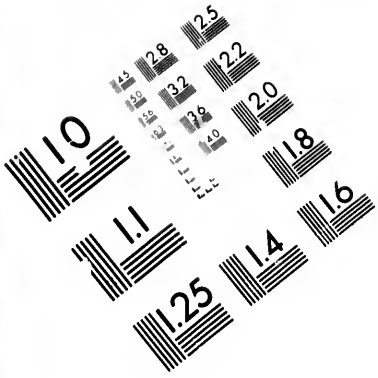

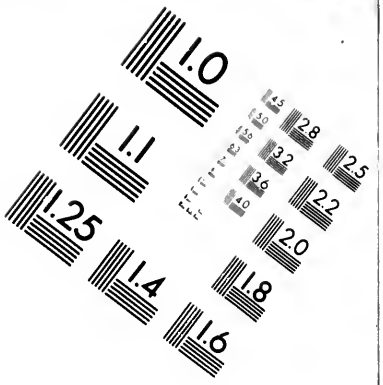

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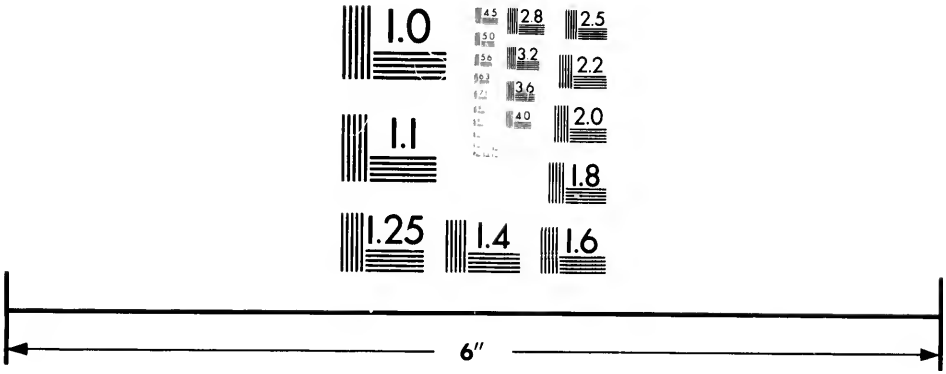

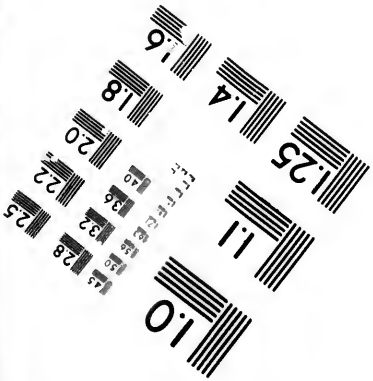

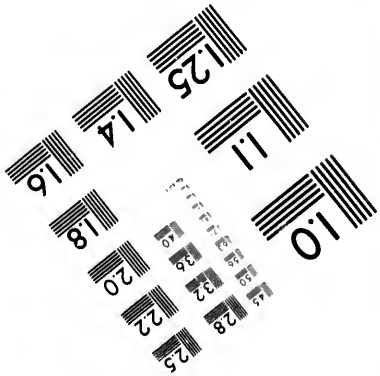

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THE PACIFIC CABLE.

Letter from Mr. Sandford Fleming to the Minister of Trade and Commerce, ex-President of the Colonial Conference, 1884.

OTTAWA, July 20th, 1894.

THE HONOURABLE MACKENZIE BOWELL.

Dear Sir,—I feel it my duty to point out that it seems to me expedient for the Canadian Government, at once to invite cable manufacturing firms or others to state the terms upon which they would be prepared to lay the Pacific Cable, supply all required station buildings, instruments and equipment generally, and maintain the whole in efficient working condition. I beg leave to submit the following reasons, viz.:—

The Conference passed unanimously five resolutions (copies appended) bearing directly on the establishment of a Pacific cable. The first states: "That immediate steps should be taken to provide telegraphic communication by cable, free from foreign control, between the Dominion of Canada and Australasia." It was considered desirable to ascertain definitely the cost of the undertaking, and it was assumed that to obtain that object a survey was necessary; it was, therefore, resolved in the second resolution "That the Imperial Government be respectfully requested to undertake, at the earliest possible moment, and to prosecute with all possible vigour, a thorough survey, the expense to be borne, in equal proportions, by Great Britain, Canada and the Australasian Colonies."

The fifth resolution threw upon the Canadian Government the duty of giving effect to these resolutions and "generally to take such steps as may be expedient, in order to ascertain the cost of the cable, and promote the establishment of the undertaking in accordance with the views expressed in the Conference."

The Conference rose on July 8th; next day the delegates proceeded to Toronto. The party was joined by Mr. Alexander Siemens, President of the Institution of Electrical Engineers, and head of the well-known firm of Siemens Brothers. Mr. Siemens, for some weeks back, had been engaged in laying the seventh cable which his firm has laid across the Atlantic, and arrived in Ottawa on the 9th, too late to give evidence at the meetings of the Conference, should he have been asked to attend. Mr. Siemens, however, placed in the hands of each delegate a paper containing his views on the Pacific cable. In this paper he points out that the character of the Pacific Ocean is already sufficiently known to admit of the cable being laid, without such a survey as that contemplated by the second resolution. I enclose a copy of Mr. Siemens' paper.

This opinion, coming from such an authority, strongly impressed the delegates, and in conversations I had with them I found the general feeling to be, that the Canadian Government should not wait for a survey such as that proposed, but should at once invite cable manufacturers to state the terms upon which they would carry out the work and leave it in a complete and perfect condition.

In taking this step it would be necessary to furnish a general specification of what is required, in order that all offers be made on the same basis; moreover as it is desirable to have full information on all points, the offers to be received should embrace the cost of the cable by alternative routes.

In travelling with the delegates during the past ten days I have had opportunities of discussing with them the financial aspect of the Pacific Cable. I likewise obtained from Mr. Siemens full explanations on all the matters alluded to in his paper.

I feel warranted therefore in submitting for the consideration of the Government the following remarks: The two main points to be considered are:

1st. The revenue, calculated on the business which may reasonably be expected.

2nd. The annual charges on revenue.

With respect to the revenue. If it will take three years to establish the cable, 1898 will be the first year of its full operation. On pages 70 and 71 of the report on the mission to Australia, will be found an estimate of the proportion of business which would fall to the share of the Pacific Cable for that year, 1898. The estimate was made a year ago and was based on the assumed telegraphic business for 1893 between Australia and Europe, which has been exceeded by actual results. *See* foot-note, page 71. Correcting the estimate in this respect, the business for 1898 may be set down at 1,105,000 words, which reckoned at two shillings a word would yield a gross revenue for the first year's operation of the Pacific Cable of £110,000. It will be borne in mind, moreover, that this estimate is for European business, and includes nothing for the business between Canada, the United States and Australia, at present insignificant, but which, in a few years, with greatly improved facilities, will undoubtedly develop to considerable proportions. For these reasons I am satisfied that the estimates submitted will be fully realized and more than confirmed by actual results.

Bearing on these estimates, a friend wrote me from London a few weeks back, as follows: "I have been looking over the proceedings of the Colonial Conference of 1887, where a memorandum of yours is given, dated April, 1886 (page 101). In it you show a probable traffic for the year 1893 of 133,000 messages, equal to 1,330,000 words. The actual business for the past year, according to Sir John Pender, was 1,306,716 words, and according to Australian returns, 1,401,293 words. In either case the prediction made eight years ago is approximately correct." I mention this merely to bring out the fact that the principles on which the estimates are formed, are sound, and that the estimates themselves may generally be considered safe.

With respect to the charges on revenue; viz.:—

1. Interest on capital.

2. Working staff and management.

3. Repairs and maintenance.

The first and second are constant, the third is variable. Experience goes to show that failure and interruptions in cables, due to defects in manufacture or causes connected with laying, generally take place within the first year or two. For this and other reasons, I propose that the manufacturers should be asked to undertake to keep the cable in efficient working order for three years; we may thus eliminate from revenue account for that period all charges for repairs and maintenance.

Assuming that the cost of the cable and its maintenance for three years will be, in round figures, £2,000,000, the revenue account for the year 1898 would stand as follows:—

Earnings as estimated.....		£110,000
Interest on £2,000,000 at 3 per cent...	£60,000	
Staff and management.....	30,000	
		90,000
Surplus revenue.....		£ 20,000

In the above I have taken Mr. Siemens' estimate of the cost of staff required for stations, and office expenses at each point, viz., £24,000 I have increased Mr. Siemens' allowance for general management to £6,000, the two making in all £30,000 per annum. This charge will be constant, and will suffice. as pointed out by Mr. Seimens, for a business more than six times greate. than that estimated for the year 1898, and by introducing duplex working, for a traffic ten or twelve times greater.

I have pointed out elsewhere that the average normal increase of telegraph business between the Australasian Colonies and Europe was 14 per cent per annum, during the period when the high rates charged for a period of eight years were in force, that is to say, under a tariff rate of 9s. 4d. per word from 1882 to 1890. Manifestly under the low rates proposed to be charged by the Pacific Cable, the normal increase will be greater than 14 per cent per annum ; more especially as the whole North American business will receive a great incentive from direct communication, and all this additional and constantly growing traffic must find its way by the Pacific Cable, to and from Australia. I venture to think that it would not be too sanguine an estimate to place the annual increase of business at 18 or 20 per cent, but to be perfectly safe I shall limit it to 15 per cent in the calculations which follow, that is to say, only one per cent more than the average annual increase realized under the high tariff for the eight years previous to 1890.

ESTIMATE

of the business of the Pacific Cable for ten years after its completion, calculated on the basis of 1,100,000 words, for the year 1898, and an average normal increase of 15 per cent per annum thereafter :—

	Gross Earnings.	Interest and Working Expenses.	Surplus.
	£	£	£
1898.....	110,000	90,000	20,000
1899.....	126,500	90,000	36,500
1900.....	143,000	90,000	53,000
1901.....	159,500	90,000	69,500
1902.....	176,000	90,000	86,000
1903.....	192,500	90,000	102,500
1904.....	209,000	90,000	119,000
1905.....	225,000	90,000	135,500
1906.....	242,000	90,000	152,000
1907.....	258,500	90,000	168,500

As we have eliminated all but the fixed charges on revenue for the first three years, an examination of the above table will show that the surplus up to the fourth year will have accumulated to 109,500, which sum, together with the annually increasing surplus thereafter accruing, would be sufficient to meet all charges for repairs and maintenance and leave a balance to be carried to a cumulative reserve, for renewals at some future day.

I may mention that I have submitted in outline this financial scheme to the delegates from New South Wales, Victoria, Queensland and New Zealand, with whom I have had the advantage of frequent consultations since the Conference rose, and I have the satisfaction to state that it finds favour with each of them. The feature of the scheme by which all the uncertain charges for repairs and maintenance would be embraced in the contract with the manufacturers of the cable, would not only have a tendency to secure a cable of the very best make and character but it would defer all charges against revenue, which revenue could not fully meet, until a date later than the payment of the last annual subsidy to the Eastern Extension Company. The Australian Governments now contributing to that subsidy could then with greater ease make up any possible

shortage which may arise in connection with the new cable. The estimate, however, shows clearly that under this scheme there is every prospect of the Pacific Cable being self-sustaining from the first.

In view of these considerations I feel warranted in strongly recommending that steps be at once taken to ascertain the terms upon which cable manufacturers would be prepared to lay the cable and maintain it in efficient operation for a term of three years. This date definitely obtained, the several Governments would be in a position to arrange how they could best co-operate in carrying out the undertaking.

Touching the co-operation of several Governments in a common object, I referred to this question in the remarks I submitted at the Conference. Since then I have discussed the matter with some of the Australian delegates, who see no difficulty which cannot be easily overcome; they give as a precedent the agreement entered into in 1886 by New South Wales, Queensland and Victoria for the administration of British New Guinea. By this arrangement one of the Colonies (Queensland) undertook the cost of administration, the other colonies passing special acts of indemnification. Mr. Thynne has sent me a copy of the Queensland Act 51 Vic., No. 9, 1887, which I am glad to place at your service.

Yours faithfully,

SANDFORD FLEMING.

RESOLUTIONS

PASSED BY THE COLONIAL CONFERENCE, JUNE AND JULY, 1884, IN RESPECT TO THE ESTABLISHMENT OF

THE PACIFIC CABLE.

1. *Resolved*,—That in the opinion of this Conference immediate steps should be taken to provide telegraphic communication by cable, free from foreign control, between the Dominion of Canada and Australasia.

2. *Resolved*,—That the Imperial Government be respectfully requested to undertake at the earliest possible moment, and to prosecute with all possible speed, a thorough survey of the proposed cable route between Canada and Australia; the expense to be borne in equal proportions by Great Britain, Canada and the Australasian Colonies.

3. *Resolved*,—That it is for the interest of the Empire that, in case of the construction of a cable between Canada and Australasia, such cable should be extended from Australasia to the Cape of Good Hope, and for that purpose arrangements should be made between the Imperial and South African Government for a survey of the latter route.

4. *Resolved*,—That in view of the desirability of having a choice of routes for a cable connection between Canada and Australasia, the Home Government be requested to take immediate steps to secure neutral landing ground on some one of the Hawaiian Islands, in order that the cable may remain permanently under British control.

5. *Resolved*,—That the Canadian Government be requested, after the rising of the Conference, to make all necessary inquiries and generally to take such steps as may be expedient in order to ascertain the cost of the proposed Pacific Cable, and promote the establishment of the undertaking in accordance with the views expressed in this Conference.

REMARKS ON THE PACIFIC CABLE, BY MR. ALEXANDER SIEMENS REFERRED TO IN MR. SANDFORD FLEMING'S LETTER JULY 20TH, 1894.

(*Extract.*)

With regard to the technical difficulties raised in 1887, it may not be out of place to consider that the necessity for a close survey of a cable route arises principally from the requirements of the engineer laying the cable, who has to know at every moment the exact depth of water into which the cable passes.

The brake-power with which the cable is held back and by which the percentage of slack is regulated, has to be adjusted according to the depth of water in order to ensure an even distribution of the slack along the whole route of the cable. Such a distribution prevents accidents, economizes cable and facilitates repairs, hence the usual practice is to lay cables only on routes where very frequent soundings have been taken; and in 1887 the experts consulted by the Imperial Government were not satisfied that the Pacific Ocean was sufficiently well explored for this purpose.

During the last seven years the work of survey has steadily progressed, and at present it may be asserted that the route proposed at the Wellington Conference passes nowhere through water more than 3,500 fms. deep.

On the Admiralty chart, No. 780, corrected to November, 1892, the route from North Cape (N.Z.) to Suva (Fiji Islands) shows 2,594 fms. as the greatest depth.

Between Suva and Samoa no very great depth is met with, and from Suva, or Apia, to the Phœnix Islands, the greatest depth is 3,312 fms.

The same chart shows 3,020 fms. as a maximum on part of the route from the Phœnix Islands to Honolulu; this route is continued on Admiralty chart No. 782, corrected to June, 1890, where a depth of 3,448 fms. is shown.

A continuation of the soundings can be seen on the same chart, or better on Admiralty chart No. 747, which is corrected to March, 1894, and gives 3,252 fms. as the greatest depth between Honolulu and San Francisco. These routes do not coincide exactly with the Wellington route, but they, together with a number of other soundings shown on the charts, bear out the general features of the bed of the Pacific Ocean shown by Mr. John James Wild, member of the civilian scientific staff of H.M.S. "Challenger," in his essay on the depth, temperature, and currents of the ocean, entitled "Thalassa." This work appeared in London (Marcus Ward & Co.) in 1877.

If the adjustment of the brake-power depended entirely on the knowledge acquired by soundings taken previously on the selected route of the cable, grave doubts might still exist whether the laying of the Pacific cable could be proceeded with without further information being obtained by carefully taking soundings over the exact route. Fortunately means have been devised to indicate to the brakesman continuously the percentage of slack with which the cable is payed out, and thus it is possible to lay a cable over a route of which only the general features are known.

This contrivance has been used with perfect success in the laying of six Atlantic cables, so that there is no doubt as to its performance realizing its theoretical advantages. The depth of water met with in the Atlantic reaches 3,000 fms. in several places where the cables have been laid, so that there is no doubt about the possibility of laying cable in 3,500 fms., or even more.

To be sure it will be necessary to select a type of cables which combines great strength with light weight, but there is no difficulty in this either, as it has been possible to construct cables for the Atlantic which will carry 7,000 fms. of their own length before they break.

It may, therefore, be taken for granted that any technical obstacles which were apprehended in 1887 have now been overcome, and that the cable can be laid as soon as the financial question has been settled.

In order to ascertain clearly what the probable financial position of the cable would be, a complete scheme has been worked out for a route consisting of the sections:—

1. Ahaipara Bay (N.Z.) to Suva (Fiji Islands).
2. Suva (Fiji) to Canton, or Mary (Phœnix Islands).
3. Canton (Phœnix) to Necker Island.
4. Necker Island to Vancouver, B.C., of which the details are appended.

As capital, the sum of £2,000,000 has been assumed to cover the cost of the cable, of two repairing steamers, of about 1,800 tons each, of building instruments, and to furnish a working capital of about £50,000.

The working expenses are divided into :—

a.	General management	£ 5,000
b.	Staff and office expenses at stations	24,000
c.	Repair and maintenance of cables	90,000
	Total annual outlay	£119,000

a. The first item explains itself.

b. Of the second item, the details will be found in the appendix.

c. The cost of the repair and of the maintenance of the cable is the most difficult to estimate, and the expenditure is naturally divided into a fixed and a variable part.

The fixed expenses consist, first, in maintaining the two steamers in efficient working order ; this is amply covered by the allowance of £100 per month per steamer, and secondly, in the wages of crew, victualling and other running expenses, these are certain not to exceed £20 per day per steamer.

It is not likely that each steamer will have to go to sea, on the average, more than two months every year, or that more than 2,000 miles of cable will be used up during that time.

Still these maximum figures are used in the estimate and bring up the total annual cost of the actual repairs and of the maintenance of the steamers to £90,000 or to over £12 per naut. mile of cable laid. That this is a safe estimate may be gathered from the fact that it is usual to calculate £6 per naut. mile to cover this expenditure, and that one at least of the Atlantic companies is able to keep its 6,000 miles of cable in efficient working order for £4 per naut. mile.

The most important factor in determining the cost of repairs is without doubt the quality of the cable laid, and no greater mistake can be committed than to cut down capital expenditure in an undertaking of the importance and of the magnitude as the Pacific cable undoubtedly is.

It should also be noticed that Sir John Pender in his letter to the Marquis of Ripon estimates the repairing expenses at £35,000 or at the low figure of £4 15s. per nautical mile per annum. This figure he may, however, have taken from previous estimates of expenditure published by the advocates of the scheme as they give the same figures.

The real uncertainty of the financial prospects of the Pacific cable is, however, encountered when the probable income is estimated.

In respect to this point, Sir John Pender's opinion is manifestly unfair as he allows not more than one-half of the existing traffic to pass over the new cables at extravagantly low rates ; although it is quite likely that this would be all the traffic obtainable during the first year.

Mr. Sandford Fleming, the indefatigable promoter of the Pacific cable, appears to have taken the fairest view of the question, when he estimates that the expenses will exceed the earnings during the first few years, but that a cheap tariff and expeditious working will soon attract the public and convert the cable into a profitable investment.

From Sir John Pender's letter it appears that the Australian traffic of the existing company is worth £209,628 net for 1,306,716 words, or 3s. 2¼d. per word. If the Pacific cable earned half this amount during the first year, it would pay, in all probability, the working expenses of that year with an ample margin, as it is not likely that any heavy repairs would become necessary during that time.

There are, however, too many factors left uncertain when the probable traffic of the Pacific cable is compared with the existing traffic over another route and under totally different circumstances. Sir John Pender has, for instance, quite ignored that at present the intercourse between America and Australasia does not give rise to frequent telegrams, but when the interests served by the cables are taken into careful consideration, and the great possibilities of commerce between America and Australasia are appreciated at their proper value, small doubt can exist about the Pacific cable earning as much money per naut. mile of its lengths as the average of the existing submarine cables.

As long ago as the 2nd April, 1887, the "Pall Mall Gazette" published an article on submarine cables by Mr. Henniker Heaton, from which the following interesting figures are taken :—

At that time 26 submarine cable companies were in existence, possessing 100,000 naut. miles of cable, laid with an expenditure of £35,000,000 capital. These cables earned (including subsidies) £3,173,692 per annum, enabling the companies to pay from 1 to 14¾ per cent dividends. In addition the reserve and sinking fund of all the companies amounted to £3,400,000.

From Mr. Heaton's figures it follows that the capital outlay per nautical mile of submarine cable is, on the average, £350 and the annual revenue is £31 15s. per naut. mile.

According to Mr. Heaton, the capital outlay of the Eastern Telegraph Company was £299 per naut. mile, and their income, at that time, £35 per naut. mile per annum.

The Eastern Extension Company had to lay out £265 per naut. mile, and was earning £39 10s. per naut. mile per annum.

If the capital outlay for the Pacific cable be taken to be £2,000,000 and its length from Ahaipara Bay (N.Z.) to Vancouver (B.C.) as 7,340 naut. miles, the cost per naut. mile will be about £273. On the other hand, earning £30 per mile, the annual income from the cable would amount to just over £220,000.

This figure will naturally not be reached during the first two or three years, but it is even under the average of the earnings of all submarine cables seven years, and since that time telegraphic correspondence has continued to increase rapidly. One of the Atlantic companies, for instance, earned on the average during the last three years more than £50 per mile.

If the share of the Pacific cable is 2s. per word, it only wants 2,200,000 words per annum to realize this income, and the cable communication, which can be established for £2,000,000, would be capable of transmitting 15 words per minute on the Recorder. This corresponds to over 7,000,000 words per annum, but the speed of sending messages through the cable can practically be doubled by introducing duplex working when the traffic requires it.

It is, therefore, not extravagant to assume that in regular working there will be a surplus of £101,000 per annum.

This would be utilized for paying 3 per cent on the capital outlay and placing the rest to the credit of a sinking fund.

As the cost of repairs includes replacing on the average 200 miles of cable per year, the whole of the cable will be renewed in about 37 years.

If the cable is manufactured with the best materials and with proper care, it may be assumed that it can only be destroyed by local influences or by extraordinary occurrences, for it is proved beyond doubt that a cable free from electrical faults will not deteriorate.

A very striking example of the durability of cables was the finding of some parts of the original gutta-percha covered conductor, laid without any further protection between Dover and Calais. Although this wire had been in the sea for over 35 years when it was picked up by the ss. "Monarch" (the General Post Office Telegraph steamer) it looked like new, and no deterioration could be detected.

Generally speaking all those submarine cable companies have succeeded who have laid their cables on a strictly commercial basis, by expending their capital for nothing but legitimate purposes; it is, therefore, to be anticipated that their example can be followed in establishing telegraphic communication between Canada and Australia and that the Pacific cable will prove to be a good investment in spite of adverse opinions.

The time required for completing the work provided that the two repairing steamers are assisting in carrying the same out would be about three years, if no serious accidents delay the undertaking.

For an additional outlay of £30,000 a second large cable steamer could be employed and the time of completing the cable shortened to two years after commencing the manufacture.

ALEXANDER SIEMENS.

Ottawa, 9th July, 1894.

ESTIMATES APPENDED TO MR. SIEMENS' PAPER.

BUILDINGS AND INSTRUMENTS.

	Morton's Buildings.		Sets of Instruments.	
	B.C.C. No. 2.	No. 795.	Recorder.	Testing.
Vancouver	1	..	2	1
Necker Island	..	4	3	1
Canton Island	..	4	3	1
Suva	1	2	3	1
Ahaipara	1	2	3	1
Totals	3	12	14	5

3 Cable Houses B.C.C. No. 2 at £300	£ 900
3 Sets Fittings for do at £200	600
12 Houses No. 795 at £1,000	12,000
12 Outfits for same at £500	6,000
14 Sets Recorders complete at £400	5,600
5 Sets Testing Instruments, with extra spares, at £240	1,200
Transport and erection	3,700
	£30,000

No land is included, nor the erection of buildings on Necker and Canton, unless in the opinion of our Engineer-in-charge the buildings can be erected by our own staff without delaying operations.

STAFF REQUIRED FOR STATIONS AND OFFICE EXPENSES.

Vancouver, B.C. :—

	Per annum.	
1 Superintendent	£400	
4 Clerks at £200	800	
2 Messengers at £50	100	
4 Boys at £30	120	
Taxes, ground rent, renewals and repairs	200	
Stationery, insurance, advertising	200	
Sundries unforeseen	200	
		£2,000

Necker and Canton Islands, (each) :—

1 Superintendent	£600	
8 Clerks at £500	4,000	
3 Messengers at £100	300	
Rations £1 per week per head	600	
Sundries unforeseen	500	
2 ×	£6,000	12,000

Suva, Fiji, and Ahaipara, N.Z. (each) :—

1 Superintendent	£500	
8 Clerks at £400	3,200	
3 Messengers at £80	240	
Rations £1 per week per head	600	
Sundries unforeseen	460	
2 ×	£5,000	10,000
Total annual cost of Staff and Office Expenses		**£24,000**

REPAIR AND MAINTENANCE OF CABLES.

Two Repairing Steamers of about 1,800 tons each, fitted complete, at	£ 100,000	£ 200,000
ANNUAL COST—		
(*a*) *Fixed Expenses*—		
Repair of hull and machinery at	£ 1,200	£ 2,400
Wages of crew, victualling and other running expenses—		
2 × 365 days, at	20	14,600
(*b*) *Variable Expenses*—		
Two months at sea, each steamer—		
For ropes and other stores, extra pay, &c., at £125 per day		£ 15,000
100 naut. miles cable, at £200 per naut. mile		20,000
100 do do 350 do		35,000
Sundries		3,000
		£ 90,000

The variable expenses (*b*) are usually estimated at £6 per naut. mile, which would, in this case, amount to about £45,000.

One steamer to be stationed at Vancouver, B. C., and the other steamer to be stationed at Suva (Fiji Islands).

CAPITAL ACCOUNT.

Capital to be raised under Government guarantee at 3 per cent.	£ 2,000,000	7,340 naut. miles cable	£ 1,720,000
		Steamers	200,000
		Buildings, &c.	30,000
		Working capital	50,000
			£ 2,000,000

Cost per nautical mile £273

REVENUE ACCOUNT.

General management	£ 5,000	Earnings	£ 220,000
Building staff	24,000		
Repairs and renewals	90,000		
To profit and loss account	101,000		
	£ 220,000		

PROFIT AND LOSS ACCOUNT.

3 per cent interest on capital	£ 60,000	From Revenue Account	£ 101,000
2 per cent amortisation of capital	40,000		
Carried forward	1,000		
	£ 101,000		

The earnings are estimated at £30 per naut. mile (the average amount of the earning of all cables, according to Mr. Henniker Heaton).

If share of Pacific cable is 2s. per word, 2,200,000 words are wanted, while cables are calculated for 15 words per minute or more than 7,000,000 words per annum. This capacity can practically be doubled by introducing duplex working when the traffic requires it.