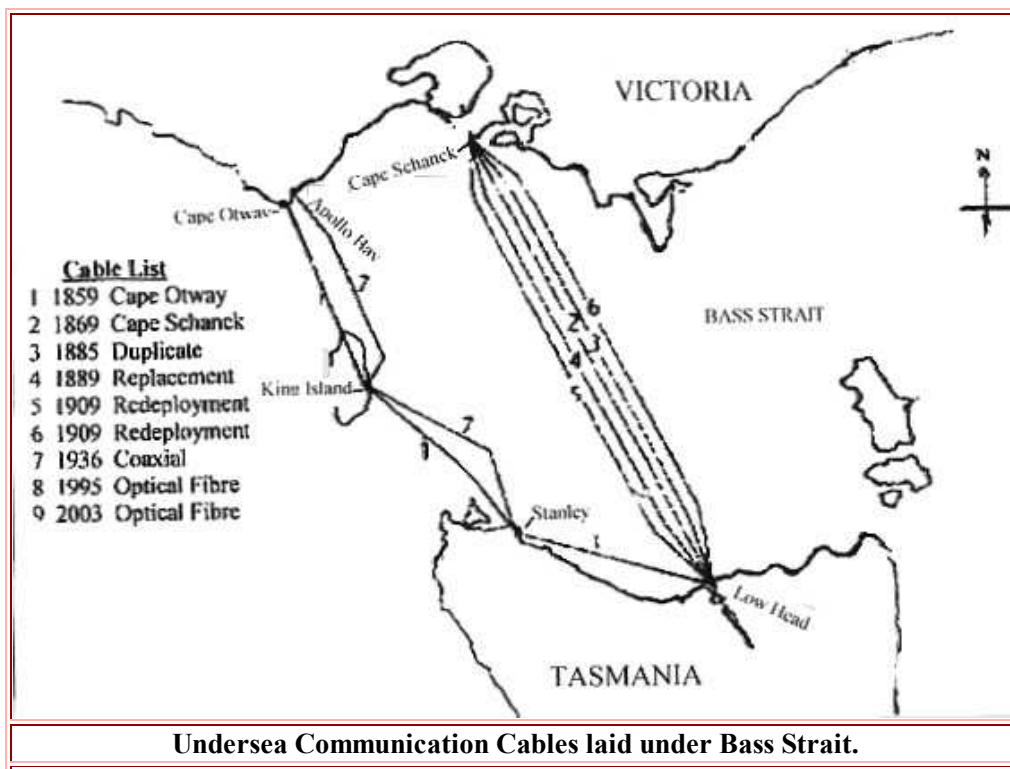
This was the single longest optical fibre transmission project Telstra had under construction. It was aimed at providing the best available telecommunications services to Tasmania by enhancing Telstra's network infrastructure capacity. The dual optical fibre link was installed to cater for the increasing uptake of high bandwidth data, broadband Internet and voice traffic access across Bass Strait and to meet future growth opportunities.

We have now experienced the introduction of the National Broadband Network (NBN). But that is another story.



The building which previously housed the undersea cable termination at Apollo Bay is now a museum.

Summary of Undersea Cables laid



Undersea Communication Cables laid under Bass Strait.

References

- (1) The article "Cape Otway" by Lloyd Butler in "OTN"
- (2) The Practical Telephone Handbook J. Poole 1912
- (3) Info on details of laying cable by Steamer "Faraday" by author A B Haines 1936 <http://atlantic-cable.com/Cables/1936BassStrait/>
- (4) Cable Laying across Bass Strait by "CS Faraday" 1935: <https://trove.nla.gov.au/newspaper/article/86568643>
- (5) Australian Cables by Bill Glover <http://atlantic-cable.com/CableCos/Australia/>

(6)The Green House - Early Telephonic Communication across Bass Strait by Winston Nickols VK7EM "OTN 52, September 2013"

(7) Cable laying dispute concerning cable laying King Island <https://trove.nla.gov.au/newspaper/article/38997016>