PAPERS

RELATIVE TO

SUBMARINE TELEGRAPH ACROSS

COOK STRAIT.

PRESENTED TO BOTH HOUSES OF THE GENERAL ASSEMBLY BY COMMAND OF HIS EXCELLENCY.

WELLINGTON.

1865.

SCHEDULE OF Papers respecting Submarine Telegraphic Cable in Cook Strait.

No.	Date.	Writer and Subject.
1	8th December, 1864.	Secretary General Post Office, to Alfred Sheath, enclosing resolution of House of Representatives, and requesting information.
2	10th May, 1865.	Secretary General Post Office, to Alfred Sheath, requesting reply to letter No. 1.
3	26th May, 1865.	Alfred Sheath, to Postmaster General, reply to letter No. 1.
4	9th June, 1865.	Secretary General Post Office, to Alfred Sheath, respecting period allowed to elapse before calling attention to the necessity for a Survey of Cook Strait.
5	10th June, 1865.	Colonial Under Secretary to John Morrison, preliminary instructions respecting telegraphic cable.
6	1st June, 1865.	Colonial Secretary, New Zealand, to Chief Secretary, Victoria, requesting suggestions, or information, regarding submarine telegraphs.
7	3rd June, 1865.	Colonial Secretary, New Zealand, to Superintendent, Otago, suggesting that the services of the Provincial Marine Engineer should be temporarily placed at the disposal of the General Government, for the purpose of a Survey of Cook Strait.
8	9th June, 1865.	Superintendent, Otago, to Colonial Secretary, New Zealand, reply to letter No. 7, and enclosing letter from Mr. Balfour.
9	26th July, 1865.	Mr. Balfour, to Postmaster General, Report of Survey of Cook Strait.

PAPERS RELATIVE

TO THE

SUBMARINE TELEGRAPH ACROSS COOK STRAIT.

No. 1.

General Post Office,

Auckland, 8th December, 1864.

Sir,—

I am directed to forward to you the enclosed copy of an extract from the journals of the House of Representatives, and to request that you would be good enough to report, for the information of Government, where you consider would be the best points for crossing Cook's Strait with a telegraph line, and what would be the probable cost thereof.

I have, &c.,

G. Eliott Eliott,

Secretary.

Alfred Sheath, Esq.,
Telegraphic Engineer, Christchurch.

Enclosure to No. 1.

Resolved: That a sub-marine line of telegraph be laid across Cook's Strait, to connect Wellington with the telegraph system of the Middle Island.

No. 2.

General Post Office,

Wellington, 10th May, 1865.

Sir,—

Referring to my letter, noted in the margin, enclosing copy of a resolution of the House of Representatives, and requesting your opinion on certain points with regard to crossing Cook's Strait with a

line of telegraph, I have to remind you that no reply has yet been received from you, and to request your attention to the matter at your earliest convenience.

I have, &c.,

G. Eliott Eliott,

Secretary.

Alfred Sheath, Esq.,

Telegraphic Engineer, Christchurch.

No. 3.

General Government Electric Telegraph Department,

Christchurch, May 26, 1865.

Sir,—

In compliance with your request, contained in letter noted in the margin, relating to the best point for crossing Cook's Strait with a telegraphic cable, and the probable cost, I have the honor to forward you the following information :—

In my letter, noted in the margin, I thus addressed—"The Honorable the Postmaster General—it would be a matter of great importance to get soundings taken in Cook's Straits to ascertain the nature of the bottom, so that the best route may be decided upon for conveying a cable across, and information at the same time be afforded as to the nature of cable required."

I will quote the answer I received per letter quoted in the margin, which was as follows :—

"It is not the intention of the Government to take any immediate steps towards laying the submarine telegraph across Cook Strait. When the land communication becomes further advanced this will be taken into consideration."

As I have received no communication as to soundings, I had recourse to the best means at my command, namely, the Admiralty Chart and the New Zealand Pilot.

In selecting a route for a telegraph cable, four things have chiefly to be avoided : A rocky and uneven bottom ; strong currents ; ground likely to be interfered with by ships' anchors, and difficult shores for landing the cable.

Taking these questions into consideration, I have arrived at the conclusion—that the points, and best place to cross Cook Strait, will be on the south, from a point in Cloudy Bay near the mouth of the Wairau ; and on the north, at a point at the head of Lyall's Bay.

The cable will require to be laid in a slight curve, so as to avoid a deep hole in the middle of the Straits, which lies between the points I have indicated.

The distance from South Point to North Point is about thirty-eight miles, and if we allow ten per cent. for slack and casualties, the whole length of cable to be ordered from England will be about forty-two miles.

Although I have avoided, as much as possible, the evils that can affect a telegraphic cable, I should still further recommend precautionary measures in the manufacture itself.

I should, in the first place, recommend the adoption of a very strong cable, owing to the shallowness of the Strait, for this would render it less liable to breakage in the case of accident by fouling of anchors.

The form of cable I should recemmend would be one containing three conductors, or three separate wires, for telegraphic purposes. This would render communication more certain ; as, should one, or even two conductors fail, the other might remain good till the necessary repairs could be effected.

It is, moreover, not at all improbable that the amount of business between the two Islands will require two or even more lines, so as to prevent the delays that arise from the accumulation of messages. The extra cost of such a cable, which would certainly be much less than one-third in excess of that of a cable with only one conductor, would be more than compensated for by the advantages derived.

The form of conductor, I should propose, would be a copper strand, consisting of seven wires, and similar to the conductor used in the first Atlantic cable, making a conductor in size number twelve, Birmingham wire guage.

The insulation, I should propose, would be gutta percha. This course I am led to adopt owing to the fact that the character of gutta percha has been fully established, while the other insulations require time to prove their permanent character and durability.

The size of insulator for each conductor should be thick enough to make each separate core intended to constitute the general core form a thickness corresponding with the size of a wire of number one, Birmingham wire guage. The three cores I should propose putting together with hemp, which would serve as a pad to protect the core. The core I should next cover with a heavy sheathing, composed of wires of number one, Birmingham wire guage, laid on spirally. As these outer wires are very liable to corrode, and be wasted away by the action of sea water, I should propose protecting them by one of the methods recently used in the manufacture of the latest sub-marine cables, and, I think, the plan adopted with the Atlantic cable, namely covering the separate wires with Manilla yarn steeped in some preserving material, is the best yet proposed.

I object to any hot mixture being applied to the outside of the cable while the core is within, as the gutta percha might thus be damaged.

I should say a cable of the above description could be manufactured for about £200 (two hundred), to £250 (two hundred and fifty pounds) per mile.

The expenses attending testing and superintendence, during the manufacture, will, however, add to the cost.

It would be preferable, I think, to enter into one contract for the manufacture and successful submergence of cable.

The total cost of the entire work, I estimate to be about £20,000 (twenty thousand pounds), and I should, therefore, recommend that sum to be placed on the Estimates for the Cook Strait Submarine Telegraph Cable.

I will, if required, forward you a proper specification for a telegraphic cable; but, before doing so, I should like to consult with the Electrician, who is now absent down South, fitting up the stations at Dunedin and Invercargill.

The map of the Straits, shewing the route, the result of the soundings, together with my letter, would, however, be a sufficient guide for any Telegraphic Engineer to procure you the cable we require.

When I consider all the improvements now taking place in the manufacture of sub-marine cables, and the delay we experience in receiving information on these subjects, I regret that I cannot be on the spot where the cable is manufactured myself so as to ensure the latest improvements.

I have, &c.,

ALFRED SHEATH,

Telegraphic Engineer.

The Honorable the Postmaster General,
Wellington.

No. 4.

General Post Office,

Wellington, 9th June, 1865.

SIR,—

I have the honor to acknowledge the receipt of your letter, of date as per margin, on the subject of the sub-marine telegraph between the shores of Cook Strait. I am instructed to remind you of the fact that consequent on a resolution of the General Legislature your attention was drawn to the necessity of giving the Government the necessary information as to the nature of the cable in my letter of 8th December, 1864, and that not having heard from you on the subject, your attention was again directed to the question on the 10th May last.

Your letter, under reply, implies that a survey of the Strait is necessary as a preliminary measure. The Postmaster General is at a loss to conceive why, if you were of opinion that the Admiralty Chart did not give you sufficient *data* for the formation of an opinion, you did not point it out at the time, instead of allowing so many months to elapse, and your attention to be recalled to the point.

I have now to inform you that a survey of the Strait has been ordered, and that Government, in order to avoid further delay, has directed the Crown Agent to obtain the best professional advice in Great Britain, in order to the immediate preparation of between thirty and forty miles of sub-marine telegraph cable.

Further instructions will be sent by the July mail, with the result of the survey.

I have, &c.,

G. ELIOTT ELIOTT,

Secretary.

A. Sheath, Esq., Telegraphic Engineer,
Christchurch.

No. 5.

Colonial Secretary's Office,

Wellington, 10th June, 1865.

SIR,—

The New Zealand Government is anxious to procure as soon as possible an electric sub-marine cable for the purpose of telegraphic communication across Cook Strait, and I am to instruct you to take at once the necessary steps for having such cable constructed in accordance with the most approved principle, and under the highest professional advice.

The length of the cable is to be between thirty and forty miles. Soundings of the bed in which it is to lie, and further particulars, will be obtained, and transmitted to you by the July mail. In the mean time I enclose a copy of a letter, dated the 26th ultimo, from Mr. Alfred Sheath, the Telegraphic Engineer in this Colony, to the Honorable the Postmaster General, on this subject. This letter is not intended as a guide, but as containing suggestions for the consideration of the best authorities in England, and as furnishing information which may be useful.

Arrangements will be made without delay for keeping you in funds to meet the cost of procuring this cable.

I have, &c.,

W. Gisborne,

Under Secretary.

John Morrison, Esq.,
3, Adelaide Place, King William-street,
London.

No. 6.

Colonial Sectetary's Office,

Wellington, 1st June, 1865.

Sir,—

It is the wish of the New Zealand Government to connect the opposite shores of Cook Straits (about forty miles from point to point) by means of a sub-marine telegraph cable, and, as no doubt the Government of Victoria has had experience of a similar work between Victoria and Tasmania, I shall feel much obliged if you would favor this Government with any suggestions or information which may serve as a guide in carrying out the work in question.

I have, &c.,

F. A. Weld.

The Honorable the Chief Secretary,
Victoria.

Note.—Similar letter, of like date, addressed to the Hon. the Colonial Secretary, Tasmania.

No. 7.

Colonial Secretary's Office,

Wellington, 3rd June, 1865.

Sir,—

The General Government is anxious to avail itself of the services of Mr. Balfour, Provincial Marine Engineer of Otago, in a Survey of Cook Strait, with a view to ascertaining the best line for a sub-marine telegraphic cable connecting the two Islands. As the object is one of great colonial importance, especially in connexion with the Panama Mail Steam Service, I trust that your Honor will be able to place the services of that officer at the disposal of the General Government for this purpose, and, in such case, may I ask your Honor to be good enough to intimate the same to Mr. Balfour, and to request him to proceed to Wellington by the first opportunity, and to report himself to the Hon. the Postmaster General.

Of course the General Government will pay all expenses of his salary during the time of his employment in such survey.

I have, &c.,

Fred. A. Weld.

His Honor the Superintendent,
Otago.

No. 8.

Superintendent's Office,

Dunedin, 9th June, 1865.

Sir,—

I have the honor to acknowledge the receipt of your letter of the 3rd instant, intimating the desire of the General Government to avail itself of the services of Mr. Balfour, Marine Engineer, of

Otago, in a survey of Cook's Straits, with a view to ascertaining the best line for a sub-marine telegraphic cable connecting the two Islands.

Your letter arrived most opportunely as I was about to have addressed you, at Mr. Balfour's request, copy of which I enclose, on the subject of the transfer of his services altogether to the General Government. I have only therefore now to say that his services for the purpose named are immediately available, and I shall be gratified to learn that the General Government can take him permanently into their service.

It is with regret that this Government would part with so valuable an officer as Mr. Balfour, of whom it cannot think too highly, but in the temporary depressed state of the Province, the Government could not feel itself justified in retaining his services after the 30th September next.

Mr, Balfour has been instructed to proceed to Wellington by the first opportunity.

I have, &c.,

J. Hyde Harris,

Superintendent.

P.S.—Should the General Government agree to retain Mr. Balfour in its service, I have the honor to request that he may still be allowed to complete any works he may have undertaken for this Government.

J. Hyde Harris,

Superintendent.

The Honorable the Colonial Secretary,
Wellington.

Enclosure to No. 8.

Marine Engineer's Office,
Dunedin, May 30th, 1865.

Sir,—

As the termination of my present engagement with the Provincial Government of Otago is now rapidly approaching, and as my knowledge of the present temporary depression of the Provincial affairs prevents me from having much expectation that the Government, however well disposed to me individually, will consider themselves justified in maintaining the Marine Department after the close of my engagement, I venture to request that your Honor, with the concurrence of the Executive, will be good enough to bring my name before the General Government, with a recommendation that my services should be transferred to them. This will tend to economy in many ways, as I should expect to be quite able to advise all the Provinces with regard to proposed Marine works, and as I should then be officially connected with the Light-houses, instead of managing them for the Marine Board, as I have done for the last two years in an informal manner. As there can be no doubt that any recommendation from your Honor's Government would have very great weight, I venture to hope that they will consider themselves justified in recommending this transfer with a certain amount of strength.

In making this request I should not wish it for a moment to be supposed that I am desirous to leave Otago, for on the contrary, I should be glad to remain could I be of service to the Province; but whether I remain or go, the unvarying courtesy with which I have been treated by your Honor, and the members of the Executive generally, have made an impression on my mind which can never be effaced.

I have, &c.,

James M. Balfour,

Marine Engineer.

His Honor the Superintendent of Otago.

No. 9.

Wellington, 26th July, 1865.

Sir,—

I have the honor to report that, acting on your instructions received in Otago on June 8th, I came to Wellington in the Queen, leaving on the 10th, in order to make a minute examination of Cook's Strait, and to procure samples of the bottom, and all other information necessary for enabling the best route to be selected for connecting the North and Middle Islands of New Zealand by a sub-marine telegraphic cable.

On my arrival in Wellington as there happened to be no steamer in port which was available for the work, I occupied myself by making an enlarged copy of a portion of the Admiralty chart of the Strait, on which to protract the soundings when taken, and getting the necessary sounding apparatus prepared; but especially by making an examination of all the bays near the entrance to Wellington

Harbor (kindly assisted in this by the scientific and local knowledge of the Hon. J. C. Crawford), and a careful study of the charts with a view to decide on the probably best line.

On examination of the charts various routes suggest themselves, all possessing more or less important advantages peculiar to themselves. Of these the most important, and the only ones to which I shall refer, are:—

1. From Port Gore or Queen Charlotte Sound to Porirua Harbor.
2. From Tory Channel to Ohaoa Bay.
3. From Port Uuderwood to Ohaoa Bay, and
4. From Port Underwood to Port Nicholson or Wellington Harbor.

The first of these routes recommends itself mainly as being across a portion of the Strait where the tidal currents are, for at least the greater part of the distance, but slight, and where the bottom is good probably all the way across; but I do not think it has much, if any, advantage over the fourth route as to these conditions, it is very little shorter, and the end at Porirua would be at times exposed to a very heavy surf. These and the additional consideration that a long and expensive and otherwise useless land line would be required from the southern end of the cable to Picton, made me decide on rejecting this alternative line even before survey.

The seconnd route (Tory Channel to Ohaoa Bay) is by far the shortest, and hence at first sight is most tempting, but even from an examination of the chart, serious objections could be discovered. Thus the line would be athwart a very strong tide in the Strait, and the great velocity of the tidal currents at the entrance to Tory Channel, combined with a comparison of the soundings, rendered it at least probable that the bottom would be rocky, and consequently most liable to damage the cable. The great depth of water on the line is also an objection, though comparatively a minor one, as cables have been successfully laid in greater depths. During the progress of the survey I took a few soundings at the entrance to the Channel which fully bore out the conclusions drawn from the chart; the bottom in each case being hard rock, while the few particles of sand and shells brought up by the lead were obviously being borne along by the current—thus more clearly proving the unfitness of the bottom for a cable bed.

The main advantage of the third alternative route (Port Underwood to Ohaoa Bay) over the fourth (Port Underwood to Port Nicholson) is its comparative shortness, as by its adoption at least six miles of cable would be saved; and as the line would have been more oblique to the tides than that from Tory Channel and hence less liable to injury, I determined to examine Ohaoa Bay, though far from sanguine as to the result, and, should it promise well, to carry a line of soundings thence as well as the line from Port Nicholson to Port Underwood.

After some unavoidable delay the Colonial steamer Sandfly arrived in this harbor on Wednesday, the 28th ult., and the sounding apparatus was fitted on board, but the weather was so unfavorable that we did not leave harbor till Monday, the 3rd inst., on which day we steamed across to Port Underwood, trying and adjusting the sounding apparatus during the passage. On Tuesday and Wednesday we had most favorable weather, and I got a very excellent line of soundings made right across from Port Underwood to Worser's Bay, being ably assisted by Captain Kennedy, of the Marine Board, and by Captain Fox and the other officers of the Sandfly. The route thus surveyed has proved a very excellent one, the bottom being sand, fine gravel, and broken shells the whole way across, though one instructive sounding taken near Sinclair Head, but landward of the intended line, showed a hard rock bottom and caused me to keep somewhat farther to the southward than originally intended. The line as completed, moreover, has the peculiar advantage of being marked out by natural objects the whole way across, so that in an equally fine day and starting from Port Underwood, I would undertake to take a vessel across without deviating in any part many yards from the surveyed track.

After completing this portion of the survey we sailed northward to examine other portions of the Straits, but, owing to heavy gales and the necessity for re-coaling, nothing could be done in the way of actual survey, beyond taking the few soundings in Tory Channel already alluded to, till Saturday, the 15th inst, when we examined Ohaoa Bay, but finding it, as it seemed probable from the chart, both very rocky and much exposed (when we were there the sea outside was perfectly smooth, but there was a very considerable break on the beach, which was for the most part paved with large boulders, and when the anchor was weighed the "pee" was scrubbed bright by friction on the rocks), I deemed it unnecessary to sound across as originally proposed.

I have no hesitation, then, in recommending that the cable should be laid on my surveyed line from Port Underwood to Port Nicholson, starting either from Oyster Cove or Ocean Bay (the former being preferable in some respects, but the latter being very good and making the cable at least two miles shorter), running up Chaffer's Passage, between Barrett's Reef and the shore of the Peninsula, and ending in Worser's Bay. This line alone of all those examined, besides presenting an excellent bottom all the way across, possesses the inestimable advantage of landing both ends of the cable, which, after all, are probably the only very vulnerable parts, in perfectly still water, the bottom rising gradually from 30 or 40 fathoms to 10, and becoming more and more sheltered as the water shoals.

The only objections which can be urged to this route are its comparative length and the danger of vessels anchors fouling on the shore ends; but it must be remembered that it would be really far more economical to pay for 10 or even 20 more miles of cable at first, and to lay it down on a route which would give almost a perfect guarantee of its permanence, than to lay down a shorter line over a track which would probably ensure its destruction in a few months. As to the danger of anchors fouling the cable, I do not think there is any risk, as I propose to lay it down as near the rocks as is prudent, and very considerably nearer than any vessel would be likely to be anchored, the perfect stillness of the water ensuring its not working on to the rocks. I believe, moreover, that vessels very seldom are anchored in Chaffer's Passage at all (and instructions could be issued that they were never to be so), because no sailing craft would take the passage without a good working wind; and even should they

anchor, it would only be in a wind blowing up or down the Passage, so that should they drift at all it would be *in the line* of, and *not athwart* the cable, and thus the chances of their fouling it are very small indeed.

Even should the general line proposed be adopted, however, it might be considered that some deviations might with advantage be made near the ends. For instance, Robin Hood Bay has been proposed for the southern landing, and Lyall and Island Bay for the Northern extremity, as tending considerably to shorten the cable, and to offer greater facilities for the shore connecting lines; and I carefully examined these places, but the result was to render their disadvantages indisputably obvious—thus, I have seen, in comparatively moderate weather, a heavy surf breaking all round Lyall Bay, and the entrance to Island Bay is certainly rocky on both sides, so that there must be a heavy surf there dangerous to the cable in south-easters, while on the morning of the day the soundings were taken, when the Strait was as smooth as I have ever seen it, and all the coves within Port Underwood were as quiet as mill ponds, there was such a break on the shores of Robin Hood Bay as to render it difficult, if not dangerous, to land in a boat.

The surveyed line begins with about three fathoms in Ocean Bay, the bottom being fine grey sand, deepens gradually to 14 fathoms outside Point Robertson, and thence on the line across very gradually to 94 fathoms nearly half way between Robertson Point and Sinclair Head, the bottom varying from fine sand to fine gravel, shells, and soft mud; from this point it shoals again to 70 fathoms, and again gradually deepens to 132 fathoms at a point fully two-thirds across, and which is the ruling depth; thence it shoals gradually, with considerable but not dangerous undulations and slight changes of direction, to 16 fathoms, at which point it turns and runs up Chaffer's Passage, the depth gradually diminishing to about 6 fathoms in Worser's Bay.

The bottom is good the whole way across, as will be best seen by an inspection of the accompanying samples which were brought up on the lead, every sounding being more or less perfectly represented with the exception of a few on the south side which were fine gray sand and were not considered worth keeping, and one or two of the others which were preserved at the time but were afterwards accidentally lost, all the lost ones, however, presenting the same general characteristics to whose which remain. From want of assistance, and the convenience of a regular drawing office, I have not yet been able to complete a chart showing the soundings as taken, and a section of the bottom, but one shall be forwarded as soon as possible after my return from Otago containing all the necessary information; and, meanwhile, I may state that the total distance as measured on the chart, with a fair allowance for all bends and changes of direction, is barely 39 nautic, or about 43½ British statute miles.

In conclusion, I have pleasure in again stating that the whole of the work was greatly expedited by the intelligent watchfulness and zeal evinced by all the officers of the Sandfly, while Capt. Kennedy's local knowledge was invaluable. The Sandfly itself proved exceedingly well suited for the work, and with a few slight alterations which the experience of the last few weeks has suggested, would make an admirable surveying vessel from her light draught of water and general handiness, while she would be of ample size for years to come for carrying the annual supplies to the various outlying lighthouse stations, and similar work.

I have, &c.,

JAMES M. BALFOUR.

The Honorable the Postmaster General,
Wellington.

D.—No. 1D.
(SUPPLEMENTARY.)

FURTHER PAPERS

RELATIVE TO

SUBMARINE TELEGRAPH ACROSS COOK'S STRAITS,

ETC., ETC.

PRESENTED TO BOTH HOUSES OF THE GENERAL ASSEMBLY, BY COMMAND OF HIS EXCELLENCY.

WELLINGTON.

1865.

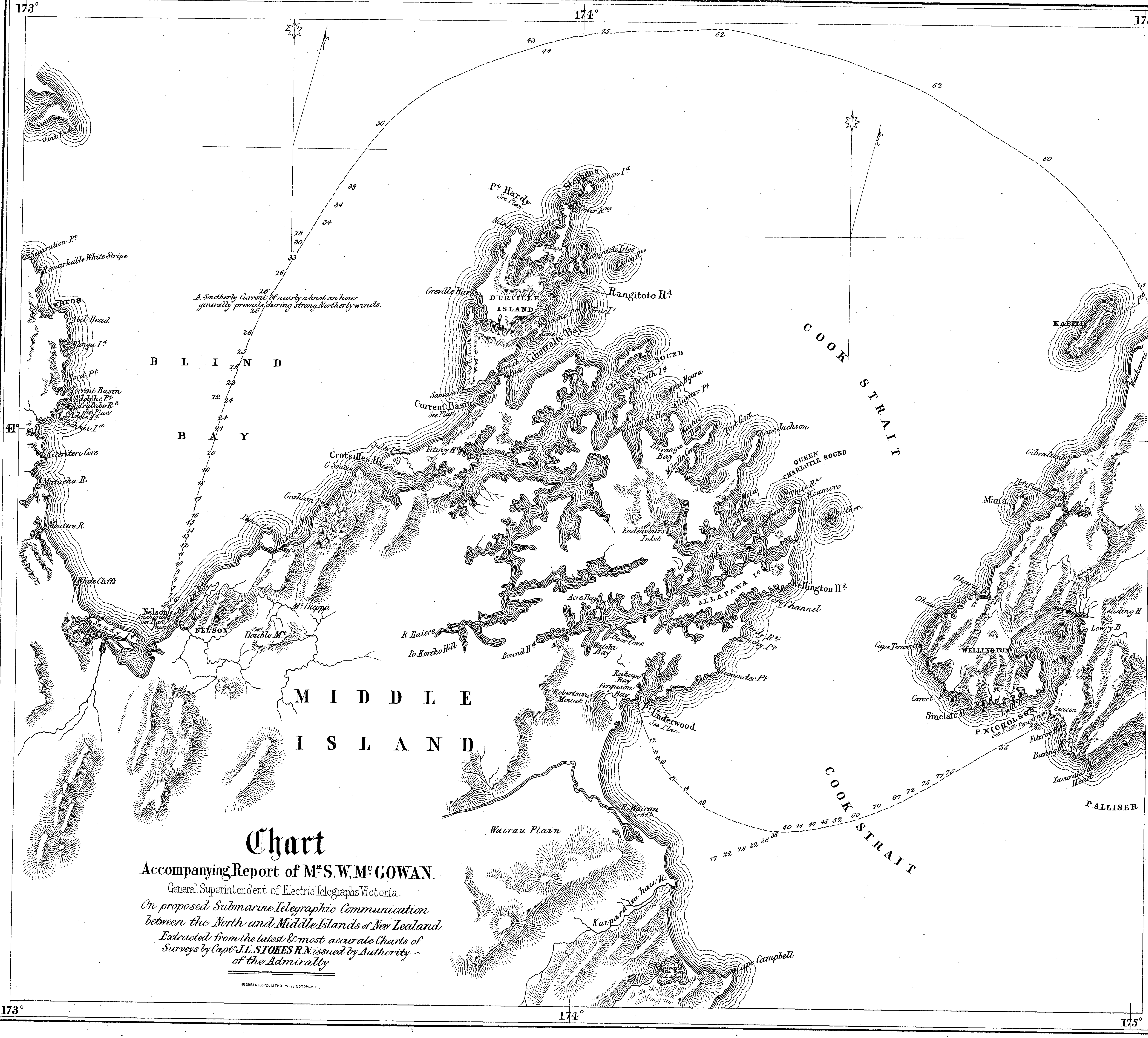
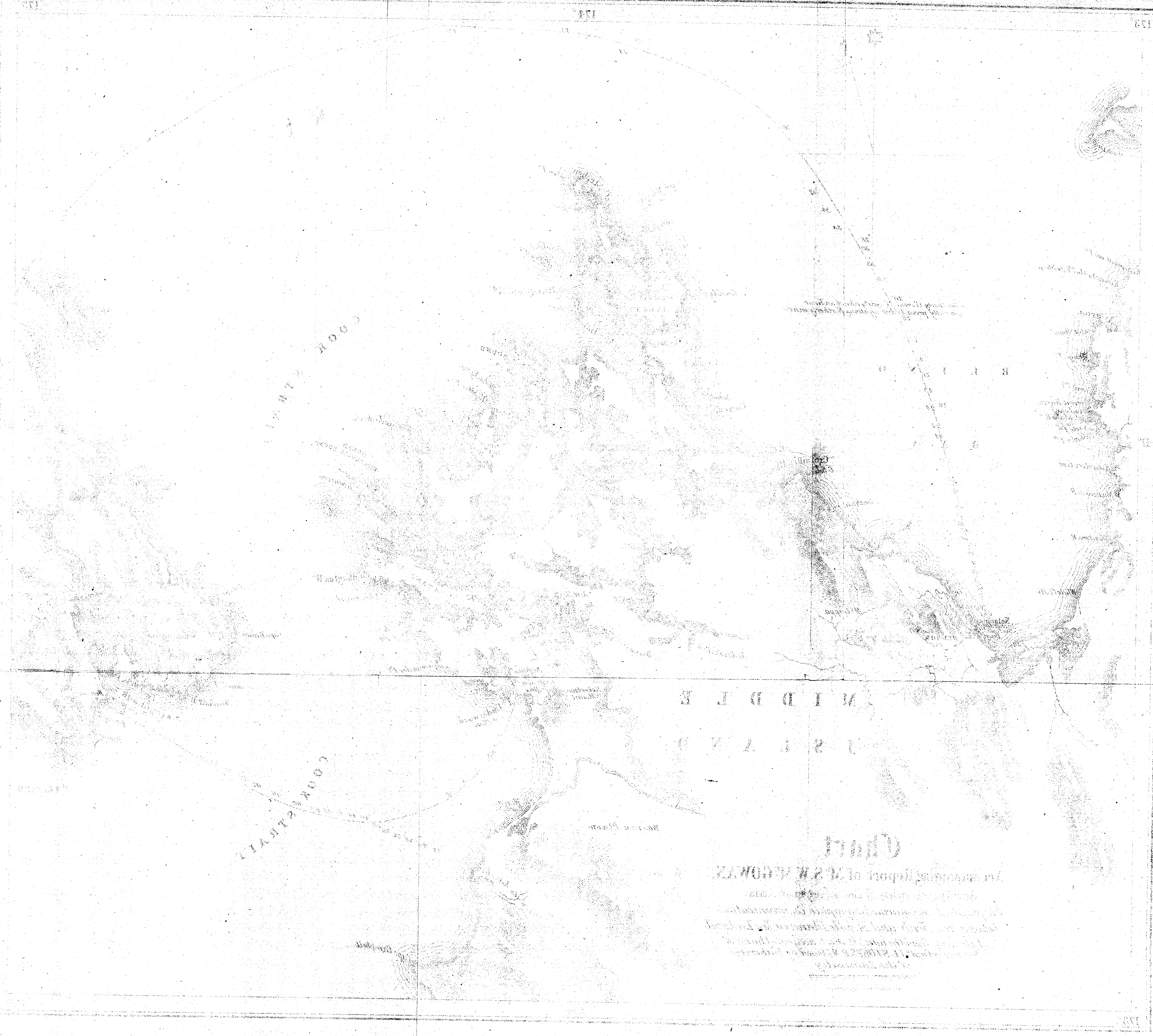


Chart
Accompanying Report of Mr. S. W. McGOWAN.
General Superintendent of Electric Telegraphs Victoria.
On proposed Submarine Telegraphic Communication between the North and Middle Islands of New Zealand.
Extracted from the latest & most accurate Charts of Surveys by Captn. J. L. STOKES R.N. issued by Authority of the Admiralty
HUGHES & LLOYD, LITHO. WELLINGTON, N.Z.
173°
174°
175°
41°
BLIND
BAY
MIDDLE
ISLAND
COOK STRAIT
COOK STRAIT
A Southerly Current of nearly a knot an hour generally prevails during strong Northerly winds.
D'URVILLE ISLAND
Pt. Hardy
Stephens
Stephen Id.
Rangitoto Isles
Rangitoto Rd.
Greville Harb.
Admiralty Bay
French Pass
Current Basin
See Plan
PELORUS SOUND
Forsyth Id.
Guards Bay
Alligator Pt.
Port Gore
Cape Jackson
QUEEN CHARLOTTE SOUND
Endeavours Inlet
Brother
ALLAPAWA Id.
Wellington Hd.
Tory Channel
Acre Bay
Robertson Mount
Kakapo Bay
Ferguson Bay
Pt. Underwood
Wairau Plain
Cape Campbell
Crotsilles Hd.
Fitzroy Hd.
Graham Pt.
Nelson
NELSON
Double Mt.
Mt. Dappa
R. Haiere
To Koreko Hill
Bound Hd.
Separation Pt.
Remarkable White Stripe
Awaroa
Abel Head
Tonga Id.
Nord Pt.
Torrent Basin
Adolphe Pt.
Astrolabe Rd.
Adele Id.
Kiteriteri Cove
Motueka R.
Moutere R.
White Cliffs
KAPITI
Long Pt.
Mana
Cibraltar
Porirua Harb.
Ohariu
WELLINGTON
P. NICHOLSON
Sinclair H.
Cape Terawiti
Leading H.
Lowry B.
Beacon
Fitzroy B.
Barring H.
Taourakira Head
PALLISER
Kaipara ta hau R.
Kaipara ta hau Lake



FURTHER PAPERS RELATIVE TO SUB-MARINE TELEGRAPH ACROSS COOK'S STRAITS.

No. 1.

The Hon. the COLONIAL SECRETARY, Tasmania, to the Hon. the COLONIAL SECRETARY, New Zealand.

SIR,— Tasmania, Colonial Secretary's Office, 14th July, 1865.

I have the honor to acknowledge the receipt of your letter of the 1st ultimo, informing me of the intention of the New Zealand Government to connect the opposite shores of Cook's Straits by submarine telegraph, and requesting to be furnished with any suggestions or information this Government may possess upon the subject of such lines.

In reply I have much pleasure in forwarding the accompanying communication from the Director of Public Works; and I trust that the information its contains may be of service to the Government of New Zealand.

I have, &c.,
JAMES WHYTE.

The Honorable the Colonial Secretary, Wellington, New Zealand.

Enclosure 1 to No. 1.

W. R. FALCONER, Esq., to the Hon. the COLONIAL SECRETARY, Tasmania.

SIR,— Office of Public Works, Hobart Town, 12th July, 1865.

I have the honor to transmit herewith the accompanying printed paper, which affords a large amount of the information applied for, and beg to direct particular attention to the letter therein of Mr. McGowan, the Superintendent of Telegraphs for Victoria.

The results attending the laying of the telegraph cable between Tasmania and Victoria go to show—

1st. That the cable adopted for that purpose was too light for laying in the narrow straits of the Australian Colonies, owing to strong currents and rocky bottoms.

2nd. That in such a work it is not desirable to trust to one copper conducting wire, as in the Tasmanian cable.

3rd. That heavy shore ends should be attached to any cable laid in the Australian or New Zealand waters. The Tasmanian cable was deficient in this respect.

4th. That great care should be taken in making a survey to avoid a rocky bottom or beds of kelp, as the Tasmanian cable was several times broken by being dragged by the kelp against the rocks and boulders at the bottom.

I agree with Mr. McGowan that the cable designed by Messrs. Ford and Jenkins for the Indian lines in the China seas is the most suitable, and the best adapted I have yet seen, for use in the Australian Colonies. I have no doubt that this cable may be improved upon—perhaps by the introduction of fluid gutta-percha or india-rubber, as in the copper-sheathed cable mentioned by Mr. McGowan.

I strongly recommend that no payment on account of a cable for the Australian or New Zealand Colonies should be made till such time as the cable has been at work for a term of not less than three months, when a payment of fifty per cent. might be made; at the end of six months, twenty-five per cent. additional; and the balance at the end of twelve months—all such payments to be made with interest from the time the cable is laid, and found to be in working order, the contractor being bound to keep and maintain it in good working order for twelve months.

I forward, for transmission to New Zealand, a sample of the Tasmanian cable.

I have, &c.,
W. R. FALCONER,
Director of Public Works.

The Honorable the Colonial Secretary, &c., &c.

Sub-enclosure to Enclosure No. 1.

REPORT of the SELECT COMMITTEE on the SUBMARINE CABLE.

Tasmania, 31st August, 1864.

Your Committee have held three meetings, and have examined such witnesses as they considered were competent to give evidence on the subject; and have also had before them communications from the adjoining Colonies, which are annexed to this Report. And your Committee have come to the decision that it would be undesirable, in a pecuniary point of view, to take any steps for the re-establishment of the present cable—specimens of which were exhibited to your Committee.

JOHN DAVIES, Chairman.

Evidence.

Mr. FALCONER, Director of Public Works, examined by Mr. DAVIES:

I am Director of Public Works for Tasmania, and Inspector of Telegraphs. The submarine cable has been laid during my tenure of office. I have a knowledge of its history since its first submersion, during its active operation, and since it became silent. I am aware that a few days after it was first laid it gave way, close to the shore at the north end of King's Island, owing to the rocky bottom and its entanglement in the kelp. Its direction was subsequently changed by the contractor, who relaid it to a sandy patch about two miles from its former bed. The cable shortly afterwards

became broken again, off Sea Elephant's Bay, 18 miles south from the northern end of the island, and did not again work between Tasmania and Victoria. It worked, however, for a considerable time, between Circular Head and Low Heads; also between King's Island and Cape Otway. The intervening space was silent. Several attempts were made by the Governments of Tasmania and Victoria to splice the cable between King's Island and the Hummocks. The expeditions were not sufficiently strong to effect the repair; they were sent more for the purpose of ascertaining the nature of the damage. The Report of their investigation is as follows:—"The cable was damaged for about 4 or 5 miles out from King's Island towards the Hummocks; and no repair could be effected without an additional shore end of cable, which would require a steamer to lay it." No estimate was made as regards the probable cost; but it was recommended that further survey should be made to ascertain whether there were loose rocks on the bottom at that spot. An estimate was made then, at a cost of £12,000, to lay a new piece of cable from the Hummocks to the north end of King's Island, it being believed that there were rocks at Sea Elephant's Bay which had caused the fracture. I have been to King's Island, and also to the Hummocks. A land line runs across King's Island, a distance of 18 miles, and across the Hummocks, 6 miles. Between the two islands a very strong current runs; and if rocks exist on the bottom there, the injury to the cable must of course be great. We have no means at present of ascertaining whether the cable from Circular Head to the Hummocks is perfect or otherwise: the distance is about 30 miles. I am of opinion that the cable from Circular Head to Tamar Heads might be repaired at a very trifling cost, only one mile of new cable being required; provided, of course, that no further injuries have been sustained since that portion was broken by the anchor of a vessel. Any other cable would answer if spliced on to the present one. It would, in my opinion, be desirable for the interests of the Colony to have the cable from Circular Head to Tamar Heads repaired, if a competent person could be found to undertake the duty. I am of opinion that Mr. Packer, with a little practice, might be able to effect it. The amount of revenue derived from messages between Circular Head and Launceston, when that line was in working order, was very inconsiderable. The general idea which has since prevailed as regards the course which should have been adopted, is, that the cable should have been, in the first instance, laid between Tamar Heads and Cape Schanck, which, according to the marine survey taken by Captain Stokes, averages a depth of 40 fathoms on a sandy bottom. Mr. Savage repaired the cable at Tamar Heads, but it never worked since he mended it. I believe that, had the splice been properly effected, the line might have been in working order at the present time. I consider that Mr. Savage's reports on the subject of the cable were very unsatisfactory. The Victorian Government refused to sanction any further outlay on the cable, and consequently the Tasmanian Government ceased its efforts to remedy the damage. Copies of Mr. Savage's Report were forwarded to the Superintendent of Telegraphs in Victoria. The Victorian Government did not act upon Mr. Savage's Report, but refused to grant further assistance as recommended by Mr. McGowan, the Superintendent of Telegraphs. The contracts for laying down the cable were £50,000, as will be seen by the return which I hand in. (Paper handed in.) Several persons, including Mr. McNaughton, considered Mr. Savage to be a highly competent person. I cannot say what the opinion entertained of Mr. Savage by Mr. Butcher was. I do not think Mr. Savage was competent or qualified to superintend and command an expedition of the kind. I produce three specimens of the cable: they are all in perfect working order, although one of them has been much chafed by the rocks. A portion which I have at Launceston (taken, I think, from King's Island) has specks in the copper wire which render it extremely brittle, and consequently useless at those places. There must have been some original defect in the copper wire where these spots present themselves—no chafing on rocks would have caused these spots; but they would, no doubt, increase on account of the heavy batteries that had to be kept at work, and the connection would at last be destroyed. The cable across the Straits might be repaired, but at a very considerable cost. It would be impossible to estimate the amount without survey. To lift the cable, for the purpose of selling it, would cost more than any sum it could afterwards realize. Great advantage would no doubt accrue to Tasmania from the renewal of telegraphic communication with Victoria, but it would not be commensurate with the expense of repairing the old cable. The terms of the contract as first made between the Tasmanian Government and the contractors were, that the cable should be kept in working order for three months after being laid; subsequently this was altered by the Government to one month. Had the original contract been carried out, no payment could have been made or demanded. I am not able to say whether the Victoria Government recognized the terms of contract finally agreed upon. I beg to hand in Mr. McGowan's Report as regards the leasing of the line, and repairs; the annual expense of the line, and the annual receipts. This Report was given to Captain Gilmore when preparing to visit England about two years ago, with a request that he would endeavour to make arrangements in England with parties there to repair the line, and afterwards lease and work it. Captain Gilmore has not reported in writing the result of his inquiries, but he stated verbally to Mr. McGowan and myself that no parties he had seen in England on the subject would entertain the proposition; and he also stated that he had been informed that "it was one of the worst cables that had been manufactured in England, and had not been made to last." I believe I have given his exact words. I produce a specimen of the proposed cable from the east end of Java to Moreton Bay: it has seven copper wires. I have read the terms of the proposed contract, which are as follows:—(Proposed contract read.) The tender for this cable would be at £220 per mile: that for the Tasmanian cable was about £200. I am of opinion that a line should be kept in thorough working order for at least three months after having been laid before payment should be made. I have sent to Melbourne for samples of the newest cables manufacturing in England, and expect them here by the next trip of the "Southern Cross." I have also written to Mr. McGowan for his opinion as to the idea of repairs to the present cable, and also as regards the notion of laying down a new cable. I cannot say if the Victorian Government would join in a scheme for laying a cable between Tamar Heads and Cape Schanck. The shore end at Circular Head is, I believe, in perfect working order, the bottom there being sandy. No portion of the submarine cable is at work now. I could not recommend that a quantity of the cable should be raised, if required, for laying across the Derwent, as this might involve greater expenditure than the cost of a new line of cable.

SIR,— Public Works Office, Launceston, 6th August, 1864.

I beg to forward you herewith letter, accompanied with two samples of submarine telegraph cable, received from Mr. McGowan, the Superintendent of Telegraphs of Victoria.

I beg particularly to recommend your attention to Mr. McGowan's recommendation, that it be "a condition that the successful tenderer would be required to guarantee the integrity of the work for twelve months."

I have, &c.,

John Davies, Esq., Chairman of the Telegraph Cable Committee. W. R. FALCONER.

Department of Electric Telegraph,

MY DEAR SIR,— (Office of the General Superintendent) Melbourne, 3rd August, 1864.

I am in receipt of your favour of the 27th ultimo, and in compliance with your request have sent per "Southern Cross" S.S. two samples of cables as seen by you when you were last at my office. One sample (the copper-sheathed) is made by Messrs. Siemens and Halske, the other by Glass, Elliot, and Co. I do not consider that the copper-sheathed would be so serviceable as the other for Bass' Straits, as it is not intended for anything but deep sea work, or sounding at least below 200 fathoms, while the other was designed by Messrs. Ford and Fleeming Jenkins specially for the telegraph to India Companies lines in the China Seas and Torres' Straits. This latter specimen of cable is in every respect the best I have yet seen for such conditions as we have in Bass' Straits: it is of great strength, increased conducting power, from the enlarged size of the copper wires, and well protected against corroding or abrading influences by the iron sheathing and outer covering of Jute and Clark's patent, a kind of hydraulic cement.

The following are the components of this cable:—

7 Copper wires in one strand, per knot	150 lbs.
3 Coverings of gutta percha and 3 of Chatterton's compound	230 lbs.
Weight of core	380 lbs.=3·40 cwt.
Jute and tar	4·20
10 best charcoal iron wires, No. 6	52·40
Outer covering, Clark's patent	14·00
Weight per knot complete	74·00 cwt.

The shore-ends would be prepared in the same way, but of much heavier materials, and would weigh 154 cwt. to the mile.

Messrs. Glass, Elliot and Co., give their prices for the above, as follows:—

For main cable, f. o. b.	£151 per mile.
For shore-ends	244 "

You will, of course, note that the above estimates and prices are for nautical miles. Considering that the prices stated are intended to cover all expenses of shipment, I do not look on them as unreasonable, or as being more than fair to the manufacturers.

The old cable having now been so long abandoned, the chances of utilising any portion of the several sections are remote, or at best very uncertain; it therefore appears to me that a proper course to adopt would be to invite offers for laying a new cable, tenderers to furnish samples of the cable they would propose to supply. Make it a condition that the successful tenderer would be required to guarantee the integrity of the work for twelve months, or that he might have a lease of the communication for a stated term of years, under certain conditions.

If notices were published at home, I am sure you would receive several tenders. Notices might likewise be published in the Colonies as well, although I do not consider that you would be likely to obtain more eligible local tenders than were sent in on the previous occasion.

The best landing for the cable on this side would be Westernport Bay, about ten miles to the eastward of Cape Schanck,—any other part of our coast in the vicinity of Cape Schanck would be altogether too rock-bound for the safety of a cable. Our present line to Cape Schanck could easily be connected with the cable, so that the cost for land line would be very trifling.

You may retain the samples of the cables, as I have kept duplicate portions here.

Trusting that the matter may be taken up in a practical and energetic spirit,

I have, &c.,

W. R. Falconer, Esq., Hobart Town. SAMUEL W. MCGOWAN.

No. 2.

The CHIEF SECRETARY, Melbourne, to the Hon. the COLONIAL SECRETARY, New Zealand.

SIR,— Chief Secretary's Office, Melbourne, 21st September, 1865.

I have the honor to acknowledge the receipt of your letter of the 1st of June, intimating that the New Zealand Government is desirous to connect the opposite shores of Cook's Straits by means of a Submarine Telegraph Cable, and requesting that this Government would furnish any suggestions or information which might serve as a guide in carrying out such work.

In reply, I transmit to you the accompanying Report of the General Superintendent of the Electric Telegraph in Victoria on the subject referred to, and a sample of cable is sent separate.

I have, &c.,

J. MOORE,

The Hon. the Colonial Secretary, Wellington, New Zealand. (for Chief Secretary.)

Enclosure to No. 2.

S. W. MCGOWAN, Esq., to the CHIEF SECRETARY, Melbourne.

Electric Telegraph Department,

SIR,— (General Superintendent's Office,) Melbourne, 3rd July, 1865.

With reference to the letter of the Hon. the Colonial Secretary for New Zealand, dated

1st ultimo, forwarded for my consideration and report from your office on the 14th idem, requesting information in respect to the proposed connection of the North and Middle Islands of New Zealand, by means of a submarine cable crossing Cook's Straits at the most favorable point of departure on either shore, I have the honor to submit the following observations:—

REPORT.

1. It is essential to the proper consideration of the subject on its general merits that special regard should primarily be directed to the peculiar physical features of the locality in which it is proposed to deposit the cable.

The necessity for such a precaution will be quite obvious when it is remembered that telegraph cables are usually constructed to meet certain existing conditions, previously determined by practical observation or inspection.

2. With the view of eliminating the most ample and authentic information on this point, I have carefully consulted the best charts, and the latest and most accurate detailed accounts of surveys of Cook's Straits and adjacent shores, published through the Hydrographic Office under authority of the Lords Commissioners of the Admiralty. From the particulars thus obtained, combined with a personal reference to the experience of several masters of vessels frequenting Cook's Straits, I have been enabled to deduce the following conclusions.

3. Atmospheric disturbance, in the form of violent gales of wind, accompanied by a heavy confused sea, appear to be more than usually prevalent in and about the locality under mention. The accounts of surveys before referred to show that marked irregularities in soundings and the presence of very strong tides are leading characteristics of Cook's Straits.

4. These conditions, I need scarcely remark, present serious obstacles to the permanent success of almost any submarine work of magnitude, but perhaps most of all to the permanency of a submarine cable.

5. South-east gales prevail most frequently in May, June, and July; while gales from the opposite quarter (north-west) are usually common during the spring and summer months (September to March).

6. On the chart accompanying this report, I have indicated two proposed courses for a submarine cable—one from Pencarrow Head to Port Underwood, by a bearing deviating to the southward; and another from a point on the mainland, nearly abreast Kapiti Island, northerly, around Cape Stevens, and through Blind Bay to the Port of Nelson.

7. The soundings on a direct course from Pencarrow Head to the entrance of Port Underwood (about forty miles) are shown to be very irregular, varying suddenly twenty and even thirty fathoms in distances of from three to five miles. A more favorable line of soundings might, I think, be found on a course bearing from Pencarrow Head for the mouth of the River Kaiparatahau, to within about ten miles off that point; then bearing gradually westward, and northward to Port Underwood. This would increase the distance by about ten miles, but the soundings would appear to be much more regular than on the direct course. The deepest is marked as ninety-seven fathoms, while the general average depth is shown as forty, fifty, sixty, and seventy fathoms, undulating within distances of five miles to the extent of from ten to twenty-seven fathoms. The bottom shows principally sand, mixed occasionally with minute shells.

8. The distance from Port Underwood to Nelson overland is probably about fifty miles, but I am without information as to the nature of the country, or relating to the facilities for intercourse between those places; there would probably, however, be no serious difficulty in constructing a line of telegraph along the route, provided that timber suitable for poles might be readily obtainable.

9. The connection on the northern shore between Pencarrow Head and Wellington would be effected by continuing the cable, by overland line, to the most convenient position inside the entrance; thence across the bay to the best landing; and thence, by a short length of land line, to Wellington.

10. Should a favorable position for landing the northern end of the cable be attainable on the west side of the entrance, at or near Lyall Bay, such a course might perhaps be adopted—the communication to be completed by a land line to Wellington; but a decision as to the best landing point could not be determined until a careful survey of both localities might first have been made.

11. In any case, I consider that it would be unadvisable to submerge the cable directly through the entrance to the inlet, as the damage from anchors of vessels would present a too serious risk of injury to the work, irrespective of other important considerations in connection with the effects of strong tidal currents, and the greatly increased power of the sea on a cable when laid in less than twenty fathoms water.

12. The general character of Cook's Straits, viewed by the soundings (*vide* chart), is most unfavorable to the permanent success of a submarine cable, as a deep and irregular channel appears to exist, with greater or lesser uniformity, throughout nearly the whole extent of the passage, commencing, for example, at a point nearly midway between Taurakiri Head and Cape Campbell, and terminating about midway between Porirua Harbour and Cape Koamoroo, and showing soundings as follows:—First two hundred and fifty fathoms, sand bottom; then on a course northerly and westerly, within less than seven miles, ninety-seven fathoms, bottom not stated; then on same course, at about five miles to seven miles, one hundred and two fathoms sand and shell, seventy-eight fathoms rock, then ninety-six and, at seven miles farther, one hundred and twenty-two fathoms sand; then one hundred and ninety-six fathoms sand and mud, one hundred and fifty-seven fathoms dark sand, one hundred and forty-three fathoms sand and shell; one hundred and seventy-eight fathoms, dark sand—the last sounding at about twelve miles distant from that of one hundred and twenty-two fathoms; then at ten miles further, on nearly the same course, and at what may be considered the northern entrance to the Straits, is shown eighty-six fathoms, sand.

13. When it is borne in mind that the ordinary tidal currents commonly set through the channel in which these soundings have been found, at a velocity of from two to five knots per hour, the extreme difficulty of submerging a submarine cable in such a position, having due regard to the future stability of the work, may readily be understood; the currents would, of course, flow generally at right angles to the direction of the line, so that at points where through the inequalities of the bottom the cable would remain partially suspended (so to speak), the active oscillation occasioned by the currents

would in a comparatively short space of time render the cable extremely defective, if not wholly useless; while as to the prospects of repairing breaks or defects in such a position, I need scarcely remark that the chances would be extremely doubtful, if indeed the process would be practicable.

14. These considerations have led me to the conclusion that it would be injudicious to select a route for the proposed cable directly across any portion of Cook's Straits.

15. A northern route *(vide* chart), and from all the evidence I have been enabled to collect apparently a most favourable course for the purpose required, might be found by starting from the position marked on the chart as Waikanae (latitude 40° 53' South, longitude 175° East), keeping to the northward of Kapiti Island, thence north-westerly until about fifteen miles due north of Cape Stephens, thence south-westerly to a landing place to be selected near Nelson anchorage.

16. The soundings on this route are comparatively even and regular, not exceeding seventy-five fathoms, and showing in the shallower portions traversing Blind Bay extensive plateaus, varying from twenty-five fathoms to thirty-five fathoms in depth, sand and mud bottom.

17. The bottom, over the whole distance, from abreast of Kapiti to Nelson anchorage, is shown to be composed of sand, sand and shell, sand and mud, and mud alone.

18. On the whole, the northern route thus indicated presents in its leading and most important essentials a much superior course to a direct (or semi-direct) line crossing the southern portion of Cook's Straits; the principal drawback, however, to this superiority of position would be the necessarily increased extent of ground to be traversed by the cable.

19. The length of cable requisite would probably amount to about one hundred and twenty-five miles. This, as compared with the relatively much shorter length of cable (say fifty-five miles) necessary for the route *viâ* Pencarrow Head and Port Underwood, would perhaps carry some weight in determining the question of route; but while allowing full force to every argument in favour of the more direct route, I am nevertheless of opinion, from the peculiar nature of the leading features in each case, viz., on the one side marked abruptness in the soundings, evidencing great unevenness in bottom, the presence of shingle (usually shifting in position), stones, rock, &c., accompanied by powerful tides in narrow waters. On the other side, a nearly total absence of marked unevenness or irregularity in the bottom; a decided preponderance of soundings most favourable for the security of a submarine cable, and a considerably reduced force in tidal currents, that after impartially considering the respective merits of the question, the longer route will be found eventually to be the safest and best for the ultimate success of the work.

20. The northern route, if adopted, would necessitate the construction of a short land line from Wellington to Waikanae, *viâ* Ohario Bay and Porirua Harbour, a distance not exceeding forty miles; a length of probably two or three miles of land line would also be required at the Nelson termini of the line.

21. Difficulties would, of course, require to be surmounted in extending a land line from Wellington to Waikanae; but I apprehend that nothing more serious would present itself (assuming the Natives to be pacific) than has already been overcome in this Colony in extending telegraphic communication to Cape Otway, where the impracticable nature of the country compelled the adoption of manual transport for over fifteen tons weight of material along some sixty miles of line, the track being then too dangerous to admit of either bullocks or pack horses being employed.

22. The relative propositions as to distances, stand as follow:—

Southern Route viâ Port Underwood.

Cable	55	Miles.
Land line on Middle Island	50	„
Land line on Northern Island	3	„
Total	108	„

Northern Route, viâ Waikanae.

Cable	125	„
Land line on Northern Island	40	„
Land line on Middle Island	3	„
Total	168	Miles.

23. Having thus, I hope, fully discussed the question of route for the proposed line of communication, I have now to deal with the proper description of cable to be recommended for the purpose, embracing also the cost of the work.

24. The forms and adaptation of submarine cable have undergone many most important and valuable modifications and improvements during the past five years; indeed it may be said that the form and mode of manufacturing telegraphic cables is constantly in a progressive state, as new conditions become gradually developed, either through scientific research or by the aid of practical experience, from the results already obtained in carrying out extensive submarine works for electro-telegraphic purposes in various parts of the world.

25. A valuable record of statistics recently (April, 1865,) published, concerning submarine cables, through a most authentic source in England, proves the following facts, selected from other matter in the same paper, as being specially applicable to the case under mention:—

That no *light* cables have proved very successful, even when laid in a moderate depth; they are subject to continual breakages by anchors and currents, when the outer wires have been rusted away by the chemical action of the salt water and of certain metals, such as copper, which occasionally enter into the composition of the sea bottom, the bare core soon becomes useless, and quite unable to exist deprived of its iron protection.

That all heavy cables laid in a moderate depth have proved permanently successful and efficient, and when broken occasionally by mechanical violence, such as anchors or currents, they are capable of being easily and speedily repaired. This is the only class of submarine telegraph that up to the present time has had permanent success. Cables laid in a moderate depth are such as lie in twenty to one hundred fathoms, a less depth than twenty fathoms is highly objectionable. A heavy cable may be taken as weighing two tons or more per statute mile; and a light cable is that whose weight is below that mark, though of course the weight of the iron casing must be adapted to the nature and depth of the bottom.

26. I need scarcely observe that the results above-mentioned have been derived from well authenticated official returns, embracing among other interesting particulars, facts as to the number of conducting wires, the length, the depth of submersion, weight per mile, and the period during which each cable has worked, on all the principal telegraph lines in Europe and elsewhere, since 1851.

27. Full consideration of the valuable experience thus available, has led me to recommend a form of cable which I believe would be best suited for the proposed connection now under discussion; and I am fortunately in a position to furnish a specimen section (herewith supplied) of the particular description of cable referred to, together with details as to the probable cost of the work.

28. My estimates are as follows:—

Southern Route as per Chart.

Forty miles of main cable, at £151	£6,040	0	0
Fifteen miles of shore end, at £244*	3,660	0	0
	£9,700	0	0
Provision for—say sixty miles of land line, at £50	3,000	0	0
Testing boxes, instruments, fittings, and other gear	1,300	0	0
	£14,000	0	0
Expenses attending transport from England, including cost of steam power in laying cable between the points indicated	7,500	0	0
Engineers' expenses, including temporary labour	1,500	0	0
Incidental expenses	1,000	0	0
Estimated total cost of the work	£24,000	0	0

Northern Route as per Chart.

One hundred and twenty miles of main cable, at £151	£18,120	0	0
Ten miles of shore end, at £244*	2,440	0	0
Provision for—say forty miles of land line, at £50	2,000	0	0
Testing boxes, instruments, fittings, and other gear	1,300	0	0
	£23,860	0	0
Expenses attending transport from England, including cost of steam power in laying cable between the points indicated	8,000	0	0
Engineers' expenses, including temporary labour	1,500	0	0
Incidental expenses	1,000	0	0
	£34,360	0	0

29. The above estimates, in so far as the probable cost of the cable is shown, are based on the authority of the description and prices given by Messrs. Glass, Elliott and Co., cable manufacturers, for the particular description of cable now under mention, as follows:—

Components.	lbs.	cwt.
Seven copper wires, in one strand, per knot	150	
Three coverings of gutta percha, and three of Chatterton's compound	230	
Weight of core	380	3·40
Jute and tar		4·20
Ten best charcoal iron wires, (No. 6)		52·40
Outer coverings of Clark's patent preparation		14·00
Weight per knot, complete		74.00

Shore ends of the same materials, but much heavier, would weigh one hundred and fifty-four hundredweight to the mile. The prices named are as follows:—

For main cable, f. o. b., £151 per mile. For shore ends, f. o. b., £244 per mile.

30. It will thus be seen that the cable recommended for Cook's Straits, would consist of a single copper conductor, composed in the aggregate of seven small copper wires, combined in one strand, insulated by a triple covering of gutta percha, and the same of Chatterton's patent compound, forming together the core; this would be protected by a covering of jute saturated in tar, which would interpose between the insulation and the ten No. 6 iron wires, forming the sheathing next to be applied as the outer protection of the core; this in turn would be covered by Mr. L. Clark's patent preservative preparation as a preventative of rapid oxidation in the sheathing wires.

31. I have carefully examined the various specimen sections of cables at present in my possession, and find none, in my opinion, so well adapted for the proposed service as that now recommended.

32. With regard to the mode in which the work should be performed, I consider that the best course would be to invite and accept tenders in England, from competent persons, for carrying out and completing under stated conditions the whole of the submarine portion. The short lengths of land line required on either side of the Straits, might in the meantime be provided directly under local supervision.

I have, &c.,
SAMUEL W. McGOWAN,
General Superintendent of Electric Telegraph.

The Hon. the Chief Secretary, &c.

* Geographical measurement.