World Connections - Charles Todd and the Overland Telegraph

Royal Geographical Society of South Australia

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Overland Telegraph
150th Anniversary
1872-2022

World Connections 1872- Charles Todd and the Overland Telegraph

Introduction

In 1872 the Overland Telegraph connected Australia to the rest of the world through Adelaide, South Australia.

The impact was huge.

In 1852 worldwide postal speeds were notoriously slow. A letter by post from London took many days to reach its destination.

New York in the United States	12 days
Alexandria in Egypt	13 days
Constantinople in Ottoman Turkey	19 days
Bombay in India (west coast of India)	33 days
Calcutta in Bengal (east coast of India)	44 days
Singapore	45 days
Shanghai in China	57 days
Sydney in Australia	73 days

The Overland telegraph meant that instead of waiting eight to ten weeks wait for information form London it became a 24 hour wait.

The construction of the Overland Telegraph

In 1872 the 34 year old Charles Todd, the South Australian Superintendent of Telegraphs was the given responsibility for leading the construction of the Overland Telegraph

The Overland Telegraph Line crossed 3,200km through mountains, flood plains and desert. It was one of the greatest engineering achievements of the 19th century.

Todd devised three teams of construction, Northern, Central and Southern from July 1870 until October 1872, a telegraph line was built in Australia more than three thousand kilometres long, through country that had only been crossed once by John McDouall Stuart in 1862. The country was, for the most part, uninhabited by white people.

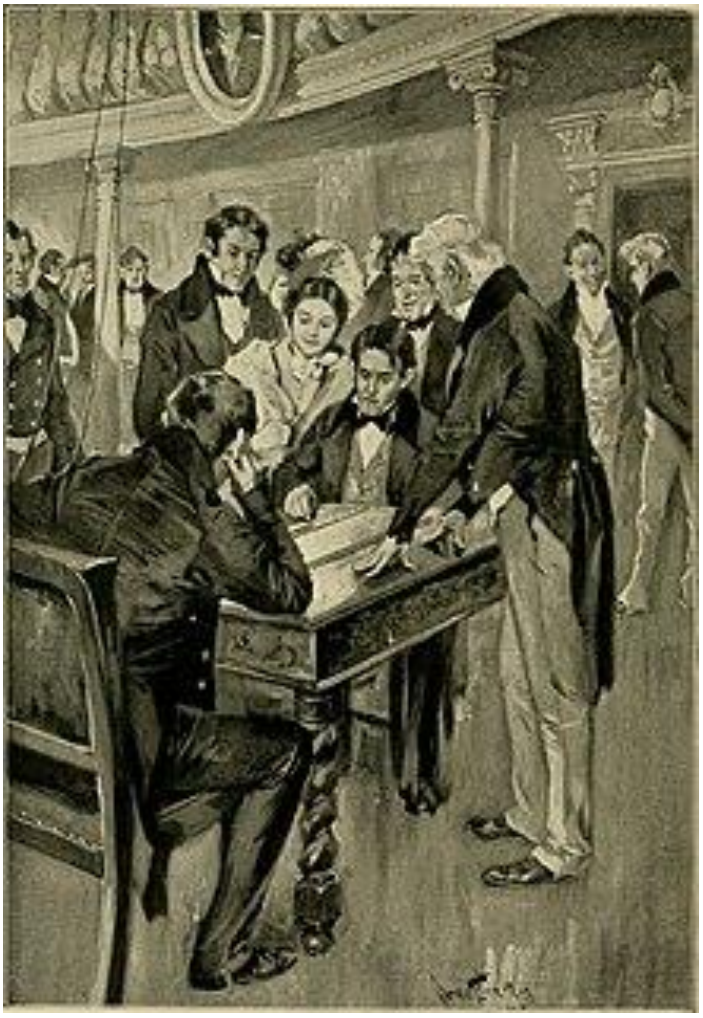
The builders had cut and prepared over 36,000 poles weighing over 5,000 tonnes and carted them an average of twelve kilometres to the route of the line. They had imported a large number of iron poles from England (Oppenheimer telescopic) and carted these an average of 650 kilometres.

Oppenheimer poles are galvanised iron telegraph poles. They consist of three oval sections that collapse into each other telescope style for transportation. Once extended the joints between the sections are clamped with collars. The pole is fixed to a base for support with a u-bolt. They were originally used .in places where there was no suitable timber but when it became clear that wooden poles on the northern part of the line were going to be rapidly destroyed by termites and were vulnerable to fire, it was decided to construct the line with 3,000 metal poles.

They had transported over 2,000 tonnes of material into the Centre of Australia and had driven several thousand sheep and cattle over 2,000 kilometres from Port Augusta. They had cut and cleared tracks ten metres wide through about eight hundred kilometres of thick forest and scrub. They had taken a fleet of ships 145 kilometres up the Roper River. They had carted building materials, batteries, instruments and stores for the repeater stations, often with camels and 'Afghan' cameleers or by bullock dray or horse dray. They had built a twenty-two-room stone station at Port Darwin and other stone stations of seven or eight rooms at The Peake, Charlotte Waters, Alice Springs and Barrow Creek. They had built wooden stations at Tennant Creek, Powell Springs, Daly Waters and the Katherine. All in one year and eleven months No 8 galvanised fencing wire was used, 36,000 insulators manufactured in Adelaide, the services used of a professional explorer, John Ross used, the project hired most of the labour from South Australia and had constructed wet batteries to power the repeater stations and the line.

Morse system

In 1851, a conference in Vienna of countries in the German-Austrian Telegraph Union (which included many central European countries) adopted the Morse telegraph as the system for international communications. The international Morse code adopted was considerably modified from the original American Morse code, and was based on a code used on Hamburg railways (Gerke, 1848). With different codes, additional operators were required to translate and retransmit the message. In 1865, a conference in Paris adopted Gerke's code as the International Morse code and was henceforth the international standard. The US, however, continued to use American Morse code internally for some time, hence international messages required retransmission in both directions.



1850s – The Crimean War was one of the first conflicts to use telegraphs and was one of the first to be documented extensively. In 1854, the government in London created a military Telegraph Detachment for the Army.

1860s -American Civil War - During the American Civil War the telegraph proved its value as a tactical, operational, and strategic communication medium and an important contributor to Union victory.

Major oceanic telegraph lines in 1891 - Transatlantic telegraph cable and submarine communications cables

Soon after the first successful telegraph systems were operational, the possibility of transmitting messages across the sea by way of submarine communications cables was first proposed. One of the primary technical challenges was to sufficiently insulate the submarine cable to prevent the electric current from leaking out into the water. In 1842, a Scottish surgeon William Montgomerie introduced gutta-percha, the adhesive juice of the *Palaquium gutta* tree, to Europe. Michael Faraday and Wheatstone soon discovered the merits of gutta-percha as an insulator, and in 1845, the latter suggested that it should be employed to cover the wire which was proposed to be laid from Dover to Calais. Gutta-percha was used as insulation on a wire laid across the Rhine between Deutz and Cologne. In 1849, C. V. Walker, electrician to the South Eastern Railway, submerged a 2 miles (3.2km) wire coated with gutta-percha off the coast from Folkestone, which was tested successfully.]

John Watkins Brett, an engineer from Bristol, sought and obtained permission from Louis-Philippe in 1847 to establish telegraphic communication between France and England. **The first undersea cable was laid in 1850**, connecting the two countries and was followed by connections to Ireland and the Low Countries.

The **Atlantic Telegraph Company was formed in London in 1856 to undertake to construct a commercial telegraph cable across the Atlantic Ocean**. It was successfully completed on 18 July 1866 by the ship SS *Great Eastern*, captained by Sir James Anderson after many mishaps along the away. John Pender, one of the men on the *Great Eastern*, later founded several telecommunications companies primarily laying

cables between Britain and Southeast Asia. Earlier transatlantic submarine cables installations were attempted in 1857, 1858 and 1865. The 1857 cable only operated intermittently for a few days or weeks before it failed. The study of underwater telegraph cables accelerated interest in mathematical analysis of very long transmission lines.

The telegraph lines from Britain to India were connected in 1870. (Those several companies combined to form the *Eastern Telegraph Company* in 1872.).

In 1862, Todd received samples of a new insulator he had invented from a Berlin pottery along with samples of a new article -- ebonite insulators, made from india-rubber by Silver & Co.

The *HMS Challenger* expedition in 1873–1876 mapped the ocean floor for future underwater (submarine) telegraph cables.

Australia was first linked to the rest of the world in October 1872 by a submarine telegraph cable at Darwin. This brought news reports from the rest of the world. The telegraph across the Pacific was completed in 1902, finally encircling the world.

From the 1850s until well into the 20th century, British submarine cable systems dominated the world system. This was set out as a formal strategic goal, which became known as the All Red Line. In 1896, there were thirty cable laying ships in the world and twenty-four of them were owned by British companies. In 1892, British companies owned and operated two-thirds of the world's cables and by 1923, their share was still 42.7 percent.

Telegraphy and longitude

The telegraph was very important for sending time signals to determine longitude, providing greater accuracy than previously available. Longitude was measured by comparing local time (for example local noon occurs when the sun is at its highest above the horizon) with absolute time (a time that is the same for an observer anywhere on earth). If the local times of two places differ by one hour, the difference in longitude between them is 15° (360°/24h). Before telegraphy, absolute time could be obtained from astronomical events, such as eclipses, occultations or lunar distances, or by transporting an accurate clock (a chronometer) from one location to the other.

Sir Charles Todd (1826-1910),

Charles Todd was born on 7 July 1826 at Islington, London. He was an astronomer, meteorologist and electrical engineer, educated locally he was appointed to the Royal Observatory, Greenwich, as a supernumerary computer in 1841; he showed ability in mathematics and potential as an observer.

As junior assistant to Professor Challis at the Cambridge university observatory in 1848-54 he assisted in the determination of longitude between the Cambridge and Greenwich observatories by telegraphic means. Early in 1854 he returned to Greenwich as superintendent of the galvanic apparatus for the transmission of time signals. This involved close co-operation with the Electric Telegraph Co., and also with C. V. Walker, electrical engineer to the Southeastern Railway, who was one of the pioneer experimenters with submarine cables.

Todd became fascinated with telecommunications. In 1855 the South Australian government requested Sir George Airy, the astronomer royal, to select an observer and superintendent of electric telegraph at a salary of £400; he nominated Todd, who was appointed on 10 February. He reached Port Adelaide in the *Irene* on 4 November.

Todd wanted to initiate plans for the connexion of Melbourne and Sydney by telegraph, followed by a link with England. In March 1856 he completed the first government telegraph between Adelaide and its port of Semaphore. He then told Governor Sir Richard MacDonnell that a line to Melbourne was of prime importance and that it should precede meteorological proposals. He went to Melbourne in July where he met Samuel W. McGowan, the Victorian superintendent, and commenced a lifelong friendship. Both governments accepted their joint recommendation that the line should be laid down under one uniform and successful system (Morse's), that New South Wales be included, and that Australia be ultimately connected by telegraph to India: they had projected the first national communications system, one of the most significant colonial decisions of the century. Todd returned to survey the route of the 300 miles (483 km) section from the border to Adelaide. His success boosted his confidence and reputation and confirmed the governor's high opinion of his character, ability, and vision. In 1858 the government awarded him good service pay of £1820.

Todd's meteorological plan, which he had submitted in 1856, depended on a network of observation stations which were required to report daily to the observatory. The telegraph system was the answer; he trained his own observers, including interested private individuals. Growth was slow initially and it was not until 1860 that the observatory was ready with the necessary instruments and fourteen selected stations. As the telegraph system expanded so did the meteorological stations, with a greater impetus ten years later when post offices came under Todd's control.

In England **proposals for connexion with Australia by telegraph had been mooted in 1854 and the first plans were submitted to the colonies in 1858**. The route was by India

to Singapore and the Dutch islands to the north, by cable around the east coast to Brisbane and by landline to Sydney. The link depended on subsidies from the British and colonial governments and involved much complex negotiation. Todd, courteous and never contentious, examined every proposal and reported simply and lucidly. **John McDouall Stuart's crossing of the continent in 1862 proved the feasibility of the project** but the discussions dragged on until **1863** and then lapsed. In Australia, **the line from Adelaide to Melbourne was doubled**, a **direct line to Sydney** with Todd as the chief negotiator was **completed in 1866** and a line was run to Port Augusta which could be a starting point for extension west or north. In 1863 South Australia had gained control of the Northern Territory and suitable cable landing places there.

1866 saw a resurgence of English proposals, and early in **1870 the British Australian Telegraph Co. planned to land a cable near Palmerston (Darwin)** and connect to Queensland. On 1 January Todd became South Australia's postmaster-general and superintendent of telegraphs and revived an old scheme for a line to Perth and up the west coast but received little support. Then the company sought permission to land the cable, and Henry Bull Strangways, premier of South Australia, decided to build an overland line to Darwin, independent of other colonies, and the company accepted.

Todd was by now Head of the Electric Telegraph, Postmaster General, Government Electrician, and Colonial Timekeeper. Todd now produced a detailed organization, the result of years of practical experience. He had to build a line some 1800 miles (2897 km), handicapped by lack of time and inadequate survey. He had to rely on Stuart's journals and maps for the greater part. But determined and confident, he divided the work into three sections: the southern and northern were let to contractors, each with one of Todd's overseers, the central was to be done by government labour under him. Having overcome initial difficulties of the passage of the MacDonnell Ranges early in 1871, he heard of disaster in the northern part: his overseer William McMinn mishandled the contractors, terminated their contract in May and returned to Adelaide. Work was practically at a standstill for five months. The government sent Robert Patterson north with a relief party and Todd followed in January 1872. As work progressed, he went south inspecting the line, which was completed on 22 August, although cable communication was not made for another two months. 'This epic construction project provided one of the greatest advances in communications between England and Australia and the enthusiastic leadership of Charles Todd … must mark the Overland Telegraph Line as an outstanding example of engineering in Australia'. During the final difficult months, he proved his acumen in dealing with the captious and dissident Patterson. He was made C.M.G. in November. These two years were the peak of Todd's career and he achieved international recognition. One line remained to be built, that to Western Australia. By 1877 he had built his portion from Port Augusta to Eucla, the connexion being made at the end of the year.

In 1864 Todd had suspected the accuracy of the fixing of the 141 meridian boundary between South Australia and New South Wales; on completion of the Sydney line in

1866 he obtained agreement to check it. In 1868 with the co-operation of the observers of New South Wales and Victoria, he worked in the Sydney and Melbourne observatories and established a transit at the border to complete the operation. The solution agreed to by all was that the 141 meridian was two and a third miles (3.7 km) to the east of the original boundary.

The full development of Todd's beloved astronomy depended on the spread of the telegraphic network and the acquisition of modern instruments to provide a complete observatory. By the early 1880s he had organized constant general astronomical work, time services, a standard point for geodetic surveys, and gradual improvement in the accuracy of climatic statistics. He had been made a fellow of the Royal Astronomical Society in 1864. His meteorological system spread to all colonies and New Zealand. He sought systematic interchange of information and pioneered the production of weather maps. When he retired there were 510 rainfall stations in South Australia and the Northern Territory, twenty-two of which were completely equipped for all meteorological observations.

Todd attended an International Telegraphic Conference in Berlin in 1885. In 1889 he was elected a fellow of The Royal Society, London. These two distinctions gave him great personal satisfaction and by 1889 his salary was £1000. In June 1893 he was made K.C.M.G. He was also a fellow of the Royal Meteorological Society and the Society of Electrical Engineers. In 1895 at the request of the Western Australian government, he chose a site and suggested the design and equipment for its new observatory, and his deputy was appointed government astronomer.

Todd held leading positions in numerous learned societies and educational and public institutions in the colony of South Australia.

Charles Todd and the Royal Geographical Society

Charles had a long connection with the Royal Geographical Society and attended many meetings.

The annual meeting of the Royal Geographical Society, South Australian branch, was held at the Arbitration Room, Marlborough Chambers, Wakefield Street, on Friday afternoon, May 27th, 1887. There was a good attendance, and the President (Sir Samuel Davenport) K.C.M.G.) took the chair.

Lord Brassey was present by invitation and occupied a seat on the right of the Chairman.

Among other gentlemen who attended were the acting Premier (Hon. J. C. Bray), Sir T, Elder, Sir Wm. Milne, The Postmaster General (Mr. Chas Todd C.M.G.[1]), and Dato J. Meldrum.

[1] *In June 1883 the Geographical Society of Australasia was founded in Sydney. In the same year three of South Australia's leading citizens met to consider the formation of a South Australian branch. They met in the office of the Postmaster General, Charles Todd. Present were Todd, Sir Samuel Davenport and the Chief Justice, S.J. Way. They decided that "it would not be wise to establish a Geographical Society at that time, and that, if*

On the walls of the room were displayed a collection of native wear.
Mr. Todd, C.M.G., moved that the Hon. S. Tomkinson and Mr. Clement Sabine should be elected auditors. He felt great pleasure in the progress that the society had made. The initiatory meeting, although the proposal to establish the society fell through at the time, was held in his office. He was President of the Royal Society at the time, and he was asked to take the matter up. But at that time they were unable to start the society. He was glad to see that the institution had been started and was pleased to be a witness of its prosperity.

Annual Meeting
Was held at the Society's rooms Grenfell Street **6th July 1888**.
Sir Wm. Milne moved the appointment of the Hon. Dr Campbell, **Mr. C. Todd C.M G.** and Mr H. Newland, as members of the council. Mr. Everard seconded, and the motion was carried.

Todd was one of a band of remarkable South Australians such as A.W. Dobbie, a versatile R G S member, delighted Adelaide with his electrical experiments; he introduced the telephone to South Australia, and Magarey was its first private subscriber. Charles Todd and W.H. Bragg set up a wireless transmitter at the Observatory in 1900.

Much of the history of astronomy, meteorology and telegraphs in South Australia is contained in his reports to parliament between 1856 and 1900.

Prior to leaving England in 1855 Todd had married Alice Gillam Bell (d.1898) in 1855 in Cambridge, England. They had two sons and four daughters, a devoted family that also brought up two sons and a daughter of his eldest brother who died in 1861. The Alice Springs telegraph repeater station in central Australia was named for Mrs Todd in 1871; the adjacent township of Stuart was re-named Alice Springs in 1933. One of the founders in 1859 of the Brougham Place Congregational Church, North Adelaide, and of the Stow Memorial Congregational Church, Adelaide, in 1865, Todd and his family were regular worshippers. He died of gangrene on 29 January 1910 at Semaphore and was buried in the North Road cemetery. He was survived by one son and four daughters; Gwendoline married Professor (Sir) William Bragg of the University of Adelaide. Todd's estate was sworn for probate at £12,876.

necessary, geography could be made one of the subsections of the Royal Society". Their decision was no doubt influenced by the smallness of Adelaide's population, an unfavourable economic climate, and the fact that the Royal Society, of which Todd was President, included in its interests geographical and allied topics. Whether there was room for the two societies was to remain a subject of debate for many years.

The Society and its links to Telegraph Cabling

William Silver, from whom the Society purchased its significant library in 1905, was involved in the development of telegraphic cabling through his manufacturing businesses in London UK.

The India Rubber, Gutta Percha, and Telegraph Works

A major change in the company's business was brought about by the development of telegraphy as means of communication over a distance by Morse and Steinheil in the 1830s. The primary requirement of this system was an insulated conductor connecting the instruments at each end. Hugh Adams Silver patented a method of winding india rubber around a cooper wire and then steam-heating it to fuse the winds into a continuous tube, which Silver & Co. started to advertise their 'Patent Caoutchouc Insulation for Telegraphic Cable' and 'Patent Caoutchouc Telegraphic Insulator' in 1858[2].

in March 1864 announced the proposed formation of a separate company, Silver's Indiarubber Works and Telegraph Cable Company Ltd., that would incorporate Hancock's business. S.W. Silver & Co. would continue to be connected with the new one and it would use the works in Silvertown. By July, the name had become The India Rubber, Gutta Percha and Telegraph Works Company.

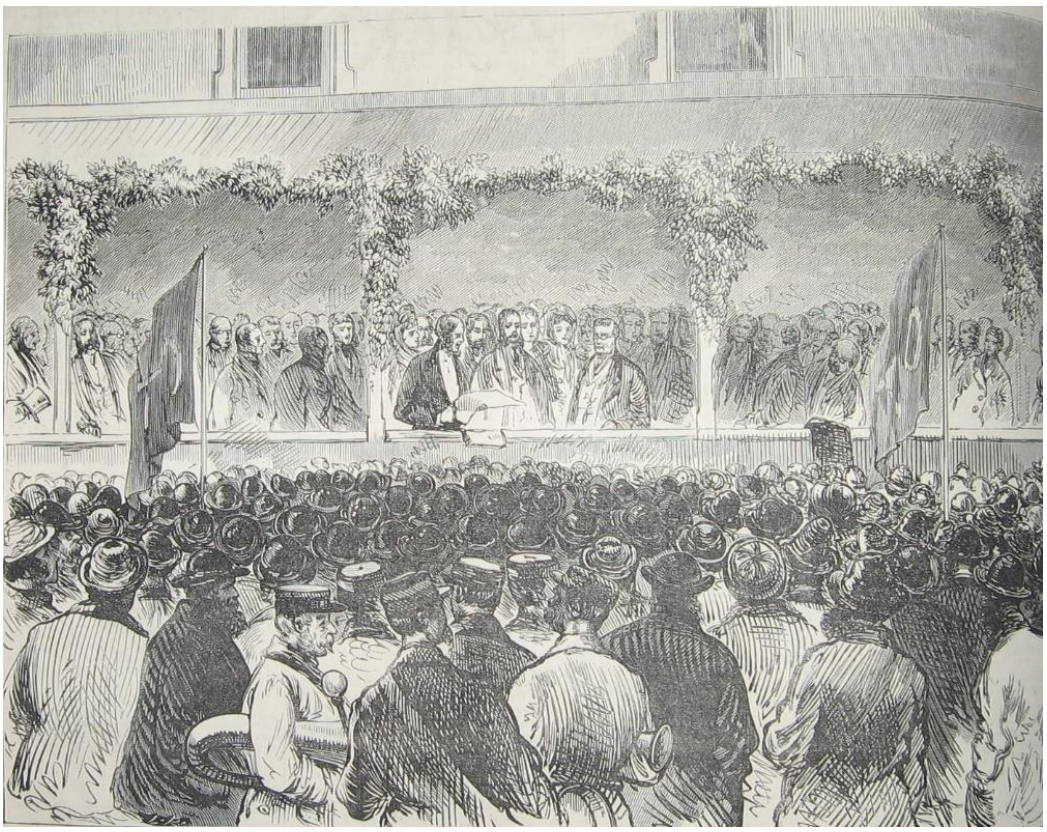
All underwater and underground cables manufactured between 1848 and 1863 were insulated with gutta-percha applied to copper wire using Hancock's patent wire-covering machine. In that time 14,826 miles of submarine cable core had been insulated with gutta percha, for crossing the English Channel, the Irish Sea, the German Bight, the Norwegian fjords, the Mediterranean Sea, the Black Sea, the Nile, the Bosporus, the Straits of Messina, the Gulf of Canso (Nova Scotia), the Baltic Sea, the Danube, the Atlantic Ocean, the Red Sea, the Indus, the Adriatic Sea, and the Indian Ocean.

Later a second submarine cable between the same locations (Indonesia - Bali and Australia), was laid in 1880. When the East-West telegraph cable between Albany and Adelaide was completed in December 1877, Western Australia was first connected telegraphically with the rest of Australia and via the submarine cable at Darwin to the rest of the world.

Due to frequent breaks in the Darwin – Banjoewangie [Bali] cables due to volcanic activity in the Timor Sea there arose an urgent need to lay a third cable from Banjoewangie to Australia, away from the seismic zone. In fact a serious interruption occurred to the operating cable between Broome and Java at 3 .30 am [WA time] on Friday, 11 July 1890. This cable came ashore at Cable Beach, Western Australia. Tests showed that the rupture took place in the Bali Straits and was caused by violent volcanic disturbances. [*Since the science of plate tectonics did not evolve until the mid*

[2] The site www.atlantic-cable.com is a mine of information on telegraphy generally, and submarine cables in particular. Material on the whole scope of the Silver businesses is available in Grace's Guide to British Industrial History at www.gracesguide.co.uk/S._W._Silver_and_Co.

1960's the planners could not have been expected to know that the security to be afforded by the new cable could not be permanent].



Charles Todd demonstrating the telegraphic communications system 1869.

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