Buildings

The lighthouse

Construction

The first step towards construction was the designing of the tower and the light. The Marine Department's specialist lighthouse designer was David Scott, a veteran in the business.[53] He was officially employed as a 'lighthouse artificer' and Cape Brett was his final lighthouse before retirement.[54] The lighting device was designed by Messers Stevenson, Civil Engineers of Edinburgh and the actual construction was contracted out to several different companies (see Figure 7).[55]

Figure 7 - The plaque inscription on the mercury bath.

The lighthouse required components from throughout the world. The shell of the tower travelled 131.8 nautical miles to get to the Cape; of the parts of the light, the apparatus travelled around 9751.2 nautical miles, while the lantern and mechanism each travelled about 9549.9 nautical miles.

The Marine Department went to tender for the best price available for the construction of the tower, the process took about one and a half months during December 1908 and January 1909 (see Figure 14). The company selected was Chas Judd Ltd (1869), an iron and brass foundry in Thames operated by the Judd brothers.[56] The Public Works Department officially accepted the contract for £930 18s 9d (roughly NZ$133,468.61 today) on 8 January 1909 and it was signed by Judd brothers James Charles and William Henry.[57] The tower plans for construction (Figure 8 to Figure 13) were signed by the brothers on the day the bond of £100 was received.[58] The completion date on the contract was 8 May 1909.[59]

The tower – built of several iron plates and thousands of bolts – was constructed and assembled at the Judd foundry yard to make sure that all necessary parts were there for re-assembly at the Cape (see Figure 15). The Cape Brett tower was one of four cast by the company, the others being the Cape Campbell, East Cape and Kahurangi Point towers (see Figure 16).[60]

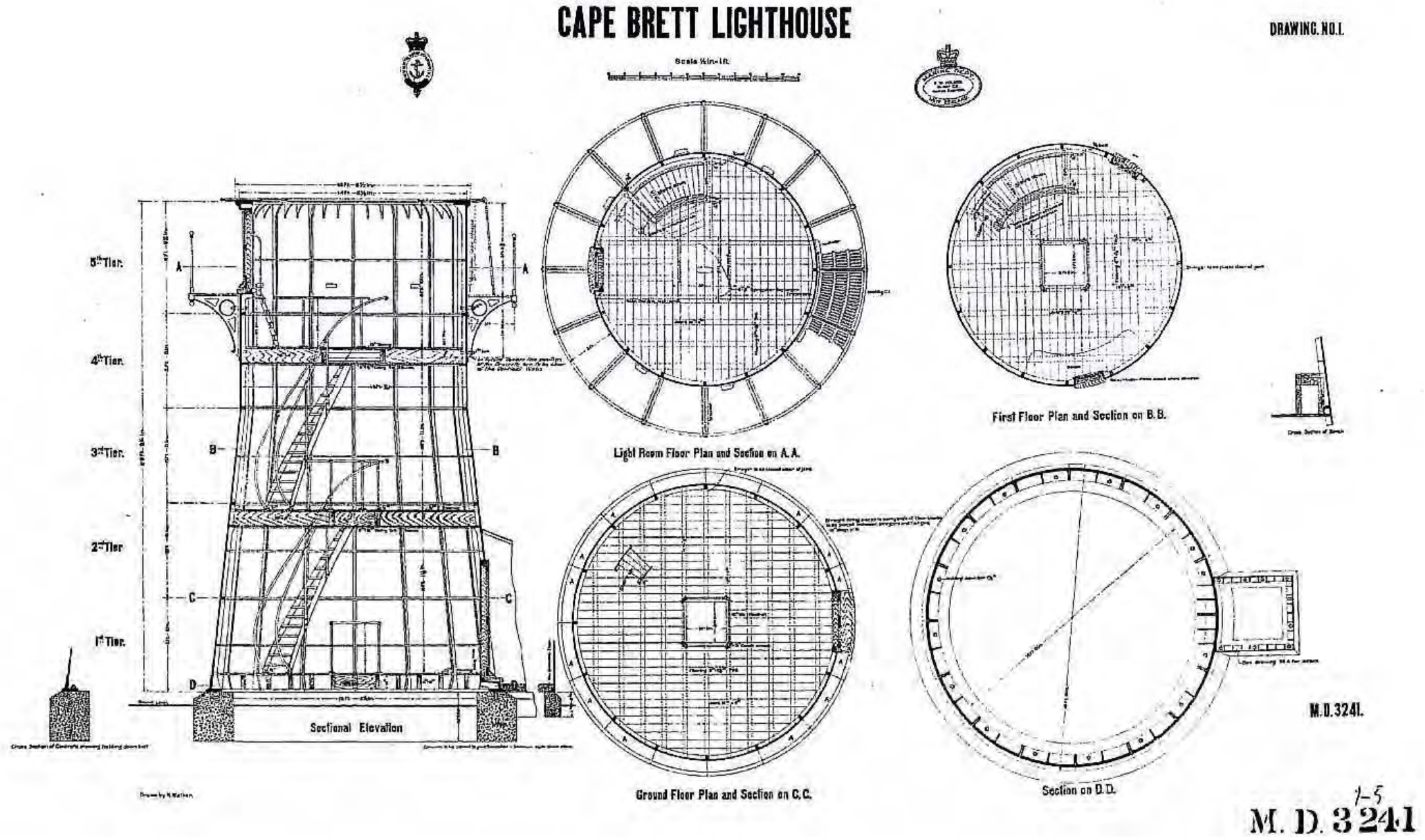


Figure 8 – The architectural plans for the lighthouse –Drawing No 1.

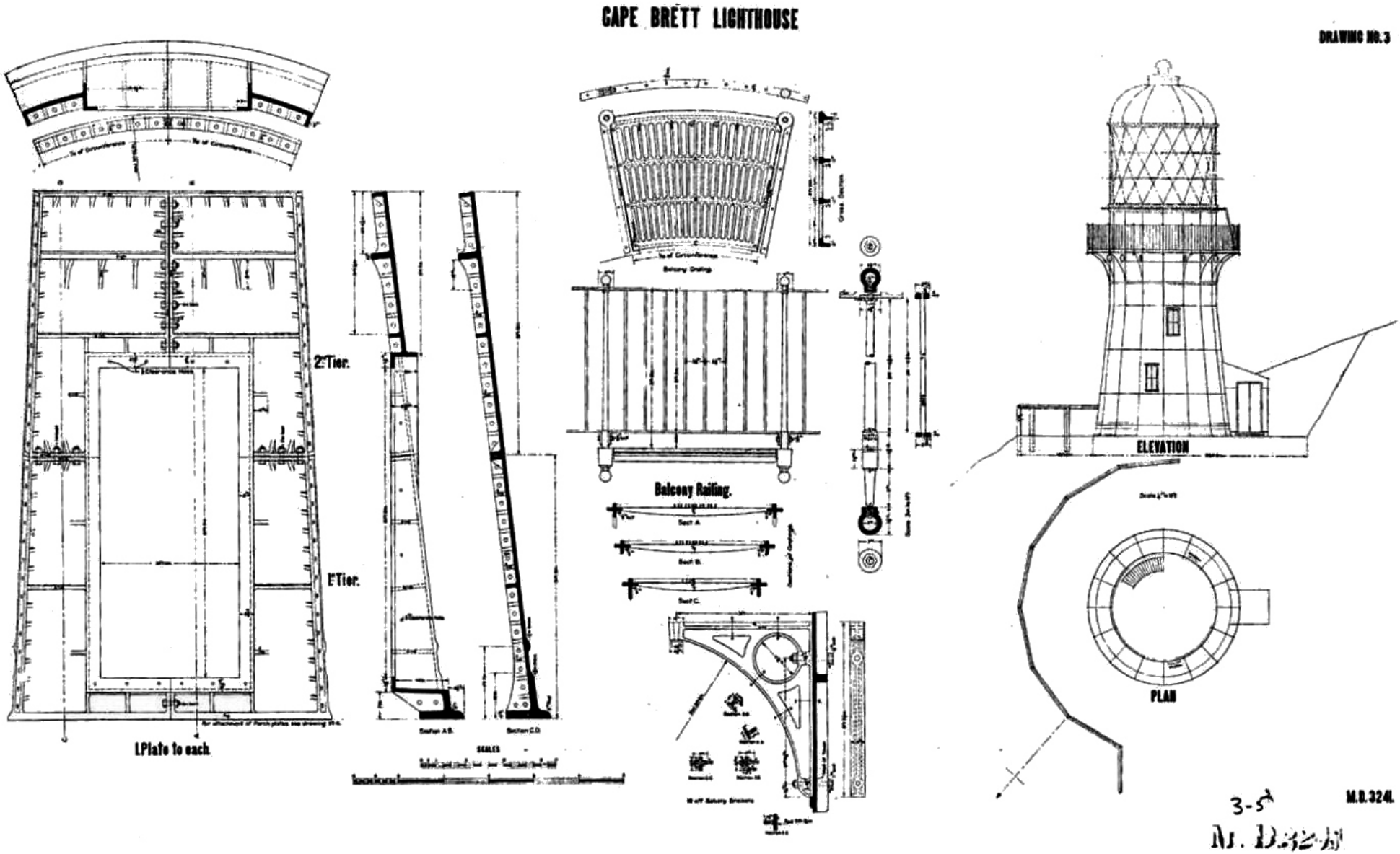


Figure 9– The architectural plans for the lighthouse –Drawing No 2.

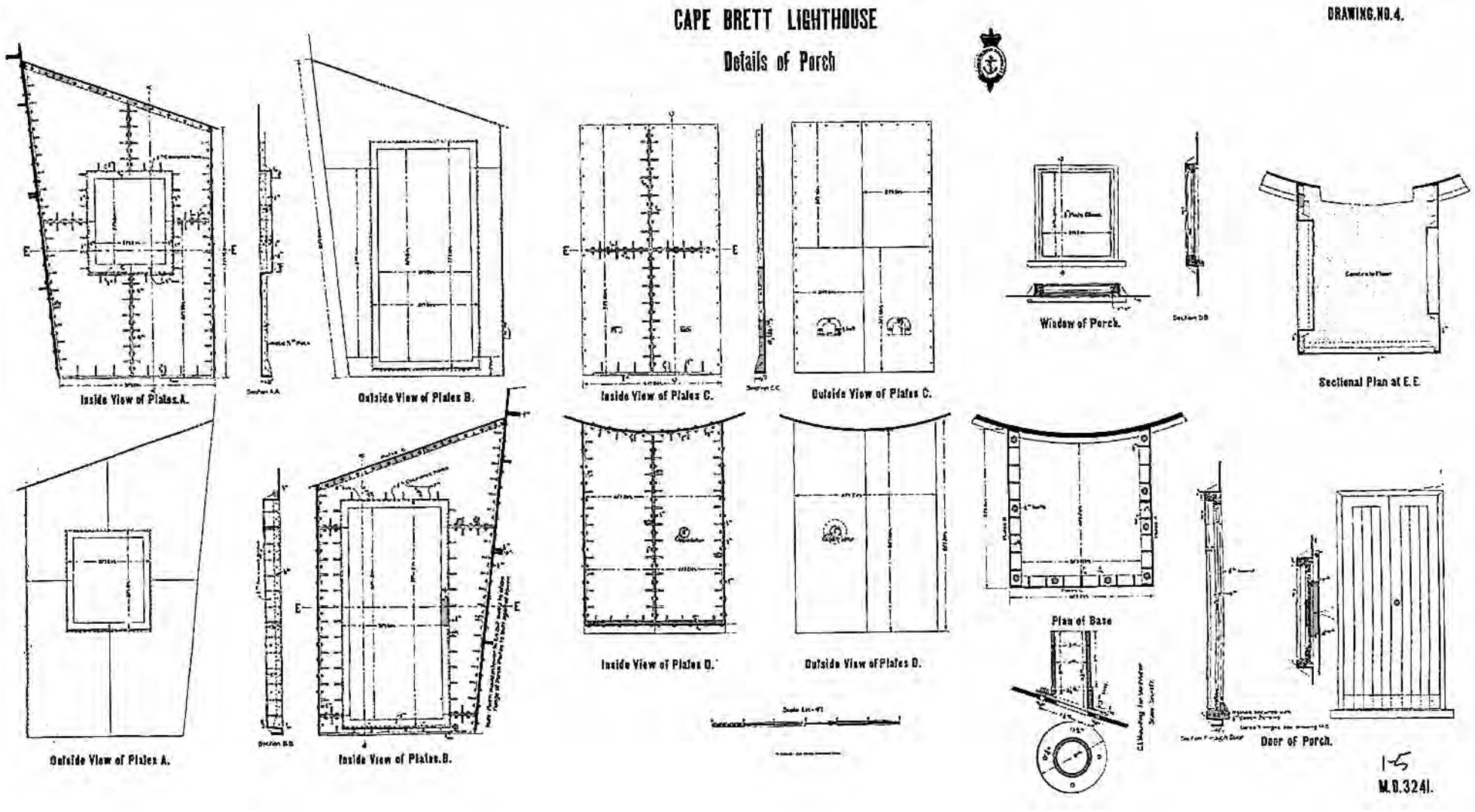


Figure 10– The architectural plans for the lighthouse –Drawing No 4.

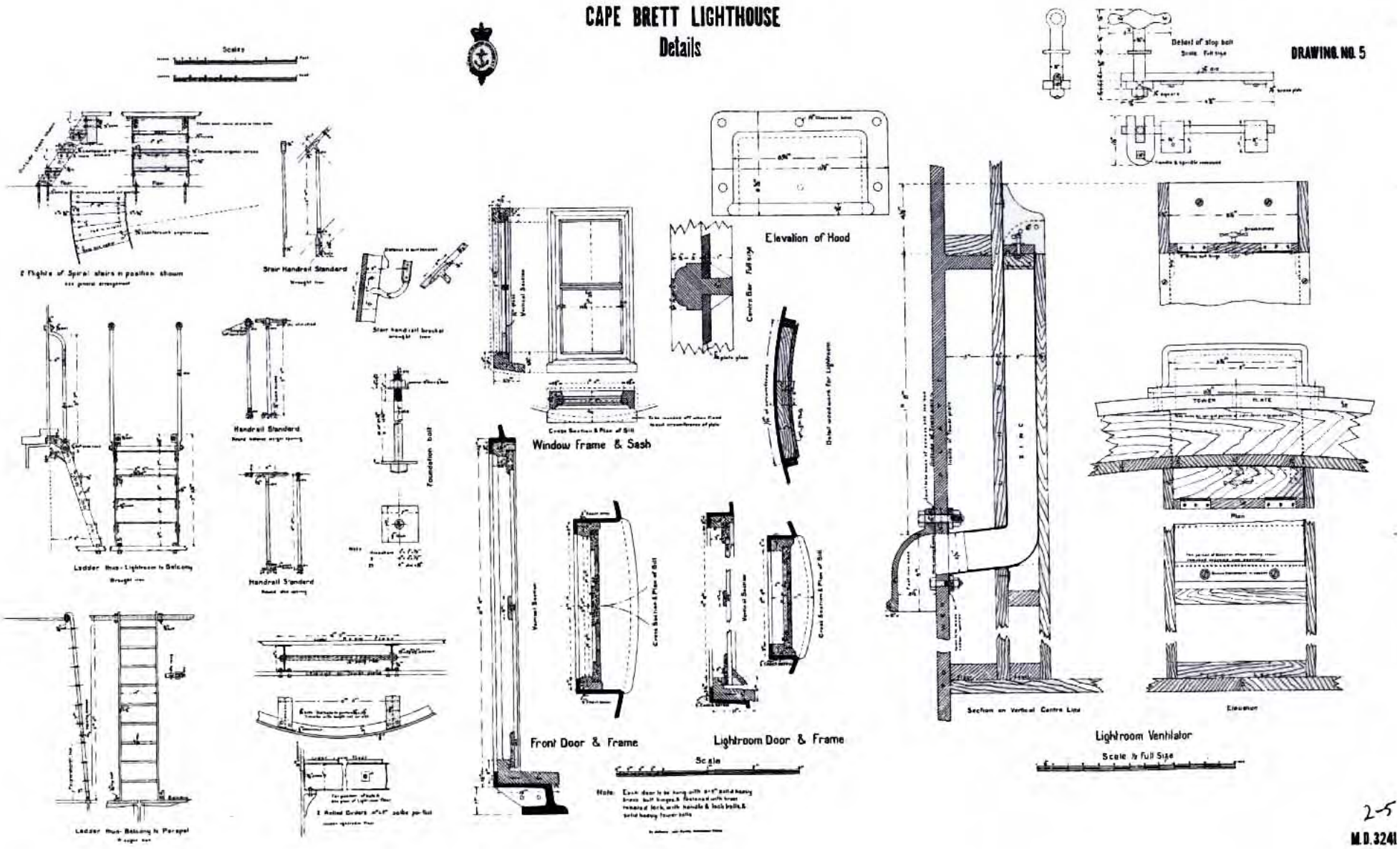


Figure 11– The architectural plans for the lighthouse –Drawing No 5.

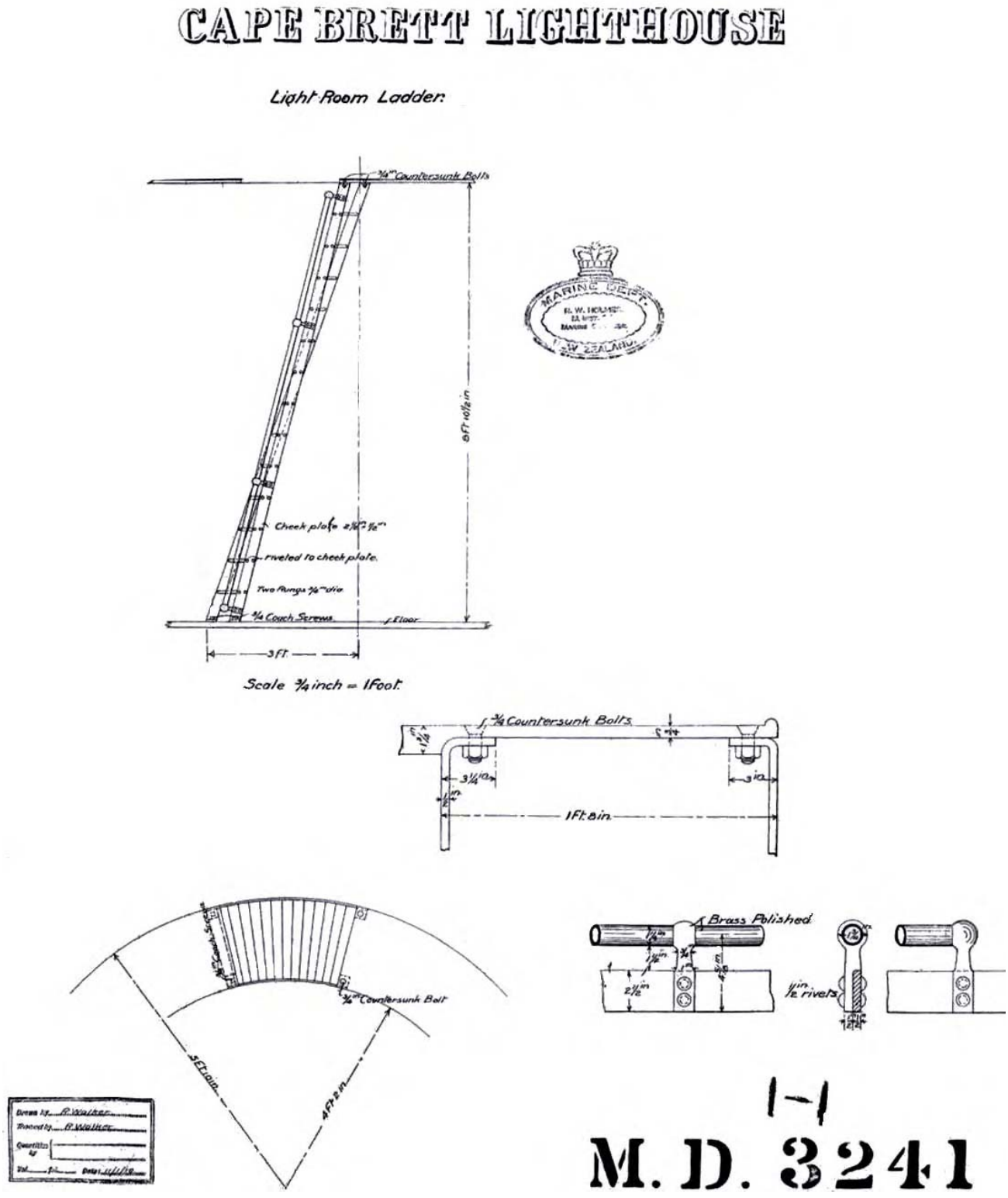


Figure 12 - The architectural plans for the lighthouse –Drawing of Lighthouse ladder.

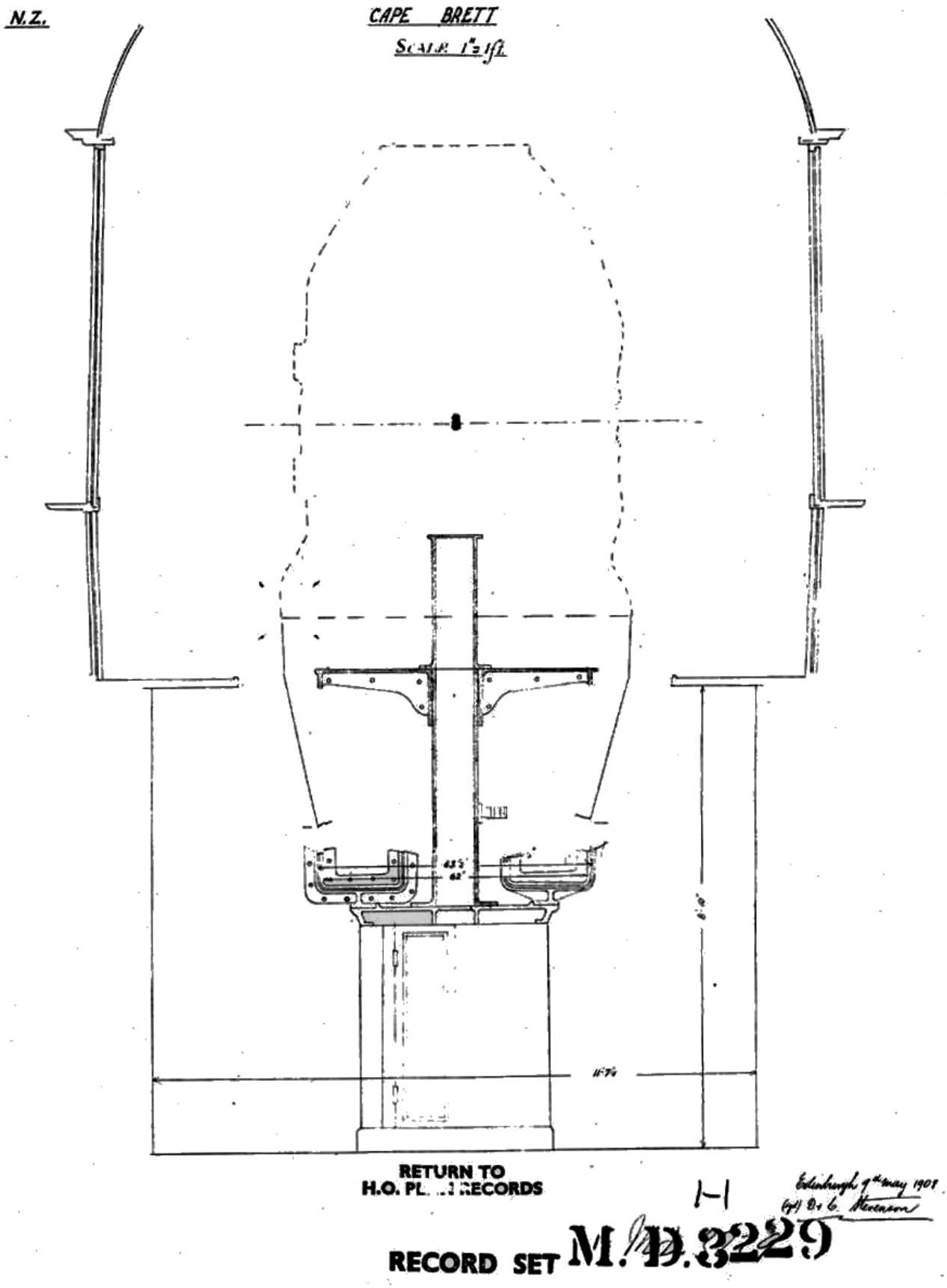


Figure 13 – Plans of the light mechanism designed by Stevenson's, dated 9 May 1909.

CAPE BRETT LIGHTHOUSE.

SUPPLY OF IRONWORK.

TENDERS will be received at this office until noon of Friday, 18th December, 1908, for the Supply of Cast and Wrought Iron and Steel Work for the Tower of the proposed Lighthouse at Cape Brett. Telegraphic tenders will be considered if presented at any telegraph office by noon of the same date, provided that written tenders are lodged at any Public Works District Office by the same hour.

Drawings, specifications, and conditions of contract may be seen at the Public Works Offices, Auckland, Wellington, Christchurch, and Dunedin. The lowest or any tender not necessarily accepted.

R. W. HOLMES,
Marine Engineer.

Public Works Office,
Wellington, 1st December, 1908.

The Public Works Department has let a contract to Messrs. Charles Judd and Co., of the Thames, for the construction of the iron tower for the new first-class lighthouse at Cape Brett, south of Russell, Bay of Islands. The lantern has arrived from Home, and the apparatus is expected shortly. The cost of the tower will be between £700 and £800.

To-morrow the Government steamer Hinemoa is to leave Auckland for Thames, where she ship's a tower for the Cape Brett lighthouse.

Figure 14 – Articles from the Evening Post, Wellington, about the construction of the Cape Brett tower, and the Judd factory advertisement.

Figure 15 - The cast iron tower for Cape Brett constructed on the Judd foundry in Thames.

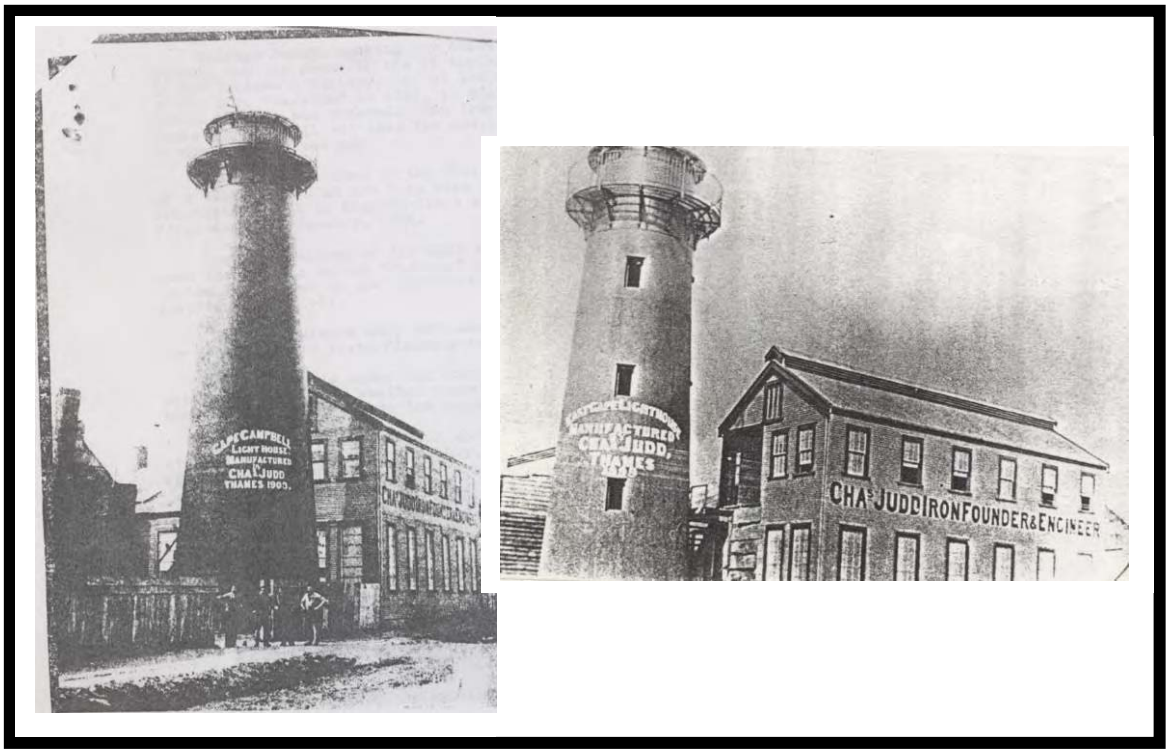


Figure 16 – Left: The cast iron tower for Cape Campbell constructed at the Judd foundry in Thames. Right: The cast iron tower for East Cape on the lot in Thames.

The construction on the 35ft tower had finished by 14 June 1909 when the Government steamer *Hinemoa* left Auckland for Thames to pick up the pieces of the tower to transport them to Cape Brett.[61] Once the steamer arrived at the Cape the pieces of the lighthouse tower were winched ashore by the crane before being put on the tramway and taken to the top of the hill for assembly.[62] Reports from the actual assembly of the tower have not been found but at a guess the tower would have been up by December 1909, if not earlier, to allow enough time to install the light itself.

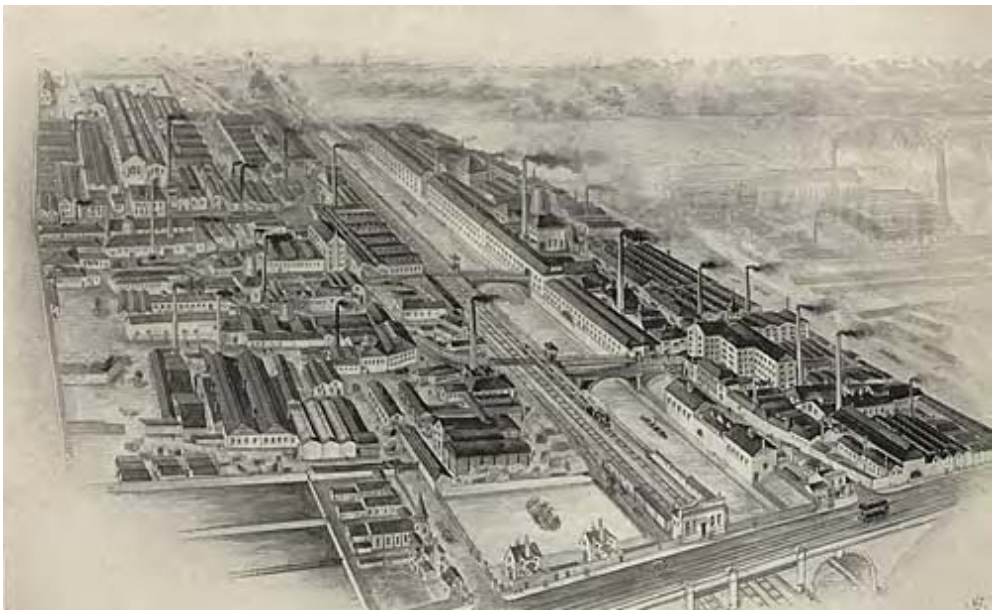
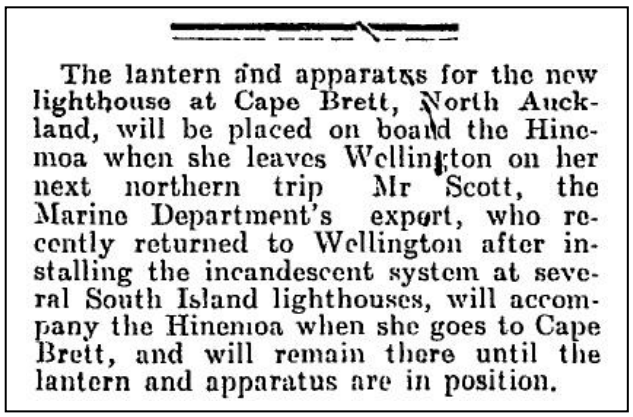


Figure 17 - The Chance Brothers Glassworks in Smethwick, Birmingham.

The apparatus of the light travelled the furthest of all the different lighthouse parts, coming from Birmingham, England.[63] The apparatus was manufactured by the Chance Brothers & Company Ltd in Smethwick, Birmingham, which was founded in 1824 and had a long history of manufacturing lenses for lighthouses. [64] The company had an extremely good reputation for producing sheet, window and optical glass and even today is considered to have been one of the most important glass manufacturers in the United Kingdom.[65]

The lantern and mechanism were both sourced from Edinburgh, Scotland.[66] The lantern came from James Dove & Company of Greenside, Edinburgh, while the mechanism (the machinery which made the light turn) was sourced from James Milne & Son Ltd who appear to have been brass founders.[67] It is likely that these two companies were sub-contracting for the Chance Brothers. To date, no other information about these companies has been found.

The pieces of the light were shipped to Wellington before being transported north to Cape Brett in August 1909, where the installation was overseen by David Scott (Figure 18).[68] The installation began in October 1909 and was carried out by five workmen.[69] When it was completed a plaque was attached to the basin of the mercury bath (see page 31 for mechanism details and advantages). Though the plaque is inscribed with 1908 this is most likely a reflection of the date the mechanism was made before being shipped to New Zealand, not when the lighthouse was completed.



The lantern and apparatus for the new lighthouse at Cape Brett, North Auckland, will be placed on board the Hinemoa when she leaves Wellington on her next northern trip Mr Scott, the Marine Department's expert, who recently returned to Wellington after installing the incandescent system at several South Island lighthouses, will accompany the Hinemoa when she goes to Cape Brett, and will remain there until the lantern and apparatus are in position.

Figure 18 – Article on the movement of the lantern and apparatus.

Light Technology

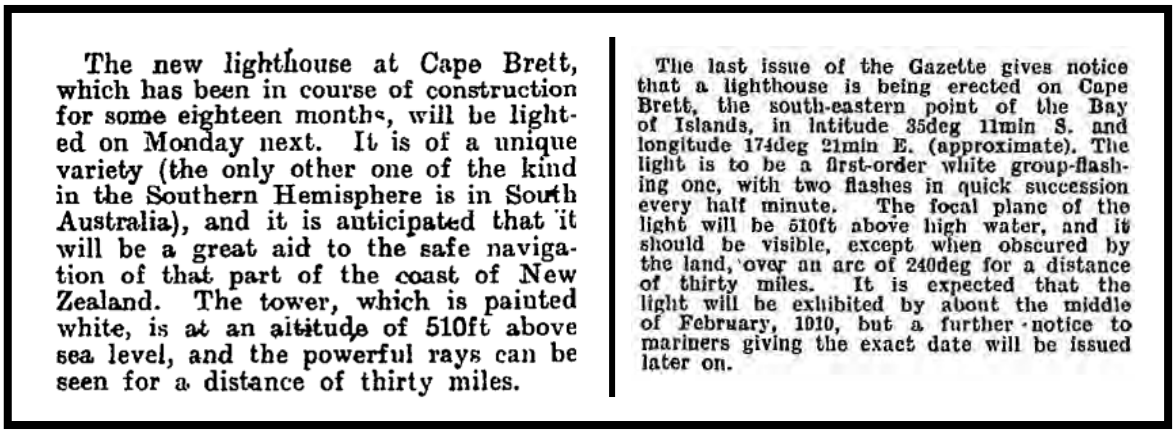
The technical operation of the Cape Brett light is the most significant aspect of this lighthouse. Technical aspects of lighthouses that have been identified as the most significant by Thomas A. Tag, an international lighthouse researcher, include:

- What is the early illumination history of the specified light?
- What types of Fresnel lenses were used?
- What types of lamps were used?
- What was the light characteristic at this site and how did it change over time?
- What types of fuel were used within the lamps?
- If the lens rotated, what type of rotation was employed?[70]

Two other major advances at New Zealand lighthouses were electrification and automation.

Illumination:

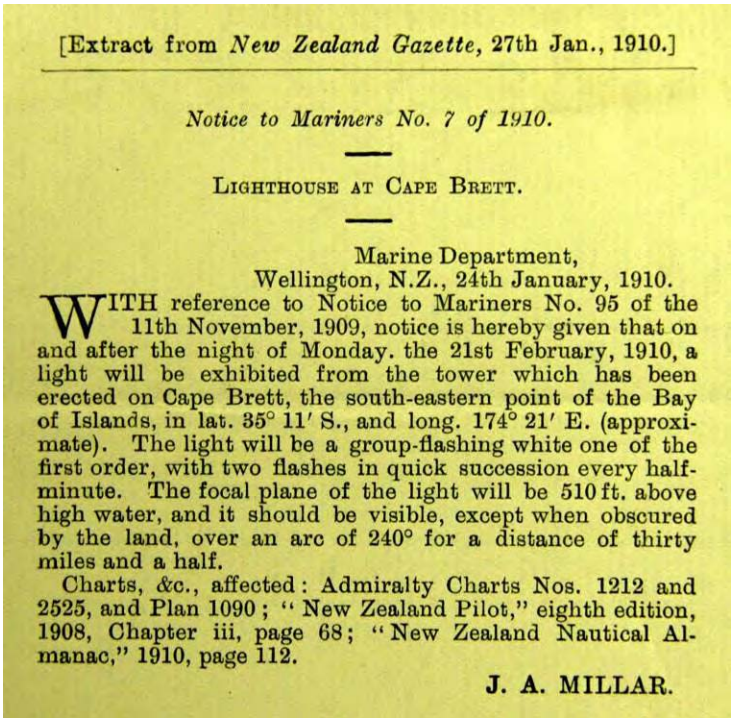
This light's first official night as a navigational aid was on 21 February 1910 and it continued to aid sailors until around October 1978.



The new lighthouse at Cape Brett, which has been in course of construction for some eighteen months, will be lighted on Monday next. It is of a unique variety (the only other one of the kind in the Southern Hemisphere is in South Australia), and it is anticipated that it will be a great aid to the safe navigation of that part of the coast of New Zealand. The tower, which is painted white, is at an altitude of 510ft above sea level, and the powerful rays can be seen for a distance of thirty miles.

The last issue of the Gazette gives notice that a lighthouse is being erected on Cape Brett, the south-eastern point of the Bay of Islands, in latitude 35deg 11min S. and longitude 174deg 21min E. (approximate). The light is to be a first-order white group-flashing one, with two flashes in quick succession every half minute. The focal plane of the light will be 510ft above high water, and it should be visible, except when obscured by the land, over an arc of 240deg for a distance of thirty miles. It is expected that the light will be exhibited by about the middle of February, 1910, but a further notice to mariners giving the exact date will be issued later on.

Figure 19 — An article from the Evening Post on 18 February 1910 announcing the lighting of Cape Brett.



[Extract from *New Zealand Gazette*, 27th Jan., 1910.]

Notice to Mariners No. 7 of 1910.

LIGHTHOUSE AT CAPE BRETT.

Marine Department,
Wellington, N.Z., 24th January, 1910.

WITH reference to Notice to Mariners No. 95 of the 11th November, 1909, notice is hereby given that on and after the night of Monday. the 21st February, 1910, a light will be exhibited from the tower which has been erected on Cape Brett, the south-eastern point of the Bay of Islands, in lat. 35° 11′ S., and long. 174° 21′ E. (approximate). The light will be a group-flashing white one of the first order, with two flashes in quick succession every half-minute. The focal plane of the light will be 510 ft. above high water, and it should be visible, except when obscured by the land, over an arc of 240° for a distance of thirty miles and a half.

Charts, &c., affected: Admiralty Charts Nos. 1212 and 2525, and Plan 1090; "New Zealand Pilot," eighth edition, 1908, Chapter iii, page 68; "New Zealand Nautical Almanac," 1910, page 112.

J. A. MILLAR.

Figure 20 – Extract from the New Zealand Gazette announcing the lighting of Cape Brett.

Automation:

Automation came about as technological developments, such as early satellite navigation systems, rendered the keepers redundant to the shipping business.[71] This was understandably a complex process, given all the personnel, practical and economic issues involved. The keepers were slowly lost through attrition rather than redundancy and the Marine Department dissolved positions as keepers were transferred to other lighthouses or other government agencies.[72] Those who stayed were offered the option of short term job sharing or a demotion.

Cape Brett was converted in 1978 – five years after the process began in 1973, continuing until 1982-83.[73] Local protests against the removal of people from Cape Brett consisted of bags of letters from individuals, commercial launch operators, yacht clubs and deep sea fishing companies who raised concerns about vandalism and the reliability of an automated system. The value of keepers for relaying radio messages (due to the blind spots in the bay) their weather warnings and the fact that their eyes could keep watch for flares from vessels in distress, were put forward as reasons to retain keepers.[74] However these concerns were all dismissed by the Marine Department and the conversion finished in October when the solar-powered beacon was installed next to the old tower, which eventually fell in to disrepair.

Automation was inevitable because the Marine Department was running at a huge loss. The cost of accommodating the keepers and their families on stations was at least $350,000 less than the department was receiving in light dues from the shipping companies. It was unfortunate that so many men lost jobs and that the lighthouse keeper career became virtually extinct in New Zealand.

The lighting system for New Zealand is now controlled remotely by Maritime New Zealand's Wellington offices using an active control system.[75] This enables a lighthouse engineer to monitor and repair faults via computer and all beacon/light parts have their own standby units that turn on automatically in case of part failure.[76]

Figure 21 – The two 'bulls eyes' in the Cape Brett lens.

Lenses:

The equiangular refractor Fresnel lens used at Cape Brett was a first order lens (the largest of seven different sizes) manufactured in England by the Chance Brothers.[77] The Fresnel lens was invented by the French physicist Augustine Fresnel in 1822, and was important because of its efficiency.[78] The lenses were only manufactured in two countries, France and England, but were used in lighthouses throughout the world.[79] The first Fresnel lens was installed at the Cordouan Lighthouse in France.[80]

The lenses were constructed with a series of concentric rings of glass prisms above and below a central drum section, all of which worked to bend the light from the light source into a narrow beam.[81] The bull's eye design that featured on most of the Fresnel lenses operated to make the narrow beam produced even more powerful and the number of beams produced depended on the configuration of the prisms.[82] The lens was extremely efficient and only lost 17% of the light produced by the source (compared to the 97% lost from an open flame).[83] The lenses were made in seven different sizes, referred to as 'orders,' with a first order lens being the largest (approximately 3-4 metres in height) and the seventh being the smallest (approximately 0.5 metres in height).[84]

Every lens had a different form so that mariners could distinguish between lights based on the characteristics the lens would produce.[85] In Cape Brett's case the bull's eye design featured twice in the design and acted with the lamp to produce the light's identifying characteristics.

Figure 22 – The lens at Cape Brett in 2008.

Figure 23 – A Fresnel lens from the Dog Island Lighthouse formally on display at the Museum of City and Sea in Wellington.

Lamps:

Several different types of lamps were used during the light's history, with the type of lamp determined by the type of fuel to be used. The first lamp was an incandescent kerosene burner (see Figure 24), which was replaced by the electric powered bulbs that are still in situ inside the lens (see Figure 25).[86] Early records are available for the transporting of kerosene to the site and the lamp is now held by the Department of Conservation at the Bay of Islands Area Office.

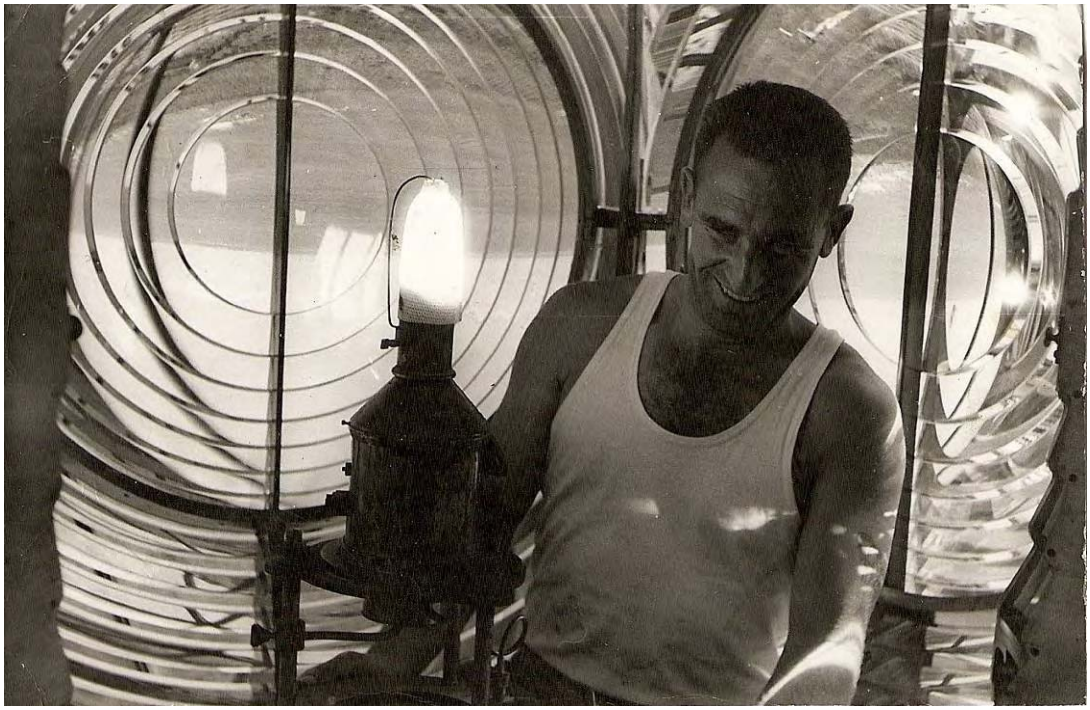


Figure 24 – Noel Proebstel with a kerosene lamp.

Figure 25 – The current lamp fixture.

Light Characteristics:

There are varying reports on the light's actual visibility, but the Marine Department classified the Cape Brett Light as a first order group white light, visibility at 30.5 nautical miles.[87] The light would flash at a standard rate of two flashes/one revolution every 30 seconds.[88]

When the light tower was closed in 1978 and the light beacon installed, the brightness of 1,000,000 candelas was reduced to 40,000 candelas, with the visibility reduced to 17 miles, and the flash changing to a 0.3second white flash every 2.5 seconds.[89]

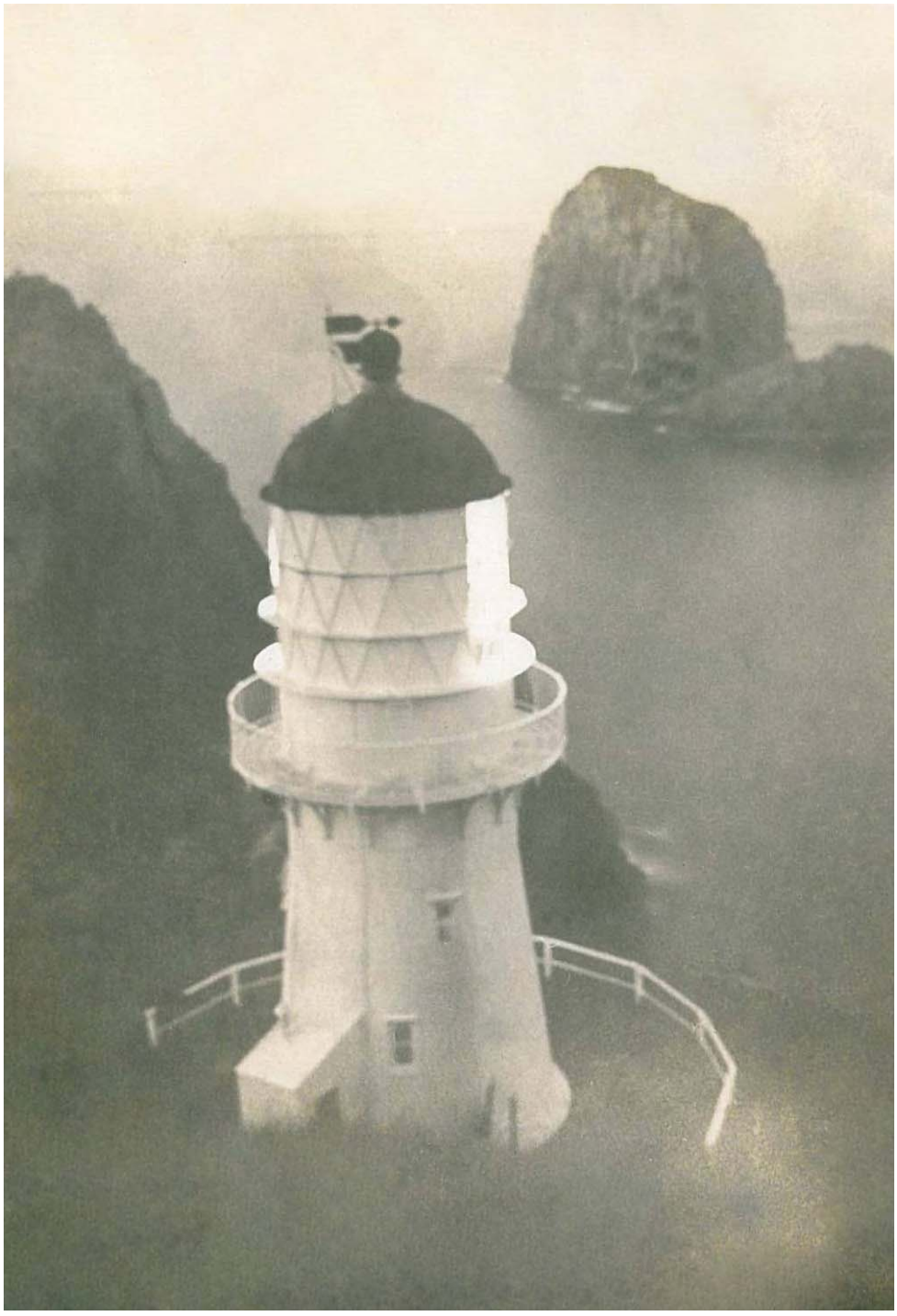


Figure 26 – The light.

Figure 27 – Another angle of the light before it was to be turned off for the day.

Figure 28 – The kerosene tanks still in the light.

Fuels:

Different types of fuel were used during the light's 68 years. Kerosene was the first, supplied regularly in small quantities and stored in a purpose-built shed next to the lighthouse. The tanks were installed on the second floor of the light tower as seen in Figure 28.

In 1955 the lamps were converted to electricity provided by diesel electric motors.[90] The engines were also used to operate the tramway when it was needed (and proved much more reliable than the horse as the engines could not run away!).

It wasn't until 1968 that the Cape Brett settlement was connected to the national power grid (when the diesel generators became the back-up power system).[91] This was a massive undertaking. A total of eight miles of 11kv single wire, 31 power poles, approximately 22 men spread from Rawhiti to the lighthouse, three boats, one amphibian aircraft and one helicopter was needed.[92] The power poles were positioned by first excavating the holes using small charges to loosen the rock, then post-hole borers dug a series of neat holes (33cm in diameter by 12.7cm deep).[93] The poles were moved to their designated positions (see Figure 29) by being attached to a cable from the helicopter and flown over the Cape, where the gangs of men were in position to put them into place.[94] The workers ran into several problems when establishing the line, mostly related to the helicopter and the weather conditions in which the pilot could fly.[95] The total cost of the line was £8000, which works out to £1000 per mile.[96]

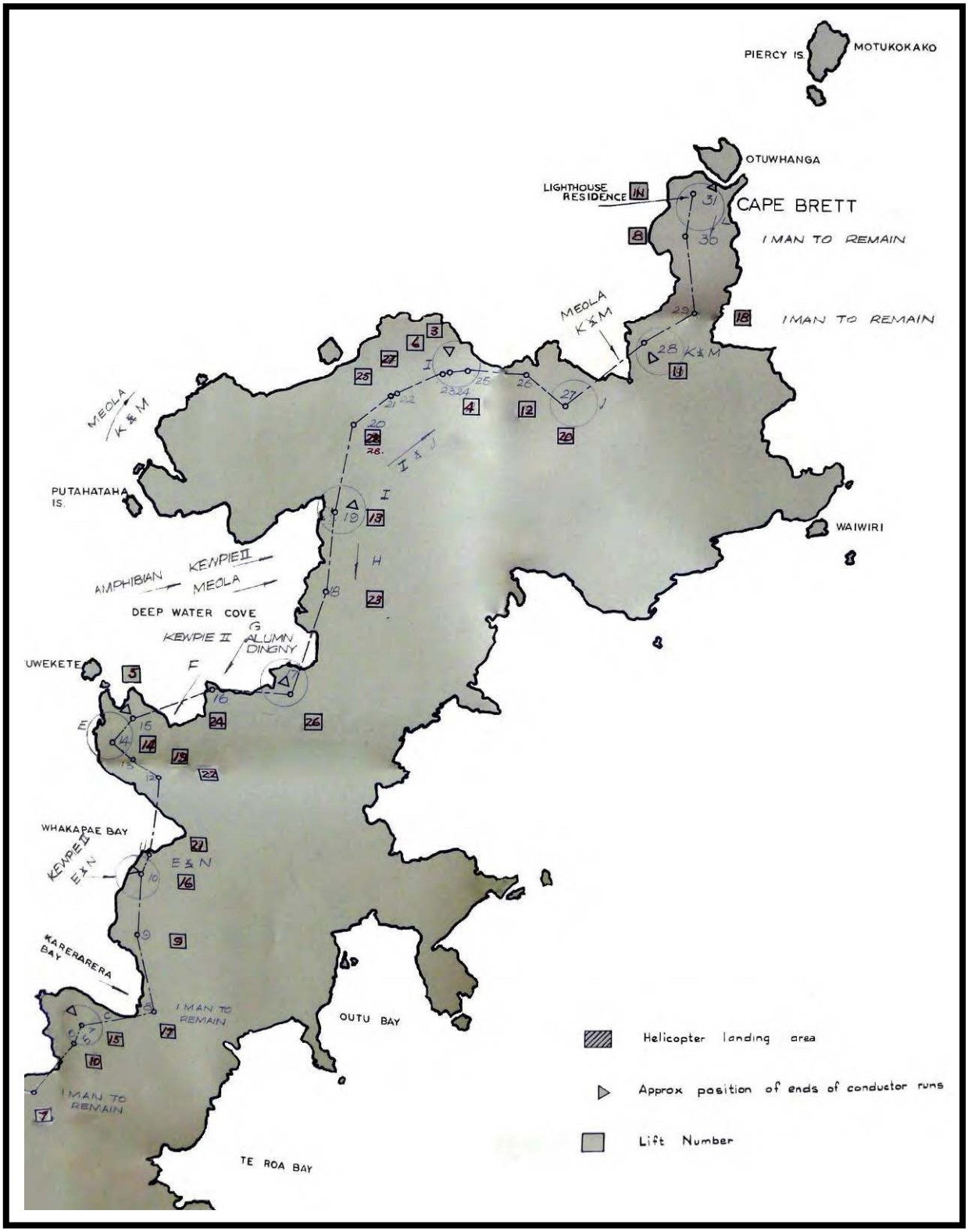


Figure 29 – The proposed route of the 11kv power supply line, from the Ministry of Works, 1965.

The Mercury Bath:

The rotating mechanism used at Cape Brett was the first of its kind in New Zealand.[97] The mercury bath was the same kind that had become a standard feature in European lighthouses.[98] There were many advantages to using a mercury bath to rotate the lens, which overruled the disadvantages of using the mercury.

Advantages included:

- Increased rotational speed of the mechanism[99]
- Near-frictionless rotation resulting from the liquid[100]
- The mercury could hold more weight than the roller and ball bearing method (approximately 100kg of mercury could support three tonnes of weight)[101]
- The system offered less wear and tear, giving a longer lifespan[102]

These factors combined meant that a smaller motor was needed because the bath could support a greater weight than other rotation devices.[103]

Disadvantages included:

- Earthquakes and spillages had to be followed by the painstaking process of gathering up all the mercury[104]
- A toxic vapour was released when the mercury amalgamated with rust from the turning unit, requiring the cleaning of the bath and replacement of the mercury.[105]

Figure 30 –The mercury bath.

Figure 31 – The mechanism that sits beneath the mercury bath.

Maintenance

Once the lighthouse construction was complete the arduous task of keeping it in perfect condition began. Keepers' tasks included maintenance on the mercury bath, the lens, the lamps, the window panes and other associated parts - not to mention the painting of the structure, the upkeep of the copper dome and the mountains of paperwork involved in everything.

Painting

Painting was a standard task for the keepers and seemed to occur at no regular interval for Cape Brett. When the tower was stripped right back to the ironwork during the Department of Conservation makeover in 2007 the painters found a build up of 60 layers of paint.[106]

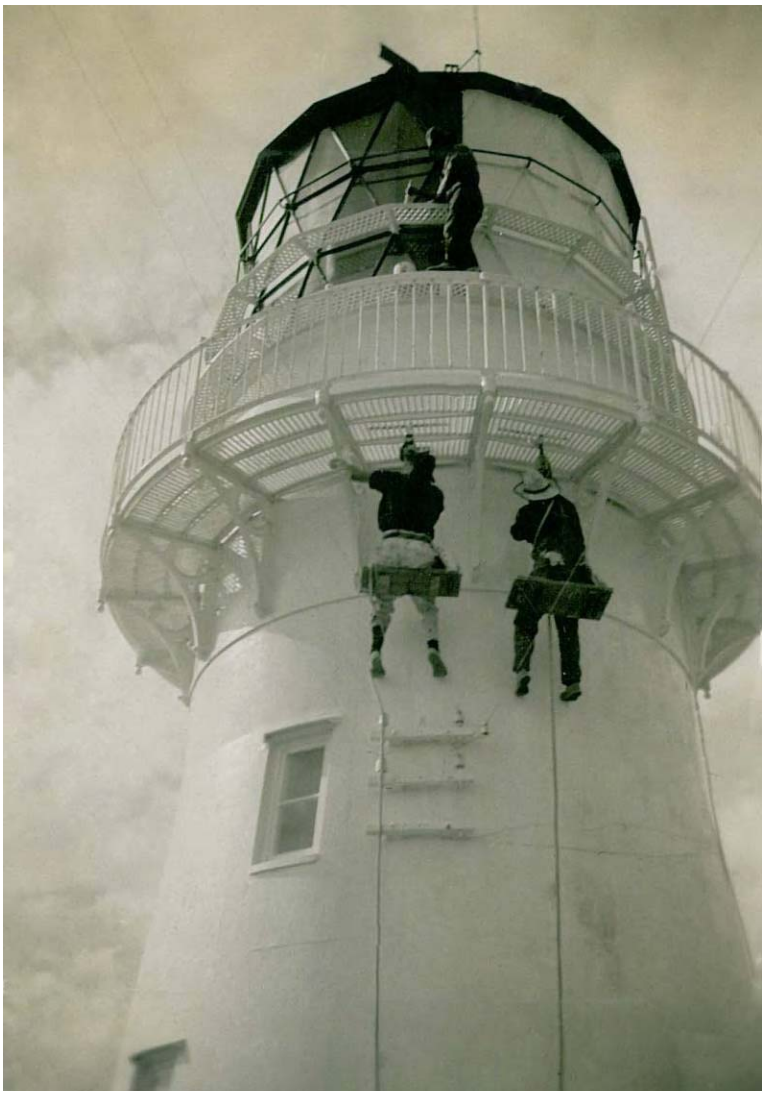


Figure 32 –Keepers painting the lighthouse.

In Mabel Pollock's book 'Children of the Lighthouse' she discusses her family's time at the Cape Brett station (one of the many her father Hugh Jamieson was posted to) and talks about various aspects of the station, including the painting. The keepers at the Cape during World War 2 would paint the light as a group. The principal keeper and first assistant keeper would hang from the balcony in bosuns' chairs, while the second assistant keeper would paint the balcony and above – including the dome – using the rungs already on the structure for support. They would treat and red-lead the rust spots on the tower before applying the undercoat, finishing with a shiny white coat, while the dome would be painted and oiled. Mabel also remembers that her father used to paint in '*long trousers, long sleeved shirt and pullover*' (all of which were covered in red and white paint) before they moved to the Cape, where he started painting in a '*pair of old shorts and singlet, old sand shoes and a shady hat.'*[107]

According to Helen Beaglehole, author of 'Lighting the Coast. A History of New Zealand's coastal lighthouse system,' the best practice for the Marine Department until the mid-1950s was for keepers to paint the tower every four to five years, and to polish the dome more regularly with linseed oil.[108]. However on stations such as Cape Brett – where there was the man power for the task - it was left to the discretion of the principal keeper.

After the Marine Department established maintenance centres in Wellington and Auckland in the 1950s the keepers were no longer faced with the massive job of painting the tower.[109] The work was done by the Marine Department's professional painters, such as Joe Conlon (who left the department in 1967) and his painting partner Henry Philips.[110]

The lighthouse received its latest paint job in early 2007 when the Department of Conservation hired Whangarei firm Rudolphs to give the lighthouse a fresh look. The paint job was a massive undertaking with the two painters taking six weeks to complete the job. All the necessary gear — sixty tonnes worth — was transported to the site using a barge and helicopter. Before painting they first had to strip off the old paint — all 60 layers of it — before they could apply a fresh six layers. Eighty percent of the tower had to be stripped by hand, while the rest was sandblasted. The six layers of paint included a special primer that had to be used because of the tower having been cast in New Zealand (English towers have a different carbon content). Also replaced were the large front doors (the new ones weighed 600kgs), a second floor window and 14 cracked panes around the light.

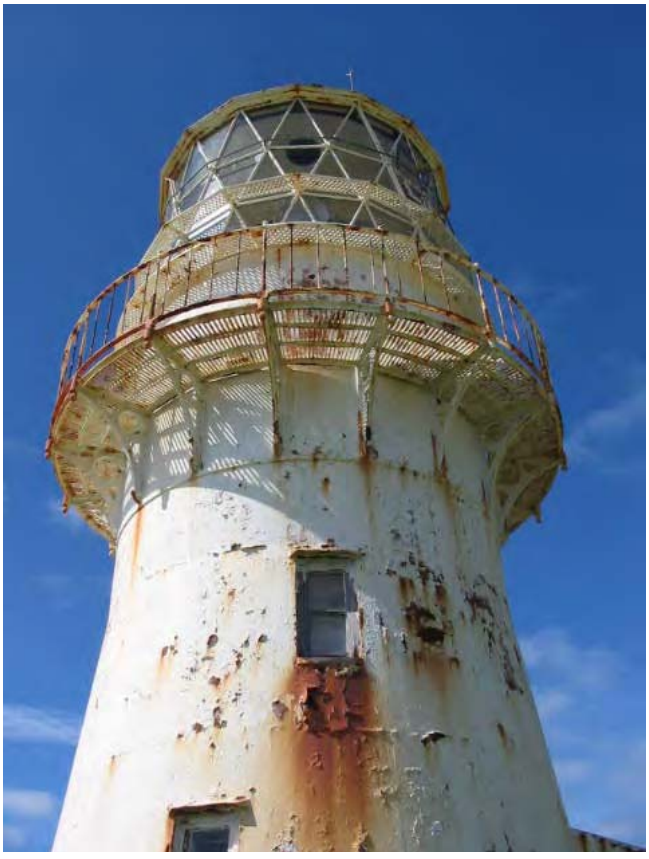


Figure 33 – The lighthouse before being painted in 2007.

Figure 34 – The worksite during the paint work with the lighthouse covered in scaffolding.

Figure 35 – The made-over lighthouse, straight after the painters had finished.