

CORRESPONDENCE

RELATING TO

PROPOSALS FOR THE IMPROVEMENT

OF

THE COCHIN HARBOUR.

MADRAS:  
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1912.

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Ch. S. V. 5000 of 1912.

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1912.

GOVERNMENT OF MADRAS.

POLITICAL DEPARTMENT.

READ—the following papers :—

I

*Letter*—from A. T. FORBES, Esq., I.C.S., Resident in Travancore and Cochin.  
*To*—the Chief Secretary to Government.  
*Dated*—Camp, Ernakulam, the 27th January 1912.

Referring to G.O. No. 611 W., dated 9th May 1911 and G.O. No. 703 W., dated 3rd June 1911, I have the honour to forward a letter from the Diwan of Cochin together with a report by Mr. Browning, Chief Engineer of the State, dealing with the questions of erosion and harbour improvement from a professional point of view.

2. While the Darbar explain clearly and at some length the reasons why they object to paying any part of the estimates amounting to Rs. 17,600, sanctioned in the Government Orders referred to above, their letter is mainly concerned with—

(i) the consideration of coast protection as a whole and with special reference to the effect of erosion on Cochin harbour, and

(ii) the question of the improvement of Cochin harbour.

3. Paragraph 5 of the Diwan's letter which deals with the question of contribution towards the two estimates aggregating Rs. 17,600 might be omitted altogether without detracting from the intensely interesting character of the proposals put forward.

4. I append a brief analysis of the Diwan's letter—

*Paragraphs 1 to 4.*—Resumé of correspondence on the subject of coast erosion with a statement of the views of the Cochin and Travancore Darbars and the order of the Madras Government on the question.

*Paragraph 5.*—Reasons why the Darbar object to applying to the sanctioned estimates of Rs. 17,600 the principle of contribution proposed in G.O. No. 355, Marine, dated 10th November 1910.

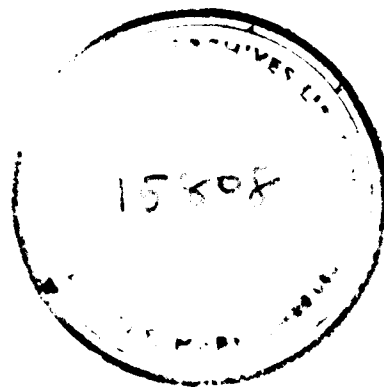
*Paragraphs 6 and 7.*—Reasons why Darbar cannot accept the decision in G.O. No. 355 of 10th November 1910 and introducing the subject of the improvement of the Cochin harbour shows how its safety is now endangered.

*Paragraph 8.*—The Darbar's contention that if they are to take the lead in anti-erosion schemes they must be given a free hand, subject to certain restrictions imposed by the Imperial Government, in the matter of harbour improvement.

*Paragraph 9.*—Justification for bringing the question of harbour improvement to the notice of Government.

*Paragraphs 10 and 11.*—Financial aspect of scheme—tonnage in 1881 and in 1900 compared.

*Paragraphs 14 to 19.*—Showing how Cochin is geographically interested and arguing that if Government persists in considering the question from a commercial and not an Imperial point of view then Cochin has a strong claim to deal with it herself. To this end the Diwan reviews the disastrous effect upon Cochin of her agreement, under the Interportal Treaty, to give up the import and export duties and shows how the State has not been benefited by the development of trade at Cochin port.



*Paragraph 20.*—The natural advantages possessed by Cochin as a port and the benefit to be gained from combining the two questions of coast protection and harbour improvement.

*Paragraph 21.*—Ways and means—The Darbar's proposals and offer.

5. The question of the improvement of the Cochin harbour is an old one. The first point, I take it, for determination is whether the bar can be kept permanently open. This, obviously, is a matter for the engineering experts to decide. The next point—the deepening of the harbour itself—presents no engineering difficulties whatever. As regards financial results, the figures given in paragraph 21 of the Diwan's report are hopeful; the trade here is steadily growing and with increasing activity in rubber and in the cocoanut trade in all its forms, there is reason to expect a steady increase even under prevailing conditions. I am not aware whether Coimbatore or any of the neighbouring British districts has any produce to export which would be attracted to Cochin, if increased shipping facilities were offered, but a good deal of merchandise of European origin would be landed here which is now landed at other ports and on which the purchaser has to pay heavy railway freight. The saving of time in loading and unloading as also the shortening of the journey to all the western ports resulting in a saving in the wages and coal bill might be expected to attract vessels to this port which do not now call here and enable those that do to increase the number of their voyages. How much of the resulting increase would be new trade and how much mere transfer is a matter for consideration but experience in other branches of administration shows that increased facilities develop new business without seriously affecting existing institutions.

6. At this stage it is not necessary to follow the Diwan through his denunciation of the Interportal Treaty; paragraphs 15 to 19 devoted to it have the appearance of having been dragged in to support the claim made by the Darbar to make the scheme of harbour improvement their own and to deal with it as they please. (In this connection please see last sentence of my letter R.O.C. No. 1440, dated 23rd October 1911.) Of course no such pretension could be entertained for a moment. In the closing portions of paragraph 19 free rein is given to a very vigorous imagination.

7. But I am entirely at one with the Darbar in their desire to see the scheme re-considered on its merits in the light of present day conditions. It is impossible to discuss the matter with the Chief Engineer as I have done without coming to the conclusion that the two questions, viz., coast protection and harbour improvement should go hand in hand and the necessity for taking up coast protection in a systematic way—being granted—at least in the vicinity of the port of Cochin, an excellent opportunity is presented for going thoroughly into the allied question of harbour improvement.

8. Owing to the advance made during the past few years in mechanical appliances and dredging, the necessity for a large area of backwater to help in scouring out the bar disappears and large extents of backwater might be scientifically reclaimed at small cost and would begin to yield handsome profits at a very early date.

9. The question of agency is a matter of first-rate importance and requires careful consideration. Without any disrespect to the professional Government agency, I would advocate the scheme being entrusted to a good syndicate at Home who would be in a position to carry it through if it is found promising—with expedition, continuity of policy and an up-to-date expert knowledge of protective coast works and harbour improvement. As I entirely share the Darbar's view that the scheme is commercially sound, I consider it should be carried out on a business footing by businessmen capable of gauging future developments of trade as well as its present requirements. In the meantime I hope Government will appoint a small committee as suggested in the concluding portion of the Diwan's letter to enquire into and report on the engineering and financial aspects of the combined scheme for coast protection and harbour improvement. I would lay particular stress on the desirability of having Mr. Browning, who has gone very thoroughly into both the erosion and harbour improvement questions and has a mass of information at his finger's ends, being appointed as a member of the committee.

## ENCLOSURES.

*Letter*—from A. R. BANNERJI, Esq., M.A., I.C.S., Diwan of Cochin.

*To*—the British Resident in Travancore and Cochin.

*Dated*—the 24th October 1911.

*No.*—Ref. on C. 420 of 1086 M.E.

I have the honour to solicit a reference to your letter Dis. No. 15, dated 14th January 1911, enclosing for the information of the Darbar a copy of G.O. No. 355, Marine, dated 10th, November 1910, together with printed copies of the correspondence relating thereto and as requested in paragraph 2 of this letter, I have the honour to communicate the views of the Darbar as regards the final decision passed by your Government in the matter of the erosion of the sea coast from Cruz Milagre to Azhikal. Since the receipt of the above communication from you, the Darbar have been informed in your letter R.O.C. No. 944, dated 26th May 1911, that owing to the present dangerous condition of the Vypeen foreshore, His Excellency the Governor in Council has considered it desirable to forward at once to the Superintending Engineer, IV Circle, for immediate execution an estimate for Rs. 12,450 for repairing the existing groynes on the Vypeen foreshore. In a subsequent communication, dated 14th June 1911, the Darbar were informed that a further estimate for Rs. 7,600 for providing temporary wooden groynes for the Vypeen foreshore has been sanctioned by your Government. In both these communications, the Darbar were requested to accept the method of distribution proposed in the Government Order of the 10th November last, if the scheme of work commended itself to them. In this connection, I have the honour to invite your attention to my letters R.O.C. No. 420/86, dated 9th June 1911 and 24th June 1911, respectively. In your letter R.O.C. No. 944, dated 20th June 1911, acknowledging my reply of the 9th June, you have observed with reference to paragraph 2 thereof, that G.O. No. 355, Marine, dated 10th November 1910, makes it clear that Cochin will also derive considerable benefit from the work that is now being undertaken. The Darbar's Chief Engineer Mr. Browning's detailed report on the whole question has now been received, and a printed copy of the same is enclosed for facility of reference.

2. Before setting forth the Darbar's views on the final decision of the Madras Government as communicated in G.O. No. 355, Marine, dated 10th November 1910, I propose to give in brief a history of the previous correspondence on the subject. In doing so, I do not overlook the fact that a good deal of the correspondence is printed and embodied in the copy of the Government Order in question, but it is necessary, with a view to make the Darbar's position quite clear in the matter, to record in this reply a short history of the discussions that have taken place since the erosion of the sea coast was brought to the notice of your Government.

3. It was on the 24th June 1907 that I brought to the notice of Mr. Carr, your predecessor in office, the seriousness of the situation and suggested at the same time a joint inspection of the coast with a view to ascertain what protective works should be carried out. This letter was followed up by a further communication dated 1st July 1907, in which I suggested that the affected locality be inspected by the Engineers of the British Government as well as those of the Travancore and Cochin Darbars. This suggestion was accepted, and the Darbar were informed in Mr. Carr's letter of the 30th July 1907, R.O.C. No. 1217/07, that the Superintending Engineer, IV Circle, has been authorised to adopt such temporary measures as may be necessary to prevent damage to property near Vypeen. The joint inspection was accordingly made in September 1907, but the report from the British Engineer was not forwarded till 12th March 1909. In the meantime, the erosion along the coast continued and assumed serious proportions and evoked alarming reports from the Darbar's Chief Engineer, Mr. Browning, and also complaints from the Indian Fishery Company and other quarters. The printed copies of correspondence that subsequently took place were forwarded to this Darbar for opinion with Mr. Carr's letter R.O.C. No. 2066/09, dated 11th January 1910 on (1) the measures recommended, (2) the apportionment of the cost of any measures that may be undertaken. The Darbar's Chief Engineer, Mr. Browning, submitted his views in detail on point (1) in his letter dated 7th March 1910, which was followed up by a further communication dated 22nd April 1910, describing the manner in which the erosion has continued and extended up to that date. This Darbar in forwarding the views of their Chief Engineer as regards the measures proposed to be adopted regretted their inability to give any opinion as to the apportionment of the cost, until the measures were determined upon and the cost ascertained, but suggested that the whole matter may be decided and taken up as one complete scheme by the Madras Government and an equitable distribution of cost may be made in accordance with the several interests involved. It is important to note in this connection that, although the Travancore Government participated in the joint enquiry, the Travancore Government declared in 1909 that they were not prepared to take any steps, but subsequently accepted the recommendations of their Chief Engineer communicated in his letter dated 30th March 1910 that the British Government might carry on the protective works in the Travancore State and recover cost from the Darbar, the head of the Travancore Public Works Department being consulted in the matter. Further, this Darbar were informed in Mr. Carr's letter of 10th March 1910 of the formation of a special sub-division in the West Coast division for a period of six months to deal with certain marine questions, the first and foremost of which was the protection of the foreshores of Vypeen, Cochin and other parts of the West Coast.

4. The final order of the Government states that the localities that require special protection from erosion are on portions of the coast situated mostly in Cochin and partly in Travancore territory, and the interests of the British Government are affected by the erosions only so far as protection and maintenance of the Cochin harbour are concerned. It is admitted, however, that to protect the interests of this harbour it is necessary to take preventive measures along the Vypeen foreshore about  $1\frac{1}{2}$  miles north of the harbour entrance and at Andikadavu some 6 to 9 miles south of Cochin, but it is observed that, as the Cochin State is losing valuable lands planted with coconuts in consequence of the erosion, it is clearly to the interests of that State, quite apart from the interests of the Cochin harbour, to take preventive measures. The Governor in Council therefore concludes that the works necessary in these two places should be carried on by the Cochin State, the Madras Government paying only one-third of the cost on condition that the plans and estimates are sanctioned by the Madras Public Works Department. In conclusion, the Government have stated that as to other localities they are not directly concerned, and that they therefore do not propose to initiate or take part in anti-erosion schemes.

5. The Darbar must at the outset express considerable disappointment that, after more than three years elaborate enquiry and discussions in regard to a question, which the Darbar considered to be one of Imperial importance, the whole burden and responsibility is now thrown on the Cochin State, a responsibility involving a considerable capital outlay extending over many lakhs of rupees, with a promise of contribution of only one-third of the cost. The Darbar consider it hard to believe that in the face of clear professional opinion on the whole question, the Madras Government do not altogether realise the seriousness of the situation, and in fact the Darbar are now convinced in view of the two subsequent communications from the Madras Government intimating that they themselves have now taken up for execution certain urgent works of protection along the Vypeen foreshore that the Madras Government fully realise the seriousness, importance and urgency of the matter and have now by a subsequent procedure altogether departed from the policy laid down of leaving everything to be done by the Cochin State. In the opinion of the Darbar, it is necessary to separate in these discussions the main major question of the West Coast erosion, which has already been the subject of enquiry by a commission of Engineers of three Governments, and the small protective works to be carried out at the Vypeen foreshore. The third paper read in the Government Order will show that during the pendency of this matter four estimates costing a sum of Rs. 2,545 were sanctioned from time to time by your Government for urgent protective measures at this locality. Such works have all along been carried out by the British Government in the past, and the Darbar see no reason why the estimates prepared and submitted by the Madras Public Works Department since the issue of the G.O. No. 355, dated 10th November 1910, should now be considered in a different light. As regards the scheme of works carried out under these estimates, the Darbar consider that the question as to whether it commends itself to them or not, is immaterial so far as the method of distribution proposed in G.O. No. 355, Marine, dated 10th November 1910, is concerned. That method was intended to apply to a general scheme of protective works to be undertaken by the Cochin State subject to the passing of the estimates by the Chief Engineer, Public Works Department, Madras, whereas the works now executed have no connection whatever with such a scheme but have been taken up in continuation of the piecemeal policy of protection to save immediate danger as in the past at the Vypeen foreshore only. The Chief Engineer Mr. Browning, in paragraph 9 of his report has dealt with these works in detail and after subsequent inspection at which I was present has come to the definite conclusion that, although they checked erosion and caused accretion and have saved the situation this year, such isolated groyves cannot do any permanent good and in fact are likely to cause danger in other localities, unless a complete groyning of all the localities affected is undertaken. In fact, there is the conclusive evidence to show that erosion has increased in all directions in other places including Travancore and the isolated works of protection at Vypeen foreshore have not in any way minimised the dangers to which the Cochin harbour and other parts of the coast line are exposed. The serious erosion that is going on in other affected localities together with the accretion indicated by fresh shoals forming seaward just opposite the harbour mouth proves conclusively the fact that sand-banks are forming out at sea, which must sooner or later interfere with the navigation in the Cochin harbour itself. Further, these isolated protective works cannot be considered to have benefited the Native State of Cochin in any way and do not reduce the responsibilities now thrown on the Cochin Darbar in regard to the general scheme of coast protection proposed to be undertaken by them. In this connection the following extract from a recent article in the Indian Engineering on the British Royal Commission on erosion will not be out of place.

"Experience has often shown that the localisation of protection works, though locally effective, results in increased erosion on the lee side of the works, and it is therefore recommended that they should always embrace a long stretch of coast covering the whole foreshore where dangerous scouring may occur, for which reason a special department of the Board of Trade should be formed to control such works. As to sea walls, the commission are of opinion that they are seldom safe without the provision of groyves as well."

Under these circumstances the Darbar regret that they do not see any justification for applying the principle of distribution of cost as proposed in G.O. No. 355, Marine, to the works of protection at the Vypeen foreshore, and they therefore adhere to the observation made in paragraph 2 of my letter R.O.C. No. 420 of 1886, dated 9th June 1911, which is quoted below.

"I have the honour to acknowledge the receipt of your letters, dated 14th January 1911 and 26th May 1911, Dis. No. 15/1911 and R.O.C. No. 944 respectively on the subject of erosion, and to inform you that the matter has been referred to Mr. Browning, the Chief Engineer, who is intimately acquainted with the facts of the case, for a full report, and the Darbar's views on the Government Order will be communicated to you at a very early date.

In the meantime, the Darbar must express the opinion that the protective works at the Vypeen foreshore have hitherto been carried out entirely at the expense of the British Government, and so long as a comprehensive scheme of protection of all the affected localities is not drawn up and approved of by all parties concerned, it seems inequitable that the Darbar should bear any portion of the cost of works carried out entirely to protect British Cochin."

6. The Madras Government have now decided that, although the interests of the British Government are affected by the erosion so far as the question of protection and maintenance of the Cochin harbour is concerned, nevertheless, it is to the interests of the Cochin State to take preventive measures. It is now proposed that the plans and estimates should be drawn by the Cochin State and passed by the Chief Engineer, Public Works Department, Madras, and the works carried out by this Darbar, which is to receive one-third of the cost thereof. The Government Order itself does not afford any guide as to the nature of the works that will commend themselves to the Madras Government, although from the printed papers embodied in the Government Order considerable difference of opinion amongst the Engineers, is apparent. As regards the cost, no definite estimate can at present be arrived at owing to the uncertainty as to the nature of the protective works to be carried out and the general scheme under which they will have to be designed. The probabilities, however, are that the total cost of the protective works in the affected localities will come to about 15 to 20 lakhs. The main considerations that this Darbar desire to urge as grounds for not being able to accept the final decision of the Madras Government in the matter can be summarised as follows:—

(1) It is practically impossible for the Darbar to take the initiative in the matter, mainly because the expenditure involved is altogether beyond their resources, and they may legitimately seek the assistance of the Paramount Power for the protection of their territory against erosion by the Arabian Sea, which is taking place along the whole coast line and which is not confined to their own territory alone. It may no doubt be considered incumbent upon them to undertake works to protect Cochin territory, but the nature and scope of such works will necessarily be determined by financial considerations, and as such may not be quite adequate for the purpose for which they are intended or expedient and consistent with the protection of other interests involved.

(2) The dangers caused by the West Coast erosions affect firstly and primarily the Cochin harbour, and secondly, Travancore and Cochin territories. Under these circumstances, even if the Cochin Darbar could command the resources to adequately deal with the West Coast erosion, they can only act in conjunction and not independently.

(3) The Darbar are strongly of opinion that piecemeal schemes are undesirable. Whatever justification there might be for temporary measures, it has already been laid down by your Government that some protective works of a standing nature are necessary. (Please see Order No. 294, dated 24th July 1907.) There is complete agreement as to the necessity of protecting the Vypeen foreshore, but there is some difference of opinion as to the urgency of works in the neighbourhood of (a) Andikadavu and (b) Kuzhupilli. As regards the Vypeen foreshore, it is admitted on all hands that the breach being contiguous to the Cochin harbour mouth, any protective works carried out at this locality must be intimately connected with the larger question of the improvement of the harbour. This leads to the next consideration, viz.:—

(4) The Cochin harbour being vitally affected, it is for the Madras Government to fix and determine the protective works in the first instance, unless of course the whole question of harbour improvement is allowed to be dealt with by the Cochin Darbar on such conditions as may be mutually agreed upon.

(5) The note of the Chief Engineer, Madras Public Works Department, shows that his views do not agree with the scheme of protection advocated by the Darbar's Chief Engineer, whose further report will show the additional grounds on which his opinion is based. It appears therefore unlikely without a good deal of further investigation and correspondence, which will mean delay and inaction in regard to this very urgent matter, that the Cochin Darbar will be able to prepare the plans and estimates and fulfil the conditions laid down as to their being passed by the Chief Engineer, Madras, before the works are undertaken.

(6) If this Darbar are to carry out the protective works on their own responsibility and at their expense, they can do so only on one condition, viz., they are given a free hand in the matter of the development of the Cochin harbour, subject of course to such conditions as may be imposed by the British Government.

In fact, the Darbar very strongly hold the opinion that this erosion question should be considered from an Imperial standpoint and dealt with as such in direct reference to the very feasible scheme that they now wish to put forward for the improvement of the harbour, a scheme that they themselves are prepared to undertake if the erosion question is left to be dealt with by them. Both the questions are so intimately connected with one another that neither can be taken up independently and irrespective of the other.

7. The Darbar are quite prepared to go into the question of coast protection and harbour improvement themselves and take up the necessary expert investigation in these matters, should your Government be pleased to accept the principle that this Darbar cannot be burdened with

the enormous cost of coast protection along the sea coast in their territory, unless they are allowed to share the consequential advantages of considerable economic importance resulting from the development and improvement of the Cochin harbour, which must *pari passu* be taken up simultaneously with coast protection. The very existence of this important port and harbour is now in danger owing to this erosion and any general anti-erosion scheme involving considerable capital outlay, which must eventually be taken up to protect the coast will not only ensure the safety of the Cochin port and harbour, but afford also an opportunity to successfully carry out the long-deferred scheme of harbour improvement, which has for the last thirty years been under consideration, but which never went beyond the stage of discussion. In support of the view that the Cochin port and harbour are in serious danger, I need only quote the following extract from the papers already published :

(1) *Extract from the joint report of the three Engineers.*

"We consider that though the erosion and accretion are somewhat irregular, erosion predominates and has reached a point at which there is no certainty that a breach may not occur. Should this happen, it might spontaneously close or be closed artificially, but in an extreme case might seriously affect the existing harbour entrance by reduction of scour. Nothing appears to be on record about the effects of the breach of 69, but it can hardly be supposed that the existence of an opening 400 and odd feet wide by 32 deep can have had no effect on the tidal scour over the bar. It must also be noted that reclamations in the backwaters and also natural silting have undoubtedly caused a considerable reduction in the tidal capacity of the backwater, a breach of the size of the original one might therefore be expected to have a greater effect on the bar than was the case during the years in which that breach remained open. In any case, we assume that the formation of a breach at or near Cruz Milagre would constitute such a danger to the interests of the port that it should be prevented at all cost."

(2) *Extract from the report, dated 3rd June 1909, from the Darbar's Chief Engineer, Mr. Browning.*

"As far as the harbour is concerned, this is unquestionably the point of the greatest immediate danger.

Unless protective works are taken up at Cruz Milagre, this will inevitably be breached at a very early date.

The result will be that the outflow of water at Cochin will be so seriously diminished, as to be a most grave menace to the existence of the Cochin harbour and the neighbouring foreshore."

(3) *Extract from the report, dated 7th March 1910, from the Darbar's Chief Engineer, Mr. Browning.*

"If a breach were to occur at this critical point, the Cochin harbour would be seriously affected, and the whole of the waters from the Vembanad lake would empty themselves into the sea through this breach. Such a breach might occur at any time during a severe storm if the foreshore is yet to be left unprotected, and if erosion continues.

I think it is a grave mistake to characterize the erosion at Audikadavu as being of a "minor" nature. In the interests of the port of Cochin, the erosion at Audikadavu deserves to be viewed with almost as much concern as that at Cruz Milagre, and it would be useless, from the standpoint of the safety of the harbour, to attempt any protective works at Cruz Milagre without at the same time protecting the Audikadavu foreshore.

Though erosion at Kuzhupilli has no direct bearing on the Cochin harbour question, it is an undeniable fact that the coast is being denuded at a very rapid rate here and that the eroded material must be deposited somewhere and form sand banks. It is impossible to assume definitely that such sand banks will not be detrimental to the Cochin harbour and shipping. On the contrary, there is every reason to believe that, since the general trend of littoral current is southward, the harbour and the coast line are being affected."

(4) *Extract from the report, dated 1st August 1911, from the Darbar's Chief Engineer, Mr. Browning.*

"It will thus be seen how intimately this question of erosion is connected with the Cochin harbour and the Government revenue, for not only is the land area for coconut trees being vastly reduced, but the harbour itself and navigation are suffering, and ships will steadily have to lie farther and farther out from the harbour mouth.

I have always said, and recent events are proving, that the Cochin harbour cannot be separated from the question of the general coast erosion.

Before leaving this question of coast erosion, I will detail what must be done to stop same, and in doing so, I must point out that before any improvements can be carried out to the harbour itself, it will be an entirely wrong policy if all erosion is not first stopped throughout this coast line by means of the groynes detailed hereafter. Otherwise not only will this wastage of valuable territory continue, but all dredging operations at the mouth of and inside the harbour, will be enormously handicapped and vastly increased in expense because of all the additional eroded material that the dredgers will have to deal with.

It was just because this absolute necessity of first stopping erosion was overlooked on the Holderness coast (England), that the annual cost of dredging the harbours at Hull and Grimsby reached such gigantic proportions. It has since been found that an enormous portion of the material torn from this coast by the sea has been washed up the Humber, and it has been calculated that, had the coast line of Holderness been protected by groynes originally, the hundreds of thousands of pounds spent in dredging at Hull and Grimsby would have been more than halved."

8. Protective works on an elaborate scale will have to be undertaken not only at the places mentioned in paragraph 4 of the Government Order as directly affecting the interests of the harbour, but at all the four sections specified in paragraph 1 of the Chief Engineer, Mr. Browning's report, dated 7th March 1910. Opportunity thus presents itself now to consider the larger question of the Cochin harbour improvement apart from the question of protection and maintenance of that harbour, which must now be merged with the former. If therefore the Cochin Darbar are called upon to take the leading part in anti-erosion schemes near and in the vicinity of the Cochin harbour, then this Darbar are entitled to ask permission to carry out the larger scheme of the development of the harbour in regard to which there can be no doubt that funds can be raised in the open market.

9. Although the Cochin harbour scheme has been considered from various points of view during the past thirty years, and although the matter has been urged for the consideration of the Madras Government from time to time during this period by the Cochin Chamber of Commerce, there is no correspondence on record to show that this Darbar had at any time approached the subject with a view to take a leading part in the scheme. G.O. No. 308, Marine, dated 13th July 1903, which records the whole of the previous correspondence on the subject shows that the proposal then made of a capital outlay of 15 lakhs with a view to secure a suitable dredger was considered by Messrs. Coode, Son and Mathews, to whom the matter was referred by the Secretary of State for India, as impracticable. The Government were therefore reluctantly compelled to abandon the scheme until time and circumstances revealed the practical possibility of improving the harbour. The Darbar now consider that the West Coast erosion, concentrated as it is along the sea board of the Cochin territory and especially at the point of the Cochin harbour mouth, has created circumstances and presented an opportunity, which render it necessary to reconsider the position relating to the question of harbour improvement. Before, however, going into this matter in detail, I propose to give a brief summary of all the previous records on the subject.

10. It is important in the first place to note that there is now a railway connection down to Ernakulam, the capital of the State. It is also important to note that the total value of the exports and imports of Cochin has increased from Rs. 92,31,447 to Rs. 2,12,04,906 under foreign trade and Rs. 2,33,88,721 to Rs. 3,89,47,788 under coasting trade during the past ten years. The gross amount of customs duty collected at the port has also increased from Rs. 46,255 to Rs. 2,41,723. When the harbour question was first raised in the early eighties the total value of the trade in Cochin was Rs. 1,11,33,058 and this has developed in 1909-1910 to Rs. 6,01,52,694. The financial possibilities of the scheme therefore, as estimated during the several discussions in the past, have no bearing whatever on the actual state of things in the present, which justify a much bolder experiment and which was then entirely beyond the expectations of the most ardent advocate of this scheme. This will be made clear by a reference to a few of the official records on the subject. The original scheme contemplated "construction of two piers from the mouth of the harbour so as to bind the current flowing outwards and direct its full force on to the bar and to construct such protective works as to prevent erosion of the sea-beach north and south of these piers as might be necessary and to construct quay walls inside the harbour on the southern side from the present mouth of the Calvetty canal and on the northern side to the face of Vypeen."

These works were estimated to cost about Rs. 2,50,000. Considerable discussions regarding the above proposals followed, and on the statistics of trade of that period, the Chamber considered the financial aspect of the scheme in a very elaborate manner, particulars of which may be of considerable interest at the present moment. I therefore quote the following extract from the

Letter from the Chamber of Commerce to Secretary to Government, Public Works Department, dated 8th October 1880.

Chamber's letter to Colonel Sankey, R.E., dated 25th November 1880:—

"The average annual import and export for ten years are found to be:—

|                     |         |    |    |    | TONS.   |
|---------------------|---------|----|----|----|---------|
| Cochin and Narakal. | Imports | .. | .. | .. | 44,513  |
|                     | Exports | .. | .. | .. | 55,799  |
| Total               |         |    |    |    | 100,312 |

At the present time, ships of three to four hundred tons burthen come into the inner harbour and in discharging and loading their cargoes merchants find a saving of at least As. 12½ per ton in boat hire as compared with the cost of discharging and loading when ships are outside (including Narakal shipments) and on the suppositions that two-thirds of the imports and exports, say 66,875 tons, are discharged and loaded outside. The further reduction in boat hire occasioned by all ships coming inside would represent Rs. 52,940, or thereabouts annually being an average of As. 8-5 per ton on the whole trade.

If, however, ships were not only all able to come inside but provision was made for them to discharge and load at quays there would be a saving of Rs. 1-1-0 per ton in boat hire on the aforementioned two-thirds of total imports and exports and of about As. 5 per ton on the remaining third now discharged and loaded inside averaging As. 13-4 per ton on the whole trade and representing Rs. 83,593 annually.

But the full benefit which Cochin merchants would derive from the contemplated improvements is not to be measured by these savings only. Various facilities would be furnished such as reductions of risk of damage to goods and loss by theft, greater expedition in the shipping and discharging of goods, ability to carry on shipping operations under conditions of sea and weather, which now bring them to a stand-still and not least the avoidance of the considerable inconvenience, delay and extra expenditure which are at present experienced in having to carry on shipping operations at Narakal. These things have an appraisable value, and were taken into consideration when the Chamber informed Colonel Thomson in its letter of 4th April 1879 that for harbour improvement which would include quay walls in the inner harbour, the trade of the port could afford to pay Rs. 1-8-0 per ton by way of wharfage or bunderfees, if necessary, a statement from which the Chamber does not recede. However as far as the Chamber understands the subject, a less tax would more than suffice to pay 4 per cent. interest *per annum* on the supposed outlay of £250,000. Say As. 12 per ton in the case of harbour improvements not including quay walls and Re. 1 per ton in the case of improvements including quay walls.

The facilities and quicker despatch which ships would gain under these circumstances might well be considered sufficient ground for an increase in the tonnage dues they pay to the port and the Chamber would propose an increase of one anna per ton all round. The existing rates are:—

On ships from or to foreign <sup>and</sup>/<sub>or</sub> British ports 3 annas per ton for 90 days.

Coasting steamers—4½ annas per ton for 30 days.

Native and coasting crafts employed entirely in coasting trade—1½ annas per ton for 60 days.

There is attached hereto one statement of number of ships, tonnage and port dues for ten years at Cochin which shows the average tonnage for four years from 1876-1877 to 1879-1880 to have been 207,312 tons. A charge of one anna per ton on this amount would give an income of Rs. 12,957 *per annum*. If the tonnage of ships visiting Narakal was taken into account, the amount would be larger, but unfortunately statements cannot be obtained in time to go with this letter.

The Chamber is also of opinion that a large portion of the surplus port dues collected might very justly be appropriated to this object. For the past four years they have averaged *per annum* at Cochin Rs. 28,692, and the expenditure against them, it is believed, has not averaged Rs. 7,000 *per annum*. The Chamber has no idea of the manner in which the surplus of Rs. 21,000 has been disposed of (though it is well known that it has not been expended on the port) but ventures to propose that at least three-fourths, if not the whole of this surplus, be applied to the improvement of the port.

Thus in one case can be raised without any undue charge on the trade of the port, an income of Rs. 1,03,700 *per annum* as follows:—

Charges on landing and shipping—

|                                           | Rs.             |
|-------------------------------------------|-----------------|
| Say 100,000 tons at As. 12 per ton ... .. | 75,000          |
| Increased port dues ... ..                | 12,950          |
| Transfer from port dues ... ..            | 15,750          |
| <b>Total</b> ...                          | <b>1,03,700</b> |

representing at 4 per cent. *per annum* interest, a capital of Rs. 25,92,500.

In the other case can be raised an income of Rs. 1,28,700 *per annum* as follows:—

Charges on landing and shipping—

|                                          | Rs.             |
|------------------------------------------|-----------------|
| Say 100,000 tons at Re. 1 per ton ... .. | 1,00,000        |
| Increased port dues ... ..               | 12,950          |
| Transfer from port dues ... ..           | 15,750          |
| <b>Total</b> ...                         | <b>1,28,700</b> |

representing at 4 per cent. *per annum* interest, a capital of Rs. 32,17,500.

It may be added that a tax of even Rs. 1-8-0 per ton would compare favourably with the charges on shipping operations at the neighbouring and thriving port of Alleppey and proceeding as above, an annual income of Rs. 1,78,700 might be raised.

Charges on landing and shipping—

|                                              | Rs.             |
|----------------------------------------------|-----------------|
| Say 100,000 tons at Rs. 1-8-0 per ton ... .. | 1,50,000        |
| Increased port dues ... ..                   | 12,950          |
| Transfer from port dues ... ..               | 15,750          |
| <b>Total</b> ...                             | <b>1,78,700</b> |

representing at 4 per cent. *per annum* interest, a capital of Rs. 44,67,500.

Such being the case and if the works proposed are considered practicable and can be constructed within the cost, the port can pay interest on, the Chamber hopes that Government will give the subject favourable attention. The near completion of the Madras harbour works seems to afford an opportunity for taking the proposals concerning this port into consideration for the working plant soon to be set at liberty in Madras might be made available for any works sanctioned here.

During the recent visit of His Grace the Duke of Buckingham and Chandos to this port, the Chamber brought the subject of this correspondence to his notice, when he was pleased to express a wish that he might have an opportunity of considering the details of the Chamber's proposals before the expiration of his term of office as Governor of this Presidency."

In the address of the Chamber of Commerce to the Duke of Buckingham, the following observations appear:—

"Your Grace has already seen how much nature has done towards making this port into a first class harbour by the creation of the magnificent backwater which extends to the north and south of it for upwards of one hundred miles and it only waits for science to complete the work so as to render it available at all times to ships of the largest tonnage."

In another letter to Colonel Sankey, dated 14th December 1880, they observe:—

"The construction of harbour works here might be expected to pay from the very beginning and when this port is placed in connection with the Railway system of the Madras Presidency, of which there seems a likelihood, the existing extensive trade of the port may be expected to greatly expand. Nature having done so much for it, it is probable that this port could be converted into a first-class harbour at much less cost than only moderate works could be carried out at Beypore."

In a letter, dated 14th January 1882, to His Excellency the Governor of Madras, the Chamber stated:—

"The geographical position of Cochin with reference to the Suez canal and the fact that it is already a centre of large trade point it out as the natural port of the Madras Presidency for trade with Europe through the canal steamers from London through the canal can make the voyage to this port and back again within 10 to 12 days less time than they can go to Madras and return and therefore with a regular service of steamers freight to and from here would be materially lower than to and from Madras

Harbour improvements which would make the port available to steamers of the largest tonnage at all seasons of the year would undoubtedly be followed by such regular service and would cause great increase in the goods traffic over the Madras Railway to the benefit of its revenues."

11. In 1885, the Madras Government referred the question of constructing a first class harbour in Cochin to the Government of India, and the Government of India thereupon issued Proceedings to the effect that in their opinion the Imperial interests involved, are not of sufficient magnitude to justify an outlay, which may possibly amount to Rs. 81,00,000. The Chamber of Commerce have however repeatedly contended that the estimate of Rs. 81 lakhs which was framed by Mr. Parkes, the Chief Engineer of the Madras Harbour Works, was excessive. I now quote a very interesting address presented to Lord Curzon by the Chamber during his visit to the Cochin State as Viceroy and Governor-General of India in 1900:—

"The scheme to which we ask your Excellency's kind attention is one that this Chamber has been canvassing for the past thirty years and has for its object the improvement of the Harbour of Cochin so as to render it capable of fulfilling its natural destiny as a first class harbour.

The controlling influence which at present prevents this being attainable is the bar across the mouth of the entrance to the inner harbour.

The Chamber will not now trouble your Excellency by recapitulating all that has already transpired with the Madras Government and others on the subject but would respectfully ask to be allowed to submit for your kind attention a copy of past correspondence and reports relating to the proposed scheme.

In addition to these particulars, the Chamber would here bring to your special notice the following important facts, which have since transpired.

The last professional report made upon the harbour was in 1881 by Mr. A. Parkes, M.I.C.E. Chief Engineer of the Madras Harbour works, who considered that Cochin could be converted into a first-class harbour at an estimated cost of 81 lakhs of rupees.

The Chamber however were then reluctantly compelled to record that it was beyond the ability of the existing trade of the port to pay the interest required by Government (4 per cent.) on such an outlay.

This was 20 years ago and we would now solicit your Excellency's kind attention to the following particulars showing development in the trade of the port since then:—

|                                            | 1881.           | Year ending 30th June 1900. |
|--------------------------------------------|-----------------|-----------------------------|
| Value of Exports and Imports ...           | Rs. 1,11,33,058 | Rs. 3,10,68,252             |
| Tonnage of vessels entered and cleared ... | Tons 217,786    | Tons 487,180                |
| Port dues collected ...                    | Rs. 31,694      | Rs. 61,400                  |

and which returns disclose the fact that during the period under review the trade of our Port has been more than doubled, so that although in 1881 it might not have been possible to contribute the required return on the outlay involved, the present visible resources justify the Chamber in believing that this could now be done.

In estimating what revenue may be expected from the existing trade of the port, the following show the basis of calculation and results arrived at:—

|                                               |         |                     |          |
|-----------------------------------------------|---------|---------------------|----------|
| Average tonnage during the last two years of— |         |                     |          |
| Exports                                       | ...     | 92,000              |          |
| Imports                                       | ...     | 125,000             |          |
|                                               |         |                     | Rs.      |
| 217,000 at 12 annas per ton                   |         |                     | 1,62,750 |
| Tonnage of vessels—                           |         |                     |          |
| Cochin                                        | 510,000 | Port dues collected | 63,400   |
| Malipuram                                     | 82,000  | Do.                 | 6,300    |
| Proposed increased dues on—                   |         |                     |          |
| Tons                                          | 59,200  | at 1 anna per ton   | 37,000   |
| Estimated annual revenue                      |         |                     | 2,69,450 |

In addition to the above the Chamber feels that it would not be unreasonable to expect His Highness the Raja of Cochin to contribute towards the revenue of the proposed harbour, for the means would thereby be provided for materially increasing the earnings of the Cochin State Railway now under construction.

When last the Madras Government was addressed on the present subject, there was then no immediate prospect of Cochin being connected by rail with the Madras Railway, but, now that through the enterprise of His Highness the Raja of Cochin, this long felt want will soon be provided, the Chamber respectfully submits that this fact together with the evidence given on the increasing trade of the port and the revenue to be derived therefrom justify our present appeal to your Excellency and would venture to hope that the particulars given herein will evoke your interest in the proposed scheme and that it may be deemed worthy of your Excellency's favourable consideration.

With reference to Mr. Parkes' estimate of the cost of the proposed improvements, it is believed that the necessary work could be done for a much smaller sum, and the Chamber would respectfully plead the desirability of another survey being held upon the harbour.

The Chamber will not presume to obtrude its opinion upon the Imperial advantages, which might be associated with a first class harbour, situated as this would be, feeling that if such exist they are not likely to escape your Excellency's observation."

Lord Curzon's reply was very sympathetic and favourable, and he promised to make enquiries of the Local Government as regards the feasibility of the scheme. In the course of his reply, Lord Curzon said:—

"There is one point however outside the technical aspect of the case which would seem to require elucidation. I have been told that during the monsoon it is so difficult to ship cargoes from the Malabar coast that the local merchants prefer to send their produce right across India for shipments at Madras. Possibly, the changes that you advocate would obviate this difficulty; if not, it might be used as an argument against the conversion of Cochin into a first class harbour at a great outlay, for which you plead. A new light is however likely to be thrown upon the entire question by the impending connection of Ernakulam by railway with Shoranur on the Madras line, a project to which the Cochin Darbar has with much prudence and public spirit decided to devote its reserves. When this line is complete, Cochin should become a more important place and the demand for harbour improvement may appear in a different perspective. In the meantime, I must congratulate you upon the figures of expanding trade, which you have placed before me and which show that Cochin itself is much better able to meet any considerable liabilities than was the case 20 years ago."

12. Government Order No. 150, Marine, dated 4th March 1902, distinctly states that a review of the conditions both economical and natural of all the feasible harbours of the West Coast of the Madras Presidency places Cochin in the first position and that it is the only port, where trade can afford to pay for a harbour. The Madras Government resolved to call for expert opinion from the India Office as recommended by the Chief Engineer and the report by Messrs. Coode, Son & Mathews, dated 23rd February 1903, was the result. This report on which the final order of the Madras Government was issued has been very pertinently criticised by the Cochin Chamber of Commerce in their letter dated 20th November 1903. Recently when His Excellency Lord Kitchener of Khartoum paid a visit to this State as Commander-in-Chief, His Highness at a banquet given in his honour spoke of the Cochin harbour scheme as follows:

"The extensive backwater as it spread before his eyes when His Excellency crossed the bar must have engaged his attention as having wonderful possibilities for the future. Four centuries ago, Vasco De Gama established his factory in what is known as British Cochin, and there is no doubt that there are immense possibilities, if only the requisite enterprise and capital be forthcoming to convert the enclosed waters into a magnificent harbour, for which the place, geographically as well as naturally, is so well adapted."

To this Lord Kitchener of Khartoum replied that "having regard to the prospects of the scheme, it would some day be an accomplished fact."

Successive Governors of Madras and such eminent statesmen as Lord Curzon and Lord Kitchener have openly declared their opinion in favour of the scheme.

The Darbar have perused all these records and opinions with great interest and have also received more up-to-date notes on the subject from Mr. Browning, the Darbar's Chief Engineer, a printed copy of which forms an enclosure to this letter.

13. From a perusal of these papers the Darbar are convinced that a great future lies before Cochin, if the Cochin Harbour scheme is now taken up and considered in all its bearings, for the scheme if carried out will make Cochin an important commercial centre not only for the West Coast but for the whole of Southern India. Up to this, this Darbar have no doubt been unable to consider the question, and the discussions on the subject have been carried out by the Chamber of Commerce in British Cochin and the considerations bestowed thereon by the Madras Government and the Government of India have to a great extent been determined by the fact that the scheme was to be undertaken by the British authorities.

14. The interest which the Cochin Darbar have in the scheme cannot be ignored or minimised. A glance at the marine chart will show that by far the largest stretches of deep water lie in Cochin territory, viz., from the public offices at Ernakulam southwards for a distance of some miles and all along the Mattancheri foreshore, while the extensive backwaters which would form the nucleus of the inner harbour belong entirely to the Cochin Government. That a considerable portion of these backwaters will have to be utilised for the construction of the harbour was not altogether ignored by the Cochin Chamber of Commerce which has been agitating this question. No harbour scheme could be complete without the assistance of this extensive and magnificent sheet of backwater. The Chamber of Commerce in their letter to the Madras Public Works Department, dated 20th January 1881, stated "the Cochin backwater will afford facility for any extent of harbour development if steps be taken to keep open a deep entrance channel, and the Chamber is satisfied that there is no such suitable site within the Madras Presidency or one that holds out so fair a prospect of success and reasonable return on capital expended." The Engineer's opinion already recorded clearly shows that there will be no difficulty whatsoever in dredging out a suitable channel to a depth of five fathoms between the guts at Cochin and Ernakulam and throughout these magnificent backwaters, and when it is borne in mind that all goods landed at British Cochin will have to be taken by boat across to Ernakulam in order to reach the Cochin Railway and the mainland, it is obvious that Cochin has an interest in the harbour at least equal to, if not more than, the British Government. It may be urged that the Cochin Darbar having surrendered their rights and all advantages derived from the trade at the port under the Interportal Trade Convention of 1865, they are not now in a position to participate in any such big scheme for the development of the Cochin Harbour, and that, should a larger scheme of constructing a first class harbour in Cochin be undertaken, it can be carried out entirely as a British enterprise, and the Darbar will only be called upon to cede such of their territories in the backwaters of Cochin as may be required for the inner harbour on payment of compensation. The Darbar will of course concede that, if the matter is taken up as an Imperial question, it is for the British Government to deal with it themselves. Previous discussions, however, have recorded the fact that the British Government are not prepared to treat it as a scheme of any Imperial importance, and it must therefore be dealt with purely from an economical and commercial standpoint. In regard to this aspect of the question, I venture to place the following important particulars before the Madras Government to make the Darbar's interest in the scheme unmistakably clear, and their claim to deal with the question themselves irresistible.

15. Situated within the limits of the Cochin State, there are altogether four seaports, viz., Cochin, Malipuram, Narakal and Cranganur. Although the first port lies territorially within the British District of Malabar, it is geographically a seaport of the state inasmuch as the whole sea-borne trade of the State passes through this port, and its improvement and development therefore are of more importance to the Native State of Cochin than to British Malabar to which it politically belongs. Although territorially the Cochin port lies in British territory, prior to the agreement of 1865 known as the Interportal Trade Convention, the Cochin State under her Customs administration exercised absolute control over imports and exports, which control was then considered prejudicial to the interests of the progress of commerce and commercial intercourse at that port. The Darbar till then were deriving pretty large revenue from the duty collected on goods that passed in and out of the frontiers of Cochin territory and the trade of British Cochin was in consequence subjected to a considerable restriction owing to the Regulations then in force under which customs chowkeys were established throughout the line of the State frontier. British Cochin, situated as it was as an isolated spot of British territory 20 miles away from any other British possessions and surrounded on land side by the territories of Cochin, was labouring for a long time under the disadvantages of a system, under which they had to pay a duty twice, viz., to the Rajas at their frontier stations and then again to the British Customs House. It is necessary to consider the respective positions of the two Governments, at the time when the question of removing these trade restrictions at British Cochin was first raised. The Darbar were realising a revenue of an expanding nature from the several customs chowkeys of the State, which came to about Rs. 40,000 for the year 1860. Three

years later, the total Customs revenue exclusive of the import duty on tobacco and export duty on pepper came to Rs. 1,12,092, and the average receipts of the previous three years to Rs. 90,123. It is also to be remembered that the total revenue and expenditure of the State in 1865 was Rs. 9,63,006 and Rs. 9,44,193 respectively. The Customs revenue therefore was roughly 1/10th of the gross revenue of the State at that period. The annual value of trade at British Cochin then was only about 125 lakhs of rupees, and the total Customs revenue Rs. 67,225. The following figures will show at a glance the commercial development in Cochin which has taken place subsequent to the Interportal Trade Convention, prior to which British Cochin was admittedly in a position of great disadvantage owing to the absence of free trade facilities in Cochin territory.

|         | Exports<br>Rs. | Imports<br>Rs. |         | Exports<br>Rs. | Imports<br>Rs. |
|---------|----------------|----------------|---------|----------------|----------------|
| 1857-58 | 23,37,838      | 27,81,308      | 1884-85 | 89,67,158      | 49,30,136      |
| 1858-59 | 15,66,567      | 18,47,217      | 1885-86 | 78,69,647      | 62,54,268      |
| 1859-60 | 15,61,480      | 15,64,362      | 1886-87 | 80,09,042      | 48,10,284      |
| 1860-61 | 38,86,878      | 34,93,346      | 1887-88 | 81,54,921      | 50,64,419      |
| 1861-62 | 59,74,937      | 42,84,216      | 1888-89 | 94,04,967      | 49,15,039      |
| 1862-63 | 64,21,785      | 38,16,783      | 1889-90 | 91,25,457      | 51,79,968      |
| 1863-64 | 78,84,441      | 87,53,000      | 1890-91 | 91,86,879      | 71,66,502      |
| 1864-65 | 74,67,941      | 50,74,952      | 1891-92 | 1,08,33,950    | 69,97,136      |
| 1865-66 | 68,70,549      | 54,83,373      | 1892-93 | 1,28,81,925    | 88,97,599      |
| 1866-67 | 51,74,588      | 43,50,852      | 1893-94 | 1,15,42,994    | 78,84,093      |
| 1867-68 | 71,69,256      | 42,03,762      | 1894-95 | 1,52,97,558    | 98,78,005      |
| 1868-69 | 95,33,814      | 66,97,895      | 1895-96 | 1,61,49,003    | 1,01,98,371    |
| 1869-70 | 86,33,210      | 54,21,587      | 1896-97 | 1,33,75,404    | 68,66,250      |
| 1870-71 | 71,48,581      | 55,70,202      | 1897-98 | 1,39,99,281    | 79,07,621      |
| 1871-72 | 1,06,28,005    | 61,69,285      | 1898-99 | 1,59,66,489    | 91,89,361      |
| 1872-73 | 99,05,203      | 70,63,021      | 1899-00 | 1,86,76,687    | 1,15,04,379    |
| 1873-74 | 89,36,444      | 57,97,685      | 1900-01 | 1,80,13,951    | 1,49,99,505    |
| 1874-75 | 75,57,950      | 54,64,249      | 1901-02 | 1,76,91,415    | 1,59,07,867    |
| 1875-76 | 84,39,749      | 59,62,275      | 1902-03 | 1,88,37,380    | 1,15,10,694    |
| 1876-77 | 96,12,408      | 76,78,354      | 1903-04 | 2,05,60,570    | 97,13,611      |
| 1877-78 | 90,81,112      | 73,65,921      | 1904-05 | 1,99,76,503    | 1,12,33,932    |
| 1878-79 | 85,72,957      | 75,97,329      | 1905-06 | 2,00,49,452    | 1,88,27,192    |
| 1879-80 | 69,73,521      | 39,70,529      | 1906-07 | 2,34,45,833    | 1,59,32,872    |
| 1880-81 | 65,81,132      | 45,51,926      | 1907-08 | 2,22,21,517    | 1,69,69,174    |
| 1881-82 | 66,27,878      | 49,05,110      | 1908-09 | 2,87,85,137    | 2,08,83,321    |
| 1882-83 | 65,43,598      | 36,77,630      | 1909-10 | 3,02,14,959    | 2,99,37,735    |
| 1883-84 | 78,21,625      | 48,79,862      |         |                |                |

16. In the very first letter addressed by the British Resident to the Darbar on the subject in 1860 forwarding for the consideration and opinion of the Darbar some papers on the trade of Cochin, Travancore and Sirkar Cochin, he stated that it was necessary to remedy the evils then existing in the commercial intercourse with the three States and pointed out that the measures formulated were intended not only to improve the trade but also to enhance the revenues of the States concerned. Cochin on account of her geographical position practically held the keys of the situation, as it has been a natural emporium as well as an outlet of the produce of both Travancore and Cochin for years past, merchandise having found its way along the magnificent water-ways of the Cochin backwaters. The difference in fiscal laws of the three Governments concerned afforded ample facilities for smuggling, which the customs chowkeys could imperfectly prevent. The British Government were therefore deprived of the revenues to the extent of the diversion of trade to the Native States ports of Malipuram, Pallipattin and Alleppey, where the duties were very much less than the duties levied at the British ports. Not only were large quantities of wines and spirits intended for consumption at British territory landed at Sirkar ports at a loss of revenue to the British Government, but large quantities of salt also were smuggled into British territory from Cochin. After considerable discussions regarding the introduction of free trade principles, the question arose as to the manner of compensating the Cochin Darbar for the loss of revenue in consequence of the abolition of their customs. The British Government point out that such abolition would divert the trade from British Cochin to some of the Native State ports, and as such they were not willing to give a share in the future customs revenue of Cochin beyond the average period of five years with reference to the proposal that the Raja of Cochin will withdraw all customs chowkeys between his territory and British Cochin, and the British Government will agree to levy the customs at British Cochin dividing the customs revenue in fair proportions amongst the States. In regard to this very vital point, the Resident Mr. Maltby with true prophetic insight made the following observations:—

“But I would observe that the territories of the Rajas of Travancore and Cochin are rapidly improving—roads are opening out the rich coffee lands of the mountains and works executed at the expense of the Rajas are connecting British Cochin with the Railway on the one side and Cape Comorin on the other. It cannot be expected that two Sovereign Princes should relinquish their rights to derive an increasing revenue from the advancing prosperity of their territories.

That some of the trade now drawn to British Cochin will revert to its natural channel and be exported at Alleppey, I fully believe, but it will only be the produce of Travancore which never should have been diverted from that port. There is no reason to think that any British produce whatever, or any foreign produce intended for consumption in British territories, will seek that port.

Cochin and Alleppey will compete fairly for the trade of Travancore. When the great advantages of the Cochin harbour attract the produce to that port, the British Government will receive a just share of the revenues.

My belief is that by the arrangement proposed the trade of British Cochin will on the whole be so increased that the British Government will not lose on the customs, although sharing them with the Rajas.

To the mercantile community of Cochin, the advantages will be very great. With perfect freedom of communication by the backwater and equal duties at the two ports, the firms will generally have establishments at Cochin and Alleppey, and when the Cochin harbour is closed, business will be carried on at Alleppey.”

It is needless to emphasise that every one of the prophetic statements has now come to pass. After much exchange of views it was accepted as an admitted principle that the British Government and the Cochin Government are “entitled to participate in the expected profits.” The Diwan furnished the British Government with statistics of trade at the Sirkar ports for the previous five years and eventually a complete reciprocity of duties and tariffs was agreed to, Cochin binding herself not to levy on foreign goods imported to her ports any duty less than that adopted by the British Government in order to prevent her rates of duty from competing injuriously with those of the latter. The State also agreed to similar conditions in regard to exports. But when the question of compensation to Cochin came up, Diwan Mr. Shangunny Menon very pertinently pointed out that the arrangements agreed to did not secure to Cochin any advantage of which she was not already in enjoyment. An extract from this important communication will not be out of place here.

“The measures proposed appear to be just and equitable, and, although they do not secure any advantages to this Sirkar which it does not now enjoy, His Highness would have at once authorised their unconditional adoption, were he not apprehensive of a considerable loss of revenue for a few years. That the customs revenue will improve gradually, and that ultimately it will be much benefited by the measures proposed, appear to be unquestionable, but from the following observations you will perceive that the fears entertained for considerable immediate loss in the customs and salt revenue of this Sirkar are not altogether without foundation.

The customs revenue of this country is derived from sources, namely:—

- 1st. The duty on its exports and imports by sea to and from British India levied at its own port of Malipuram or at the chowkeys at Mattancheri and Vypeen.
- 2nd. The duty collected on its exports and imports by sea to and from Foreign States.
- 3rd. The duty levied on the trade of Travancore with Foreign States passing through this country.

4th. The duty levied by the two Native States on the trade of each other.

5th. The chowkeys on our northern frontier were abolished in 1846, and since that year goods passing from the Cochin territory to the Collectories of Malabar and Coimbatore and *vice versa* have paid no duty to this Government. The first of the conditions now suggested is therefore partly in force at the present moment, British-Indian goods imported by land being already free of duty, but the free admission of British-Indian goods into this State by sea is likely to cause a considerable loss of revenue and the concession offered in return for this condition, viz., the free admission of Cochin produce into the ports of British India, has really been in operation for years, for though the produce of this country pays an import duty to the British Government, if it be exported from the Sirkar port of Malipuram, you are aware that it can be taken to British Cochin, exported thence and imported into any British-Indian ports without the payment of any duty to the British Government.

The (conditions Nos. 2, 3 and 5) adoption of the British Tariff valuations and the levy of the British rates of duty on all foreign produce imported into this country as well as on the produce of this country when exported from its own port will render Malipuram of little or no use as a port, as it can never compete on equal terms with the port of British Cochin, possessed as it is of such a commodious and safe river harbour. Besides the natural disadvantages of Malipuram, the native merchants all reside and have their warehouses in Mattancheri and other places close to British Cochin, and it is not likely that they will take their goods to a distance of two or three miles, break bulk more than once and then carry the goods through the breakers of Malipuram to some distance at sea, where the anchorage is, when they can ship these goods with comparatively little expense, trouble, delay or danger in vessels lying in the placid waters of the river close to their own doors. The result of the conditions above mentioned will therefore be that all our imports from Foreign States will be imported into British Cochin, and that all our exports whether to British India or to Foreign States will be exported from the British port, and according to the concluding portion of concession No. II, the British and Travancore Governments will come in for a share of our import duty limited as it is on foreign goods, and the Travancore Government (if not the British Government also) will participate in the duty levied on all our exports.

Of the two concessions, the first will be of the utmost importance to Travancore, as, if it be carried out, the produce of that State can be exported from Alleppey to any British-Indian port on the same terms on which a great portion of it is now exported from British Cochin, and these goods will not have to pay a duty to this Sirkar as at present. The produce of this Sirkar will not be exported from Malipuram as long as it can be exported on the same terms from British Cochin, and as these goods can even now be exported from British Cochin and imported into any British-Indian port without the payment of any duty to the British Government, the above concession will be of no advantage to this Sirkar as I have already mentioned. As the export of the produce of Travancore from their own port of Alleppey will be the result of the above concession, the concession, although a just one, will prevent this Sirkar from deriving as at present a revenue from such goods, nor will these goods contribute to the increase of the export duty to be collected at British Cochin.

If, at the same time, it be intended as I believe it is, and think it should be, to abolish altogether all the chowkeys belonging to the two Native States on their frontiers, this Sirkar will lose also the duty now levied on its trade with Travancore.

It will be evident from what has already been stated that by the enforcement of the conditions and the grant of the concessions mentioned in your letter this Sirkar will have to relinquish all the customs revenue now realised and to receive in lieu of it its portion of the customs receipts of British Cochin and the duty to be levied on the excepted articles. The customs revenue of this State for the year 1038 M.E., exclusive of the import duty on tobacco and the export duty on pepper, was Rs. 1,12,092 and the average receipts for the last three years amounted to Rs. 90,123. What this revenue will be when it is confined to the share of this Government out of the receipts of British Cochin and the duty on the excepted articles, I am unable for want of sufficient data to calculate, but as any considerable decrease in the customs revenue is likely to give rise to financial difficulties, especially as the salt revenue is also likely to be reduced as will be shown hereafter, I am of opinion—an opinion in which His Highness fully concurs—that, before the proposed measures are carried out, the British Government should guarantee to this Sirkar a customs revenue of not less than the average receipts of the last three years, viz., Rs. 90,123, or in other words, that, should the share of this Sirkar out of the receipts of British Cochin and the duty collected at Malipuram on goods (pepper and tobacco excepted) imported into and exported from that port fall short of the above sum of Rs. 90,123, the British Government should make good the difference from their share of the receipts at British Cochin."

"With respect to this Sirkar, the case is quite different. What is now called British Cochin was previous to the coming to India of any of the European Nations, an integral portion of the Cochin territory and the Port then belonged exclusively to the Raja of Cochin. Even after the settlement of the Portuguese in Cochin, the port was considered, as far at least as the customs receipts were concerned, as belonging jointly to the Portuguese and the Cochin Governments, as both participated in the customs revenue collected at this port. In the time of the Dutch, who succeeded the Portuguese, this Government continued to receive a portion of the customs receipts of Cochin, and even after the arrival of the English a moiety of these receipts was paid to this Sirkar for a few years. The payment of this moiety was subsequently discontinued, and a rather unwilling consent was obtained from His Highness the Raja to yield his claim to it, but although the Sirkar was thus deprived of a moiety of the duty on goods imported into or exported from British Cochin with the exception perhaps of few goods which were actually consumed in British Cochin, for duty continued to be collected at the chowkeys surrounding the town which all goods intended for exportation from British Cochin or imported into it must pass. It was probably in consequence of the double duty thus levied on the imports and exports of British Cochin that there was up to a recent date a distinct tariff for this port. At any rate, it will be perceived that this Sirkar has always received a portion of the duty levied on the trade, which is in a great measure the trade of Sirkar Cochin merely passing through the above port, there can, I feel, be no question as to the justice of such participation. The proportion allowed to this Sirkar was, I find, one-half of the customs receipts of British Cochin and this in my opinion is the proportion to which the Cochin Sirkar will be entitled when the measures proposed are carried into effect.

With regard to the inland trade of the two Native States with each other, I am of opinion that it should be perfectly free and that the chowkeys of the two States on their frontier should be altogether removed. Such, I believe, was the intention of Mr. Maltby, when he wrote to the Collector of Malabar on the subject of the improvement of the trade of the three States, for, although I do not find it expressly mentioned in any part of his letter, he speaks (paragraphs 65 and 71) of the "perfect freedom of communication by backwater" and the removal of all customs on the backwater, as some of the advantages anticipated from the measures proposed—advantages which cannot be realised except by the total withdrawal of all chowkeys and subordinate stations on the frontiers. If it be resolved to continue the levy of a duty on the exports and imports of the two Native States with each other, any goods passing from the British Cochin into Travancore or from Travancore into British Cochin will have to be stopped at each of these chowkeys and detained, until the papers, if any, and the goods are, examined and it be ascertained that the goods came from British Cochin or are being taken to the port, and that they

correspond in quality and quantity with those mentioned in the paper, and after all it would be impossible to determine the place from which they come in the one case and their destination in the other; for, supposing that goods, the produce of Travancore, are passed at the Travancore chowkeys as intended for exportation from British Cochin and a rewannah be granted to that effect, what guarantee have these two Sirkars that these goods are actually taken to British Cochin and that they will not be consumed in this country. The duties can moreover be easily evaded by taking the Travancore produce into British Cochin previous to its being stored at Mattancheri and other places in this country and by shipping the produce of this country in boats at British Cochin preparatory to its being exported into Travancore. You will thus perceive that the continuation of this duty will give rise to constant disputes without its being of any material advantages to the revenues of the two Native States. I beg you will be so good as to inform me whether the frontier chowkeys belonging to the Native States are to be retained or to be abolished."

The above communication more or less states the case for Cochin as then urged fully. Eventually, an agreement was drawn up on the following lines:—

I. All goods, the produce or manufacture of British India, and all goods exported from any port or place in British India, which are exempted from or have paid duty on import into British India, will be admitted into the territories of His Highness the Raja of Cochin, by sea, land and backwater, free of all customs duty, salt, opium and country spirits excepted.

II. All goods, the produce or manufacture of the Cochin State and all goods exported from any port or place in the territories of His Highness the Raja of Cochin, which are exempted from or have paid duty on import into those territories, will be admitted into British India, by sea, land and backwater, free of all customs duty, salt, opium and country spirits excepted.

III. The rates of customs duties and tariff valuations in force from time to time in British India will be adopted in the Cochin State.

IV. Foreign goods, imported direct into any port belonging to His Highness the Raja of Cochin will be charged with the same duty as they would be liable to, if similarly exported from a port of British India, tobacco excepted.

V. Goods, the produce or manufacture of the Cochin State, on export to any foreign port or place will be charged with the same duties as they would be liable to, if similarly exported from a port of British India, pepper and coffee excepted.

VI. No drawbacks will be allowed on goods re-exported from any port or place in the Cochin State to any port or place in British India or vice versa.

VII. The monopoly price of salt in the Cochin State will be the same as in British India, an addition on account of carriage, etc., being made to that price when the salt is sold by the Cochin State at an inland depot.

VIII. The whole of the net duty realised on foreign tobacco imported into British Cochin (tobacco imported for Travancore excepted) and on Cochin coffee exported from British Cochin, will be paid over to the Cochin State.

IX. A moiety of the net customs revenue realised on imports and exports at British Cochin, tobacco, pepper, coffee, salt and opium excepted, will be paid over to the Cochin State.

X. The British Government will engage to make good to the Cochin State any deficit between the sum of Rs. 90,000 and the aggregate of the net duty on tobacco, Cochin coffee and pepper, of the moiety of the net customs duties at British Cochin and of the customs duties realised at the Cochin ports and customs houses.

XI. The special duties will be the following:—

Foreign tobacco on import into British Cochin or any Cochin port—Rs. 20 per candy of 600 lbs.

Coffee, the produce of His Highness the Raja's territories, on export similarly, 5 per cent. *ad valorem*.

Pepper (as in Act III of 1061).

Subsequently the minimum guarantee was raised to one lakh and an additional clause was added to admit British Indian tobacco duty free on a compensation of Rs. 10,500.

17. I have referred to some of the correspondence that took place in connection with this Convention in detail with a view to bring out in relief the special circumstances connected with the development of trade in the port of British Cochin subsequent to it. The port was at that time labouring under several disadvantages. The immediate results of the Convention were—

(1) The radical destruction of a nursery of crime in the smuggling trade, regarded always as "a monster ill of monopoly".

(2) the recovery to the British Government of considerably over a lakh of rupees on the salt revenue, a large increase in the revenue from wines and spirits and an increasing revenue from the Customs house at British Cochin.

The prospective benefits contemplated were—

(1) to the *Commercial Community*, the impulse given to trade at British Cochin on the removal of the duties and restrictions thereon,

(2) to the *British Government*, a corresponding increase and improvement in the port dues and customs revenue owing to expansion of export and import trade,

(3) to the *Cochin State* generally, a great impetus to her trade with the British territories, and

(4) to the *Cochin Government* themselves, a promise of an increasing customs revenue from the prosperous trade in their midst.

The improvement that has taken place in the trade of British Cochin during the last 45 years or so, which is mainly attributable to the withdrawal of the fiscal restrictions by Cochin is out of proportion to the benefits that Cochin has derived thereunder, although this Darbar have followed a liberal and enlightened policy, which was characterised by the Right Honourable the Secretary of State for India in the following words "Her Majesty's Government notes with much satisfaction the liberal and enlightened views with which His Highness has met the proposals of the Madras Government in accepting the measures for relieving fiscal restrictions upon the trade between British territory and the States of Cochin and Travancore". (British Resident's letter, dated 26th April 1865.)

Subsequently the Cochin Darbar boldly came forward to utilise all their surpluses in constructing a railway through the heart of their territory, which now in a manner connects the port with the whole Railway system of India. This embarrassed their finances to a great extent, but so far Cochin has not been allowed her legitimate share in the growing prosperity of trade of the Cochin port, which is admitted as her just due in the past correspondence. It has been recorded in that correspondence that any future increase in the trade of Cochin must in fairness be attributed in no small measure to the improvements projected and being carried out by the Native State Government and that they are fully entitled to participate in the expected profits. Apart from the Railway which was a large undertaking involving a capital outlay of nearly 70 lakhs of rupees, the Darbar have constructed innumerable roads, bridges and canals and could now boast of a net-work of land and water communications, which have undoubtedly contributed towards the growth of commerce between British Cochin situated on the south-western frontier of the State and the surrounding country. In spite of the large expenditure on such works which has steadily increased especially during the past ten or fifteen years, and which come up to over 100 lakhs, this Darbar's revenue from trade has remained stationary. The Travancore Government have fared otherwise, for in spite of the collection of export duties prevailing in that State, the value of exports have gone up from Rs. 35,47,653 in 1861 to Rs. 2,21,24,932 in 1907. Had Cochin not relinquished her rights to the import and export duties, its share of the moiety would now amount to nearly six lakhs of rupees. Diwan Mr. Shangunny Menon in agreeing to the terms of the Convention was certainly led to expect that, in return for relinquishing the position of advantage, the State would legitimately be benefited by the gradual improvement in the revenues at British Cochin which the State was to share with the Imperial Government, but this Darbar have not secured any decisive advantage, but on the other hand have suffered heavy loss by the reduction of duty on salt in British India. Reduction has had to be made in the State by 8 annas on three occasions involving a total reduction of Rs. 1-8-0 per maund up to the end of 1882. Further, the bulk of trade at the State's own Ports of Narakkal, Malipuram and Cranganur has since been lost as it gradually passed into British Cochin. The Cochin State has also lost her revenue from the trade which she used to carry on with Travancore. A comparison of the figures relating to the customs revenue of Travancore between 1040 and 1084 will afford further evidence of the great disadvantage, which Cochin has suffered in spite of the large expansion of trade within her territory. In Travancore, the customs revenue in 1040 was Rs. 3,78,213 and in 1084 Rs. 13,35,552. Cochin has therefore lost heavily by giving up her export duties and this relinquishment has only benefited British Cochin. At one time the prosperity of the customs revenue was considered to be the cause of a general improvement in the finances of the State. Diwan Mr. Shangunny Menon has recorded the observation in his notes of instructions during the negotiations at the time of the Convention that the Native State Governments find it difficult to give up the duty on their exports at the British Indian Ports. The rates of duty proposed by the Cochin State was 3 per cent., and the Sirkar was to reserve to itself the right of increasing or decreasing taxation, should it be found necessary to do so. However under the Convention, Cochin received a guarantee of customs revenue of Rs. 1,10,500 and agreed to the abolition of duties within her territories with the result that she has lost the trade in her own Ports and derived no pecuniary benefit whatever over and above what she was actually receiving 46 years ago. It is only since the Darbar brought to the notice of the Madras Government, their claim for the full moiety of customs collections in British Cochin that they have realised an increased revenue and that only during the past three years. In order to derive the fullest benefit from the growth of trade irrespective of the Trade Convention of 1865, this Darbar are not prohibited from collecting duty on exports at their own Ports. Of course, whatever is collected by them will be deducted from the amount payable by the British Government under the guarantee. Further, the Darbar could declare Mattancheri as a Port, and in conjunction with Malipuram could work up their trade revenue considerably in excess of what they can expect to make under the present arrangement. All petroleum that is imported into the State and stored there come through British Cochin, and the duty is collected by the British Government. There seems to be no reason why this Darbar should not prevent the import of such articles imported at British Cochin by them, through their own Sirkar Ports. This Darbar have also to pay to the British customs not less than Rs. 20,000 per annum for all articles imported at British Cochin by them, which would of course be free of duty when imported at their own Sirkar Ports.

18. To sum up the above arguments, in 1865 when a guarantee of Rs. 1,10,500 was given, customs revenue at British Cochin was only Rs. 67,225, the value of trade only Rs. 1,13,53,922, the amount of Port dues collected at British Cochin only Rs. 8,798 and the tonnage of vessels 1,27,723. In 1910, the value of trade in British Cochin has risen to Rs. 6,01,52,694 and the tonnage and Port dues to about eight and one lakh respectively. In spite of this enormous expansions of trade, Cochin has derived no pecuniary advantage. On the other hand, she has lost a considerable portion of the revenue which she would have legitimately earned, had she continued to exercise her rights of taxing imports and exports. Even to this date the neighbouring State of Travancore derives a substantial revenue from customs duties which is three times the amount that she used to derive half a century ago. To improve her position in the matter, the Cochin Darbar should declare new Ports and insist on the trade passing through them to other territories and place other restrictions, which no doubt would be considered as retrograde in policy, having regard to the liberal spirit which she had displayed in the past. The question of making Mattancheri a Port was once considered in 1905, but no satisfactory agreement with the British Government was arrived at at the time (please see Resident's letter dated 28th August 1905). The development of trade in British Cochin is due in a large measure to the sacrifice that this Darbar have made and to the spirited policy that she has pursued in regard to the development of her internal communications and the construction of the Railway. The inland backwaters between Cochin and Ernakulam presents not only facilities for the construction of a magnificent harbour, and the question of constructing this harbour has hitherto been taken up by the Cochin Chamber of Commerce, although the Darbar's interest in the matter is considerable and cannot for a moment be denied. The backwater is described by experts as "a wet dock of greater area than all the great docks of Great Britain put together". The importance of Cochin as the greatest outlet in the west coast for the trade of Southern India especially in regard to her past history and her subsequent development in Railways and internal water communications cannot now for a moment be doubted. Looking at all the questions referred to above from a general standpoint, the Darbar therefore consider that no more suitable opportunity can be found for reopening the question of the harbour improvement in conjunction with the proposed anti-erosion schemes as well as all matters connected with the modifications that must necessarily have to be made in the treaty arrangements and stipulations now existing with reference to the trade at British Cochin, between this Darbar and the British Government. Cochin can in fairness and justice claim to be the leading partner in the scheme, take the initiative, undertake the enterprise and thus derive the fullest benefit from her natural position of advantage, which has hitherto been denied to her owing to her own altruistic policy.

19. Looking at the scheme and its possibilities from a broad and general standpoint, it is impossible not to be struck with the advantages that Cochin possesses, which, in spite of the fact that they have been brought to notice on several occasions have nevertheless up to the present time not encouraged the enterprise being undertaken either by Government or Capitalists. A reference to the map will show that, for vessels plying between Europe and Australia, via the Suez Canal, Cochin is the more convenient place of call than Colombo and inevitably more accessible than Madras. Further, while Colombo and Madras are entirely dependent on artificial means for their harbours, Cochin already possesses an enormous and deep natural inner basin capable of unlimited expansion. The backwater between Ernakulam and Cochin is 2½ miles broad and is of great depth in many places. Its advantages as a naval port have already been pointed out in the past correspondence. It could afford anchorage and safe hiding to battle ships and torpedo boats, and it could also provide berths, for a large fleet of commerce. The shore-line along the eastern side (Ernakulam) of this extensive inner basin which is now being acquired by the Darbar and cleared at a considerable cost as part of the Town improvement scheme affords unlimited opportunities for the construction of magnificent wharfs, while sidings from the Railway could be run on these wharfs throughout the entire length, by which means ships of the very largest size would be able to load and unload directly from the Railway trucks. Climatic conditions as regards periodical cyclones, which visit Madras and other places, are extremely favourable, and the Darbar have not the least doubt having regard to the professional opinion already on record that the bar at the harbour mouth can be easily and permanently removed and the inner basin can be deepened to accommodate ships of the largest sizes at all times with ease. In regard to this point, I extract below the following from a note by the Darbar's Chief Engineer on the subject:—

"Up to the present time no money has been spent on harbour improvements in Cochin, and therefore, from the very inauguration of this scheme, the harbour and all works connected with the scheme can be taken up and carried out on the most modern principles and by means of the most up-to-date methods. There is nothing antiquated or defective to be demolished or rectified, and hence much useless expense will be spared.

Thorough dredging can be accomplished and to such an extent, that the very largest ships that can pass through the Suez canal, even if it be deepened to any extent in the future, can always anchor in the Cochin harbour throughout the year in all weathers, and have ample space and every shipping facility for the rapid discharge of cargo.

Another great advantage that Cochin will have, is the valuable use she will be able to make of what is in most places an actual nuisance, which has to be got rid of often by expensive means. I refer to the sand and mud dredged up out of the harbour, which will be instantly converted into valuable land areas.

Moreover, this dredged up material can well be utilised in the construction of the quays, Railway sidings, and warehouses, and hence no expensive lands will need to be purchased for this purpose. There is also ultimate room for the extension of these quays, etc., without in any way interfering with vested rights and interests.

Again, the water brought down from the interior, after being used to generate the electric power required, will be an incalculable blessing to the thousands of people, who at present are liable to elephantiasis and other terrible diseases undoubtedly due to bad water.

Cochin has another great advantage, in that she cannot be looked upon as an experimental Port, but must even now be considered as *the Port* indicated in South India, both geographically and historically for such a harbour.

Even now her annual revenue from shipping dues is £21,000, and this, when there is only 12 feet of water on the bar, which necessitates steamers lying 2 or 3 miles out at sea, and when there is every other shipping disadvantage that can be imagined.

It was laid down by probably one of the greatest geninuses and authorities on shipping questions, the late Sir George Stevenson that the commercial value of any harbour which shows a steady increase in revenue in the face of disadvantages as is the case in Cochin—*increases as the cube of the depth*.

As we could count on 35 feet of water on the Cochin bar immediately the dredging is undertaken, a small mathematical calculation will show the immense increase in Port revenue that could be confidently anticipated.

From all the foregoing facts and details, it will be evident how clearly all the different points connected with this great matter are linked together—so much so that it is practically impossible to separate one from another without greatly imperilling, nay even actually destroying, the unity and value of the whole scheme.

It is absolutely imperative that from the very outset, this scheme should be regarded as *one cast whole*, and that on no account, shall any attempt be permitted at anything in the nature of piecemeal work.

If only *parts* of the project are taken up from time to time, the results will be absolutely fatal.

Time and money will be wasted, and while one work is being carried out, actual harm may be done through the non-execution of another work, which should have been taken up at the same time.

*But*, if the whole scheme be inaugurated at one and the same time, *and the various portions carried out more or less simultaneously* as parts of *one vast whole*, then from the beginning, time and money will be saved, and large profits will be obtained from the very outset.

No doubt, there is a professional report by Messrs. Coode, Son & Mathews, dated 23rd February 1903, but as pointed out by the Cochin Chamber of Commerce in their letter of the 20th November of that year, the views expressed in the report have been admittedly arrived at without "sufficient data having been available for the purpose of enabling that Firm to correctly determine the feasibility of the scheme." The Chamber, however, observed that the whole report teems with expressions, which show that Messrs. Coode, Son & Mathews have had to rely on documents, which apparently were in no way sufficiently complete for the purpose in view. They also observed that the financial aspect of the scheme was based on a calculation of only Rs. 1,39,000 as dues on cargo alone and no reference was made to Port dues. The Chamber therefore suggested the introduction of landing and shipping dues at this Port in order to provide sufficient funds to enable a thorough survey. The chart that accompanied this letter gives an idea roughly of the harbour scheme, and what the Darbar would now suggest is the appointment of an expert Commission to go into the whole question and submit a report. The Darbar understand that a survey of the Port is about to be undertaken by the Marine Department, and if their information is correct, the survey may be ordered to be taken up without delay in conjunction with the proposed investigation.

20. The statistics for the years 1907-08, 1908-09, 1909-10 of trade in Cochin Port are given below:—

| Description.                                                                                                                           | Imports.                    |          |          |                          | Exports.         |             |             |                          |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|----------|--------------------------|------------------|-------------|-------------|--------------------------|
|                                                                                                                                        | Quantities reduced to tons. |          |          |                          | Value in rupees. |             |             |                          |
|                                                                                                                                        | 1907-08.                    | 1908-09. | 1909-10. | Average for three years. | 1907-08.         | 1908-09.    | 1909-10.    | Average for three years. |
| A.—Goods with quantities recorded by different units of weight in the statistics and oil at 280 gallons per ton (now reduced to tons). | 1,35,753                    | 1,60,597 | 2,66,439 | 1,87,596                 | 1,20,81,847      | 1,67,88,074 | 2,44,78,831 | 1,77,76,251              |
| B.—Do. quantity not recorded by weight.                                                                                                | ..                          | ..       | ..       | ..                       | 41,09,348        | 40,95,447   | 54,56,879   | 45,53,891                |
| Total imports ..                                                                                                                       |                             |          |          |                          | 1,61,71,155      | 2,08,83,521 | 2,99,35,710 | 2,23,30,142              |

Oil is calculated at 8 lbs. per gallon, or 280 gallons, per ton.

| EXPORTS.                        |        |          |          |          |             |             |             |             |
|---------------------------------|--------|----------|----------|----------|-------------|-------------|-------------|-------------|
| A.—Quantity recorded by weight. | 94,079 | 1,16,811 | 1,15,298 | 1,08,729 | 2,08,49,894 | 2,75,07,038 | 2,88,88,230 | 2,57,48,221 |
| B.—Do. not expressed in weight. | ..     | ..       | ..       | ..       | 10,68,912   | 12,61,644   | 13,18,002   | 12,14,519   |
| Total exports ..                |        |          |          |          | 2,19,18,806 | 2,87,68,682 | 3,02,01,232 | 2,69,62,740 |

The average annual exports and imports for three years are found to be—

|          | Tons.    | Value. | Value. | Total value. |
|----------|----------|--------|--------|--------------|
|          |          | LAKHS. | LAKHS. | LAKHS.       |
| Imports  | 1,87,596 | 177.7  | 45.6   | 223.3        |
| Exports  | 1,08,729 | 257.5  | 12.2   | 269.7        |
| Total .. | 2,96,325 | 435.2  | 57.8   | 493          |

Taking an average of, say, 300,000 tons and calculating the charges under landing and shipping thereon at one rupee per ton, there would be an income of 3 lakhs per annum. The increased Port dues may be calculated at the rate of one anna per ton on the average tonnage of vessels entering and clearing from the ports, which may safely be estimated on the figures of 1910-1911, *viz.*, 8,40,000. If to this is added 75 per cent. of the surplus Port dues collected at Cochin, the total income that may be anticipated as revenue per annum will be Rs. 4,25,000 as follows:—

|                           | RS.      |
|---------------------------|----------|
| Landing and shipping dues | 3,00,000 |
| Increased port dues       | 50,000   |
| Surplus port dues         | 75,000   |
| Total ..                  | 4,25,000 |

This represents, at 4 per cent. per annum interest, a capital of Rs. 1,06,25,000. The Darbar consider that the Harbour scheme will not in any case cost more than 100 lakhs and there will be sufficient income to pay interest on the capital expended. They are also convinced that it will not be difficult to raise the capital in the open market on a guarantee of 4 per cent. interest, say, for 10 years, which the Darbar are prepared to give, should the whole work be undertaken by them. The question of apportioning the income and expenditure relating to the whole scheme may be considered by the British Government and the Cochin Darbar jointly. Should the whole expenditure be incurred on the guarantee and risk of the Cochin State, it is only fair and just that they should credit the income from the harbour to her revenues, allowing the British Government to levy Port dues at the harbour mouth at the existing rates only, any enhanced dues going along with the landing and shipping charges to the State. The construction of the harbour will necessarily entail a revision of the terms of the Interport Trade Convention, and Cochin can legitimately ask for a larger share of the anticipated profits on account of increased customs revenue than has been allotted to her since the date of the Convention. All these and subsidiary questions may be referred to the Harbour Commission proposed to be appointed, and a final decision may be arrived at with a view to secure the agency to draw up the necessary plan and estimates under expert advice and supervision not only for the construction of the harbour, but also for protective works against erosion along the coast. The Darbar anticipate that, when a scheme of such hopeful and sound financial possibilities is made known to the public, there will be no difficulty for a Syndicate to undertake the same on the guarantee proposed. The financial aspects of the scheme, with reference to subsequent development of trade, are more than 50 per cent. better than those considered 30 years ago. The Cochin State revenue has also advanced during this period from 9.6 lakhs to 43.5 lakhs per annum. The Darbar are strongly of opinion that the present conditions are extremely favourable for taking up the whole scheme, which is bound to prove financially prosperous as well as a great boon not only to the State and the surrounding country, but also to the whole of Southern India. In conclusion, I am to add that the Darbar will be prepared to bear the initial cost of the investigation that may be ordered by the British Government, or they are themselves prepared to undertake the investigation on their own responsibility, if permission be granted to them to convert the inner backwater into an expansive harbour according to the rough plan indicated above. I have the honour to request that you will be good enough to place the views of this Darbar before your Government at an early date and communicate to me their decision so that no further time may be lost in drawing up a combined scheme of harbour improvement and protection against erosion after necessary investigations have been made into all the important questions involved jointly by the two Governments. The Darbar propose that the Joint Harbour Commission may consist of the Chief Engineer of the Madras Public Works department, the Chief Engineer of the Cochin State, the Presidency Port Officer, Madras, the President, Chamber of Commerce, Cochin, and one harbour expert from England. A list of papers referred to in this letter is enclosed for facility of reference.

LIST OF PAPERS REFERRED TO IN THE LETTER FROM THE DIWAN OF COCHIN,  
DATED 24TH OCTOBER 1911, REF. ON U. No. 420 OF 1086.

- (1) Resident's letter, dated 14th January 1911, Dis. No. 15 of 1911.
- (2) G.O. No. 355, Marine, dated 10th November 1910.
- (3) Resident's letter, dated 26th May 1911, R.O.C. No. 944.
- (4) Do. 14th June 1911, R.O.C. No. 944.
- (5) Diwan's letter, dated 9th June 1911, R.O.C. No. 420/1086.
- (6) Do. 24th June 1911, R.O.C. No. 420/1086.
- (7) Resident's letter, dated 20th June 1911, R.O.C. No. 944.
- (8) Darbar's Chief Engineer, Mr. Browning's report, dated 1st August 1911. (Printed copy enclosed.)
- (9) Diwan's letter, dated 24th June 1907.
- (10) Do. 1st July 1907.
- (11) Resident's letter, dated 30th July 1907, R.O.C. No. 1217/1907.
- (12) Do. 11th January 1910, R.O.C. No. 2066/1909.
- (13) Darbar's Chief Engineer, Mr. Browning's report, dated 7th March 1910. (Please see G.O. 355, Marine, dated 10th November 1910.)
- (14) Darbar's Chief Engineer, Mr. Browning's report dated 22nd April 1910. (Please see G.O. referred to above.)
- (15) Travancore Chief Engineer's letter, dated 30th March 1910. (Please see G.O. referred to above.)
- (16) Resident's letter, dated 10th March 1910, R.O.C. No. 2066/1909.
- (17) Extract from the Indian Engineering.
- (18) G.O. No. 294, Marine, dated 24th July 1907.
- (19) Extract from the joint report of the three Engineers. (Please see page 6 of G.O. dated 10th November 1910.)
- (20) Extract from the Darbar's Chief Engineer, Mr. Browning's report dated 3rd June 1909. (Please see page 11 of the G.O. dated 10th November 1910.)
- (21) Extracts from the Darbar's Chief Engineer, Mr. Browning's report, dated 7th March 1910. (Please see pages 27 and 28 of the G.O. dated 10th November 1910.)
- (22) G.O. No. 308, Marine, dated 13th July 1903.
- (23) Letter from the Cochin Chamber of Commerce to the Secretary to Government, D.P. W., dated 8th October 1880.
- (24) Extract from the Chamber's letter to Colonel Sankey, R. E., dated 25th November 1880.
- (25) Extract from the Address of the Chamber of Commerce to the Duke of Buckingham.
- (26) Extract from the Chamber's letter to Colonel Sankey, R. E., dated 14th December 1880.
- (27) Extract from the Chamber's letter to His Excellency the Governor of Madras, dated 14th January 1882.
- (28) Extract from the Address of the Chamber of Commerce to Lord Curzon in 1900.
- (29) Extract from Lord Curzon's reply to the above.
- (30) G.O. No. 150, Marine, dated 4th March 1902.
- (31) Report by Messrs. Coode, Son and Mathews, dated 23rd February 1903. (Please see G.O. dated 4th March 1902 above.)
- (32) Extract from His Highness' speech at the Banquet given in honour of Lord Kitchener. (Please see Cochin Administration Report for 1084.)
- (33) Extract from Lord Kitchener's reply to the above.
- (34) Letter dated 20th January 1881 from the Chamber of Commerce to the Madras Public Works Department.
- (35) Interportal Trade Convention of 1865.
- (36) Resident's letter, dated 23rd November 1860, No. 1953, forwarding for the consideration and opinion of the Darbar some papers on the trade of Cochin, Travancore and Sirkar Cochin.
- (37) Letter dated 22nd August 1860, No. 1421, from the British Resident to the Collector of Malabar.
- (38) Diwan Mr. Shangunny Menon's letter to the British Resident, dated 14th September 1863, No. 490/1863.
- (39) Paragraph 40 of the Proceedings of the Madras Government, No. 709, dated 23rd April 1864.
- (40) Resident's letter, dated 26th April 1865, No. 574.
- (41) Resident's letter, dated 28th August 1905, No. 307.
- (42) Extract from the Darbar's Chief Engineer Mr. Browning's report, dated 1st August 1911.
- (43) Letter dated 20th November 1903, from the Cochin Chamber of Commerce.

ENCLOSURES TO THE DIWAN'S LETTER DATED 6TH NOVEMBER 1911, R.O.C.  
No. 420 OF 1086.

- (1) List of papers referred to in the letter.
- (2) Printed copy of the Darbar's Chief Engineer Mr. Browning's report, dated 1st August 1911.
- (3) Printed copy of the Darbar's Chief Engineer Mr. Browning's report, dated 7th October 1900.
- (4) Printed book containing the correspondence relating to the proposals for the improvement of the Cochin Harbour.
- (5) The Chart referred to in the Chief Engineer's report, dated 7th October 1900.

SUB-ENCLOSURES.

(1)

LIST OF PAPERS REFERRED TO IN THE DIWAN'S LETTER DATED 6TH NOVEMBER  
1911, R.O.C. No. 420 OF 1086.

- (1) Resident's letter, dated 14th January 1911, Dis. No. 15 of 1911.
- (2) G.O. No. 355, Marine, dated 10th November 1910.
- (3) Resident's letter, dated 26th May 1911, R.O.C. No. 944.
- (4) Do. 14th June 1911, R.O.C. No. 944.
- (5) Diwan's letter, dated 9th June 1911, R.O.C. No. 420/1086.
- (6) Do. 24th June 1911, R.O.C. No. 420/1086.
- (7) Resident's letter, dated 20th June 1911, R.O.C. No. 944.
- (8) Darbar's Chief Engineer, Mr. Browning's report, dated 1st August 1911. (Printed copy enclosed.)
- (9) Diwan's letter, dated 24th June 1907, R.O.C. No. 1976 of 1082.
- (10) Do. 1st July 1907, R.O.C. No. 1968 of 1082.
- (11) Resident's letter, dated 30th July 1907, R.O.C. No. 1217/1907.
- (12) Do. 11th January 1910, R.O.C. No. 2066/1909.
- (13) Darbar's Chief Engineer, Mr. Browning's report, dated 7th March 1910. (Please see G.O. No. 355, Marine, dated 10th November 1910.)
- (14) Darbar's Chief Engineer, Mr. Browning's report, dated 22nd April 1910. (Please see G.O. referred to above.)
- (15) Travancore Chief Engineer's letter, dated 30th March 1910. (Please see G.O. referred to above.)
- (16) Resident's letter, dated 10th March 1910, R.O.C. No. 2066/1909.
- (17) Extract from an article in the Indian Engineering on the report of the British Royal Commission on erosion.
- (18) G.O. No. 294, Marine, dated 24th July 1907.
- (19) Extract from the joint report of the three Engineers. (Please see page 6 of G.O. dated 10th November 1910.)
- (20) Extract from the Darbar's Chief Engineer, Mr. Browning's report, dated 3rd June 1909. (Please see page 11 of the G.O. dated 10th November 1910.)
- (21) Extracts from the Darbar's Chief Engineer, Mr. Browning's report, dated 7th March 1910. (Please see pages 27 and 28 of the G.O. dated 10th November 1910.)
- (22) G.O. No. 308, Marine, dated 13th July 1903.
- (23) Letter from the Cochin Chamber of Commerce to the Secretary to Government, D. P. W., dated 8th October 1880.
- (24) Extract from the Chamber's letter to Colonel Sankey, R. E., dated 25th November 1880.
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- (26) Extract from the Chamber's letter to Colonel Sankey, R. E., dated 14th December 1880.
- (27) Extract from the Chamber's letter to His Excellency the Governor of Madras, dated 14th January 1882.
- (28) Extract from the Address of the Chamber of Commerce to Lord Curzon in 1900.
- (29) Extract from Lord Curzon's reply to the above.
- (30) G.O. No. 150, Marine, dated 4th March 1902.
- (31) Report by Messrs. Coode, Son and Mathews, dated 23rd February 1903. (Please see G.O. dated 4th March 1902 above.)
- (32) Extract from His Highness' speech at the Banquet given in honour of Lord Kitchener. (Please see Cochin Administration Report for 1084.)
- (33) Extract from Lord Kitchener's reply to the above.
- (34) Letter dated 20th January 1881 from the Chamber of Commerce to the Madras Public Works Department.
- (35) Interportal Trade Convention of 1865.

- (36) Resident's letter, dated 23rd November 1860, No. 1953, forwarding for the consideration and opinion of the Darbar some papers on the trade of Cochin, Travancore and Sirkar Cochin.
- (37) Letter dated 22nd August 1860, No. 1421, from the British Resident to the Collector of Malabar.
- (38) Diwan, Mr. Shangunny Menon's letter to the British Resident, dated 14th September 1863, No. 490/1863.
- (39) Paragraph 40 of the Proceedings of the Madras Government, No. 709, dated 23rd April 1864.
- (40) Resident's letter, dated 26th April 1865, No. 574.
- (41) Resident's letter, dated 28th August 1905, No. 307.
- (42) Extract from the Darbar's Chief Engineer, Mr. Browning's report, dated 1st August 1911.
- (43) Letter dated 20th November 1903, from the Cochin Chamber of Commerce to the Chief Secretary, Marine Department, Madras.
- (44) Darbar's Chief Engineer, Mr. Browning's report, dated 7th October 1900. (Printed copy enclosed.)

(2)

Letter—from G. E. BROWNING, Esq., M.I.C.E., M.A., Sec. Chief Engineer, Cochin Government.

To—the Secretary to the Diwan, Public Works Department.

Dated—Trichur, the 1st August 1911, 17th Karkadagom 1086.

No.—R.O.C. 1364/86.

With reference to Diwan's Proceedings, dated 22nd April 1911, Ref. on C. No. 420 86, and to subsequent Diwan's Proceedings, dated 12th June 1911, R.O.C. No. 420/86, I have the

Introduction.

honour to submit the following report on the question of erosion on this West Coast of South India and all the points connected with it which require the Darbar's careful consideration and action.

2. With regard to the criticisms of the Ex-Chief Engineer of Madras, on my original report, I have already dealt fully with these, vide my report, dated 7th March 1910, R.O.C. No. 967/85, a copy of which is appended herewith.

3. Since submitting the above report, I have had the opportunity of going into this question of erosion very thoroughly whilst on leave in England.

I visited numerous localities where erosion was serious, and was able to compare my notes here with information kindly given me by certain experts, who had to deal with this question at Home.

I was also fortunate in being able to meet some of the greatest living experts on harbour and coast works, and discussed the matter very thoroughly with them.

4. I am glad to be able to inform the Darbar that these gentlemen were unanimous in approving of the protective measures advocated by me from the very beginning. It may, therefore, now be definitely accepted by the Darbar that the Coast protective measures for Cochin must consist of long, low groynes capable of immediate adjustment, extension and augmentation, as occasion arises.

A reference to back records will show that from the very beginning, after many years of careful observations and notes, I advised the construction of groynes for Cochin, either on the Case system or a development of same. Since then, the Royal Commission on Coast Erosion in Great Britain has found that, for similar localities under similar conditions, groynes such as those I recommended are the remedy—with such modifications and improvements as modern experience, local conditions, and research dictate.

5. Sea walls are utterly unsuited for a coast like Cochin, and the only place where rubble work of any description should be used is at Vypeen point, where a different state of affairs from ordinary coast erosion has to be considered.

6. In my last report, as the Ex-Chief Engineer, Madras Government, laid such stress on the necessity for a seawall of rubble work to be run along the narrow spit of sand between Vypeen point and Cruz Milagre, and as I saw that things had become so very critical owing to delayed action, that a breach into the backwater appeared imminent, I agreed to rubble work being executed to protect the eastern bases of the groynes, and to give a basis for them to rely on. I did this, as I realized how serious a breach into the lagoon would be. However, since going into the matter in England and comparing my notes there with the notes I have made here, I now definitely abandon this costly rubble work, as I am satisfied that we may satisfactorily substitute for it the much cheaper and more effective type of protective work originally proposed and detailed by me and described later on in this report. This protective

Regarding Groyne work.

work will run north and south, and will be used in conjunction with gunny bags filled with sand to protect the groynes proper being outflanked by the sea. This longitudinal groyning will be constructed in such a way as to catch and retain all materials in suspension that would otherwise be washed over into the backwater, and a high level beach will thus be formed along the base of the groynes.

7. In a previous report I have already pointed out that the situation at Cochin and Vypeen was originally saved by Mr. Geo. Brunton, who converted all the useless rubble stone

Mr. Brunton's first groynes and their results.

works along these foreshores into groynes. Where these groynes were sufficiently near together erosion was, to a certain extent, checked, but owing to the nature of these groynes, and the somewhat experimental manner in which they had to be run out, accretion is not permanent with them, but the erosion and accretion more or less counterbalance one another year in and year out.

Moreover, where these groynes are too far apart, erosion has continued, with the result that they are being outflanked in places by the sea.

8. When Case timber groynes were to have been tried a few years ago on my recommendation the works proved a failure, as instead of being constructed as Case groynes, sheet

Faulty groynes subsequently constructed and their results.

piling was tried.

I have already pointed out why these could only be expected to prove a failure.

9. On my return from England I found that as recommended by me previously, experimental timber groynes were being run out north

Recent experimental timber groynes at Vypeen.

of Vypeen where the old stone groynes ceased to be grouped close together, and where erosion had become extremely critical. This timber groyne work, however, was only started after the monsoon had actually set in, and had therefore to contend with most adverse circumstances. As I brought to the notice of the Darbar at the time, these groynes, though marking a step in the right direction, were too short in length, and had certain defects in design and construction which handicapped them seriously in their work. One defect was that the planks could not be adjusted, nor could

Their defects.

they adjust themselves to any local scour along the length of the groynes. Further, owing to the planks being nailed to the piles, it was observed, as anticipated, that an unnecessary commotion and swirl of water took place during storms, and that owing to the height of the planks above the sand, a serious disturbance of the latter occurred and damage was done to the groynes.

Had the planks been slipped in between piles as detailed in my report, dated 21st September 1907, they would have adjusted themselves to such temporary local scours, and accretion

would have been continuous and systematic, as the planks, instead of being 4 or 5 feet above the beach level, would have remained just sufficiently above same as to minimise commotion, and yet to catch and retain all sand in suspension. This effect was very pronounced in the extreme northern groyne, where the upper planks were

Report, dated 21st September 1907.

knocked off by hand, so as to keep the lower planks at about 18" above the beach. A very remarkable accretion took place just to the north of this groyne, and was distinctly attributable to the above effect.

Another defect these groynes possess is that, instead of running down to zero at their seaward end, this was actually their highest point above the beach slope with the result that there was considerable commotion at the seaward ends, and the accretion therefore, instead of feeding in from the seaward end, as it should, accumulated in a hap-hazard manner more at the landward end.

Further these groynes were not run out seaward at the correct angle. It may be noted that I informed the Darbar, after my first inspection on my return from Home, that, on account

Inspection, dated 30th May 1911.

of these defects in direction and construction, I anticipated that sand would accumulate to an excessive extent on the southern sides of the groynes to the detriment of the groynes themselves. This, I found last week, when visiting the place with the Diwan, is exactly what has occurred, and I actually saw the undermining process take place on the north side of one of the groynes—one of the three very bad ones after which the accumulation on the southern side was scoured away, and the planking left 18" above the beach level. Of course, wherever the planking had been undermined from this cause, erosion

Present result of these groynes.

was aggravated. In spite of this, I found that the general effect of these groynes had still been not only to check the very serious erosion that was taking place at the time of my first inspection this year, when the groynes were being constructed, but actually to cause considerable general accretion. I, therefore, think it is very probable these groynes saved the situation.

General protection imperative.

10. General protection has now become imperative all along this coast: on this point there can be no two opinions.

Since my return from England, I have inspected the greater portion of the foreshore along the Cochin seaboard, and excepting where the timber groynes have been put up this year, serious erosion has been general. I found that in some places 60 feet of foreshore had been washed away since last year, and excluding the portion protected by the old stone groynes, the minimum erosion observed was 10 feet. I need hardly point out what a doubly serious matter this is, for it means that not only is an enormous area of valuable coconut land being engulfed by the sea, but also that the eroded material is being carried seaward and along the coast, to add to the amount on the bar at Cochin, and to form sand banks out at sea which must sooner or later interfere with navigation.

Breakers this year were noticed by me, seaward, where I have never observed them before during the last 16 years: this shows that fresh shoals are forming seaward.

13. Also as will be detailed later on another very important point in connection with this must be borne in mind, viz., that the great dredgers which will inevitably ultimately be used for keeping open the Cochin harbour mouth will be unable to work there during the south-west monsoon. Meanwhile, if this erosion has not previously been completely stopped, the great pit which the dredgers will have dug out during the non-monsoon period to trap the bar, will not only be completely filled in by the eroded material, but a fresh bar will be formed during the south-west monsoon when the dredgers are not able to work, with the result that steamers will be unable to make the harbour mouth during that season, and shipping and revenue will be interfered with most seriously.

14. I have lately made a very remarkable discovery at Cochin. Some years ago, when taking samples of water during the monsoon at the bottom of the gut at Cochin, I found, as stated in my original reports, that practically no alluvial matter or sand came down from the interior as was generally supposed.

This proved that at the time that those original samples of water were taken the extensive Cochin backwaters were acting as traps, and it was this fact that originally led me to the conclusion—since found to be correct—that the Cochin bar is not formed by river action as a sort of delta formation, but is due to wave action, coast erosion, and to sand held in suspension at the harbour mouth, and to currents.

I have now found that, during the monsoon, there is a considerable amount of sand in suspension now found inside harbour mouth, in suspension inside the harbour mouth. This shows that eroded material from the beach, owing to some new causes, is being carried inside the harbour, and this of course will tend to silt up the inner harbour. All this shows how extremely far-reaching is this question of general coast erosion.

#### Details of groyne work.

15. I will now give details of the groynes that should be constructed. At the more critical points the groynes must either be of Hennibique ferro-concrete, or of timber. The sea ends of these groynes should be augmented by submerged chain cable groynes: these latter have been considered carefully by me whilst at Home, and I am quite certain they could be applied with enormous advantage and at a minimum of cost as a means of reclaiming the lost beach seaward.

16. With regard to the Hennibique ferro-concrete groynes, these should be 350 feet long, and spaced 300 feet apart. They must be of the low adjustable type, and great care must be taken to construct them in the correct direction seaward. Each groyne should consist of H section columns 16 square, with the H ends levelled off to zero, i.e., to the points where the longitudinal slabs of concrete fit into the grooves.

These columns should be 7 feet apart; the spaces between them should be closed by ferro-concrete slabs 4 thick and 9 deep, which slabs must be dropped into position down the grooves in the H columns. These slabs must be left free to allow them to adjust themselves automatically, whenever any temporary local scour takes place, so that there shall never be any underwash between the slabs and the beach. Not more than two slabs must ever be exposed above the beach level, and any slabs that happen to be above this point during any sudden local disturbance must be removed immediately, so as to retain the slabs invariably at a maximum height of 18 above the beach.

These H columns or piles must be driven to a depth of 9 feet into the sand and mud.

All the reinforcements should be of round section steel, and the concrete for the columns and slabs may be made of hard laterite, gravel and sand, from the seashore mixed with the usual proportion of mortar, viz., say 27 c.ft. of ballast, 12½ c. ft. of sand and 7 c. ft. of cement. All the ballast should pass a ½ mesh, and great care must be taken in mixing the concrete. The slabs and columns could be moulded at the site of work to facilitate transport, and cheapen the cost of same. The moulds could be struck off after 24 hours, after which the columns and slabs should be given six full weeks to season.

Great care must be taken not to construct these groynes with an unvarying gradient seaward. The curve at the shoreward end must be much steeper than at the seaward end, and the curve must conform to the natural sectional curvature of the shore, that is to say, the sectional curve must become flatter and flatter as it runs seaward, till the groyne buries itself in the sand not less than 60 feet beyond L.W.M. of ordinary spring tides.

#### Gradient of ferro-concrete groynes.

As there will be difficulty in constructing the seaward portion of these groynes, and as it is of the utmost importance to induce the sea to feed in sand at the sea end of the groynes, it would be best to utilise H section iron piles for the seaward portion wherever the ferro-concrete H section piles cannot be fixed.

These H section iron piles would be driven into the sand in place of the ferro-concrete uprights, while the spaces between the H section iron piles should be closed by dropping ferro-concrete slabs as previously described. By such means, the groynes, both inland and seaward, could be raised and extended, till the required beach is finally built up and consolidated.

In all cases the groyne work should begin from the south and work northwards.

On enquiry, I found that in England the cost of such groyne works comes to 4s. 3d. per c. ft.

When such groyne works are taken up, I consider it will be most economical and satisfactory to entrust the work to an experienced syndicate.

17. If it is decided to construct the groynes of timber, the following details may be noted. The groynes should be 350 feet long and 300 feet apart, and should consist of piles 9" x 6"

#### Timber groynes.

section, driven down in couples. Each couple should be made into practically one single pile with a 4" space between them. This space should be temporarily filled by a slab of wood, to be removed when the pile has been driven home to a depth of 9 feet below the beach level. The bottoms of these twin piles must be made into a common point, and formed into a solid block to a height of 4 feet from the bottom point. These pairs of piles should be 7' 6" apart centre to centre, and the planking should be 9" x 4" and should be inserted between the piles and carried down well below the beach level, so as to avoid any possibility of under scour.

A "Bearer" must be bolted in at every alternate set of piles for the bottom planks to rest on. At the intermediate set of piles, the bottom plank should be bolted to the pile instead of resting on a "bearer," the object being to save excavation around the piles as much as possible. A cross piece must be temporarily fixed above the uppermost plank to prevent the planks rising during storms or at high tide, and to keep them in position. All these "bearers" and bolts must, however, be easily removable, so that the planks may, in case of emergency, drop down easily and automatically in order to avoid under scour. Old iron rails can, with advantage, be used for the topmost planks, when the "bearers" and bolts have been removed, when it is considered that automatic adjustment of the planks has become necessary.

The groynes must be constructed so that not more than two planks project above the sand level. As the sand accumulates, additional planks must be inserted between the piles, the groynes must be steadily raised with the formation of the new beach, always keeping the top of the uppermost plank as near as possible an average height of 9' above the beach. The planks must be so arranged that one plank spans two bays, and the next plank three bays, and they are so inserted to break joint. The twin piles are to be levelled off to zero where the outer surfaces come down to the planks.

Experiments with long timber groynes of this type have proved that sand accumulates uniformly on both their leeward and windward sides without impeding the flow of the local current, always provided that such groynes are run out at the correct angle from the shore. All the remarks in paragraph 14 of this report, regarding the direction and gradient of the ferro-concrete groynes, apply equally to these timber groynes.

#### Use of Cochin jungles woods advocated.

The timber should be creosoted. I have found from experiment that mango wood driven into this sea-shore stands peculiarly well and also lasts remarkably well for the planking. As these planks can be easily replaced if necessary and as after a short time the buried planks will probably be no longer required on a foreshore such as Cochin, with the steady advance of a good new beach seaward, I strongly recommend that all kinds of junglewood be tried for at least the planking portion of these groynes, great care being taken only to use one kind of timber for each groyne. Considering there are some 600 kinds of timbers in the Cochin jungles, at present practically unknown and unused, such timber groyne work would enable the Sirkar to give the Tramway a large amount of work to do and would encourage the use of much hitherto unexploited and unprofitable jungle timber.

As per details supplied by the Royal Coast Erosion Commission, timber groynes in England work out at a little over 4s per c. ft. This is a matter which will have to be gone into very carefully before any definite amount can be fixed.

Concrete and timber groynes compared.

18. The concrete groynes, though slightly more expensive, would of course be permanent. Against this, however, it must be remembered that though the timber groynes would require a certain amount of renewals; there is absolutely no reason why they should not be entirely of local production, and money therefore that would otherwise go out of the State for materials, would be kept in the State.

19. With regard to the submerged chain cable groynes, which I was able to examine very closely whilst in England, the following details may be given:—

Submerged chain cable groynes.

These groynes consist of an old or wire cable to which are attached brushwood, shrub and concrete blocks at intervals throughout the length of cable to weight same. The seaward end of this cable is securely anchored, and the shoreward end secured by means of a post or rail driven firmly into the sand in the vicinity of the L.W.M. The process of fixing these cable groynes in position is very simple. The cable, first of all having been secured at the shoreward end, has all the faggots and weights attached to it, and the seaward end is then taken out by boat, and told out, to conform itself to the undulations of the sea bed. It thus becomes a submerged hedge, firmly anchored at both ends, and kept in its position by means of the weighted chain or wire cable passing centrewise through its entire length. It was most interesting examining these through the clear water on calm days; I found that an astonishing accumulation of seaweed and marine life rapidly attached itself to this submerged hedge, and I found, at very exceptionally low tides, that the amount of detritus accumulated by this type of groyne on sandy shores was quite remarkable.

In one instance, where one of these groynes had been misplaced much further shoreward than was originally intended, I found that it had become rapidly buried in sand. This shows that these groynes might be tried with advantage in place of the Hennibique ferro-concrete and timber groynes at points where erosion is not very acute.

Submerged cable groynes should supplement the more reliable groynes.

Moreover, from what I saw in England, I think that this type of cable groyne could be used with great advantage for accumulating detritus and assisting reclamation seaward of the Hennibique ferro-concrete and timber groynes, and as a supplement to them. This is why, in my present recommendations, I have shortened the length of the more reliable ferro-concrete and timber groynes, as compared with my previous recommendations.

New feature in the present silting up of the Cochin harbour.

20. I have stated in paragraph 14 of this report that sand and detritus, obviously washed in from the open sea, and eroded from the coast, is now found in suspension inside the Cochin harbour mouth and backwater harbour. From my own observations, extending now over 15 years, this is a new phase, and an extremely serious one, that must be considered, not only in connection with the silting up of the harbour, but also in connection with the general coast erosion.

Past observations have shown that when this erosion was not acute, as was the case some years ago, there was practically no detritus, etc., in suspension, even during the monsoon, inside the Cochin harbour, whereas now the opposite is very markedly the case. This, in itself, shows how much the general erosion of the coast has increased of late. In the face of all the discoveries made in England lately, as to the suicidal policy that has been followed by neglecting to check coast erosion in the neighbourhood of harbours, and in view of all the lessons learnt on this subject, it will be a fatal error on the part of Government if they fail to take immediate action to stop this coast erosion throughout on account of the future of the actual harbour.

Backwaters silting up.

21. During recent years I have been greatly struck by the manner in which the backwaters adjacent to the Cochin backwater harbour have silted up. Having constantly sailed over them for many years, and knowing the channels most intimately and also knowing that the backwaters farther inland were acting still as silt traps for all alluvial matter brought down by the rivers, I was, I admit, completely puzzled at this obvious shoaling up of the backwaters adjacent to the harbour.

Recently, on examining the material from some of these new shoals, I found that where in the past much of it had obviously been alluvial matter, now it is very easy to discern that much of the material is actually sand and detritus which has been torn from the coast and carried into these backwaters by the tides and currents.

Whilst in England, I had the opportunity of inspecting certain channels in the Thames estuary, with a gentleman who is one of the erosion experts at Home. Contrary to the accepted theory which held that the silting up of these channels was due to matter brought down from the Thames and Medway drainage areas, it has been found that this shoaling up is obviously considerably due to the erosion of the Kent and Essex coasts.

Another point which I feel I should lay stress upon, is that I have found that the distance horizontally between L. W. and H. W. has, as a rule, remained constant during the steady erosion that has taken place in Cochin in recent years. This shows that the beach has more or less retained its general slope seaward, and soundings have shown that the depths seaward have similarly remained constant.

Erosion not confined to the beach, but working seaward.

This is clear evidence that the erosion is confined to the beach, but working also up the sea and this indicates how seriously general is this advance of the sea-bed and coast eastward. This is why I recommend chain cable groynes in addition to the more permanent and solid groynes, and I further beg to point out that these chain groynes will have to be considerable length. I wish to make this clear now, as it is obvious that with the advance deep water from the seaward side, the mere groyning of the beach itself will be quite futile.

Necessity for the submerged cable groynes.

Direction the waves impinge on the Cochin beach.

22. As there seems to have been considerable misunderstandings as to the direction which the waves impinge on the Cochin beach. I think it necessary to point out that though the south-west monsoon waves—which cause the chief damage—advance with the right shoulder forward, they swing round till they become almost parallel to the coast as they enter and travel forward on the shallows adjacent to the beach. This is simply because of the rule that smaller the surface offering resistance to movement is, in proportion to the volume of water in motion, the greater the velocity. It is this alone which accounts for the fact that with appreciable current running along the coast line, as at Cochin, the foreshore being of gradual slope, the wave crest inclines to become parallel to the beach. This fact must be very carefully borne in mind when the groynes are constructed.

Uselessness of protecting only short areas of easily eroded coasts.

23. Research in England has shown that as a rule, an easily eroded sea-bed indicates an easy and rapid sand deposit, when long low groynes are systematically constructed over considerable area of coast; whereas short areas of protection on such coasts invariably prove disastrous to the neighbourhood. This I saw clearly illustrated in several cases whilst inspecting the general coast protections in England.

Checking of erosion at Cochin will also mean accretion and reclamation.

Now in Cochin the sand is peculiarly eroded. It may, therefore, be hoped that following the general rule, if sufficiently extensive groyne works are carried out all along the coast, not only will erosion be checked, but considerable accretion and even reclamation may be definitely anticipated.

Personally, after studying this subject most thoroughly, locally after visiting many of similar places where protective measures have been carried out, I do not hesitate to express opinion that much of the eroded material which is now lying out at sea in the form of shoals will be recaptured, and much of what has been planed away from this coastline in past years will be recovered, to the obvious advantage of the country and navigation.

Original suggestions for harbour works.

24. It will be remembered that when I brought up the question of the Cochin harbour improvement, I advocated the construction of a specially designed curved breakwater and training walls to concentrate the ebb and flow of the tidal waters at the Cochin harbour mouth in order to scour out and maintain a deep channel where the bar now exists.

I also laid special stress on the then great necessity for retaining the largest tidal area backwater possible, for sluicing reservoir purposes.

This was a matter which I had the great good fortune of discussing with some of the greatest experts on harbour matters.

Since those days, however, the advance in mechanical appliances has been so stupendous that the old accepted principle of harbour construction has lately been revolutionised, though, the old principle above referred to must not be lost sight of, yet in view of the gigantic strides made in dredging operations the developments that are now known will take place as regards same, I have come to the conclusion that the question of the breakwater, etc., may be set aside, at any rate for the present.

With the abandonment of this curved breakwater and training walls, goes the necessity for the retention of the sluicing reservoirs inseparable from them.

28. With regard to the dredging operations, the cost of suitable dredgers for the Cochin bar will probably be approximately £70 each, and I cannot too strongly emphasise

Type of dredgers required.

importance and ultimate economy of getting the largest and most powerful type at the beginning.

The results obtained at Portsmouth, Dover, Durban and other places have peculiarly pointed this point.

Manner of dredging.

29. The principle on which the dredging will have to be done at Cochin is as follows: During the non-monsoon months an immense trench will have to be excavated adjacent to the present bar, to act as a trap during monsoon months, when the dredger will be unable to work outside the harbour mouth. Experience with these dredgers has shown when such bar traps are excavated, and coast erosion affecting such points checked, the wave is instead of forming a new bar during the non-working period, only precipitates sand and debris into the trap dug, and the bar is thus controlled.

Important to note.

It has further been found that with the bar so controlled at such harbour mouths, the channels dug out by the dredgers, not only seaward but also inland, retain their shape remarkably well, excepting when subjected to peculiarly violent temporary storms.

The dredger or dredgers—for I advocate the purchase of at least two—, would not only have to deal with the harbour mouth, but would also rapidly excavate a magnificent inner harbour where the Cochin lagoon now exists.

In a previous report I have pointed out that no rock exists in the Cochin backwater formation, and these magnificent backwaters and lagoons can therefore be dredged out to practically an unlimited extent.

30. I will now detail the type of dredgers I recommend and outline the work to be carried out by them. During the last 12 months I have been fortunate enough to have had unique opportunities of seeing the actual work done by the type of dredgers I propose, and I went into the matter very thoroughly with the leading experts at Home, who have had vast practical experience with such dredgers.

The type of dredger I recommend is the latest suction hopper dredgers somewhat similar to that recently purchased by the British Admiralty for dredging out the deeper portion of the new berth of the new floating dock at Portsmouth.

I was fortunate enough to be able to see this wonderful new dredger at work, and was supplied with full details regarding same. It is able to dredge out channels to a depth of 65 feet, and the type of material I saw brought up with ease by this dredger was simply astounding. Even rocks of large size were sucked up with ease and discharged through the tubes, and the cutters remained undamaged under conditions that would have brought any other dredger I have ever seen to a full stop at once.

I was informed by the Chief Director that this dredger was capable of removing 1,000 tons of clay, etc., per hour, and from what I saw this certainly appeared to be the case, as it simply seemed to eat out a channel under one's very eyes.

Two such dredgers would be able to keep the Cochin harbour mouth completely clear of its bar, and would further be able very quickly to excavate such a magnificent harbour and area for docks in Cochin as would enable it to become the commercial centre of the East.

I have examined borings throughout the area that would have to be dredged, and find that there is absolutely nothing which will in any way interfere with such works.

31. These dredgers have lately been supplied with a wonderful floating pipe connection, by means of which, all dredged up materials can be discharged direct into any selected site, up to a distance of fully two miles away from the dredger. This at once does away with the necessity for any expensive and laborious process of transport, by means of lighters, barges or any other such arrangements.

I actually saw one of these dredgers discharging mud and clay at the rate of 3,000 cubic yards per hour.

I need hardly point out what an enormous vista this opens out for Cochin. It means that these marvellous dredgers would not only be able to give Cochin such a magnificent harbour mouth that the very largest ships ever constructed could enter and depart at all times of the year and under all conditions, but also that the Cochin lagoon and backwaters could be dredged out sufficiently to accommodate all the shipping to the East, if necessary, including the navy.

It means that great canals could be dredged out rapidly and with extraordinary economy from Cochin northwards right up to Trichur, if necessary, or at any rate to Karupadna, and southwards to Travancore, thus linking up the whole of this portion of the coast with a splendid internal system of waterways converging on to the Cochin harbour itself. These waterways augmented by railways radiating out north-eastward, eastward, and south-eastward, would mean such a revolution in shipping and commercial facilities for South India, and such a cheapening on import and export, as compared with other harbours, as deserves the most serious consideration by Government.

Dredgers such as the above, are capable of cutting out a channel 300 feet wide "equal to twice the width of the Suez Canal at the bottom", with an average depth of 21 feet, to a length of 1,000 feet in an actually tested time of 85 dredging hours. This speed could even be exceeded considering the softness of the material to be dealt with in Cochin.

(3)

Letter—from G. E. BROWNING, Esq., Chief Engineer, Cochin Government.  
To—the Diwan of Cochin.  
Dated—Trichur, the 7th October 1900.

I will now proceed to detail my scheme for the conversion of the Cochin backwater into a first class harbour.

As the Cochin State has never taken up the question of the harbour before, there are, of course, no State records on the subject, and my information therefore has had to be gleaned from other sources and personal investigations.

I am relying mainly therefore on my own observations and experience, not only of Cochin port itself (which I have most carefully studied for several years under all conditions and phases) but also of several other harbours which I have had the good fortune to visit and study in various parts of the world.

To turn to the technical details of the scheme.

The six chief points to be considered are—

A. The best and most effective means for the removal of the narrow bar that obstructs the entrance to the Cochin harbour

B. The construction of breakwaters, in such a manner as to keep out the heavy swell that will result in the inner harbour when the bar is removed and of such design that large ships will have no difficulty in making the harbour in bad weather.

C. The best method to be adopted for dredging out the Cochin backwaters in order to convert them into a really first class inner harbour.

D. The enormous importance of maintaining the largest available area of backwater as a sluicing reservoir.

E. The probable initial cost of such harbour works.

F. The annual amount from shipping dues that may be depended on for paying interest on any loan raised for this purpose.

A. With reference to A—

Unquestionably the best method will be to construct training walls in such a manner as to concentrate the ebb and flow between Vypeen and Cochin, so as to maintain the current in its full strength till it arrives in such a depth of water that the action of the waves shall have not sufficient power to stir up the bottom and reform a bar further seaward.

To this end, in my opinion, a breakwater should be run out due west from the groyne which is 260 yards to the north of the Cochin lighthouse for a distance of from 750 to 1,350 yards. Thence from tangent point  $\infty$  it should sweep in a flat curve round to tangent point  $\infty$  whence it must bear away in north-westerly direction till it terminates at a distance of from 2 to 25 miles from the shore in  $5\frac{1}{2}$  fathoms of water, the angle of intersection at apex ( $\theta$ ) being  $162^\circ$ .

This breakwater should have a sea slope of 4 to 1 and inner slope of  $1\frac{1}{2}$  to 1 up to the tangent point  $\infty$  when the slope should increase to 2 to 1.

This breakwater should be constructed of rubble gneiss or concrete blocks thrown in to find their own "slop" which could be deposited from open stages of pile works.

This rubble work should rise to 18 feet below low water level and would act as the foundation on which the concrete blocks of the upper works should be constructed. These concrete blocks should be laid as they have been laid at Colombo, and should be blocks weighing some 35 tons, each set on edge. (Concrete mixed about 1 of cement to 7 of other material could be used.)

A similar training wall but of lighter proportions should also be constructed, starting from groyne No. 5 on the Vypeen foreshore (marked on the chart which accompanies this letter, which groyne is 1,014 yards north of B) inclining at an angle of  $5^\circ$  south of true west, for a distance of about 1 mile 300 to 900 yards, so that its western extremity approaches in  $3\frac{1}{2}$  fathoms of water within 660 yards of the breakwater first mentioned, and at such a point that its western extremity lies in the radial line, which when extended, bisects the angle of intersection at ( $\theta$ ).

This training wall would then extend to the present position of the bar, and would so direct the outflowing current against the inner face of the curve of the breakwater, as to scour out and keep open a deep channel all along its northern side to its western extremity.

Such arrangements of training walls under similar conditions have been found to give excellent results.

As investigations prove that no rock exists under the bar, the above arrangements of training walls would permanently remove the obstruction.

As further investigations showed that the extensive Cochin backwaters act as traps for all silt brought down by the rivers, and that, in consequence, the water flowing between Vypeen and Cochin does not carry silt in suspension, it is evident that the bar is not caused by the

deposit of silt brought down by the rivers, as is the case with river harbours, but is entirely due to the action of the surf endeavouring to reform the profile of the coast line broken through by the outflowing current.

As records and investigations show that the water over the bar *invariably* tends to deepen during the calm weather of the north-east monsoon, because the force that acts in the south-west monsoon ceases, and the storm waters of the north-east monsoon not being checked by the opposing forces of the south-west monsoon scour out the surface deposit over the bar, a suction dredger or sand pump of large dimensions should be employed to assist the action of the training walls during the calm seasons of the year. During the tempestuous weather of the south-west monsoon, such a dredger could be conveniently employed in deepening the inner harbour and in assisting the "Hopper" dredger, which would be permanently at work there.

#### B. With reference to B—

Observations during the south-west monsoon show that the waves at this time of the year (which are the only waves that ever give any trouble at the Cochin harbour) advance from the west with the right shoulder forward, forming an angle of 20° with the coast line, *assuming this* to run due north and south.

A glance at the chart which accompanies this letter will show that by the arrangements of breakwaters and training walls proposed by me, all fear of a "boiling pot" at the entrance to the harbour will be avoided, in that the harbour mouth is entirely protected from waves advancing from the south-west whilst those which pass the breakwater head, will not break till they have passed to the north of the training wall head C where there are excellent "spending beaches" on which the waves can disperse themselves.

Such an arrangement of the breakwaters possesses a further advantage in that it will afford a most excellent "loose" or point of entrance and departure, from which incoming ships will immediately run into smooth water even in the worst weather, and where, at the same time, they will have ample room to steady themselves before proceeding to the actual harbour mouth between V and C.

As the current with the incoming tide invariably flows from the south *during the south-west monsoon*, it will, in rounding the westerly point A, of the breakwater, scour away any spit of sand that tends to form at the breakwater head, and will thus maintain deep water at this point.

#### C. Regarding C—

As the bottom of the Cochin backwaters opposite Ernakulam consists entirely of soft sand and mud, there is absolutely no reason why the whole of this magnificent natural basin should not in time be dredged out by powerful dredgers into one of the finest harbours in the world.

As however we are now interested in the preliminary stages of the harbour works, I am of opinion that the portions that should be dredged out first are:—

(1) The deep channel which already exists from the municipal jetty at Cochin along the N.E. and E. shores of the Cochin spit, to half a mile beyond the Women and Children's hospital at Mattancheri.

Wharfs would have to be constructed all along this shore line for ships to discharge their cargo.

(2) The Ernakulam foreshore from Paliyam corner southwards.

A reference to the latest marine chart will show that the main channel already exists here. By building quays well out from the existing foreshore and by depositing silt taken out of the backwater behind these quays, and filling in between them and the foreshore, a splendid quay side could be made. The whole of the remaining channel could be easily dredged out to an unlimited distance south.

These quays would have to be connected with the Gut at Cochin by a five-fathom channel through the deep pot-holes which lie between Ernakulam and Cochin, and would possess enormous advantages over the Cochin-Mattancheri quays, in that they would be in direct communication with the railway. For whilst goods unloaded at Cochin and Mattancheri would have to be transhipped in lighters to the railway those unloaded at the Ernakulam quays, could be placed direct from the ships into trucks if so desired as sidings could be run out along the quay side throughout its entire length.

#### D. With reference to D—

I have to call the earnest attention of the Cochin Government to the serious encroachments that are taking place all along her backwaters, and to the groynes that are being constructed by cultivators and others with a view to silting up the backwater as much as possible in order to convert the same into coconut topes.

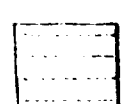
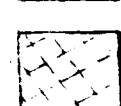
I would therefore urge the Sirkar to issue *immediate* and stringent orders for the checking of both these evils, in order to secure the *largest possible* area of backwater to act as a sluicing reservoir for the Cochin harbour.

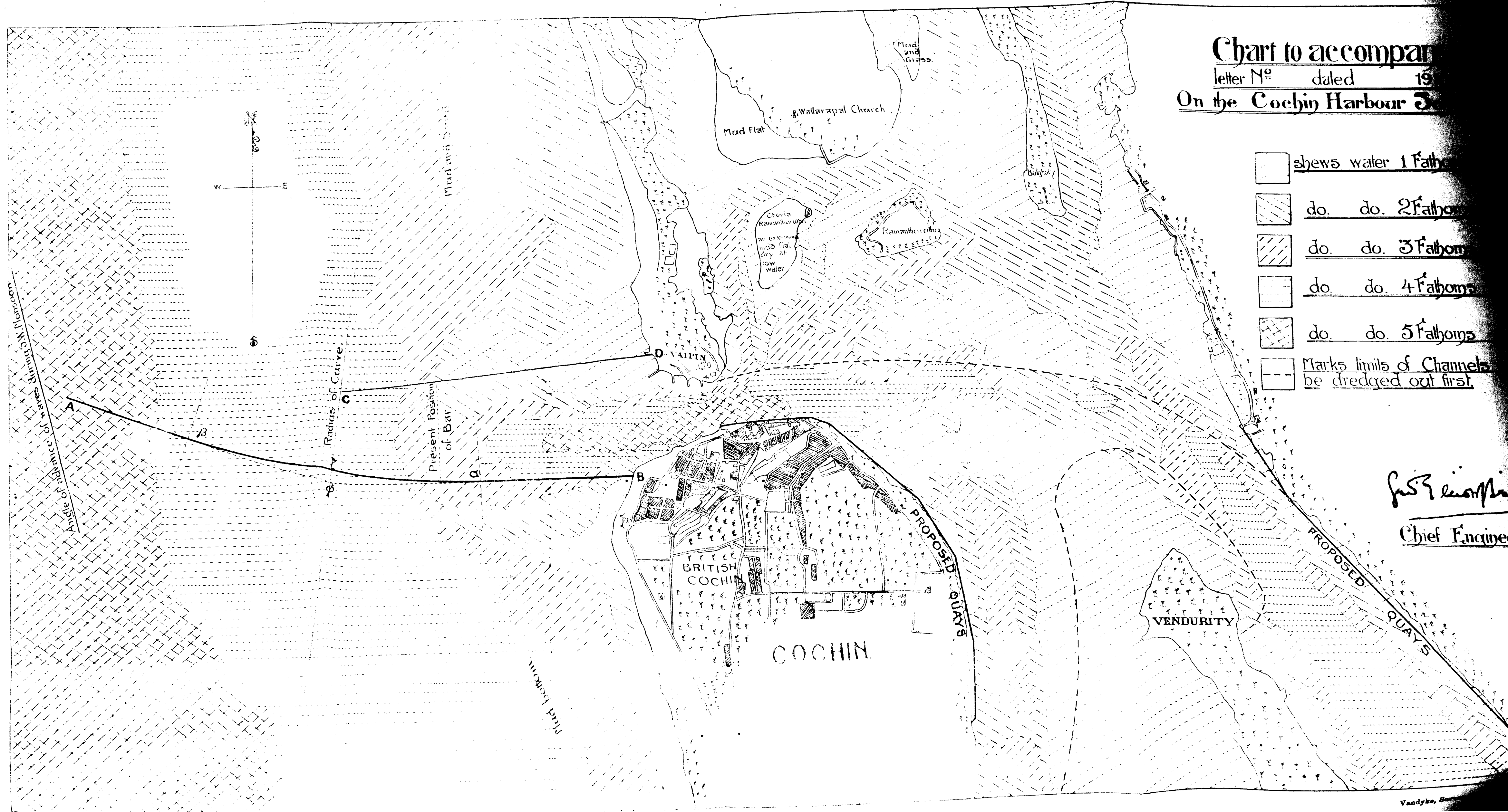
This is a matter of urgent primary importance on which immediate action should be taken.

Such sluicing reservoirs have been found invaluable at Calais and other similar harbours for the scouring out of their bars, and are absolutely inseparable from the Cochin scheme.

Copy of the Chart which accompanied the Chief Engineer's Report given to the Diwan in 1908

**Chart to accompany**  
letter No. dated 1908  
**On the Cochin Harbour**

-  shows water 1 Fathom
-  do. do. 2 Fathoms
-  do. do. 3 Fathoms
-  do. do. 4 Fathoms
-  do. do. 5 Fathoms
-  Marks limits of Channels to be dredged out first.



*J. S. S. S. S.*  
Chief Engineer

E. As to the initial cost of such a scheme, I find, on going carefully into the subject, that the preliminary works would cost approximately 85 lakhs.

The gneiss rubble for the breakwaters and training walls could be procured in sufficient quantities within 10 miles of the harbour, and there is good water communication between the quarry and site of work, the cost of transit would be small, especially if small tugs and fleets of barges were utilised for the purpose.

F. On going into the question of shipping returns, I find that even in the present state of the harbour, at least 3 lakhs per annum could be relied upon at the beginning, and, as the commercial value would increase as the cube of the depth, a large increase in revenue would soon take place. Thus from the beginning the harbour would pay 3 per cent. on the 85 lakhs first required and a rapidly increasing revenue could confidently be expected.

I may here point out that whilst in most ports no return can be expected during the construction of the harbour, at Cochin we would *begin* with a revenue of 3 lakhs per annum, which would steadily increase whilst the improvements were being carried on.

In conclusion I have no hesitation in stating that I am of opinion that, should the above measures be adopted, Cochin would become one of the finest harbours in the world, open in all weathers and capable of unlimited expansion.

The first outcome of such a development would be to double and probably quadruple the returns on the State railway, and the ultimate result would be to raise Cochin to the position of being the most important commercial and mercantile centre in South India.

taken.

Such sluicing reservoirs have been found invaluable at Calais and other similar harbours for the scouring out of their bars, and are absolutely inseparable from the Cochin scheme.

*Correspondence relating to proposals for the improvement of the Cochin Harbour with reports thereon by G. Robertson, Esq., M.I.C.E., F.S.S.E., etc., and N. Parkes, Esq., M.I.C.E., published by the Chamber of Commerce, Cochin.*

G.O. No. 2943 W., dated 27th December 1880.

Read—the following papers:—

Letter—from J. H. ASPINWALL, Esq., Chairman, Cochin Chamber of Commerce.  
To—the Secretary to the Government, Public Works Department, Ootacamund.  
Dated—Cochin, 28th September 1880.  
No.—89.

As one of the objects of your visit will doubtless be to inspect our harbour, I enclose, for your information and guidance, a copy of a letter our Chamber addressed to Colonel Thomason, R.E., after his visit here, which treats fully on all points connected with it and the trade of the port.

Letter—from J. H. ASPINWALL, Esq., Chairman, Cochin Chamber of Commerce.  
To—Colonel A. Thomason, R.E., Calcutta.  
Dated—Cochin, 4th April 1879.

Referring to the interview which a deputation of the members of this Chamber had with you in November last, I have now the honour to address you on the subject of the improvement of Cochin Harbour, and to request that you will be pleased to submit this communication to Government for its favourable consideration.

2. This Chamber has heard with pleasure that professional opinion is unanimous on the point that Cochin could be converted into a first-class harbour at a reasonable cost; but, from your observations at the interview referred to, I gather that, as it is essential, before any project is sanctioned, it should be demonstrated by reliable data that the work would be reproductive to the extent of at least 4 per cent. on the proposed outlay, I beg to forward herewith statistics of shipping tonnage and imports and exports for the years 1876-77 and 1877-78, which have been carefully compiled from official records and are perfectly trustworthy. It will be observed that the trade of Narrakal has been included in these statements, as vessels frequent that port, not because it has any traffic of its own, but on account of its safe anchorage during the south-west monsoon, when Cochin is inaccessible. The whole of the business done there is on account of the mercantile community of this port, so that virtually it is part and parcel of the trade of British Cochin, which would not be temporarily diverted to that place if facilities for landing and shipping during the monsoon existed here.

3. Although these statistics speak for themselves, this Chamber would urge upon your special attention the fact that, allowing the figures relating to Narrakal to stand separately, the proportions of the import and export trade of Cochin alone are of sufficient magnitude to justify this Chamber's holding out the prospect of the merchants being well able to contribute the whole of the interest on the estimated amount required for the harbour.

4. The imports during the last two seasons have been as follows:—

|                  |       | Cochin. | Narrakal. |
|------------------|-------|---------|-----------|
|                  |       | TONS.   | TONS.     |
| 1876-77          | ...   | 73,817  | 19,648    |
| 1877-78          | ...   | 56,165  | 27,424    |
|                  | Total | 129,982 | 47,072    |
| And the exports— |       |         |           |
| 1876-77          | ...   | 61,147  | 3,456     |
| 1877-78          | ...   | 45,629  | 1,518     |
|                  | Total | 106,776 | 4,974     |
| Aggregating—     |       |         |           |
| 1876-77          | ...   | 134,964 | 23,104    |
| 1877-78          | ...   | 101,794 | 28,942    |

As almost all articles of export go free of duty, and it is also probable that import duties will be either abolished or considerably reduced this Chamber is decidedly of opinion that both importers and exporters would cheerfully consent to pay a tax of Rs. 1½ per ton by way of wharfage or bunder fees, in view of the numerous advantages which they would enjoy by the construction of the harbour, chief among which would be the saving in lighterage alone, and the ease and facility and the immunity from damage with which goods could be landed and shipped at all times of the year. This alone would give a revenue of more than 4 per cent. on the proposed outlay of a quarter of a million, but, if an additional guarantee and source of income were required, the port dues could be raised at the rate of one anna per ton, an impost which would certainly not be appreciably felt by the shipping, considering how greatly it would benefit by a harbour which would afford it shelter and numerous conveniences, when other ports on the coast are unapproachable. The Chamber has given this matter mature and careful consideration, and, so far as the mercantile community is concerned, it has no hesitation in asserting that the proposed charge of Rs. 1½ per ton will in no way cripple or strangle the trade of the port, and it therefore respectfully begs that due weight will be given to this suggestion by the Government in considering the claims of this port to improvement.

5. From your personal inspection of this harbour you are no doubt satisfied that its capabilities are such that it could without difficulty accommodate 25 large ships, but, should any portion of the river or backwater belonging to the neighbouring State of Native Cochin be required, this Chamber has the assurance of those in authority in that State that, no obstruction or difficulty need be anticipated, as the Government of His Highness the Raja of Cochin will be prepared to make any reasonable concessions which may be required by our Government.

6. Another matter which the Chamber would bring to your notice is the existence, in abundance, of material for works of the proposed kind at Kakanad, a place in Native Cochin in close proximity to this port. The groynes which were thrown out on this as well as the Vypeen shore some years ago, when the encroachments of the sea threatened the town, are composed of granite brought from this place. Large quantities of material of this description are available and could be conveyed by the backwater at comparatively cheap rates.

7. The Chamber would further beg to observe that, during the late famine an immense trade was carried on between the rice ports and Cochin, and almost all the towns on the line of railway and in Travancore to the south received a large share of their supplies from this port. Narrakal proved a valuable auxiliary to Cochin, as during the south-west monsoon numerous cargoes were landed there and conveyed to the famine-stricken districts. Vessels which were unable to approach any other port on the coast found shelter at Narrakal and discharged their cargoes. Had landing and shipping facilities been available at Cochin during the rainy season all those vessels which resorted to Narrakal would have come into this harbour and landed their goods more expeditiously and cheaply.

8. The Chamber would take this opportunity of stating that the subject of extending the Railway to Cochin is now engaging the serious attention of the Cochin Sirkar and the mercantile community, and arrangements are already in progress to bring the project forward in a definite and tangible shape. The proposed line will run through a thickly-populated country, as may be seen from the subjoined comparative statement of the density of population in the report of the Census of Native Cochin taken in 1876:—

Density per square mile.

|                      |     |        |
|----------------------|-----|--------|
| Oude                 | ... | 463.06 |
| Belgium              | ... | 451.50 |
| Cochin               | ... | 441.51 |
| England and Wales    | ... | 389.30 |
| North-west Provinces | ... | 378.31 |
| Bengal               | ... | 269.30 |
| Madras               | ... | 227.19 |
| British India        | ... | 200.70 |
| Germany              | ... | 193.36 |
| France               | ... | 178.82 |
| Punjab               | ... | 172.51 |
| Bombay               | ... | 133.40 |

Taking the above fact in connection with the well-known fertility of the country and the importance of the port of Cochin as the natural outlet for the produce of the neighbouring Native States, an enormous goods and passenger traffic may safely be calculated upon. It would be superfluous to dilate upon the numerous advantages which the railway to Cochin

would secure to the country, but the Chamber would only remark that a railway in times of famine is simply invaluable. The Secretary of State for India, in his despatch of the 10th January 1878, appointing the Famine Commission, writing on this subject observes:— "The value of railways as an assurance to the population against the worst sufferings of famine has been singularly illustrated during the past year. Without their aid it would have been wholly impossible to convey sufficient grain to the inland districts. Their resources, however, were strained to the utmost, and at one time a serious apprehension was entertained that they would be overtasked. How far it will be possible with a due regard for financial considerations, to bring a wider range of country within their immediate reach is a question which will doubtless occupy your earnest attention at an early period." Considering the magnitude of the rice trade of this port, particularly during the prevalence of the famine, and the difficulty experienced in conveying supplies in large boats to Tirtur, the nearest Railway Station, cheaply and expeditiously, owing to the want of water in the canals, a line from Cochin to Shoranur would be an excellent feeder in similar emergencies, especially when time and expenditure are two important considerations. The Chamber need not dwell further on this subject, as it will in due course go before the Government in a matured and definite form.

9. The Chamber would take this opportunity of thanking you for the ready and courteous attention with which you have received its representations, and, in concluding, it hopes that the claims of the Cochin harbour to improvement will meet with the consideration they deserve at the hands of Government.

STATEMENT showing number of vessels and their tonnage and port dues collected at Cochin and Narrakal during the following seasons.

| Seasons. | Description of vessels. | Number. |           | Tonnage. |           | Port dues collected. |           |    |            |
|----------|-------------------------|---------|-----------|----------|-----------|----------------------|-----------|----|------------|
|          |                         | Cochin. | Narrakal. | Cochin.  | Narrakal. | Cochin.              | Narrakal. |    |            |
|          |                         |         |           | TONS.    | TONS.     | RS.                  | A.        | P. | RS. A. P.  |
| 1876-77  | Steamers                | 96      | 36        | 102,121  | 35,287    | 17,878               | 0         | 0  | ..         |
|          | Ships                   | 189     | 31        | 45,663   | 18,439    | 5,647                | 14        | 0  | ..         |
|          | Native craft            | 995     | 2         | 42,846   | 26        | 4,059                | 1         | 0  | ..         |
|          | Total                   | 1,280   | 69        | 190,630  | 53,752    | 27,584               | 15        | 0  | 5,896 10 0 |
| 1877-78  | Steamers                | 110     | 36        | 115,100  | 46,076    | 18,161               | 13        | 6  | ..         |
|          | Ships                   | 122     | 24        | 43,363   | 11,549    | 6,488                | 10        | 3  | ..         |
|          | Native craft            | 1,260   | 1         | 50,463   | 13        | 3,263                | 9         | 0  | ..         |
|          | Total                   | 1,492   | 61        | 208,926  | 57,638    | 27,914               | 0         | 9  | ..         |

STATEMENT of imports and exports—Cochin and Narrakal.

| Seasons. |          | Total imports. |        | Total exports. |       | Imports of rice and paddy only. |
|----------|----------|----------------|--------|----------------|-------|---------------------------------|
|          |          | TONS.          | TONS.  | TONS.          | TONS. |                                 |
| 1876-77  | Cochin   | 73,817         | 61,147 | 48,263         |       |                                 |
|          | Narrakal | 19,648         | 3,466  | 14,980         |       |                                 |
|          |          | 93,465         | 64,613 | 63,243         |       |                                 |
| 1877-78  | Cochin   | 56,165         | 45,629 | 49,211         |       |                                 |
|          | Narrakal | 27,424         | 1,518  | 19,516         |       |                                 |
|          |          | 83,589         | 47,147 | 68,727         |       |                                 |

GOVERNMENT OF MADRAS,

PUBLIC WORKS DEPARTMENT,

STONEHOUSE, OOTACAMUND,

Dated, 1st October 1880.

J. H. ASPINWALL, Esq.,

Cochin.

MY DEAR SIR,

I am much obliged for your letter of the 28th ultimo, and for the courteous invitation which it contained. Should I be enabled to visit Cochin, I should be most happy to put up during my stay with you, but at the present moment my plans are a little uncertain, and I half fear that I shall be unable to visit, as I had intended, the Western Coast harbours till January. In any case I will give you as early intimation as I can.

Meanwhile I should be glad to know precisely what are the proposals in connection with the port, as I have not myself had an opportunity for visiting it nor have I seen any report by Colonel Thomason. His scheme whatever it was went in all probability to the Supreme Government.

From what I have generally been given to understand, Cochin has in the Narakkal mud banks a costless and safe landing place throughout the south-west monsoon, while at all other times there is no serious inconvenience from the present bar so far as landing and discharging cargoes is concerned.

Having lately visited our northern ports, I had occasion to study the general conditions under which harbours could be constructed at the mouths of our rivers, and as you will see from my note attached to the Government Order of 13th August (which kindly return on perusal) I was obliged to come to unfavourable conclusions, see particularly paragraphs 29 to 39 inclusive.

Setting aside the question of a railway, which I should presume is sufficiently before Government, do you really need any large or expensive harbour works? and if so, what form should they take bearing strictly in mind the action which is inevitable at the mouths of all our rivers?

Yours very truly,  
R. H. SANKEY.

No. 89-A.

Letter—from W. T. HOLMES, Esq., Honorary Secretary, Cochin Chamber of Commerce.

To—the Secretary to Government, Public Works Department, Madras.

Dated—Cochin, the 8th October 1880.

No.—68.

Mr. J. H. Aspinwall has placed before the Chamber your letter to him, dated 1st instant, with a view to the Chamber addressing you direct on the subject of the proposals in connection with the improvement of this port.

2. Your remarks and paragraphs 29 to 39 inclusive of your note attached to Government Order of 13th August have been carefully considered, and by desire of the members of the Chamber I have the honour to offer the following observations for your consideration.

3. In the month of November 1878 Colonel A. Thomason, R.E., visited the port and met the members of this Chamber to confer about proposals for the improvement of the harbour and the ability of the trade of the port to bear a charge for interest at 4 per cent. per annum on the cost of the proposed improvements.

4. Owing to Colonel Thomason's short stay in Cochin and to the fact that the Chamber had no previous knowledge of his intention to visit the port, there was not time to bring before him all the information bearing on the latter point, but in conference it was understood that no engineering difficulty existed in the way of converting the port into a first-class harbour at a moderate cost.

5. The works which were under contemplation at this interview were the construction of two piers from the mouth of the backwater so as to confine the current flowing outward and direct its full force on to the bar; to construct such protective works to prevent erosion of the sea beach north and south of these piers as might be necessary, and to construct quay walls inside the harbour, on the south side, from the present mouth to the Calvetty canal; and on the north side, on the face of Vypeen point.

6. These works were roughly estimated to cost about £250,000; and it was left with the Chamber to show that the trade of the port was able to pay interest at 4 per cent. per annum on this outlay. This the Chamber did in a letter to Colonel Thomason, dated 4th April last, a copy of which Mr. Aspinwall has forwarded to you.

7. The Chamber, however, is now of opinion that, as a beginning, works of much less magnitude than those originally contemplated might suffice, and would propose the construction of the piers seawards and such protective works on the seashore to the north and south of them as may be considered necessary. These works might be expected to cost considerably less than the amount formerly estimated. Other works might be subsequently constructed as the development of the trade of the port required.

8. For any works that may be decided on there is abundance of stone within moderate distance of Cochin which could be conveyed by backwater at cheap rates from the quarries to the works.

9. In considering the question whether the proposed works, if carried out, would permanently affect their object, the Chamber inclines to the opinion that they would, and it feels some confidence in it because a similar opinion seems to have been arrived at by professional men who have visited and inspected the port. The circumstances of this port are so widely different from those of Vizagapatam and other ports on the Madras coast that conclusions which may be perfectly sound with reference to the latter may be found quite inapplicable here.

10. The Cochin backwater is considerably over one hundred miles, extending to the north and south of Cochin, in length; is in some parts about fifteen miles broad; is perhaps nowhere less than one-and-a-half to two miles broad throughout its greatest length; and is of great depth in many places. Into this inland sea all the rivers, some of them considerable, from the Travancore and Cochin Hills debouch (the nearest of them being fully ten miles from Cochin), and find a passage into the sea at Cochin and Paliport, but in the passage of their waters down the still backwater the silt brought down by them is wholly deposited, so that by the time they reach Cochin there is no matter borne in them, even in the height of the monsoon floods, which depositing outside, could form a bar. In fact the water flowing out of the opening generally called the Cochin river is practically free from silt. It would appear from this that the bar at the Cochin mouth of the backwater is not caused by deposit of silt brought down by the rivers, but is owing to the action of the surf endeavouring to reform the profile of the coast line broken through by the outflowing current, as pointed out by Mr. Robertson, and, if this opinion is correct, there is ground for belief that such works as are proposed would have the effect of permanently removing the bar.

11. It may here be mentioned that the depth of water on the bar at high water is  $16\frac{1}{2}$  to 17 feet, and at low water  $14\frac{1}{2}$  to 15 feet, and not 11 feet as stated by Mr. Robertson.

12. With reference to the facilities offered by Narrakal to shipping operations during the monsoon months, the Chamber would point out that there are serious drawbacks to those facilities, amongst which may be mentioned the inconvenience arising from the place being at so great a distance from Cochin, the cost of keeping extra staff there, the extra cost of boat-hire, the cost and inconvenience of portage across the land between the backwater and the sea, the damage done to cargo by long exposure to wet in passing between the two places and on to the ships, and, not least, the loss sustained by the pilfering by boatmen and others which cannot be checked. In these things there are reasons sufficient for a strong desire amongst merchants of this place to be independent of Narrakal as a shipping port. But as a port of safety in stormy weather, when ships might be unable to make this port, Narrakal would always be available as a temporary anchorage.

13. The Chamber notices with gratification that there is a prospect of your visiting the port and trusts that you will find it convenient to do so at an early date.

### TOTAL Imports to Cochin and Narrakal from 1870—1880.

|                | 1870-71. | 1871-72. | 1872-73. | 1873-74. | 1874-75. | 1875-76. | 1876-77. | 1877-78. | 1878-79. | 1879-80. |
|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    |
| Cochin .. ..   | 35,354   | 39,951   | 47,676   | 39,229   | 41,814   | 43,835   | 73,817   | 56,165   | 70,051   | 31,872   |
| Narrakal .. .. | 500      | 500      | 164      | 944      | 1,522    | 2,972    | 19,648   | 27,424   | 12,680   | 11,869   |
| Total .. ..    | 35,854   | 40,451   | 47,840   | 40,173   | 43,336   | 46,807   | 93,465   | 83,589   | 82,731   | 43,741   |

W. T. HOLMES,  
Honorary Secretary.

### STATEMENT showing the Number and Tonnage of Vessels that frequented the Port of Cochin and the amount of Port Dues collected thereon.

| Official Year. | Number and Tonnage of Vessels. |          | Amount of Port Dues collected. |    |    |
|----------------|--------------------------------|----------|--------------------------------|----|----|
|                | NO.                            | TONNAGE. | RS.                            | A. | P. |
| 1870-71 ...    | 1,466                          | 131,482  | 13,606                         | 9  | 3  |
| 1871-72 ...    | 1,621                          | 143,079  | 14,815                         | 8  | 0  |
| 1872-73 ...    | 1,430                          | 162,901  | 19,650                         | 0  | 3  |
| 1873-74 ...    | 1,511                          | 123,938  | 14,221                         | 3  | 9  |
| 1874-75 ...    | 1,842                          | 164,747  | 19,739                         | 1  | 0  |
| 1875-76 ...    | 1,639                          | 192,693  | 24,123                         | 3  | 0  |
| 1876-77 ...    | 1,598                          | 204,796  | 27,811                         | 9  | 0  |
| 1877-78 ...    | 1,500                          | 209,199  | 28,276                         | 13 | 3  |
| 1878-79 ...    | 1,484                          | 216,065  | 29,868                         | 12 | 6  |
| 1879-80 ...    | 1,135                          | 199,189  | 28,811                         | 10 | 0  |

Total tonnage for four years from 1876-77 to 1879-80—Tons 829,249, averaging 207,312 tons per annum.

Total port dues collected for four years from 1876-77 to 1879-80—Rs. 1,14,768-12-9, averaging Rs. 28,692 per annum.

W. T. HOLMES,  
Honorary Secretary.

### TOTAL Exports from Cochin and Narrakal from 1870-80.

|                | 1870-71. | 1871-72. | 1872-73. | 1873-74. | 1874-75. | 1875-76. | 1876-77. | 1877-78. | 1878-79. | 1879-80. |
|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    | TONS.    |
| Cochin .. ..   | 36,054   | 47,512   | 39,905   | 37,460   | 40,321   | 39,598   | 58,399   | 44,298   | 37,303   | 35,328   |
| Narrakal .. .. | 2,300    | 2,300    | 2,443    | 2,121    | 1,927    | 2,689    | 5,106    | 2,835    | 2,332    | 4,898    |
| Total .. ..    | 38,354   | 49,812   | 42,348   | 39,581   | 42,248   | 42,287   | 63,505   | 47,133   | 39,635   | 40,226   |

About 5,000 tons exports belonging to 1879-80 were not shipped until 1880-81 owing to want of tonnage, so do not appear in this statement.

GOVERNMENT OF MADRAS,  
PUBLIC WORKS DEPARTMENT,  
STOREHOUSE, OOTACAMUND,  
12th October 1880.

To the Honorary Secretary,  
Chamber of Commerce,  
Cochin.

DEAR SIR,

I beg to acknowledge your obliging communication No. 68 of the 8th instant on the subject of the requirements of the Cochin Harbour. It will afford me great pleasure to visit Cochin and examine for myself the points advanced in your letter, but as I may not be enabled to arrange them for some time I should be glad if you would kindly let me have even a rough plan of the works you suggest laid down on a reliable chart to allow of a general opinion being formed of the probable expense.

Thus if you could indicate generally the length of the groynes which it is now thought would suffice to sweep away the bar, their probable section, and distance apart it would not be difficult to frame some kind of approximate estimate—particularly, if you can state the rate at which the material could probably be laid down at.

If the scour is such as to sweep away the bar you must bear in mind that the material composing the training groynes must as the channel is deepened by this action have a tendency to slip down the inner slopes and that then much more material will be needed than that merely required for making up a breakwater or groyne of a given section.

May I ask also what is the general character of the seas brought up by the S.W. Monsoon, *i.e.*, whether they are in any way comparable with the rollers at Madras, as in that case, the material would either have to consist of stone in large masses or of concrete blocks, the expense of which I need hardly say would be considerable.

Without wishing to express at present any opinion as to the validity or otherwise of the contention in your letter against the probability of a bar reforming with the scour it is proposed to bring upon it by the suggested groynes, I should be glad to have some good nautical opinion as to whether in the south-west monsoon ships could safely be warped up between such groynes.

I confess it seems to me at first sight that at such times an operation of the kind would be attended with considerable risk, and that steamers and vessels frequenting the port at such times would be very chary about entering a narrow canal of this kind: in fact that they would much prefer discharging their cargoes off Narrakal.

Please also if possible let me have a statement of the exports and imports for the last 20 years, with some general statement of the dues which you think the trade could bear to pay interest on the capital required for the proposed works.

Believe me,

Dear Sir,

Yours faithfully,

Signed: R. H. SANKEY, COLONEL, R.E.

No.—89-B.

Letter—from W. T. HOLMES, Esq., Honorary Secretary, Cochin Chamber of Commerce.

To—the Secretary to Government, Public Works Department.

Dated—Cochin, the 25th November 1880.

No.—75.

I beg to acknowledge your letter of 14th October which has been laid before the Chamber, and have now the pleasure to furnish you with such of the information called for as is available.

2. As requested, a chart of the port (with latest corrected soundings on and about the bar) which is in use by the Marine department is forwarded herewith, and there have been marked thereon the directions which, or about which, the proposed piers may be expected to take; but the Chamber feels some diffidence in offering suggestions on points which are matters for professional opinion.

3. It is of course understood that the piers will require to be extended to such a length as will enable the current to maintain an always open channel into deep water, and must be placed, with reference to each other, so as to direct as much of the force of the out-flowing current on to the bar as may be possible without exposing them to the risk of being undermined by the scour which the confinement of the current may be expected to set up, considering that the ebb ordinarily flows at about four knots per hour and at six knots during the freshes.

4. If it is considered necessary to carry the piers out into five fathoms water, they will have to be constructed to a distance of about 2,800 yards from the river's mouth. It may, however, not be thought necessary to carry them out so far for the following reasons:—The

chart shows that in the narrowest part of the mouth of the backwater, where it is 450 yards broad, there is a depth of 42 feet, gradually shallowing to 38 feet at the point (600 yards broad) where the shore line is left and the backwater empties into the sea. Immediately the shore line is passed the current spreads out fan-like, and much of its force is lost; yet, notwithstanding, it is able to maintain a depth of 26 feet of water at a distance of 1,100 yards from the shore. It therefore seems that, if the piers were carried out just past the bar, a distance of about 1,750 yards or thereabouts, the whole volume of the current discharging into the sea at that point might be expected to form and keep open a channel of sufficient capacity right into deep water. This of course is on the supposition that the position of the bar is the limit of the disturbing action of the swell and surf on the sand of the coast.

5. In considering the distance apart at which the piers should be built, it may be noted that the chart shows that the main current is skirted, as far as the bar, by sand banks, the soundings on which are very shallow, being only 13 feet at both ends of the bar at a mean distance of 1,625 yards from the shore. If these banks may be considered as indicating about the proper line for the construction of the piers, then the south pier will run out almost due west from the light-house bastion for a distance of 1,500 yards and the north pier take a south-westerly line from Vypeen point for a distance of 1,750 yards. These directions will place them about 1,000 yards apart at the base or shore end and 650 yards at the bar, and may be expected to give a depth of about 30 feet of water where the bar now is.

6. If the triangular area thus enclosed be open to objection, outweighing the economy in construction effected by building the south pier due west from the light-house bastion (though it might be useful as affording space for any swell entering between the piers to spread and disperse), then the alternative line for this pier marked on the chart may perhaps be the best, and the two piers will then be parallel at a distance apart of 650 yards.

7. Should it be considered necessary to carry the piers into five fathoms water, the south pier could be extended the required distance due west, and a direct line, as marked on the chart, be followed for the north pier.

8. As the Chamber is quite unable to express an opinion on the method of construction most fit to be adopted in the piers, it cannot furnish a probable section of them, but it would seem necessary that they should be sufficiently solid to prevent such percolation through them as might weaken the current.

9. It was thought that some information about the Madras Harbour Works would have been of assistance in the preparation of rough plans and estimates, and the Superintendent of those works was applied to for it. He obligingly replied very fully to the Chamber's inquiries; but, owing to the great depth of water in which those works have been constructed, and consequently the more massive character of them than is required in works here, it was found impossible to frame any reliable calculations on the information furnished.

10. The Chamber is informed that for some small protective works which have been constructed on the beach the material (large boulders of gneiss rock) was obtained at two rates, *viz.*, Rs. 2 per ton and Rs. 3½ per cubic yard. Considering that the material is obtainable in unlimited quantity and almost without quarrying at about ten miles from Cochin, and that its carriage would be by water, the Chamber is inclined to think that for large works such as proposed, arrangements for laying it down in Cochin at cheaper rates might be found practicable.

11. In the opinion of the Chamber the seas brought up by the south-west monsoon are not at all comparable to the rollers which break on the Madras coast, nor are such storms as are met with on that coast ever experienced here. The long shelving bottom perhaps explains the comparative lightness of the seas breaking on this shore.

12. It is not anticipated that there would be any special risk to ships passing in between the piers during the south-west monsoon. The process of warping would be quite unnecessary, for, as every wind that blows during that period is a fair wind for entering the port, ships once in the channel would be able to sail right in. The wind, however, at that and other times of the year when the early morning land winds do not prevail does not serve ships going out, and for use at all such times it might be desirable to keep a small tug steamer at the port.

13. The Chamber regrets that a statement of imports and exports for twenty years is not available, but one for ten years, which has been compiled by the Chamber from the official records, is attached hereto, and its figures are reliable.

14. On the subject of dues which the sea-borne trade of the port can bear, to pay interest on the required capital, the Chamber feels better qualified to express an opinion than on some of the other points raised in your letter under reply.

15. The average annual imports and exports for ten years are found to be—

|                         |         | TONS.   |
|-------------------------|---------|---------|
| Cochin and<br>Narrakal. | Imports | 44,513  |
|                         | Exports | 55,799  |
| Total                   |         | 100,312 |

16. At the present time ships of 300 to 400 tons burthen come into the inner harbour, and in discharging and loading their cargoes merchants find a saving of at least As. 12½ per ton in boat-hire as compared with the cost of discharging and loading when ships are outside (including Narrakal shipments), and on the supposition that two-thirds of the imports and exports, say 66,875 tons, are discharged and loaded outside, the further reduction in boat-hire occasioned by all ships coming inside would represent Rs. 52,940 or thereabouts annually, being an average of 8 annas and 5 pies per ton on the whole trade.

17. If, however, ships were not only all able to come inside, but provision was made for them to discharge and load at quays, there would be a saving of Rs. 1-1-0 per ton in boat-hire on the aforementioned two-thirds of total imports and exports, and of about As. 5 per ton on the remaining third now discharged and loaded inside, averaging 13 annas and 4 pies per ton on the whole trade, and representing Rs. 83,593 annually.

18. But the full benefit which Cochin merchants would derive from the contemplated improvements is not to be measured by these savings only. Various facilities would be furnished, such as reduction of risk of damage to goods and loss by theft, greater expedition in the shipping and discharging of goods, ability to carry on shipping operations under conditions of sea and weather which now bring them to a standstill, and, not least, the avoidance of the considerable inconvenience, delay, and extra expenditure which are at present experienced in having to carry on shipping operations at Narrakal. These things have an appraisable value and were taken into consideration when the Chamber informed Colonel Thomason, in its letter of the 4th April 1879, that for harbour improvements which would include quay walls in the inner harbour, the trade of the port could afford to pay Re. 1-8-0 per ton by way of wharfrage or bunder fees if necessary, a statement from which the Chamber does not recede. However, as far as the Chamber understands the subject, a less tax would more than suffice to pay 4 per cent. interest per annum on the supposed outlay of £250,000, say As. 12 per ton in the case of harbour improvements not including quay walls, and Re. 1 per ton in the case of improvements including quay walls.

19. The facilities and quicker despatch which ships would gain under these circumstances might well be considered sufficient ground for an increase in the tonnage dues they pay to the port, and the Chamber would propose an increase of one anna per ton all round. The existing rates are—

On ships from or to Foreign <sup>and</sup> or British Ports, As. 3 per ton for ninety days.

Coasting steamers, As. 4½ per ton for thirty days.

Native and coasting craft employed entirely in coasting trade, As. 1½ per ton for sixty days.

20. There is attached hereto a statement of number of ships, tonnage, and port dues for ten years at Cochin, which shows the average tonnage for four years, from 1876-77 to 1879-80, to have been 207,312 tons. A charge of one anna per ton on this amount would give an income of Rs. 12,957 per annum. If the tonnage of ships visiting Narrakal was taken into account, the amount would be larger, but unfortunately statements cannot be obtained in time to go with this letter.

21. The Chamber is also of opinion that a large portion of the surplus port dues collected might very justly be appropriated to this object. For the past four years they have averaged per annum at Cochin Rs. 28,692, and the expenditure against them, it is believed, has not averaged Rs. 7,000 per annum. The Chamber has no idea of the manner in which the surplus of Rs. 21,000 has been disposed of (though it is well known that it has not been expended on the port), but ventures to propose that at least three-fourths, if not the whole of this surplus, be applied to the improvement of the port.

22. Thus in one case can be raised, without any undue charge on the trade of the port, an income of Rs. 1,03,700 per annum as follows:—

|                                                                     | RS.             |
|---------------------------------------------------------------------|-----------------|
| Charges on landing and shipping, say 100,000 tons at As. 12 per ton | 75,000          |
| Increased port dues                                                 | 12,950          |
| Transfer from port dues                                             | 15,750          |
| <b>Total</b>                                                        | <b>1,03,700</b> |

representing, at 4 per cent. per annum interest, a capital of Rs. 25,92,500.

23. In the other case can be raised an income of Rs. 1,28,700 per annum as follows:—

|                                                                    | RS.             |
|--------------------------------------------------------------------|-----------------|
| Charges on landing and shipping, say 100,000 tons at Re. 1 per ton | 1,00,000        |
| Increased port dues                                                | 12,950          |
| Transfer from port dues                                            | 15,750          |
| <b>Total</b>                                                       | <b>1,28,700</b> |

representing, at 4 per cent. per annum interest, a capital of Rs. 32,17,500.

24. It may be added that a tax of even Re. 1-8-0 per ton would compare favorably with the charges on shipping operations at the neighbouring and thriving port of Alleppey; and, proceeding as above, an annual income of Rs. 1,78,700 might be raised.

|                                                                      | RS.             |
|----------------------------------------------------------------------|-----------------|
| Charges on landing and shipping, say 100,000 tons at Rs. 1/8 per ton | 1,50,000        |
| Increased port dues                                                  | 12,950          |
| Transfer from port dues                                              | 15,750          |
| <b>Total</b>                                                         | <b>1,78,700</b> |

representing, at 4 per cent. per annum interest, a capital of Rs. 44,67,500.

25. Such being the case, and if the works proposed are considered practicable and can be constructed within the cost the port can pay interest on, the Chamber hopes that Government will give the subject favorable attention. The near completion of the Madras Harbour Works seems to afford an opportunity for taking the proposals concerning this port into consideration, for the working plant soon to be set at liberty in Madras might be made available for any works sanctioned here.

26. During the recent visit of His Grace the Duke of Buckingham and Chandos to this port, the Chamber brought the subject of this correspondence to his notice, when he was pleased to express a wish that he might have an opportunity of considering the details of the Chamber's proposals before the expiration of his term of office as Governor of this Presidency. The Chamber, therefore, respectfully requests that, if possible, you will obligingly lay the proposals before His Grace at an early date.

27. The delay in replying to your letter, for which the Chamber apologizes, has been occasioned by the difficulty experienced in preparing the statement of imports and exports.

No. 89,-C.

Letter—from W. T. HOLMES, Esq., Honorary Secretary, Cochin Chamber of Commerce.  
To—the Secretary to Government, Public Works Department, Madras.  
Dated—Cochin, the 14th December 1880.  
No.—76.

A notice appears in the *Madras Mail* of 11th instant that Mr. Parkes, the Consulting Engineer for the Madras Harbour Works, is to visit Beypore this month to report on the practicability of constructing a harbour there, and I am desired by the Chamber to request, that you will be so good as to obtain the sanction of Government to Mr. Parkes visiting this port also for a like purpose.

2. The Chamber trusts that nothing will be decided about the proposed works at Beypore until the proposals for harbour improvements at this place have received consideration, and the fact that this port is second in trade and importance in the Madras Presidency, whilst Beypore remains, what it always was, only a fishing village, may be deemed to give it a prior claim on the attention of Government.

3. It is open to doubt that the construction of harbour works at Beypore would ever be a remunerative undertaking, or that the produce of the Wynaad which now goes to Tellicherry and Calicut for shipment (chiefly to Tellicherry) could be diverted from those places without a railway through the Wynaad, and even that might be insufficient, for it is unlikely that curing firms established at those places will remove themselves to Beypore, and there seems to be less likelihood that they will incur the cost and risk of sending goods to Beypore for shipment when they can ship more cheaply and conveniently from their own ports.

4. Another point for consideration is the fact that there would be no produce for shipment from Beypore during the monsoon months, when it is probable the port would be quite deserted. The coffee crops usually begin to reach the coast about the end of November and are all shipped before the end of May, so that for about six months in the year the port would yield no revenue towards paying interest on capital expended in harbour construction. During the remaining months of the year shipments are now made without inconvenience from Tellicherry and Calicut, and at less expense than they could be made from Beypore were that port converted into a harbour.

5. The construction of harbour works here might be expected to pay from the very beginning, and when this port is placed in connection with the railway system of the Madras Presidency, of which there seems a likelihood, the existing extensive trade of the port may be expected to greatly expand. Nature having done so much for it, it is probable that this port could be converted into a first-class harbour at much less cost than only moderate works could be carried out at Beypore.

6. For these reasons the Chamber hopes that the claims of this port to first consideration will have the attention of Government before the Beypore schemes, and that Government will be pleased to allow Mr. Parkes to visit this port with a view to harbour improvements.

No. 89-D.

Letter—from J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant,  
Administrative Department.

To—the Secretary to Government, Public Works Department.

Dated—Madras, the 16th December 1880.

No.—11132.

From Mr. J. H. Aspinwall, dated 28th September 1880.  
From Honorary Secretary, Cochin Chamber of Commerce,  
No. 68, dated 8th October 1880.  
From Honorary Secretary, Cochin Chamber of Commerce,  
No. 76, dated 26th November 1880.

In returning the papers marginally noted,  
I have the honour to offer the following  
remarks.

conflicting reports and opinions prevail on the one hand that no reliance ought to be placed  
upon them from a favorable point of view until the interests of Government in the other most  
important scale are secured.

3. I personally consider it impossible to make Cochin a first-class harbour: nature has not  
done enough for it. A second-class one it may already be considered during the fine season, at  
which period I believe nearly all trade operations are conducted.

4. I will recapitulate my chief reasons for this opinion. In the first place, independently  
of the bar obstruction, more than a sea mile of about 18 feet of water has to be approached and  
passed over from the open sea with its heavy ground swell.

5. Now the least depths that would justify a large ship in approaching the coast and  
making a narrow harbour mouth is, I consider, 5 fathoms or 30 feet, and I know no instance  
where so small an allowance even as that obtains at present. The removal of the bar, which is  
only from 2 to 4 feet less than the entire passage, would not remedy this crushing defect.  
The Cochin Chamber put the present depth on the bar at 16 feet, but I have known it 14.

6. On the subject of removing the bar by a natural process, I would observe that the sand-  
spit on either side of the entrance to Cochin come up nearly to the surface to some portions, and  
it is now guided, and though the bar is found much diminished after a good scour during the  
heavy rains of the south-west monsoon, yet it speedily reforms during the fine season and the  
regular return of ebb and flow. If the contemplated walls are to take the usual harbour form  
and, after reaching the bar, converge to a narrow opening, I see no reason to doubt that the  
stream thus narrowed would soon represent the only deep portion, the sides silting up as is  
evidenced at the Vizagapatam backwater and other places. I have marked on the chart in  
blue pencil the points mentioned above from A to B. Then, as regards a first-class harbour,  
the passage between Cochin and Vypeen, where the deepest water is situated, is only 1,100 feet  
across, so that a first-class steamer of, say, 350 feet, even if very tightly moored in the centre,  
would require the whole width to swing in safety, so that only one tier could be moored in line,  
and pilots now experience great difficulty in avoiding collision while bringing ships in under  
canvas, which would be increased if a large class of ships had to be provided for. One tug, in  
my opinion, would be a necessity.

7. The space inside the backwater after Vypeen is passed is also extremely limited. I have  
drawn a blue pencil mark about where the harbour would practically end, C to D. The  
remainder water-space, though having holes or swatches here and there, is too shallow for use,  
and the holes have no leads into them. The hundreds of miles of backwater spoken of by  
the Chamber can, I therefore suppose, only be meant for boat traffic. The chart sent with your  
letter is old—1858.

8. About the section of the walls being weaker than those at Madras, I am of opinion that  
the Madras system of blocks cannot be used at Cochin. The sand is now near the surface, and  
a rubble base would have no sufficient depth. The method used at Alexandria and Port Said,  
where large blocks are thrown in to find their own slop, would, I imagine, answer better.

9. No reliable data as to the comparative force of the sea on the East coast and West coast  
exist, except in one instance of the small Calicut Pier, which has stood some years in its present  
position, the portion close to the shore having alone suffered from the surf, but I am  
confident some of the seas we have had in Madras during the same period would have destroyed  
it entirely. I should have been very glad if I could have conscientiously endorsed the hopeful  
and confident character of the correspondence forwarded with your letter, but the points I have  
raised demand, in my judgment, careful consideration. Colonel Thomason does not seem to  
have viewed Cochin or any other Madras harbour from a nautical point of view. If you  
adhere to the proposal to visit the West coast in January in the *Margaret Northcote* with me,  
many subjects of great interest to Government will receive the attention that has not been  
properly given to them hitherto.

No. 90.

Order thereon—No. 2943 W., dated 27th December 1880.

The Right Honourable the Governor in Council is of opinion that no action should be  
taken in regard to the proposed improvements to the Harbour of Cochin until, after personal  
inspection by the Chief Engineer and Master Attendant, Madras, a joint report by those officers  
shall have been laid before Government and considered.

2. Arrangements will therefore be made for such inspection at an early date.

3. Meanwhile the Government of India will be requested to obtain the opinion of Captain  
A. D. Taylor, Superintendent, Marine Survey of India, on the general question. It is under-  
stood that Captain A. D. Taylor is intimately acquainted with the port, and his observations,  
accompanied by the latest chart, will doubtless be valuable.

4. The Government of India have already been requested by telegram on the 18th Decem-  
ber to forward any report and plans which Colonel Thomason, R.E., may have laid before them  
in connection with his recent examination of the harbour.

[Here enter No. 2944 W., dated 27th December 1880.]

(True Extract.)

R. H. SANKEY, Colonel, R.E.,  
Secretary to Govt., P.W.D.

G.O. No. 222 W., dated 26th January 1881.

Read—the following paper:—

No. 141.

Letter—from W. T. HOLMES, Esq., Honorary Secretary, Chamber of Commerce,  
Cochin.

To—the Secretary to Government, Public Works Department.

Dated—Cochin, the 20th January 1881.

No.—81.

The Chamber has had under consideration the letter from Captain J. H. Taylor, Master  
Attendant, Madras, dated 16th December 1880, attached to Proceedings of Government, dated  
27th December 1880, No. 2943 W., and I am desired to make the following representations in  
answer to his remarks on the Chamber's application for harbour improvements.

2. The Chamber concurs in the opinion that the question of converting Cochin into a first-  
class harbour can only be settled on the spot; and is sanguine that no person coming to the study  
of the question with a practical and unbiassed mind can fail to be impressed with the facilities  
offering for such conversion. It may be Captain Taylor's opinion that it is an impossibility; but  
other equally competent judges who have visited the port and considered the question have  
formed an opposite opinion, and the weight of professional judgment is, so far, the Chamber  
considers, strongly against Captain Taylor. Amongst Commanders of vessels visiting the port,  
there is but one view of the facility with which the conversion could be effected, and Captain  
Taylor's opinion is the only conflicting one that has come to the Chamber's knowledge.

3. In the third paragraph of his letter Captain Taylor seems to imply that, as a second-  
class port, the harbour meets all requirements of trade during the season, and that during the  
monsoon months there are no trading operations requiring harbour facilities. If this were  
the state of the case, it is probable that it would be familiar to the merchants of the port, and  
knowing it, they would hardly propose to Government a measure for additional taxation on  
their trade to pay for works which they felt to be unnecessary. It is, of course, true that the  
bulk of trade is done between the months of October and May, both months inclusive, but a  
reference to the statistics of imports and exports at Narrakal, already furnished to Government,  
will show that the monsoon trade of this port (the trade of Narrakal is only the monsoon trade  
of Cochin) is a rapidly growing one. The imports rose from 500 tons in 1870-71 to 11,869  
tons in 1879-80, and the exports from 2,300 tons in 1870-71 to 4,898 in 1879-80. It was  
owing to there being no facilities for monsoon trade that none existed prior to 1870-71, and  
that it has not greatly exceeded the rapid advance already made since that date is because the  
port of Narrakal has not furnished all the facilities required.

4. From the tenor of his remarks in paragraphs 4 and 5 of his letter, Captain Taylor  
would seem to have missed the purport of the Chamber's proposals, which are not only to  
remove the bar but to carry out a deep channel into deep water by pier walls built out into five  
fathoms water if necessary; in fact to provide a channel of 30 feet deep into the same depth of  
water which Captain Taylor admits would justify a large ship in approaching the coast. The  
Chamber's proposals for effecting this and its reasons for believing that they would be effective  
are set forth in paragraphs 3, 4, 5, and 7 of its letter, dated 25th November last.

5. The time when Captain Taylor knew the depth of water on the bar to be only 14 feet  
was probably when the Cruz Milagre gap was open. It has not been so low since.

6. Captain Taylor's remarks against the possibility of removing the bar and other obstruc-  
tions by a natural process as contained in paragraph 6 of his letter are, in the Chamber's  
opinion, altogether erroneous. It is not the case that the sand spits on either side of the  
entrance to the backwater come so near to the surface that the contemplated walls would do little  
more than guide the current as it now flows; and it is difficult to understand how, with the chart  
of the port, before him and, it may be supposed, some personal knowledge of the port, he has  
fallen into such an inaccurate statement.

7. Near the shore line the water on the spits is shallow; and at a little distance to the west of Vypeen point a small sand bank is visible at low water for about one month after the monsoon, formed, probably, by the action of the monsoon floods on the littoral sand laden current. This bank disappears with the subsidence of the floods, and for the rest of the year there is no sand appearing above the surface of the water. Between the site of this sand bank and the Vypeen point there is a broad channel with, at present, a depth of 12 feet of water (during the monsoon floods it is more) through which sweeps a powerful current northwards. The sand spits as they proceed seawards gradually fall into deeper water until, where they join the bar, there is about as much water on them as on the bar. A reference to the chart shows a depth of water on the N. spit ranging from 4 feet at its shore end to 17 feet near the bar, and on the S. spit of from 4 feet near the shore to 11 and 12 feet near the bar.

8. Now, considering that the bar is about 1,700 yards from the mouth of the backwater, it must be admitted that, before it is reached, there is room between the top of the spits and the surface of the water for a very considerable portion of the current to pass without going near the bar at all, and, as a matter of fact, which is open to ocular demonstration every day, much more of the current passes over the spits and through the channel round Vypeen point than crosses the bar.

9. The construction of the proposed walls, which, it may be remarked, are not intended to take the usual harbour form, but, as before stated, to direct the current would, therefore, very materially alter the course of the current, bringing the whole of it into a channel in which but a small portion of it now flows; and there is reason to believe that this confinement of the current would effectually remove the obstructions which Captain Taylor considers "crushing defects," from the fact that where the out-flowing current is now confined, it maintains a depth of from 36 to 42 feet of water.

10. With reference to the statement that the breadth of the passage between Cochin and Vypeen at the point of deepest water is only 1,100 feet, the Chamber begs to remark that, according to the Government chart now in use at the port, it is 1,350 feet across, and the channel has not narrowed since the chart was drawn; but there is no reason to suppose that, as a matter of necessity, a steamer of 350 feet length would be anchored in this particular portion of the harbour and be left to swing with the tide to the obstruction of navigation. Vessels would be moored stem and stern as in other places, it may be presumed.

11. Not having before it the chart on which Captain Taylor has drawn his blue pencil lines, the Chamber cannot judge what he considers to be the limited space within the backwater, but has no hesitation in affirming that there is at the present time ready space of sufficiently deep water for mooring several vessels of considerable size.

12. If a line be drawn eastward from Builder's point parallel with the Cochin shore, and terminating in a line with the corner at the end of the yards, there will be enclosed a space, inside the backwater, of 1,000 yards long by 400 yards broad, all deep water, with the exception of a small piece in the north-east corner. Supposing that every vessel visiting the port is 350 feet long and requires a length of 550 feet for a mooring, there could be accommodated within these limits eight such vessels moored in double tier, leaving ample room for passage on both sides and a space of 600 feet by 1,200 feet for ships to be turned in so that they might be berthed with their stems seaward. If, instead of confining the moorings to space actually within the backwater, they be extended down the passage between Cochin and Vypeen, where ships often now anchor, and the whole of which would become available under the Chamber's proposals, there would be a length of 1,650 yards which would accommodate sixteen ships of 350 feet moored in double tier, and leave a space of over 500 feet by 1,200 feet as a turning station. It is a mistake, however, to suppose that every vessel visiting the port would be 350 feet in length or that there would ever be so many vessels of such size in port at once (it is probably not found so in Madras); and allowing for a large proportion of vessels of smaller size, the space pointed out would afford accommodation for a larger number of ships.

13. Should more space be required with the development of trade or for other reasons, it can be obtained by the construction of training walls and the operation of dredging further into the backwater, which operations were contemplated by Colonel Thomason, R.E., in his estimate of probable cost; and there is somewhere a powerful dredger, purchased a few years ago for use at this port at a cost of £20,000, which has never done a day's work in the port. This plan of extending the harbour accommodation might be made doubly profitable; for, besides providing accommodation for more shipping, the depositing of the mud, dredged up, behind the training walls would reclaim an area of the backwater that would be of great value for yards and would be eagerly taken up by the mercantile community.

14. Captain Taylor is also in error in his remark, "the hundreds of miles of backwater spoken of by the Chamber," for the Chamber has not made any such statement. The Chamber has stated that the backwater is over one hundred miles in length, and this reference to its length was not made with a view to make it appear that the whole of it is available for shipping, but, in a consideration of the silt question, to show that it collects all the silt brought down by the rivers and of which none passes into the sea. But many parts of the backwater are very deep, particularly the wider ones, and over it is conducted an immense traffic. It furnishes water communication from British territory right through the Native States of Cochin and Travancore and bears much of the produce of those two States to British Cochin for shipment.

15. With reference to the comparative force of the sea on the east and west coasts of South India, the Chamber is of opinion that the case of the Calicut pier, mentioned in the 9th paragraph of Captain Taylor's letter, is about as good data as need be required, but it may be supplemented by an allusion to the Alleppey pier, a construction of wooden piles without bolt or nail, the superstructure being secured by chain and rope lashings only.

16. Captain Taylor expresses an opinion that Colonel Thomason did not view the Cochin harbour from a nautical point of view. The Chamber, however, believes he viewed it from a practical point of view, and more does not seem necessary.

17. The Cochin backwater will afford facility for any extent of harbour development, if steps be taken to keep open a deep entrance channel, and the Chamber is satisfied that there is not such a favourable site within the Madras Presidency, or one that holds out so fair a prospect of success and reasonable return on capital expended.

18. The Chamber begs to express its obligation to Government for having sanctioned an early inspection of the port, but it regrets to observe that Captain Taylor has already committed himself to the opinion that it is impossible to make Cochin a first-class harbour for reasons which are now shown to be fallacious.

No. 142. *Order thereon—No. 222 W., dated 26th January 1881.*

Communicated for the information of Captain Taylor, R.N.R., who will take into consideration the arguments in favor of a Harbour at Cochin as now advanced by the Chamber of Commerce, and state his views thereon after visiting the port in company with the Chief Engineer.

(True Extract.)

R. H. SANKEY, Colonel, R.E.  
Secretary to Govt., P.W.D.

*G.O. No. 911 W., dated 4th April 1881.*

*Read—the following paper:—*

No. 15. *Letter—from W. T. HOLMES, Esq., Honorary Secretary, Chamber of Commerce, Cochin.*  
*To—the Secretary to Government, Public Works Department.*  
*Dated—Cochin, the 19th February 1881.*  
*No.—87.*

Referring to the meeting which the members of this Chamber had with you and Captain Taylor, R.N.R., on Saturday the 5th instant, I now, by desire, have the honor to offer the following observations on the various points which you left for further consideration by the Chamber.

2. The first in order is the question whether the floods in the backwater bring down such silt as, depositing outside the entrance, now forms the bar. The Chamber has already expressed a very decided opinion that no such silt is discharged from the backwater, and its opinion on this point was not in any degree shaken by the opposite views expressed at the meeting referred to.

3. At the meeting there were produced by the Chamber two bottles of flood-water taken from the mouth of backwater on the 4th December last. Between that date and the 20th November preceding there had been a fall of upwards of 8 inches of rain over the district between Cochin, Alleppey, and the Travancore hills, and the rivers from the hills being in heavy flood, there was being discharged from the mouth of the backwater an usual monsoon flood.

4. The samples of water which were drawn in the presence of the Master Attendant of the port were as bright and clear as water can be. A few particles of substance were contained in them, but not sufficient to form the thinnest film over the bottoms of the bottles, or when shaken up to at all cloud or discolour the water. The taste of the water was but slightly brackish, a fact which may be noted as a proof of its being flood-water, for in the absence of floods the backwater becomes salt to a distance of 30 to 35 miles from Cochin.

5. The appearance of this water was not considered by you as at all confirmatory of the Chamber's statement, because (1) you deemed it probable that the silt, being heavy, might not be held in suspension by the waters, but by the strength of the current might be rolled along the bottom of the backwater, and (2) because inside the backwater you had observed along the shore obstructions placed with a view to causing reclamations by the deposit of silt.

6. In reply to the first objection the Chamber begs to observe that such rivers as the Hoogly, Godavari, Cauvery, Indus, and perhaps all other rivers that are known to bear down silt, and, in consequence, to have bars at their mouths, run during flood time in turbid streams which discolour the sea for considerable distances from shore. In like manner run the rivers which discharge into the Cochin backwater.

7. But the Cochin backwater ranges from 2 to 15 miles in width, and over these broad areas, some of which are from 30 to 50 feet deep, the current is necessarily slow, and in passing them the flood-waters deposit all their silt. If, however, it can be urged that the current over such places is so strong as to roll heavy silt from the bottoms of such deep pools and over steep banks, it must be admitted that it is also strong enough to keep in suspension lighter particles of silt, in which case the flood-waters discharged from the mouth of the Cochin backwater ought to present the appearance of the floods from the rivers which have been referred to. The fact that they do not present such appearance is proof, in the Chamber's opinion, that the objection of rolling silt on the bottom of the backwater is untenable.

8. With reference to the second objection, it may be mentioned that during the monsoon months there is of necessity a wash from the lands on the margin of the backwater, and where there are no protective works there must be some attrition of the shore, regulated by the strength of the current. During flood-tide, too, a certain amount of sand is rolled in from the sea along the shores. These are the materials which form the reclamations referred to, aided by mud excavated by hand from the bottom of other parts of the backwater. In this view, which the Chamber believes to be the correct one, the reclamations lend support to the statement that no silt is discharged from the mouth of the Cochin backwater which, by depositing outside, forms the bar.

9. The next point to be considered is the objection that the construction of the works proposed by the Chamber would not alter the direction and strength of present forces, and that, therefore, the bar must reform, the time required for it to do so being regulated by the length of the breakwaters.

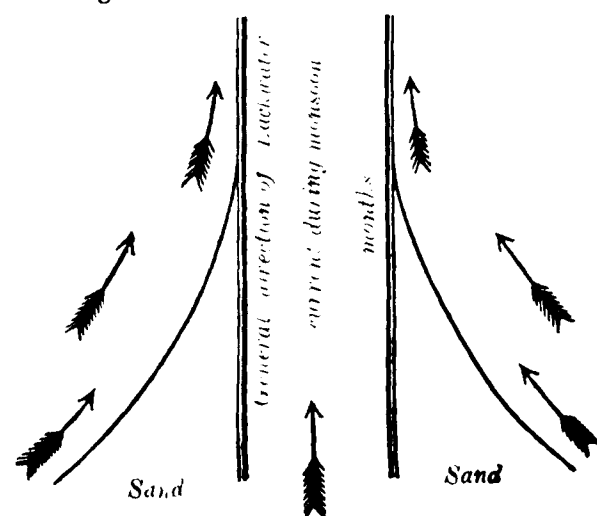
10. The Chamber is not prepared to allow that, with groynes thrown out to the length and depth contemplated, the present forces will remain unaltered. The bar is now formed and reformed by sand forced into mechanical suspension in the water owing to the action of the surf on the coast, and then being carried by the littoral current across the backwaters' mouth where, meeting with opposing currents, the sand is at once deposited. This being so, the groynes once prolonged beyond the effect of the surf on the bottom, the reforming action becomes, at any rate for a time, impossible.

Mr. Robertson says, page 31 of his report:—"Were the current to be kept together in full strength till it got into such a depth of water that the action of the waves was not sufficiently powerful to stir up the bottom, there would be no decided bar."

11. If it be urged that the littoral currents would still bring up the sand and deposit it north and south of the groynes, increasing the breadth of the beach until the profile of the coast extended to the sea end of the groynes, and would there reform a bar, the Chamber submits that such action must be the work of a great length of time; that the coasts north and south would have to be eroded to an unprecedented extent before the materials could be obtained for such an extensive filling in; and these coasts are protected for some distance by the small groynes already in existence. Again, the bottom of the sea is nothing but mud and could lend no material for the purpose.

12. The same action around the Madras harbour works has been estimated, the Chamber believes, to require about two hundred years; and at Cochin, where there is a slower littoral current and the proposed groynes longer, an equal time may be necessary, even though the depth of water be less.

13. Moreover, supposing this filling in to have taken place, the profile of the coast would then be altogether different to what it now is, for it would exhibit two tolerably sharp curves along the contour of which the littoral currents would be forced to sweep, and the sand which they would carry would be deposited, not in a line running at nearly right angles to the scour in and out of the river, but into lines which, with the assistance of that scour, would form for a long distance prolongations of the groynes, and thus assist and not obstruct the endeavours to form a good harbour.



14. The common belief that the mud banks of Narrakal and Alleppey have been the work of rivers depositing their silt at these places is, the Chamber thinks, erroneous; as far as Alleppey is concerned, it has no river near it.

15. It is a well-known fact that the bottom of most of the Cochin extensive backwaters is a deep bed of mud, similar in every respect to the mud composing the banks at Alleppey and Narrakal. It is also a pretty well ascertained fact that the strip of sand which separates the backwaters from the sea was a long distance further to the west than it now is, and that the sea has encroached. Nothing, therefore, is more likely than that the mud banks of those two places were once bottoms of backwaters.

16. Some stress was laid on what was said to be a fact that in no part of the world had bars to rivers been got rid of. But the Chamber does not consider this to be an overwhelming argument against the proposed works for Cochin, for in the case of this port the circumstances to be dealt with are not such as are met with in other parts of the world. Cochin is an exception in many ways to every thing met with elsewhere—

1st. Cochin has no river strictly speaking, but only an opening from the backwaters to the sea.

2nd. The extent of backwater which has to be filled and emptied every tide is altogether unprecedented, thereby giving an impetus to the ebb and flood unknown elsewhere.

3rd. No ascertainable silt is deposited.

4th. The bottom of the sea is mud, not sand.

5th. Cochin has both to the north and south a safe anchoring ground in smooth water for vessels in case of weather so bad as to make it unwise to risk an entry into the harbour.

6th. The wind during bad weather is invariably fair for ships entering the harbour.

7th. Cyclones are absolutely unknown.

17. The Chamber, in its letter of 25th November 1880, No. 75, paragraph 16, estimated that about one-third of the trade of the port is conducted inside the mouth of the backwater, and allowed for the less lighterage such trade has to bear in the average of the lighterage paid on the whole trade of the port. The one-third includes both British and native trade, whether carried in British or native craft. The native craft, being of small tonnage, is able to come close in shore and so to a large extent incurs much reduced lighterage, but the number of such vessels is rapidly diminishing owing to their inability to compete with the coasting steamers, and it is only a matter of a few years when the native carrying trade between all ports visited by steamers will practically have ceased to exist. The following figures warrant this anticipation:—

| Native vessels frequenting the port of Cochin— |     |          |            |
|------------------------------------------------|-----|----------|------------|
|                                                | No. | Tonnage. | Port dues. |
| 1876-77                                        | 863 | 45,224   | 4,334      |
| 1877-78                                        | 736 | 34,815   | 3,263      |
| 1878-79                                        | 741 | 35,010   | 3,282      |
| 1879-80                                        | 496 | 25,060   | 2,347      |

These vessels never venture to sea during monsoon weather, say, for five months in the year.

18. The Chamber is having prepared a statement of the value of the trade carried by this class of vessels during the past two years as compared with the total value of the trade of the port, which, when completed, will be forwarded to you.

19. A meeting of native merchants was convened by the Chamber on the 11th instant. when the Chamber's proposals to Government were formally laid before them for expression of their opinion thereon. To the most influential of the body the proposals had been fully explained some days previously, and they were requested to give them every publicity in the bazaar. At the meeting the following resolution was passed, and a certified copy of the proceedings is attached hereto:—

"Having had explained to us the details of the scheme for the improvement of the Cochin harbour which has been prepared by the Chamber of Commerce, we are of opinion that the proposals are in the interests of the native mercantile community and merit their support. We fully endorse the views expressed by the Chamber in their communications to Government on the subject of the dues which the trade of the port can bear to pay interest on the cost of the proposed works, and are confident that the interests of the native mercantile community in this matter can be safely left in the hands of the Chamber of Commerce."

20. In considering the claims of the respective interests, Europeans and Native, on Government in connection with the proposals for harbour improvement, it should be borne in mind that only few of the principal native merchants of Cochin reside and carry on business in British territory. The majority are subjects of the Native State of Cochin, and whilst enjoying all the advantages of a British port for their sea-borne trade, the opportunities for trade opened out by British enterprise, and, in fact, owing their whole prosperity as traders to their continuity to a body of British merchants, contribute but little to the Imperial Revenues of India. On these grounds, if their views had been antagonistic to the proposals put forward for the improvement of the port, the Chamber would have been prepared to urge the prior claims of the interests of British subjects over those of a foreign State on the consideration of the British Government. Native merchants, however, have recognized that, their interests are identical with those of British merchants in the Chamber's proposals.

21. The extra charge of one anna per ton proposed to be levied on vessels visiting the port ought to be specially assigned to the port, even though there be no change in the grouping of western ports. All that the chamber has to propose is that the earnings of the port be applied to its improvement, and arrangements to effect this would seem a matter of account and not difficult.

22. In the present system of grouping the ports on this coast it does not follow that the amount of port dues collected in Cochin represents more than its proper earnings. Coasting vessels do not always pay their port dues in Cochin. Having paid the dues here once, the next time they become payable the vessel may be at any one of the other ports of the group and there they are levied. Each port has its chance.

23. Whether the trade of the port can provide not only interest on the cost of construction, but also cost of maintenance of works and allowances to establishment, the Chamber cannot say, not having an estimate of the capital required. The Chamber has shown on an average of the trade of the port for ten years, about what the port can now provide, and there is reason to believe that such improvements as have been proposed would increase the trade and also the revenue. On the figures which have been furnished it is for Government to decide, after obtaining estimate of cost, whether the trade can bear all the charges referred to.

24. But supposing the estimated revenue falls short of the required sum, the Chamber would urge that as the proposals they have made merit the attention of Government from an Imperial point of view, Imperial Revenues should be charged with the deficiency, which it is anticipated cannot be large.

25. The Chamber in putting its views before Government do so in what is believed to be the interests of the port and the whole mercantile community. But at the same time cannot fail to notice the fact that the harbour improvements advocated, while benefiting the local trade, would also be of essential importance to the whole of South India, connected with it as the port is likely soon to be by rail.

26. In case of war with a naval power such a land-locked harbour, centrally situated between Bombay and Trincomallee, would be of inestimable value as a harbour of refuge where ships could repair and refit, and as a resort for our ships of war; and its nearness to Aden, being about two days nearer than Bombay by homeward bound steamer routes during monsoon months, points it out as a port possessing every capability for becoming of very considerable importance.

27. The Chamber had not had an opportunity of perusing Mr. Robertson's report on the port prior to your visit, and the copy kindly lent by Captain Taylor has been read with considerable interest. The favourable opinion of such an authority, the Chamber trusts, will have great weight with Government, and lead them, before deciding against the Chamber's schemes, to appoint a practical expert to inspect and report, if further report is thought necessary. If Mr. Parkes or Mr. Thorowgood of the Madras Harbour Works could be deputed to this duty, he would be able to make an approximate estimate of cost, and his practical experience would enable him to put a true value on the objections raised and the arguments used to overrule them. He would be able to properly estimate the great advantages of the port and suggest the best means of making the most of them.

28. Steps are being taken to obtain the views of Commanders of vessels visiting the port on the points on which a nautical opinion is desired, and the opinions which may be received will be forwarded to you.

*Proceedings of a Meeting of European and Native Merchants of Cochin held in the Office of the Municipal Commissioners of Cochin on the 11th February 1881 to consider the interests of the Native Mercantile Community in the proposals made to Government by the Local Chamber of Commerce for the improvement of the Harbour of Cochin.*

#### PRESENT:

G. BRUNTON, Esq., in the Chair.

|                                               |                                          |
|-----------------------------------------------|------------------------------------------|
| J. H. ASPINWALL, Esq.                         | JENARDINA GOVINDA GORET, Esq. (Vishnool) |
| W. T. HOLMES, Esq.                            | Donaka Devada)                           |
| G. A. JUNG, Esq.                              | PUNDALING RAMJEE, Esq.                   |
| O. M. RAPHAELS, Esq.                          | HARRI VASOODEVIA PERROO, Esq.            |
| J. R. OUGHTERSON, Esq.                        | LECKMENA BABAJEE, Esq.                   |
| VEERJEE KANJEE, Esq. (Mooljee Jattah and Co.) | OPENDRA SHETTY GANAPATHY, Esq.           |
| HASSARY DEVJEE, Esq. (Samjee Padomsee & Co.)  | RAMACHENDRA MAHA DEVA, Esq.              |
| HADJEE MOOSAH HAJI HAMED, Esq.                | T. V. PERCHOO PUTTER, Esq.               |
| DAMJEE RAMJEE, Esq. (Damjee Oookah and Co.)   | DHARSEE KETSEE, Esq.                     |
| MALJEE KASAVAJEE, Esq.                        | C. A. FERREIRA, Esq.                     |
| VISHNOO KASAVA SAMPLA, Esq.                   | P. VIEYRA, Esq.                          |
|                                               | G. LAFRENAIS, Esq.                       |

THE Chairman explained the details of the Chamber's proposals for harbour improvements, and invited any gentlemen wishing for further information to inquire for it; after some discussion it was proposed, in behalf of the Native mercantile community, by Mr. Hadjee Moosah Haji Hamed, and seconded by Mr. Veerjee Kanjee, that—

"Having had explained to us the details of the scheme for the improvement of Cochin Harbour which has been prepared by the Chamber of Commerce, we are of opinion that the proposals are in the interests of the Native mercantile community and merit their support. We fully endorse the views expressed by the Chamber in their communications to Government on the subject of the dues which the trade of the port can bear to pay interest on the cost of the proposed works, and are confident that the interests of the Native mercantile community in this matter can be safely left in the hands of the Chamber of Commerce."

The resolution on being put to the meeting was carried unanimously.

G. BRUNTON,  
Chairman.

#### No. 16. Report on the Cochin Harbour.

In compliance with the decision of Government conveyed in G.O. of 27th December 1880, No. 2943 W., we, the undersigned, inspected the Cochin Harbour on the 4th and 5th instant, and on the latter date had the advantage of a very complete discussion of the several points at issue with the Chamber of Commerce, several of the leading native merchants being also present on the occasion.

2. Prior to our arrival the Chamber of Commerce had submitted their letter, No. 81,\* dated 20th January 1881, combating the views put forward by the Master Attendant in his letter of the 16th December 1880, No. 11132, printed with the previously quoted Government Order, and again they have in a still later communication explained very fully their views in the Honorary Secretary's letter, No. 87, dated 17th instant, dealing with some of the most important points discussed in the conference of the 5th instant.

3. Unfortunately Commander A. D. Taylor, whose presence was specially desired by Government, and whose advice would have been most useful to us, was unavoidably detained in Calcutta. He has, however, telegraphed to the Master Attendant expressing general concurrence with his views regarding the Cochin Harbour.

4. On the whole, we believe that we have obtained a sufficient knowledge of the locality, and of the views of those who are most interested in the question of a harbour, to indicate the points on which future discussion must hinge, and thus at least narrow the issues in a way that will enable Government to obtain the opinion of experts like Commander A.D. Taylor in this country, and, if necessary, of professional men in England, before committing themselves to a final decision.

5. The previous printed reports, as also that by Mr. George Robertson in 1871, will have already sufficiently explained the physical features of the present port of Cochin and its exceptionally large backwater; we shall, therefore, at once proceed to state the facts that have come under our notice as bearing upon the question of the proposed harbour, and the inferences we have drawn therefrom.

6. On the morning of the 4th February 1881 we found two vessels anchored, as stated to us by the Port Officer, at not a less distance than  $1\frac{1}{2}$  miles west of the bar which again, was not less than 1,300 yards in a direct westerly direction from Lighthouse point.

7. Our own small steamer, the *Margaret Northcote*, anchored 1 mile west of the bar, apparently just at the limit of the 5-fathom contour, as the soundings taken in proceeding inwards towards the bar clearly indicated.

8. The buoys at north and south ends of the bar showed it to be 385 yards in length, the water shoaling sensibly beyond this limit on either side. At half tide the minimum depth of water was found by us to be 14 feet or somewhat less than 13 feet at low water.

9. The last monsoon being of more than usual strength the bar seems to have been forced back 200 yards closer to the shore than during the previous year, when it was 1,500 yards west of Lighthouse point, and seems to have had a minimum depth in it of 16 feet.

10. Mr. Robertson, it will be observed, found only 11 feet on the bar, but as the Cruz Milagre Gap was then open, this may be considered as less than what may be fairly calculated on in ordinary seasons; but it must be borne in mind that very extensive reclamations have for a long time been in progress in the Cochin backwater, and as the area over which the flood tide has to spread is thus being gradually, though probably not as yet very sensibly, contracted, the volume of water poured out at the mouth has a tendency to be decreased, and with this decrement, both the velocity and scouring power must diminish. It must also be borne in mind that the whole of the backwaters being within native territory, the influence of the Madras Government in limiting or controlling the reclamations can at best be only indirect. These facts must have weight in deciding on any harbour scheme that may be devised.

11. Immediately on the bar we found the material brought up by a diver to consist of rather coarse sand and shells, but there is nothing here or in any of the surrounding country to indicate that laterite or any kind of rock underlies the bar at a depth that would call for removal. Outside to seaward there would appear to be mud in a very fine state of comminution not unlike that found at Narrakal to the north. This may, as supposed by the Chamber of Commerce, have anciently been a backwater though there is every reason to suppose that it also consists or has been added to by the continued though yearly small deposits of silt carried over the bar in the height of the monsoon.

12. North and south of the general run of the deep channel, between the actual mouth and the bar, the shoals, though necessarily varying somewhat in contour from time to time, continue pretty constant in extent and position, and, so far as we are able to judge, there is apparently no tendency for the effluent water to take any other direction or establish a new channel. The narrow channel adverted to by the Chamber of Commerce as passing in front of the long groyne at Vyppen point, and stated to be sometimes used for boats, is, we find, merely trifling excavation due to the swirl of the ebb water at the spot, and only to extend a few yards. Its existence can have no bearing on the question of a harbour.

(1) The construction of breakwaters on this plan would neither change the volume nor the velocity of the stream which now issues through the mouth, in spite of which the present bar has been formed. The natural and inevitable tendency would

28. In Mangalore we have lately been able to show that the movement northward of the river mouth due to this action, has apparently been pretty steady at the rate of 300 feet per annum during the last 54 years. But without multiplying instances it will probably suffice to note, as now clearly established—

1st,—that whether the effluent stream contains material in suspension or not, the tendency is for a bar to be formed, wherever the forces of the surf on one side and the stream on the other sufficiently neutralize each other;

2nd,—that the sand forming such bar is carried chiefly from south to north across the line of the normal direction of the debouching river. The contention of the Chamber of Commerce, in paragraph 13 of their letter No. 87 of the 19th instant, that "the currents and deposits at the ends of the proposed groynes would thus assist and not obstruct the endeavours to form a good harbour" is therefore in our opinion not borne out by the facts as now explained.

29. It may, of course, be fairly contended that there is a certain depth below the surface at which the wave action is nil, and there is no sensible amount of sand in movement at such depth. This is practically the contention of the Chamber of Commerce, and it is at first sight supported by the following observation of Mr. Robertson to warrant consideration, viz., that "were the current kept together in full strength till it got into such a depth of water that the action of the waves was not sufficiently powerful to stir up the bottom, there would be no decided bar."

30. Mr. Robertson does not, it will be noted, say at what depth of water such action may be expected to cease, and in the plan he proposes for a harbour at Cochin he evidently considers that the groynes suggested would not reach this undisturbed depth, as he observes that "a little dredging or raking" will be needed to preserve the depth of channel. (In connection with this remark it may be parenthetically observed that Mr. Robertson considered that the effect of the works suggested by himself would only secure a depth of from 20 to 21 feet at low water, which it is unnecessary to say would be wholly insufficient for a first-class harbour.)

31. Without a series of very carefully conducted experiments, it would be impossible to decide this point in a manner sufficiently conclusive to satisfy every one, but in the paper before adverted to by Mr. Mann, there is a good deal of evidence to show that wave action is felt at depths hitherto apparently unsuspected.

32. Without overburthening our report with quotations, it may be sufficient to say that among the evidence adduced, it seems that on the banks of Newfoundland the agitation during storms has been known to affect the bottom at a depth of over 80 fathoms; at St. Jean de Luz in the Bay of Biscay over 160 fathoms; and at Land End the lobster traps are frequently filled with coarse sand and shingle during heavy ground swells in depths of 30 fathoms. Sir G. Airey mentions also that ground swells frequently break in a depth of 100 fathoms.

33. We do not wish it for a moment to be understood that looking to the general character of the seasons on the west coast, and the immunity which it appears to enjoy from cyclones, that disturbance may be expected at depths such as these; but accepting the fact that the south-west monsoon sets in at times with considerable abruptness and strength, we are not prepared to say that in such occasions the sea bottom is not agitated at 5 fathoms in depth. In fact we incline to the opinion that unless there be some very direct proof to the contrary, such may be accepted as almost certain to be the case, especially considering the very shelving character of the west coast, which in this respect differs materially from that found near Madras, and most of the east coast, and that it would therefore behove Government to hesitate in adopting a scheme which, perhaps a single season of an unusually heavy monsoon, might render nugatory.

34. Dredging, as we shall presently show, is not apparently available for deepening channels situated like the one proposed with mouth open to the sea and exposed to swell; consequently if it be desired to give a prolonged life to the harbour with works of this character, it would be desirable not to stop the groynes in 5 fathoms, but to run them out another half a mile into 7½ fathoms (which is the same as that adopted for the Madras harbour) as the best available expedient.

35. We now beg to turn to the second set of difficulties which has presented itself to us, viz., those which would probably be felt by every master of a vessel, approaching a harbour of the proposed character during the south-west monsoon, or in fact at any time when there was a heavy sea and wind.

36. It will be remembered that the essence of the proposed scheme is to preserve an uniform section of channel into deep water, so as to maintain, as far as possible, intact the scouring power of the effluent water, and keep the whole as clear as possible of deposits. However the direction of the groynes might be varied, this must in the main be the guiding principle so as to sustain the validity of the grounds on which the scheme is based.

37. But if this be so, there must be an exposed mouth and a long channel up which the seas must sweep with uninterrupted swing, till they gradually die away or become dispersed by the shoals of the backwater, at the extreme east end of the harbour. Mr. Robertson clearly indicates this difficulty, when he observes that, "it must be remembered that in reducing a bar we take away a kind of breakwater in front of an entrance and introduce a bigger wave."

38. A strong opinion has already been expressed by the Master Attendant on this point, and statements have reached us of the extreme difficulties and dangers which comparatively small crafts have experienced in approaching the present mouth of the port in the monsoon, though having plenty of sea room to work in and able by their small draught to double sharp round to south-east end of the channel, after passing through the mouth and bring up in a perfectly sheltered anchorage, none of which advantages would be open to large vessels entering the harbour under the proposed scheme.

39. As directly bearing on this point, we would now quote the following observations from a report by Commander A. Dundas Taylor in reference to the proposed ship canal between Ceylon and India, dated 28th July 1871, viz., "To examine the sea approaches and thus to determine the accessibility of a port, is a first essential, and comes within the province of the Marine Surveyor. A glance at the plan which exhibits the site of all proposed schemes (for Pamban) will explain how unreasonable would be the tax upon a Master Mariner's skill, in seamanship and navigation, when attempting to enter either of the openings, which were submitted to the consideration of the Parliamentary Committee. I am convinced that mishaps would have attended any attempt to shoot the canal's mouth when the monsoon swell and current accompanied the steamer."

40. It is needless to say that the dangers thus foreseen with reference to Pamban, would have equally to be counted on and disposed of, in dealing with any harbour scheme for Cochin.

41. The third and last difficulty as to the impossibility of carrying out satisfactorily dredging operations, in a channel exposed to heavy swell, is more easily disposed of. No dredge so far as we are aware has yet been devised for working satisfactorily in such positions. With all the adjustments that it may be possible to make, any sudden jerky movements in the vessel must communicate themselves to the bucket ladder, and produce strains which would very soon break up the strongest framing of this character. On a few quite still days, aggregating say six weeks in the year, a dredge like the *Albuquerque* might work, but it must be obvious that this would go but a small way to meet the requirements of the case. The *Albuquerque* dredge with her side anchors and cables would moreover by herself take up 800 feet in width of the channel when at work and thus seriously impede traffic.

42. After the foregoing exposition of our views, which owing to the very able manner in which the Chamber of Commerce have stated their case, we have found it desirable to detail at greater length than might under other circumstances have appeared necessary, it is needless to say that personally we feel ourselves unable to recommend the scheme put forward by that body and that consequently it is at least at this stage unnecessary to go into any of the engineering details.

43. It does not, however, necessarily follow that the rejection of this particular scheme would invalidate all others. We are given generally to understand for instance that Mr. Parkes is under the impression from the papers sent him by the Chamber of Commerce, that a plan by which the bar might be sheltered and then removed by dredging, somewhat in the same way as in his Kurrachee harbour, might be feasible; and although it would probably take some time to mature a scheme of this nature, we are not prepared to say, that with abundant means at disposal, a harbour based on this principle might not have a good deal to recommend it. The general principle whether applied in the form of a detached break-water entirely shielding the bar from the action of the surf or otherwise, has certainly more to recommend it than the one we have been considering, though the latter might under certain conditions be either wholly or in part incorporated with it.

44. All we are now concerned with however is whether with this new light on the subject, it would be desirable to have the details of the scheme worked out by Mr. Parkes.

45. It can hardly be questioned that the cost of constructing such a breakwater out to sea as would admit of the bar being entirely sheltered, and of the whole of the stuff being dredged out (this would be by far the cheapest part of the operations) must of anything be greater than what we have before named as likely to be required in the scheme we have been obliged to condemn.

46. The question again therefore arises as to whether any Provincial or Imperial subsidy can be looked for in aid of the local resources, which would certainly be insufficient for the execution of a project of the kind. The Chamber of Commerce urge strongly their claims for a subsidy of this character, and in the late minute by the Hon'ble Sir Andrew Clarke, the necessity of creating a certain number of harbours of refuge along our shores, to meet the exigencies of war have been seriously pressed on the attention of the Government of India. It appears to us, however, that it would be exceedingly difficult to render an open place like Cochin defensible against an enemy's vessels, which stealing in sufficiently close at night could easily injure the place without running much risk themselves. Trincomalee is in fact so far as we are aware the only harbour between Bombay and Calcutta which naturally lends itself to such an object, and which could be at once perfectly secure and easy of access.

47. We can only therefore say that if the Government, after weighing what we have advanced, still consider these claims sufficiently well founded, and there be any probability that they will be recognized by the Government of India, it would be difficult to find a more able professional Harbour Engineer for drawing up a complete scheme, and framing an estimate of the probable cost, than Mr. Parkes.

48. There would in our opinion be no sufficient object gained in going minutely into a discussion of ways and means for meeting interest on outlay, at this stage of the enquiry especially as under the proposals put forward by the Chamber of Commerce in the letters printed with G.O. No. 2943 W., dated 27th December 1880, there are several points involving not a little complexity, regarding which our information is incomplete.

49. We took advantage of our visit to Cochin to inspect the singular mud bank at Narrakal situated some six miles to the north, and which for the last few years has been used by the merchants for shipping and landing goods throughout the monsoon.

50. There is backwater all the way to within a quarter of a mile of Narrakal, where the Cochin Government have cut a boat canal across the sand-spit separating it from the sea, and constructed a covered passage with tramway from this close up to the beach, as also a small landing pier. The very serviceable condition of this latter work after three years wear and tear shows that at least in that period there have been no heavy seas at this point.

51. The bank consisting of the very finest mud (of a greenish black color and very unctuous to the touch) seems so far as can be ascertained to extend about three miles along the shore from south to north, and  $4\frac{1}{2}$  miles out to sea. It has not apparently shifted its position as seems to have been the case with other similar banks, notably that which though known to have been at Alleppey some 20 years ago, has apparently moved 7 miles south to Porcad, and is still believed to be progressing gradually to the south.

52. The effect of the bank on the portion of the sea covering it is singular, as at the first burst of the monsoon there is said to be the same surf as in other parts of the coast; the water is discolored and dark with the churned up mud. But after this stage has passed this seems to settle down and becomes clear like the rest of the neighbouring sea. Some persons consider the surface has an oily look at this time, and others that air bubbles, stems and branches of apparently submerged trees rise to the surface, etc., but of none of these statements is there any distinct proof.

53. What, however, appears certain is, that the full characteristics of this tract in providing a perfectly quiet anchorage during the monsoon are not fully developed till the monsoon has sufficiently advanced to render the water in the backwater on the land side quite fresh, and that during this period the water on the bank out to sea is also so fresh as to lead to the conclusion that such water at this time rises from the bottom under pressure.

54. The effects, however, are that the monsoon swell gradually subsides over the outer limits of the bank and vessels are thus enabled to run into comparatively quite still water at the height of the monsoon, thus providing Cochin with an unrivalled harbour during this period. So far as can be ascertained, no surf breaks along the margins of the bank; the seas merely die away.

55. There can of course be no question that there are a number of serious drawbacks to trade conducted in this manner, and that merchants suffer considerably by losses of goods exposed in the canal boats, and by fraud and carelessness on the part of the boatmen, but the fact remains that they are able to carry on trade at this period when all other West Coast ports (except Porcad) are closed.

56. As considerable interest attaches to the conditions under which the mud banks alluded to exist on the coast, it is to be hoped that Mr. W. King, Assistant Superintendent, Geological Survey of India, who joined us, and secured some specimens of the mud for analysis, may be enabled to follow up the inquiry.

57. A chart giving general information about the Cochin anchorage and port, and also showing sufficiently the proposed scheme for a first-class harbour accompanies this report for facility of reference.

R. H. SANKEY, Colonel, R.E.,  
Chief Engineer, P.W.D.

J. H. TAYLOR, Lieut., R.N.R.,  
Master Attendant.

MADRAS  
26th February 1881.

Letter—from W. T. HOLMES, Esq., Honorary Secretary, Chamber of Commerce, Cochin.

To—the Secretary to Government, Public Works Department.

Dated—the 17th March 1881.

No.—88.

Since addressing you on the 19th ultimo the Chamber has had the port inspected by Mr. Parkes, M.I.C.E., Chief Engineer of the Madras Harbour Works, and I have the honour to forward a copy of his report for the information of Government.

2. It will be observed that Mr. Parkes is of opinion that the bar can be permanently removed and the port converted into a first-class harbour; but the works he considers necessary to accomplish this will be more extensive and costly than hitherto estimated. Such works, however, Mr. Parkes informed the Chamber in conference, would give Cochin a harbour equal to that of Bombay, and capable of indefinite extension at the moderate cost of dredging within the backwater.

3. The cost of the works proposed is estimated at 81 lakhs of rupees, and it is scarcely necessary to remark that this is much beyond the ability of the existing trade of the port to provide four and-a-half per cent. interest on. But the facilities which a first-class harbour and railway communication would provide might certainly be expected to increase the trade of the port from year to year, which would be attended by an increased revenue on harbour works.

4. There may, however, be Imperial interests involved in the conversion of this port into a first-class harbour which may induce the Government of India to expend, without immediate expectation of interest thereon, that portion of the cost for which the present trade of this port cannot provide; and the Chamber begs leave to mention what appear to it a few of the more important of those interests.

5. It is generally understood here that the Government of India are desirous to have a first-class harbour or harbour of refuge on this coast between Bombay and Ceylon, and that Marma Goa and Carwar have been recommended as suitable sites. The cost of harbour works at either of those places would be considerable, and neither place has yet a trade that could return any appreciable revenue on the outlay. A railway to connect the port with the railway system of India would also have to be constructed either as a State work or under a State guarantee.

6. Against Marma Goa there is the special objection that it is not in British territory.

7. The Chamber begs to urge in favour of the selection of the port of Cochin, as the site for such a harbour, that it is more centrally situated between Bombay and Ceylon than either of the ports named; that it is already a port of considerable trade, being fifth in importance in India and second in the Madras Presidency, and able to pay about 2 per cent. interest on Mr. Parkes' estimate of the cost of the required works; that it is probable it will soon be connected with the railway system of India at a very moderate liability by way of guaranteed interest to the British Government, and that the total cost of harbour works here might not impose on Government a greater liability than would the harbour and railway works at either of the other places mentioned. The nearness by railway of this port to the principal Military stations in the Madras Presidency and also its nearness to Aden would seem points of importance in connexion with the movements of troops.

8. Mr. Parkes, when in conference with the Chamber, expressed a wish that his report and suggestions might be submitted for the opinion of another Marine Engineer; for whilst there is no doubt that the Cochin bar can be permanently removed, it is possible that another competent authority might be of opinion that this could be accomplished by less extensive and costly works than now projected. The Chamber does not see its way to making such a reference, and feels that it must now leave any further proceedings in the matter deemed necessary in the hands of Government. In what it conceives to be the interest of the port the Chamber has ventured to urge the subject on the attention of Government and trusts that it will be accorded due consideration.

Letter—from N. PARKES, Esq., M.I.C.E.

To—the Honorary Secretary, Chamber of Commerce, Cochin.

Dated—the 11th March 1881.

Having now carefully perused the documents referring to the proposed improvement of the Harbour of Cochin which you have laid before me, having received much valuable information on the subject from various gentlemen on the spot, and having made such personal inspection as was possible during my short stay, I beg now to lay before you, for the information of the Members of the Chamber of Commerce, the conclusions at which I have arrived.

Your questions to me are substantially the following:—

1. Can improvements commensurate with the cost be made for a sum not exceeding £250,000 for such improvements of the entrance as would enable the class of ships at present frequenting the port to come at all seasons to the inner harbour when fully loaded instead of lying in the roads or at Narrakal as at present?
2. Is Cochin capable of being made into a first-class port accessible to the largest ships at all times, and if so, by what means and at what cost?

With regard to the first question, I feel compelled after much consideration and with very great reluctance to give a negative answer. I think that such works as could be carried out for the sum named would be in any case ineffectual and probably injurious. Works to be really efficient must be carried out on a much larger scale, but if so carried out they would render Cochin such a port as is contemplated in the second question, to which therefore my reply is affirmative.

Proposals appear to have been considered by the Chamber for carrying out piers from Cochin and Vypeen respectively so as to concentrate the scour on the bar.

This it is correctly supposed would form for itself a channel between the piers equal in sectional area to that existing in the present entrance, as far as their ends, and for some distance beyond. It is further supposed that, if this distance beyond the piers be such as to reach the depth of water in which the wave will not act upon the bottom so as to heap up another bar similar to the present one, there will be such a continuous depth throughout as the scour may produce.

The piers described in paragraph 5 of your letter to the Secretary to Government, Public Works Department, of 25th November 1880, appear to be laid down upon this principle, and they terminate in a depth of 24 feet. Their cost would, as I estimate, be about 50 lakhs of rupees.

I agree in very much of the principles upon which these lines were laid down, but there are some important respects in which I think the plan requires to be modified and supplemented, and these will further increase the cost.

In the first place, the process of obtaining the increased depth by scour in the face of the waves is a hazardous one. A large quantity of material would be disturbed and driven out beyond the piers; some of it would be deposited in the eddies near their unfinished ends, and would form new material for the waves to act upon and nuclei for new accumulations. It would also consist of heavier and coarser material than that of which the bar is now composed, and would therefore, under the influence of the waves, remain at least temporarily at a higher level. From this cause the navigable depth over the bar would be temporarily reduced, and the contour of the depth within which the wave has injurious action would be permanently pushed out to sea. These anticipated difficulties may at first sight appear hypothetical, but they are suggested by the experience of my own practice both at Kurrachee and at Madras. At the former place the attempt to remove the bar by scour in the face of the sea produced a great aggravation of the evils. Another objection to the lines as laid down is that there is no room for the wave to spend itself between the piers, so that the seas entering between their ends would be propelled in almost full force to the ships' berths. At present the seas are broken by the bar and the shallow water on either side and this advantage would be lost.

To avoid these two evils it would be necessary to start the piers from the shore at a much greater distance apart, and they should be kept at such a distance from the existing navigable channel that any disturbance or accumulation that may take place around their advancing ends may not affect the channel. They should begin to approach one another only when they have arrived in the depth of water in which the bottom is not affected by the wave. Thus there would be no disturbance of the existing bottom in the navigable channel by increased scour. It may appear to be throwing away a natural advantage not to effect the required deepening by natural scour, but the cost of dredging it would be under 3 lakhs of rupees—a small sum for avoiding the evils consequent on an excess of scour.

A more important source of economy would be sacrificed by carrying the lines of the piers away from the land spits which, more especially on the south side, lie parallel with the channel and placing them in deepest water north and south; but I can see no alternative to surrendering the advantage. To do so, however, would necessarily increase the cost of the piers by about 8 to 10 lakhs.

Then comes the question of the depth in which they are to terminate. I think 24 feet is too near the outside limit of wave action to be thoroughly safe, but a more imperative reason for a greater depth is that required for navigation. Twenty-four feet, with 2 feet rise of tide, is sufficient in smooth water, but it is not enough where a ship is liable to a lift and drop of 5 or 6 feet by the waves. I think 27 feet is the least that should be allowed for the ends of the piers.

In order to carry out the principles here laid down therefore I would propose to remove the north pier to a distance of 900 yards northward from the shore of the channel, and the south pier 1,100 yards southward, giving with the width of the channel itself a total width

between them of 2,700 yards; that they be carried out parallel to one another in a due westerly direction to a depth of 24 feet, and then curving towards one another, terminate in 27 feet with a distance between them of 900 yards or double that of the channel between Cochin and Vypeen. Having a uniform depth of 27 feet, the new entrance would have also nearly double the sectional area of the Vypeen channel, there would be consequently only half the velocity of current, and no disturbance of the bottom.

The piers as I have described them, one 10,600 feet and the other 11,330 feet, or each over two miles in length, together with the dredging of the channel, I estimate to cost 81 lakhs of rupees. Their execution would make Cochin a first-class port, and utilize the fine anchorage 3,000 yards long by 250 yards and upwards wide, with more than 24 feet depth. Thirty steamers of the largest size could be moored in this space in a single row of 15 on either side with ample width between them for passage, and in some parts there is room for double rows. Besides this there is practically unlimited space of shallower water, the depth of which could be increased to any required extent by dredging. It would likewise be in direct communication with an immense extent of inland navigation by means of the backwater.

These advantages already exist, but they are unavailable by reason of their inaccessibility from the sea.

It is no part of my duty to express any opinion as to whether the acquisition of such a harbour is ever likely to justify the outlay required for it; but it is at any rate desirable that the capabilities of the place should be known. It is unfortunate that from the nature of the case it is impossible to recommend a plan for a smaller measure of improvement or at proportionally smaller cost. The swell from every direction between south-west and north-west must be reduced before the bar can be even lowered, and that can only be done by breakwaters two miles from shore.

No. 18.

*Order—No. 911 W., dated 4th April 1881.*

The Government are compelled to accept the unanimous opinion of the Chief Engineer, Public Works Department, the Master Attendant, and Mr. Parkes that no permanent improvement to the Harbour of Cochin is attainable except at a cost, the interest of which could not possibly be met by the trade of the port, even allowing for the increase that might reasonably be expected.

2. Nor do the Government consider that such a work could justifiably be undertaken from Provincial Funds, or recommended to the Government of India for execution as a productive work.

3. It is for the Government of India to decide whether the construction of a first-class harbour at this port is of sufficient importance from an Imperial point of view to justify its construction without reference to financial results, and the papers will therefore be forwarded to that Government for consideration.

(True Extract.)

C. C. RAWSON, Captain, R.E.,  
Ag. Under Secy. to Govt., P.W.D.

## REPORT TO THE GOVERNMENT OF INDIA ON COCHIN HARBOUR

BY

GEORGE ROBERTSON,

*Fellow of the Royal Society of Edinburgh; Member of the Institution of Civil Engineers; Past President of the Royal Scottish Society of Arts.*

FROM February 23rd to March 2nd I was engaged in examining Cochin and its vicinity. Mr. Dalrymple, the Master Attendant at Madras, who takes a great interest in the prosperity of Cochin, Captain Maiden, the Master Attendant, and Mr. Grimes, the Assistant Engineer of the range, were with me. The Government of Madras had instructed Captain Castor, formerly Master Attendant at Cochin, but now at Cocanada, to meet me here. His experience and information were of great assistance to me. I had interviews likewise with Mr. Brunton, C.E., and with others, who knew the place well.

There are three main points to be considered at Cochin—(1st) the question about closing the Cruz Milagre Gap, (2nd) the improvement of the bar at the entrance to the harbour, (3rd) the best method of resisting the encroachments of the sea.

(1) Cochin Harbour is part of the large backwater already described under the head of Internal water communication. The outlet at Cochin was the only outlet to the sea till 1862, with the exception of the extreme north one, near Paliport. In that year the sea, which has for long been encroaching on this part of the coast, burst through at Cruz Milagre, about one and a half miles to the north of Cochin. At first the gap might have been stopped as easily as Captain Castor promptly stopped a neighbouring one in 1868. Now, however, the Cruz Milagre gap is 720 feet wide, and has 27 feet in the deepest point, with a strong current through it.

Since the survey of 1858, made before the gap opened, the ship channel at Cochin entrance has gone to the north, the sides are more irregular, the bar is 200 yards nearer shore, and double the width, and there appears to be 2 feet less water on it. The current through the entrance has also a more decided tendency to escape towards the north. Part of the changes above alluded to may fairly be put down to the effect of the gap, though the encroachment of the sea in shortening the entrance at Cochin some 600 feet on the north side, and 1,000 feet on the south side—has probably had much more effect than the gap. There is such an immense body of water in the backwater to the south, that the escape of water at the gap has, comparatively, a trivial effect on the scour at Cochin. The scour at the gap loses its effect very soon, and a short distance out to sea there is only 2 feet of water on its bar. Still, however, as matters may get much worse, and as it is desirable to do what is possible to increase the scour at Cochin, I think the gap should be closed, or, at least, if not closed, fixed in its position. By comparing the sections of Cruz Milagre with the section of the gap at Mangalore, it will be found that the depth at the former, though twice as much at one place, is really, on the average, not greater than at the Goorpoor Gap. On each side of the deep part there is a considerable extent of shallow water. Before closing the gap, I think it would be well worth while to try to shallow it, by adopting a somewhat similar course to that recommended for Mangalore. A groyne of piles and brushwood should be projected from the north-east angle of the gap taking care, by carrying the groyne well into the bank, and for some distance along it to act as a training-wall, that the current does not out-flank the groyne. The Cruz Milagre gap is not quite so favourable for being thus recessed from the stream as the one at Mangalore, because it enters from a tidal backwater, filled every tide, equally or nearly so, and not from a decided river, like the Goorpoor, pouring down, during the monsoon, flood waters right into the gap. The advantage, in the latter case, of recessing the gap from the main current, will be more apparent; still, I think it worth while to try to shallow Cruz Milagre; and there are plenty of materials on the spot, which have been collected for some time with the view of closing the gap.

It has been proposed to close it 'by an embankment of a series of modussils, or timber frames, brushwood, grass, straw sand, clay, stones, and sand-bags. The frames are to be put together on the banks, and floated on rafts to their places, 10 feet apart across the channel, and to be sunk firmly into the bed by a forward a backward movement, and secured to each other and the banks by spars. The clear space between the uprights to be closed in by a double wall (so to speak) of interlaced bamboos; these walls can be sunk easily in still water at the changes of the tide, and they can be kept in their places by a few stones, or by a few light posts and cross pieces; only they should not be raised to a height of more than six feet at a time, and the space between them filled in by brushwood, sunk by stones or sand-bags.' This description is extracted from the specification, which goes into other details as well. I think it will be found a very difficult and elaborate way of stopping the gap, though it may do in the Tanjore district, in rivers where the current is all one way, and where perhaps, there is not 27 feet of water. I prefer the more simple method, of heavy bags of clay, or sand even, thrown down in broad successive layers, backed on one or both sides, with stone thrown down in corresponding layers, as described for Mangalore. If it be determined to close the gap at once,

without endeavouring to shallow it first, there is little fear at Cruz Milagre of the lands being covered by flood water. The gap is a pot hole caused by the rush of the stream in and out. There is only 10 to 12 feet of water in the backwater, and on the seaside there is on the bar only 2 feet of water a short distance out. Any diminution of stream in the gap will allow the surf to push the bar in, to shallow the opening. At present no groyne should be put on the seaside, but groynes will be useful hereafter to widen the strip of sand between the sea and the backwater. Coconut trees ought to be planted at Cruz Milagre and on the site of the other partial or temporary gaps. All extensive reclamations in the backwater, especially in the neighbourhood of Cochin, should be interdicted, for they have just the same effect as gaps in diminishing the amount of tidal water passing through the harbour mouth.

It occurs to me that it would be worth while to notice at what point the tidal water coming from the Paliport end meets that from Cruz Milagre; for, if the tide comes in pretty strongly from Paliport towards Cruz Milagre, it might be advisable to put a bund with a lock in it, across the backwater, at the narrowest point, near Paliport. This would give the Cochin month a larger area to fill with tidal water, and thus cause a greater scour in and out. The effect of a bund in this position during the rains would, however, require to be carefully considered.

(2) Before considering how the depth of water on Cochin bar can be increased, it may be as well to make some remarks on the cause of the bar.

Cochin backwater, especially the Southern part of it, is a magnificent reservoir for tidal water, the greater part of which has its entrance and exit through the harbour mouth. Though the rise of the tide is seldom more than from 1 to 3 feet, yet the tidal water keeps a depth of from 40 to 50 feet in the entrance. Whenever the stream leaves the 'fauces terræ' at Vypeen Point, it is discharged on to the shallow exposed sea coast, but is still able to keep up a considerable depth for some distance out, although the water has now begun to spread out sideways and escape, especially towards the north. Meanwhile the surf is always striving to restore the natural profile of conservancy of the shore. After the current has flowed out to sea for nearly a mile, it is no longer able to resist and keep down the ever-working and powerful efforts of the waves to reform the profile of the coast by continuing the beach line which has been broken through by the outgoing current. Where the current to be kept together in full strength till it got into such a depth of water that the action of the waves was not sufficiently powerful to stir up the bottom, there would be no decided bar. The same result would happen were the current to discharge under shelter from the waves, as, for instance, into a land-locked estuary.

At Cochin the surf has sufficient power on the bottom, in 15 or 16 feet of water, to overcome the levelling efforts of the current, as at present existing, and throw up a bar with only 11 feet of water upon it.

All that has been said of the outgoing current applies also, though with less effect, and inversely, to the ingoing current.

To strengthen the current, and confine it till it arrives into deeper water, where the waves act with less effect on the bottom, is evidently the way to treat the harbour at Cochin.

With this method of treatment in view, it is instructive to examine the various surveys. In the survey of 1835, when the current was kept longer together by more projecting 'fauces terræ,' and by hard sandbanks, which prevented the stream from spreading, there was 16 to 17 feet on the bar. Since then the 'fauces terræ' have been gradually eaten away by encroachments of the sea, and the survey of 1852 shows that a bar was beginning to form, with only 13 feet on it. In 1858 the bar had completely formed, but was very narrow. After that, the Cruz Milagre gap took place, and the following survey, in 1869, shows the bar nearer shore, broader, and with 2 feet less water on it.

These surveys illustrate the true theory of the formation of bars at river mouths, more beautifully than any set of surveys with which I am acquainted; for, it seldom happens that the 'fauces terræ' of a river are so much eaten away, and the results of their diminution so plain.

I propose to restore artificially the 'fauces terræ' and to carry them much farther to sea than they ever were when there was 16 to 17 feet of water on the bar, by projecting long groynes on each side of the harbour entrance. These are laid down on the plan. The South groyne to start from the lighthouse, and to run out for 3,000 feet. The North groyne to commence at Vypeen Point, and to run out for 2,300 feet. I should wish to project this groyne a little further; but it will be noticed, that the deep water into which it would immediately get, would make a prolongation very expensive. The current will thus be kept together, and concentrated on the bar, and in a direction more nearly approaching, than at present, the general direction of the harbour mouth. The South groyne, in projecting beyond the North one, not merely helps to direct the stream, but also gives considerable shelter to the harbour entrance, from some of the strongest winds. It must be remembered, that in reducing a bar, we take away a kind of breakwater in front of an entrance, and introduce a bigger wave, so that some shelter is desirable. These groynes assisted after very unusually heavy gales by a little dredging or raking, will, I believe, keep a constant depth, at low water of springs, of 20 to 21 feet in the approach to Cochin; making it the finest close harbour in India.

Before any works are decided upon, it will be necessary to make borings over the bar, to ascertain that there is no rock just under the sand. There is not likely to be any, but it is as well to be certain.

It will probably be necessary to gain a portion of the proposed depth by dredging, because a current which is sufficient to keep down a bar, may not be sufficient to remove it after it is once formed. It requires a strong stream to excavate. I expect, however, that as the training walls are pushed forward, the greater part of the deepening will be done by the increasing current. Something may be done by raking, to help the efforts of the ebb current; but that is never so satisfactory as dredging, as the stuff is only shifted and not removed. At Cochin the flood tide would bring back a certain amount of what the ebb tide shifted. The ebb tide has always the benefit, however, of whatever land water happens to be in the backwater.

It is much better to start the South groyne from somewhere near the lighthouse, than to take it from the harbour entrance, and run it parallel with the groyne, on the North side. In the first place, a much greater distance to sea is gained by the same length of groyne, and, secondly, because two parallel piers would conduct the waves right into the harbour entrance and cause such a swell as to prevent vessels lying there. The South groyne I propose will, to a great extent, conduct the waves into an angle out of the way and beach them, thus reducing the swell in the entrance.

The best section for these training walls, and the method in which they should be constructed, are matters for future consideration. A great deal will depend upon the character and size of the stone which can be obtained. I was told that stone could be got from the other side of the backwater, some 12 miles off. The site is not one for anything vertical or of solid masonry, because considerable settlement may be expected. In my opinion the very best way to form the groynes would be with large concrete blocks, as in the break-water at Port Said. They might be blinded with rubble, or backed with it, as is proposed to be done at Alexandria.

Concrete blocks made with Portland cement are being used at Kurrachee; and Mr. Parkes informs me that the cost of current expenses in making each block is about £12, but this does not include anything for plant, preliminary works, or superintendence. Each block weighs about 27 tons, and contains 432 cubic feet. The cost is, therefore, at the rate of 7½ rupees per cubic yard, or rather under 4½ rupees per ton. It will not be necessary to use such heavy blocks at Cochin, where no part of either of the groynes will be in more than 15 feet of water, at high water.

Taking this price for Portland cement concrete, and allowing 20 per cent. for plant, superintendence, etc., I estimate the proposed works at 7½ lakhs of rupees.

This appears a large sum to be spent on one harbour in India, but it is nothing to what is spent on many a less important harbour in England and elsewhere.

Though I don't think it necessary that the blocks need be so large as at Kurrachee, yet it is not very likely that stone will be got in large enough blocks to stand the sea, like blocks of concrete. If it be decided, therefore, not to try concrete, resource must be had to rubble.

The groynes may be made in two ways with rubble. Either a great mass of simple rubble allowed to take its own slopes from the action of the sea, as in the outlying breakwater at Portland,—or pitched to given slopes above low water, as at Granton and many other places.

According to the first plan, a great quantity of rubble is used, which, at Cochin, I was informed, will cost 4 rupees a cubic yard. According to the second plan, there would be less rubble, but more skilled work in the pitching. So that, on the whole, I don't think that either plan would be cheaper than concrete; unless, by quarrying on a large scale, rubble can be obtained at a cheaper rate than the above.

The blocks may be made with cement, sand, and broken stone, in proper proportions, mixed either by hand or in Messent's machines (first used at the Tyne piers); or they may be made by building up blocks of rubble with Portland cement mortar.

Portland cement costs, at Kurrachee, 84 s. per ton, and the casks are used as fuel. I think it might be made in India. It is an artificial cement, composed of chalk, lime, and alluvial clay from creeks in the Medway. The manufacture of it requires care, but is not difficult. It would be worth while trying experiments with coral lime and alluvial clay from some of the Indian rivers. If Portland cement could be cheaply made in India, the expense of executing marine or hydraulic work in that country would be greatly reduced. Every part of the Coast supplies sand; and at Port Said the concrete blocks have been made of Theil lime and sand alone.

It is possible that there may be some good natural cements in India, like Roman cement, which would do for the manufacture of concrete blocks.

The groynes should be 20 feet wide at the top, with a height of 5 feet above high water; so that heavy waves may pass over them, and yet the shelter behind be considerable.

(3) The measures to be adopted for preventing the erosion of the beach to the North and South of the harbour entrance.

This is a subject about which there has been an immense deal of discussion, both as to facts and as to principles. The papers and reports about the groynes and revetments at Cochin occupy a prominent position in the literature of that place. Into the minutiae of the "battle of the groynes" it is not my intention to plunge. Many of the groynes have acted very well in protecting the shore; and those erected by Captain Castor some years ago, were, doubtless, the means of saving part of the town from inundation. I would rather treat of the principles involved in groynes and revetments.

In a place like Cochin, a groyne on the sea shore acts in two ways. It catches any sand which may be travelling along, acted upon by a littoral current or otherwise and it recesses at small piece of shore between it and the next groyne from the current, and permits some of the sand which is washed up by the waves, to lie at rest, and in time to collect in considerable quantities. In one of the reports on Cochin, the existence of a littoral current, sufficiently close in shore to have any effect in accumulating deposit against groynes, is denied. Now, it is quite true, that the currents out at sea may be so diminished by the friction of passing over a long shallow shore, that, by the time the land is reached, there may be very little apparent current left. But they have their effect nevertheless at the water's edge. If the lines of surf waves be examined it will be found that they never roll in exactly on to, and parallel with, the shore, but always a little obliquely to it, touching the shore at one point first, and pushing the sand along in one direction, as the breaker shoots along the shore, that direction, being influenced by the direction of the current out at sea, and quite independent of the local wind. The oblique action of the surf roller is particularly well seen on the coast of India, where there are long stretches of straight coast, with few indentations to interfere with the normal direction given by the ocean current, which, during the year, runs for the most part to the North. When I was on the Malabar Coast, the rollers always, so to speak, approached the shore with their right shoulders forward. On the Coromandel Coast, on the other side of India, the rollers neared the shore with the left shoulders forward; in each case pushing slightly Northward towards the head of the great bay on that side of India. This is exemplified in the sketch drawn on the plan of Cochin. A nearly calm day is the best for watching the obliquity of the lines of surf waves to the shore, and the way they approach the high water line. The general tendency of the surf at Cochin is to push the sand, which is a wash at the edge of the sea, towards the North. Groynes, therefore, are useful, even though there may be no observable current just at the shore line, for they arrest this travelling sand. Besides, there is at Cochin a strong tidal current at the shore, for some distance on each side of the harbour entrance, owing to the water rushing into and out from the backwater. True, it acts both ways, and of itself may not tend to lodge sand much more on one side of a groyne than on the other. It is, however, desirable to recess the beach by groynes, so as to protect it, in short lengths, from the erosive action of these tidal currents.

In considering the action of a revetment (and by that I mean a pitched slope more than anything in the nature of a wall), it is to be remembered that groynes, after all, are put merely for the purpose of forming a revetment in front of a piece of beach, the revetment being of sand, or shingle, as the case may be. Groynes lead to revetments, revetments never lead to groynes. The revetment is the final object aimed at. Where important places have to be guarded, such as near the lighthouse, the sides of the harbour channel, and at Vypeen Point, there ought to be revetments between the groynes. Indeed, to a certain extent, this is being done. There is an amount of uncertainty in the action of groynes, which renders it desirable to fix and secure any important places. With particular winds, it often happens that the sand between two groynes is scooped out in a few tides.

In a long line of coast, and especially where it is intended not only to protect land, but to regain what is lost, it is proper to throw out groynes, the intervals depending on the length of the groynes, the exposure, and other circumstances, so that no general rule can be given. I would advise an extension of the line of short groynes all along the shore towards Cruz Milagre, and at the site of the gap after it is closed. I fully expect, however, that the proposed long groynes for training the current on to the bar, will have a wonderful effect, not merely in resisting the encroachments of the sea, but in restoring the coast towards its former line, say that of 1858. It is difficult to believe that the coast line for 1835, on the North side of the harbour entrance, is correct, for it shows a direction quite different from the general trend of the coast at Cochin.

In the shipping area of the inner harbour, Captain Castor thinks there is room at present for fifty ships of large size, say 700 tons, if properly moored in tiers; but any amount of area can be got by dredging. Cochin backwater can be converted into the largest close harbour in the world by dredging the shallow places. The rise and fall of tide is so small, that the backwater is practically a wet dock, of greater area than all the docks in Great Britain put together.

I have already mentioned that the bar will have to be dredged to a certain extent, to get the full depth upon it, which the scour will be able to maintain when the proposed groynes are built; a little dredging will probably also be required after unusually heavy gales. But as the dredging will not be continuous, it occurred to me that a combination might be made of a dredger and tug-steamer. If the harbour at Cochin is to be used during the monsoons, a

tug-steamers will be necessary, as the stream then is, for the most part, always outward, and sailing vessels could not get in unless it happened to be blowing half a gale of wind from the west. Even in fine weather, a tug would often be useful. At present, vessels sometimes pay as much as 200 or 400 rupees to be towed out by steamers frequenting the port.

I find, however, that the idea of combining a dredger with a tug is not new; for Messrs. W. Simons & Co. of Renfrew, the principal manufacturers of dredging plant in this country, inform me that they have a patent for it and are making one at present for the Canadian Government. They state that the cost of one of their patent screw-dredgers, such as would be useful at Cochin, is £8,600 delivered on the Clyde. The vessel to draw 7 feet of water, to have compound engines of 50 nominal horse power, with a central-bucket well, and ladder to dredge in 21 feet at low water. She should be capable of raising from 100 to 150 tons of sand per hour, and would be designed and fitted as a tug-steamers, having a speed of 7 or 8 miles per hour. The patent screw-dredger is provided with rudder, masts, spars, and canvas for wind propulsion, like a full rigged screw-steamer, the lower masts being constructed in combination with the shear legs for lifting the bucket ladder, so as to leave clear spaces centrally for the dredging apparatus. The craft could quite safely steam out to India via the Suez Canal. I think such a vessel would be of great value at Cochin. When not required either at the bar or for towing purposes, she might be employed in deepening and extending the accommodation for vessels inside the harbour.

It is hardly necessary to remark, that dry docks, or repairing slips, can be made at Cochin whenever required, or rather, whenever the funds are forthcoming, for something of the kind would be of great use at present. While I was at Cochin, the large vessel which had been injured at Calicut was being careened over for examination—a troublesome, dangerous, and imperfect operation, in comparison with the ease with which repairs can be executed in a dry dock or on a slip.

On the future importance of Cochin as the great western outlet for the trade of Southern India, viewed in connection with the Suez Canal, and the probable development of Railway and Internal water communication, it is hardly my province to dwell.

During the last ten years, the average annual tonnage of vessels visiting the port of Cochin has been—

|                                   | Inwards. | Outwards.     |
|-----------------------------------|----------|---------------|
| Steamers                          | 25,816   | 25,816        |
| Foreign Ships                     | 42,428   | 41,731        |
| Native Craft                      | 43,371   | 41,934        |
| The value of exports has averaged |          | Rs. 70,26,325 |
| “ imports                         |          | “ 49,36,873   |

## REPORT TO THE GOVERNMENT OF INDIA ON NARRAKAL

BY

GEORGE ROBERTSON,

*Fellow of the Royal Society of Edinburgh; Member of the Institution of Civil Engineers;  
Past President of the Royal Scottish Society of Arts.*

On the 28th February I visited the remarkable mud bank of Narrakal, in the pearl fishery steamer *Margaret Northcote*. The Diwan of Cochin was on board, and also the Master Attendants of Madras, Cocanada, Cochin and Tuticorin; so that nautical advice was not wanting. This curious and valuable anchorage was fully reported on and surveyed by Captain Castor, when he was at Cochin. From his reports, and from what others told me, there cannot be the slightest doubt as to the tranquillizing effects of the mud during stormy weather, and the value of Narrakal as a natural harbour of refuge during the monsoon.

We sent a diver down for specimens of the mud, which is of a dark green colour, and of a peculiarly greasy character. It has been analysed at Madras. When we were at Narrakal, though there was a considerable swell on the sea, yet the weather was too fine to develop the peculiarities of the bank. There was, however, sufficient surf on the coast elsewhere to show the marked difference at Narrakal, where, for some miles, the surf ceased, and there was not a ripple at the water's edge.

The whole phenomena connected with the mud banks, both here and at Alleppey, are well worthy of careful scientific investigation. There are many places on the coast of India, where the presence of mud has a quieting effect on the surf; but none so remarkable as these two spots; both of them, be it remarked, in the vicinity of the same backwater, and far from any great silt bearing river.

Several theories have been raised in connection with these mud banks; but I consider that, at present, there are not sufficient scientific data upon which to found a true theory as to the origin of the banks, and the connection that is supposed to exist between them and the adjoining backwater.

The special point upon which the Government of India have asked my opinion in connection with Narrakal and Alleppey, is “the possibility of taking advantage of such localities, and opening out communications between them and the backwaters.”

With regard to taking advantage of the localities, as two natural harbours of refuge in the vicinity of the close harbour of Cochin, I consider the banks most valuable additions to that port, and amongst the most cogent reasons for its improvement. No other harbour in the world has such adjuncts. But, with regard to opening out direct communication between Narrakal and the backwater, I consider it would not be prudent to attempt it. It would manifestly be unwise to shut the Cruz Milagre Gap, for the purpose of improving Cochin, and at the same time to open another gap close by. In the long shallow coast at Narrakal, even though there is little surf, it would not be possible, unless by incessant dredging, to keep open the mouth of a canal, without a current through it of tidal water. It would not be safe, in the present absence of scientific data, to throw a current of water into the centre of the Narrakal mud bank. So far as is known, that bank is stationary; but at Alleppey the bank there shifts, and has gone four miles to the south in ten years. The ingoing stream also, during flood tide, would fill the backwater with mud. The banks are too valuable to try experiments with. The six feet line at no place here comes nearer shore than 900 yards in very soft mud, and in one place Captain Castor's chart shows it to be a mile from shore. Any canal, therefore, would require to be carried out between long protecting groynes, or it would be filled up almost every tide. I do not recommend the trial. A scouring current might be injurious to the mud bank; and if a lock were put on the canal, the difficulty of keeping the entrance clear of mud would be great.

At Narrakal there already exists a small canal of 985 yards in length, from within 80 yards of the high water line to the Cochin backwater. This canal can be widened and deepened in connection with any general improvement of the internal water communication, so as to admit large cargo boats, or even steamers. The canal is very close to the southern boundary of the smooth water at Narrakal, but it is at the point where the six feet line comes nearest to the shore. Boats landing goods have to be dragged on shore for a long way through slush. A jetty would be an advantage, but it would require to be a very long one, three times as long as the pier at Calicut, to be of much use.

The three fathom anchorage is two and a quarter miles from shore.

Order—No. 1356 W., dated 30th September 1912.

The estimate submitted by the Superintending Engineer with his letter No. 756-W./611-P. of the 13th August 1912 read above, amounting to Rs. 25,000, of the cost of the special establishment and plant required for the investigation and survey of the Cochin Backwater, Bar and Littoral in connection with the proposed improvements to the Cochin Harbour, is sanctioned.

2. Separate orders will issue as to allotment of funds for the investigation sanctioned above. The cost will, in the first instance, be provided under 45. Civil Works—Provincial, but it will eventually be debited to the capital cost of the harbour, should the project mature, or to the landing and shipping dues to be levied hereafter at Cochin, if the investigation shows that the creation of a harbour is impossible.

3. As the working season is about to commence, the Superintending Engineer will be directed to set to work at once on the proposed investigation. The Chief Engineer, Public Works Department, will also take the necessary steps to post the Assistant Engineer and the upper subordinates required for the work.

4. Orders in regard to the motor launch required in connection with the investigation will issue separately.

5. The sanction accorded in paragraph 1 above has been registered as Provincial No. 26 W. of 1912-1913 and classified as Miscellaneous Public Improvements—Original works.

(True Extract.)

H. E. CLERK,  
Ag. Secretary to Government, P.W.D.

To the Superintending Engineer, IV Circle.  
“ Chief Engineer, Public Works Department.  
“ Accountant-General.  
“ Collector of Malabar.  
“ Political Department.  
“ Marine Department.  
“ Financial Department. } with copy of notes.

## II

Letter—from R. A. GRAHAM, Esq., I.C.S., Acting Resident in Travancore and Cochin.

To—the Collector of Malabar.

Dated—the 16th February 1912.

With reference to your letter Ref. on C. No. 183/P-12, dated 3rd February 1912, I have the honour to inform you that the estimate for Rs. 7,600 for providing temporary wooden groynes for the Vypeen foreshore was forwarded to the Cochin Darbar on the 14th June last. The Darbar then entered a protest against being asked to bear any portion of the cost for protective works on the Vypeen foreshore solely intended for the protection of British Cochin-works which were hitherto carried out entirely at the expense of the British Government. Since then the Darbar has sent a long letter discussing the questions of taking up coast protection as a whole and of improving the Cochin Harbour and formulating certain proposals under which the Darbar is prepared to participate with the Government in providing protective works at all affected localities on the coast. The matter has been submitted to Government for consideration and until their orders are received on the subject, I do not see my way to address the Darbar for the payment of the contribution referred to in your letter quoted above.

Dis. No. 11, dated 6th March 1912.

Copy communicated to the Executive Engineer, West Coast Division, for information with reference to his letter No. 211 M., dated 25th January 1912.

C. A. INNES,  
Collector.

No. 222-S.E./25-K of 19th March 1912.

Forwarded to the Superintending Engineer, IV Circle, for favour of orders with reference to G.O. No. 611 W., dated 9th May 1911, communicated with Superintending Engineer's No. 388-W.C., dated 26th May 1911, and in continuation of this office No. 212 M., dated 25th January 1912, to the Deputy Accountant-General, Public Works Branch, forwarded through the Superintending Engineer, IV Circle.

ALLAN CAMPBELL,  
Executive Engineer, West Coast Division.

No. 258-W/611-C-2, dated 23rd March 1912.

Copy forwarded to the Chief Engineer, Public Works Department, for information and favour of orders with reference to G.Os. Nos. 611 W. of 9th May 1911 and 703 W. of 3rd June 1911.

W. M. ELLIS,  
Superintending Engineer, IV Circle.

## III

Letter—from Colonel W. M. ELLIS, R.E., Superintending Engineer, IV Circle.

To—the Chief Engineer, Public Works Department.

Dated—Coimbatore, the 6th September 1912.

No.—842-W/611-P.

I have the honour to forward in original a confidential letter from the Executive Engineer, West Coast Division (Mr. Allan Campbell) making certain suggestions regarding arrangements for the control of ship harbour at Cochin and for the arrangements which it may be desirable to come to on the subject with the Native States of Cochin and Travancore. I consider that many of the proposals put forward are premature but I think it proper nevertheless to forward the letter so that Mr. Campbell's suggestions may be on record.

2. There can be no doubt that if a deep channel through the bar at Cochin is cut and can be maintained a splendid harbour with facilities for formation of a first-class coaling station will at once become available. Such a harbour must be kept under the control of the Imperial Government.

Whether the Cochin Darbar should be approached on the subject at once is a matter on which I do not express any opinion and I forward Mr. Campbell's letter without further comment.

## ENCLOSURE.

Letter—from Mr. A. CAMPBELL, Executive Engineer, West Coast Division.  
To—the Superintending Engineer, IV Circle, Coimbatore.

Dated—Calicut, the 1st September 1912.

No.—908-S.E.

[Cochin Harbour Project.]

When preparing a project of such momentous importance, as that of opening the harbour at Cochin to the maritime world, it cannot be considered that an Engineer's responsibility ceases entirely with the mere discharge of his purely technical duties or that he would be justified in neglecting to draw attention to certain political and commercial aspects of the case, of which it is possible he, at the moment, may be the sole observer, but which must inevitably call for serious consideration from others in the near future. Holding these views, I think no apology is due from me for offering my opinions and suggestions on the following questions:—

- (1) The terms on which works for the improvement of the harbour should be carried out, by the British Government, within the Cochin State.
- (2) The effect that the opening of the harbour will have in attracting land borne trade to the Port of Cochin.
- (3) The effect of the Port of Cochin becoming a coaling station, of possibly imperial importance.

I shall now proceed to take each question *seriatim* and discuss it on broad general lines.

1. *The terms on which works for the improvement of the harbour should be carried out within Cochin State.*—These will naturally be governed to a great extent by the attitude that Cochin State adopts towards the scheme. If this is conciliatory I have no doubt that without much difficulty, a working arrangement, satisfactory to all parties, will be arrived at, and thus enable us to deal freely with the backwaters and eventually develop the harbour to any extent, that the requirements of commerce may demand. It appears to me, however, that no arrangement that admits of dual control over the harbour as at present can be regarded as entirely satisfactory, and that there will always remain possible grounds for misunderstandings, so long as the entrance from the sea and one half of the harbour is under one control, while the approach to it from the mainland and the other half is under another. As a solution of this difficulty, I strongly advocate that the whole harbour, and such of the foreshore as is required for working it efficiently whether British or Cochin territory, be placed under the administration of an impartial body of trustees, who will have no interest in developing one portion more than another. I think possibly the best way to attain this end would be by the promulgation of a Cochin Port Trust Act, similar to that of Madras, simultaneously in the Madras Presidency and Cochin State. For the purposes of administration, I would propose that all land vested in the Board of Harbour Trustees, so constituted, should as in the case of railways, (worked by British Corporations), traversing Native States, be placed under British jurisdiction. Further, if the erection of an additional British custom house were permitted within the Port Trust limits at Ernakulam, the railway terminus at the harbour, merchandise arriving by sea could be landed directly on to the mainland without having to pass through the customs house at Cochin as at present. The immediate effect of this arrangement would be to confer on Ernakulam equal landing and shipping facilities with Cochin, and thus undoubtedly greatly benefit that town and indirectly Cochin State as a whole. For the opening of the harbour will be naturally followed by an influx of new firms eager to secure business premises, who, if they find equal facilities for trading afforded them at Ernakulam, will prefer to remain there, where unlimited land is available, at comparatively low prices, in preference to crossing the harbour and endeavouring to obtain a footing in the already congested town of British Cochin. As far as the Port Trust is concerned it will be a matter of complete indifference whether merchandise is shipped from and to Ernakulam or Cochin town, the dues being the same in either case.

I would suggest that the Board of Harbour Trustees be composed as follows:—

- |                                             |                                                                                                                            |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| (1) Engineer—Chairman, British Officials.   | } Note.—Owing to inability to attend the Board meetings regularly, these officers would usually be represented by proxies. |
| (2) The Collector of Malabar.               |                                                                                                                            |
| (3) The Collector of Customs.               |                                                                                                                            |
| (4) The Presidency Port Officer.            |                                                                                                                            |
| (5) The Superintending Engineer, IV Circle. |                                                                                                                            |
| (6) } Two Cochin State officials ... ..     | Appointed by Cochin State Government.                                                                                      |
| (7) } One Travancore official ... ..        | Appointed by Travancore Government.                                                                                        |
| (8) } One non-official ... ..               | Nominated by British Government.                                                                                           |
| (9) } Two non-officials ... ..              | Appointed by Cochin Chamber of Commerce.                                                                                   |
| (10) } The Agent ... ..                     | South Indian Railway.                                                                                                      |

There is yet another question to be settled, namely, the ownership of the land in Cochin State which may be reclaimed, in carrying out improvements to the harbour. It is extremely probable, that within a few months a harbour expert from home will be asked to tender his advice on the measures to be taken for the improvement of the harbour, and it is almost certain that this will include dredging not only in the vicinity of Port, for increasing the size of the anchorage, but also in the remote backwaters for enlarging the tidal compartments, it behoves us therefore, in anticipation of this, to lose no time in settling with Cochin State the terms on which such reclamations will be made. Within the boundaries of the property held by the Board of Harbour Trustees, all land so reclaimed would naturally become vested in that body, but beyond these limits this would not necessarily follow. I would therefore suggest tentatively the following terms, on which land suitable for cultivation might be reclaimed, outside the Port Trust limits:—

(1) That Cochin State have the option of taking over all such lands, and in the event of it exercising such option to refund the Port Trust the cost of building the necessary revetments or retaining walls, the mud filling being done free of charge by the Port Trust's dredgers.

(2) That when the Cochin State does not wish to exercise its option, and the whole cost of reclamation is borne by the Port Trust, the land reclaimed should be vested in the Board of Harbour Trustees rent free, and the revenues derived therefrom considered as part of the income from the harbour works.

It will be seen from the foregoing that I am inclined to take a broad view of the harbour question, and advocate dealing liberally with the Cochin State; at the same time I do not wish it to be supposed that in so doing I admit that the State's claims in Cochin harbour are superior or even equal to those of the British Government. It is neither mere chance nor the geographical position of the Port that has developed the sea-borne trade of Cochin into the immense proportions it has assumed to-day, and on whose account costly improvements to the harbour are now warranted. British capital and enterprise may truly be said to have alone done this, and that had the Port of Cochin not been British its trade would, in all probability, have remained insignificant, and some other port on the backwaters in British territory, such as Oletwaye or Pounani (old European trading centres) would have been developed and taken the trade that now goes to Cochin.

I have hitherto considered Cochin State as a junior partner cordially co-operating, in its own interests with the British Government in all works and measures for the improvement of the harbour. Unfortunately, it is not altogether certain that the State will meet us in such a mediatatorial spirit, in which case, we may be forced to revert to the original scheme proposed by me, for developing only that portion of the harbour which lies indisputably within British territory and ignoring that lying in Cochin State. As this proposal was described in my note sent as an enclosure to my letter No. 3479, dated 27th December 1911, to the Collector of Malabar, I shall not repeat its details, but merely mention that though a considerably more satisfactory scheme can be evolved if the whole of the backwaters are placed at our disposal without let or hindrance; yet, in the case of the Cochin State taking up an unreasonable attitude, we shall still be able to develop a very useful harbour of considerable dimensions, entirely located in British territory.

2. *The effect that the harbour will have in attracting trade to port of Cochin.*—I do not think it necessary to discuss this question at any great length but merely to indicate the lines on which shipping trade of Cochin is likely to expand.

That the presence of a deep water harbour at Cochin, in which vessels can lie in safety at all seasons of the year, will exert some influence on the routes by which merchandise is now exported from Southern India, is certain, but to what extent is a matter of speculation at present. There can however be no doubt that the fact of steamers being able to load and unload with greater certainty and despatch than at any other port in the Presidency, excepting Madras, will in itself prove a considerable attraction to trade. If this is so, I anticipate that railway extensions from Palghat to Dindigul and from Quilon to Ernakulam will be called into existence, and that Shoranur-Cochin Railway will be converted into broad gauge to meet the demands of traffic to and from Cochin.

It is not, however, at the expense of other Madras ports that the shipping trade of Cochin will be increased to any considerable extent. For our supply of shipping, we must look further south, to the harbour of Colombo, which ranks seventh in the world's list as regards the total tonnage of vessels entering the port, and whose area is as arbitrarily limited as that of Madras, so that there are occasions even now when she cannot accommodate all the shipping seeking admission. As it will take years and the expenditure of much money before Colombo harbour can be appreciably extended, the present appears a most opportune time for opening up an additional coaling station at Cochin, to enter into friendly rivalry with Colombo or at least take her surplus shipping. I may mention that I have been informed on reliable authority that two well-known lines of passenger steamers intend making Cochin a port of call, as soon as it is decided to dredge the bar, in order to be first in the competition, for passenger traffic by the new route, which will inevitably ensue. As I pointed out on a previous occasion, a vessel going from Aden to Australia will cover the same distance whether she calls at Cochin or Colombo, but

with a cheaper harbour and consequently lighter dues than Colombo can afford to charge, the balance will be in favour of Cochin. Already the mere fact of it being common knowledge that Government seriously contemplates dredging the harbour bar has been sufficient, within the last few months, to greatly inflate the price of land both in Cochin and Ernakulam. There is, therefore, every indication that an immediate and vast expansion of trade will follow the realisation of the scheme for opening the harbour.

3. *The effect of the Port of Cochin becoming a coaling station of possibly imperial importance.*—It is stated in the Ceylon Administration Reports 1910-11 that Colombo in the year under review obtained over 40 per cent. of its coal, valued at nearly six crores of rupees, from the United Kingdom. As Cochin is equally if not more favourably situated, for importing that commodity, it is reasonable to suppose that it also will become an important coaling station, eventually rivalling Colombo itself. From an imperial point of view therefore, it is possible that the question of the protection of a harbour admirably suited as a naval base, and containing large stocks of coal, will have to be ultimately considered.

It may be thought that I am somewhat premature in drawing attention to the foregoing questions, I would therefore point out that there is every possibility of the Port of Cochin developing with great rapidity. Conditions here are somewhat different to those usually met with. At Cochin there is already a harbour capable of accommodating ten steamers, which can be made immediate use of the moment the bar has been removed, and as this will only take some 18 months to do, from the time the dredger or dredgers commence work on the bar, I do not think it too early to consider the probable consequences.

## [SUBJECT.—Erosion and harbour improvement of the port of Cochin.]

## Previous papers:

| Cochin Harbour. |               |            |       | Loans raised by Native States.                                                                           |                   |            |           |
|-----------------|---------------|------------|-------|----------------------------------------------------------------------------------------------------------|-------------------|------------|-----------|
| G.O.            | 48, Marine,   | 12th Feb.  | 1859. | G.O.                                                                                                     | 746, Political,   | 12th Nov.  | 1900.     |
| "               | 453 W.,       | 11th "     | 1869. | "                                                                                                        | 152 "             | 13th Mar.  | 1901.     |
| "               | 2543 W.,      | 25th Oct.  | 1870. | "                                                                                                        | 12 "              | 6th Jan.   | 1908.     |
| "               | 2767 W.,      | 17th Nov.  | "     | Interportal Trade Convention stock file on<br>Interportal Trade Conventions in Travancore<br>and Cochin. |                   |            |           |
| "               | 147 W.,       | 19th Jan.  | 1871. | G.O.                                                                                                     | 2213, Revenue,    | 7th Dec.   | 1864.     |
| "               | 587 W.,       | 28th Feb.  | "     | "                                                                                                        | 407, Political,   | 8th July   | 1905.     |
| "               | 1105 W.,      | 20th April | "     | "                                                                                                        | 551, Revenue,     | 1st Mar.   | 1911.     |
| "               | 1567 W.,      | 12th June  | "     | "                                                                                                        | 2274 "            | 25th July  | "         |
| "               | 3055 W.,      | 4th Dec.   | "     | "                                                                                                        | 383 "             | 12th Feb.  | 1912.     |
| "               | 1125 W.,      | 2nd May    | 1872. | "                                                                                                        | 1927 "            | 28th June  | "         |
| "               | 1449 W.,      | 11th June  | "     | Shoranur-Cochin Railway                                                                                  |                   |            |           |
| "               | 1757 W.,      | 24th July  | "     | Stock file regarding Shoranur-Cochin Railway.                                                            |                   |            |           |
| "               | 1323 W.,      | 13th May   | 1873. | Reclamation.                                                                                             |                   |            |           |
| "               | 2138 W.,      | 27th Aug.  | "     | G.O.                                                                                                     | 41, Marine,       | 12th Feb.  | 1910.     |
| "               | 3450 W.,      | 6th Dec.   | 1875. | "                                                                                                        | 1667 W.,          | 30th Nov.  | 1911.     |
| "               | 325, Marine,  | 17th May   | 1877. | Erosion of Coast.                                                                                        |                   |            |           |
| "               | 624 W.,       | 22nd Aug.  | "     | G.O.                                                                                                     | 123, Marine,      | 14th Mar.  | 1907.     |
| "               | 871 W.,       | 21st Feb.  | 1878. | "                                                                                                        | 294 "             | 24th July  | "         |
| "               | 2926 W.,      | 19th July  | "     | "                                                                                                        | 93 W.,            | 5th Feb.   | 1910.     |
| "               | 4013 W.,      | 15th Oct.  | "     | "                                                                                                        | 45, Marine,       | 16th "     | "         |
| "               | 4046 W.,      | 17th "     | "     | "                                                                                                        | 355 "             | 10th Nov.  | "         |
| "               | 1830 W.,      | 12th July  | 1879. | "                                                                                                        | 1369 W.,          | 14th Dec.  | "         |
| "               | 2943-2944 W., | 27th Dec.  | 1880. | "                                                                                                        | 611 W.,           | 9th May    | 1911.     |
| "               | 222 W.,       | 26th Jan.  | 1881. | "                                                                                                        | 703 W.,           | 3rd June   | "         |
| "               | 911-912 W.,   | 4th April  | "     | "                                                                                                        | 1443 W.,          | 11th Oct.  | 1912.     |
| "               | 280, Marine,  | 16th June  | "     | Miscellaneous.                                                                                           |                   |            |           |
| "               | 1883 W.,      | 1st Aug.   | "     | G.O.                                                                                                     | 1558 W.,          | 3rd July   | 1880.     |
| "               | 2226 W.,      | 8th Sept.  | "     | "                                                                                                        | 2149 W.,          | 13th Sept. | "         |
| "               | 196, Marine,  | 17th April | 1883. | "                                                                                                        | 909 W.,           | 4th April  | 1881.     |
| "               | 3477 W.,      | 4th Dec.   | "     | "                                                                                                        | 96 W.,            | 15th Jan.  | 1901.     |
| "               | 655 W.,       | 13th Mar.  | 1885. | "                                                                                                        | 68, Marine,       | 1st Mar.   | 1909.     |
| "               | 2245 W.,      | 28th Sept. | "     | "                                                                                                        | 82 "              | 19th "     | 1910.     |
| "               | 857 W.,       | 30th Mar.  | 1886. | "                                                                                                        | Letter            | 317 "      | 15th Oct. |
| "               | 1999 W.,      | 11th Aug.  | "     | "                                                                                                        | "                 | 220 "      | 28th July |
| "               | 188 W.,       | 17th Jan.  | 1888. | "                                                                                                        | "                 | 287 "      | 21st Oct. |
| "               | 30, Marine,   | 2nd Feb.   | "     | Boundary between British and Native States.                                                              |                   |            |           |
| "               | 804 W.,       | 12th Mar.  | "     | G.O.                                                                                                     | 338-339, Revenue, | 15th May   | 1897.     |
| "               | 131 W.,       | 18th Jan.  | 1889. | "                                                                                                        | 314, Political,   | 12th July  | 1909.     |
| "               | 150, Marine,  | 4th Mar.   | 1902. | "                                                                                                        | 56, "             | 29th Jan.  | 1912.     |
| "               | 308 "         | 13th July  | 1903. |                                                                                                          |                   |            |           |
| "               | 250 "         | 20th "     | 1904. |                                                                                                          |                   |            |           |
| "               | 923 W.,       | 6th "      | 1912. |                                                                                                          |                   |            |           |
| "               | 1356 W.,      | 30th Sept. | "     |                                                                                                          |                   |            |           |

## POLITICAL DEPARTMENT.

## I

*From the Resident in Travancore and Cochin, dated 27th January 1912.*

An advance copy of the Diwan's letter now submitted by the Resident was received by Government in the middle of November last and was dealt with in Marine. That file is going to Financial for consideration of the financial aspect of the question. Submitted this current may be sent to Financial through Marine.

V.S.M.—7-2-12.

S. H. SLATER—9-2-12.

## MARINE DEPARTMENT.

*Under Secretary—*

The file referred to has since been sent to the Secretary to Government, Public Works Department, to take with him during his ensuing visit to Cochin. In the notes to that file, the Chief Secretary noted that the Political aspect of the question should also be noted. The present file may, it is submitted, be returned to the Political Department for action being taken in the matter, pending the receipt of the main file from the Public Works Department.

D.V.—19-2-12.

Yes, but meanwhile the financial aspect should be considered in this department as already directed, and a copy of the Resident's letter may be sent to the Public Works Department for being added to the main file.

M. S. MASCARENHAS—20-2-12.

## PUBLIC WORKS DEPARTMENT.

## II

*From the Superintending Engineer, IV Circle, dated 23rd March 1912, No. 258-W/611-C. 2.*

*Under Secretary—*

The current read above may be forwarded to Marine for information. The Cochin Darbar's proposals in regard to the improvement of the Cochin harbour, which are referred to in the Resident's letter dated 16th February 1912, are under consideration in that department.

R.K.—2-4-12.

W. G. MOLESWORTH—3-4-12.

## MARINE DEPARTMENT.

May be perused and returned to the Public Works Department. The decision of this question will have to await orders on the proposals regarding improvements to the Cochin Harbour.

P.G.—22-4-12.

*Ooty office—*

Where is the main file now?

M.S.M.—24-4-12.

*Under Secretary—*

The file is with the Chief Secretary.

D.V.—24-4-12.

*Deputy Secretary—*

M.S.M.—24-4-12.

Perused and returned.

C. W. E. COTTON—5-5-12.

## PUBLIC WORKS DEPARTMENT.

*Deputy Secretary—*

Attention is solicited to the notes in the Marine Department above. This file may lie over pending final orders on the proposals regarding improvements to the Cochin harbour which are now under consideration in Marine.

W.G.M.—8-5-12.

## POLITICAL DEPARTMENT.

Where are the connected files about Cochin harbour now?

A. G. CARDEW—21-6-12.

The main file is in Public Works Department where the question of the appointment of an Assistant Engineer to take soundings with a view to a complete case being sent to the India Office for expert opinion is being considered.

2. The file in Political, where the political aspect has to be considered, is lying over. Mr. Slater went through the file and, after speaking to Chief Secretary just before the move to Ooty, returned it to the office saying that the political aspect could be considered only after the scheme had taken a definite shape.

This file I also spoke about to the Chief Secretary, who took charge of it, and expressed the opinion that it might be linked with the main file.

L.J.P.J.—22-6-12

3. The file regarding the boundaries of the Cochin port is now in Revenue where they are awaiting the reply of the Board of Revenue (Land Revenue).

4. Files regarding the reclamation of the backwaters and erosion of the coast are in Marine (now with Under Secretary, Marine).

V.S.M.—22-6-12.

*Chief Secretary—*

L. J. P. JOLLY—22-6-12.

I spoke to Mr. Pears today about the main file. It has been referred in Public Works Department to the Superintending Engineer for a report as to the establishment required to take soundings. Mr. Pears has written to Colonel Ellis on the subject. I do not see that much can be done until Public Works Department has received a reply from the Superintending Engineer and formulates its proposals.

A.G.C.—11-7-12.

## PUBLIC WORKS DEPARTMENT.

The Superintending Engineer's letter No. 842 W./611 P., dated 6th September 1912, may be transferred to Political for disposal.

S. D. PEARS—11-9-12.

## POLITICAL DEPARTMENT.

The general question of the improvement of the Cochin harbour is now under consideration in Marine and Public Works Departments. This file may be transferred to Marine.

V.S.M.—12-9-12.

S.H.S.—12-9-12.

## MARINE DEPARTMENT.

The file relating to preliminary investigation was referred to the Financial Department recently. Where is it now?

M.S.M.—12-9-12.

The file is still in Financial.

K.P.A.—18-9-12.

M.S.M.—13-9-12.

## FINANCIAL DEPARTMENT.

The main file has been passed on to Public Works Department. Submitted that this file may be returned to that department.

A.H.—16-9-12.

C. REILLY—16-9-12.

## PUBLIC WORKS DEPARTMENT.

Deputy Secretary—

The main file is linked [since disposed of in G.O. No. 1356 W., dated 13th September 1912].

K.G.—18-9-12.

## POLITICAL DEPARTMENT.

The Public Works Department may be requested to say whether the Superintending Engineer has submitted the report referred to in Chief Secretary's note, dated 11th July 1912 on page 3 *ante*, and if the report has been received to kindly let this department have a copy.

A.J.J.—24-9-12.

V.S.M.—24-9-12.

Yes, please.

S.H.S.—25-9-12.

## PUBLIC WORKS DEPARTMENT.

## III

*From the Superintending Engineer, IV Circle, dated 6th September 1912, No. 842-W/611-P.*

Under Secretary—

The Superintending Engineer's report was received and disposed of in G.O. No. 1356 W., dated 30th September 1912. In this G.O. an estimate, amounting to Rs. 25,000, for the necessary establishment and plant required to make the necessary preliminary investigation at Cochin has been sanctioned and the Superintending Engineer has been directed to set to work at once. A copy of the order only has been communicated to Political and copies of the full order and notes will be furnished as soon as the papers have been printed.

2. Colonel Ellis' letter No. 842-W/611 P., dated 6th September 1912, forwarding a note by Mr. Allan Campbell, Executive Engineer, on the political aspect of the question has been added to the file, as the questions therein raised appear to be for Political to deal with.

3. The file may be returned to Political u.o.

K.G.—2-10-12.

G.D.P.—2-10-12.

W.G.M.—2-10-12.

## POLITICAL DEPARTMENT.

This file may lie over until receipt of a printed copy of G.O. No. 1356 W., dated 30th December 1912, and of notes to it.

A.J.J.—3-10-12.

V.S.M.—5-10-12.

S.H.S.—7-10-12.

## PUBLIC WORKS DEPARTMENT.

Deputy Secretary—

Please see paragraph 9 of Honourable Member's note, dated 24th September 1912, on page 19 of notes to G.O. No. 1356 W., dated 30th September 1912. The Cochin Darbar has to be addressed in the terms described in Honourable Member's note. Submitted that the matter seems one for the Political Department to take action upon. If approved, the file may be transferred to that department for necessary action.

K.G.—18-10-12.

G.D.P.—16-10-12.

[Political u.o.]

D. MARSHALL—16-10-12.

## POLITICAL DEPARTMENT.

*[Extract from the notes to G.O. No. 1356 W., dated 30th September 1912.]*

"9. I now come to the letter from the Resident in Travancore and Cochin with its voluminous enclosures from the Diwan of Cochin. This letter is nominally an item in the correspondence about the sharing of cost of anti-erosion measures on the Cochin coast. In paragraph 6 (1) of his letter Mr. Banerji makes the astounding assertion that the Darbar may legitimately seek the assistance of the Paramount Power for the protection of their territory against erosion by the Arabian Sea. That view should be emphatically negated at once. I would tell the Darbar that we are only concerned with the erosion of the Cochin coast inasmuch as it affects the British port of Cochin, that the Darbar are also concerned with that portion of the erosion to the extent to which they suffer loss of land and land revenue, that the Darbar is also interested to some extent in the welfare of the port since they get a share of the customs revenue collected there, that it is not easy to put into exact figures the value of these respective interests, but we are quite prepared to discuss the question of a reasonable apportionment of the cost of the measures taken with this limited object. I would then go on to say that erosion, which does not endanger the backwater and therefore does not affect the port, is no concern of ours, and we certainly cannot entertain for a moment the preposterous proposition that we should hand over to the Darbar the port of Cochin in order that the Darbar may reimburse itself from the income of the port for the cost of anti-erosion measures along the coast of the State. I would thank the Darbar for the expression of Mr. Browning's views regarding the improvement of the port, a matter, we may say, which was already engaging our attention on a representation from the Cochin Chamber of Commerce, and I would add that the port, whether improved or not, will remain entirely British. His Excellency the Governor has agreed to my visiting Cochin in the early part of next month, and I should like to communicate to the Resident the views of the Government on Mr. Banerji's wide-ranging proposals. I might also give a hint to the Raja that the port will remain a British port and that its improvement is a matter which would be kept entirely in the hands of the British Government. I am sure it will be wise to administer this check to Mr. Banerji as soon as possible."

H. A. STUART—24-9-12.

"The first thing to do, without delay, is to get out an order approving the Rs. 25,000 and directing the Superintending Engineer to set to work at once.

"Then drafts to the Secretary of State and the Darbar on lines indicated by the Honourable Member will be wanted."

S.D.P.—25-9-12.

Attention is solicited to paragraph 9 of Hon'ble Sir Harold Stuart's note, dated 24th September 1912, extracted above from page 19 of the Notes to G.O. No. 1356 W., dated 30th September 1912. The Honourable Member has already visited Cochin.

2 G.O. No. 1356 W., dated 30th September 1912, regarding the investigation and survey of the Cochin backwater, bar and littoral in connection with the proposed improvements to the harbour has already been communicated to the Resident.

3. Mr. Campbell's suggestions can, if at all, be taken up for consideration only after the feasibility of the Harbour scheme has been determined.

Pages No. 6-37 of G.O. No. 1356 W., dated 30th September 1912.

4. The Cochin Darbar's letter is mainly concerned with—  
(1) the consideration of coast protection as a whole and

(2) the question of the improvement of the Cochin Harbour.  
The first practically is a protest against the orders in G.O. No. 355, Marine, dated 10th November 1910. It is submitted that Marine seems to be the more appropriate department than Political to issue orders on this subject. Now that it is decided that the Harbour improvement, if at all, should be undertaken by the British Government, it seems proper that orders stating that the improvement of the Cochin port was

Paragraph 9 of Sir Harold Stuart's note, dated 20th September 1912, on page 19 G.O. No. 1356 W., dated 30th September 1912.  
already engaging the attention of this Government on a representation from the Cochin Chamber of Commerce and that whether improved or not the port will ever remain British should also issue in Marine. The order may be communicated to the Resident through Political. If this view is accepted, the file may be transferred to Marine u.o.

A.J.J.—29-10-12.

V.S.M.—31-10-12.

A draft on the lines of paragraph 9 of Sir Harold Stuart's note, dated 24th September 1912 (on page 19 of the notes to G.O. No. 1356 W., dated 30th September 1912), should be prepared in *Political* at once. It will go to Marine for acceptance.

S.H.S.—1-11-12.

A draft order is submitted for approval. It may be sent to Marine, Public Works Department and Revenue for acceptance.

It is contrary to rule to have two drafts on two current files in the same case. But here there is no need at all for a separate Government Order recording Mr. Campbell's letter. It should be printed as part of the current file.  
A.G.C.—11-12-12.

The order does not cover Mr. Campbell's suggestions which may be taken up after the feasibility of the Harbour scheme has been ascertained. A separate draft order regarding that letter is submitted. This also may be sent to the departments noted above.

\* G.O. 355, Marine, 10th November 1910.  
" 611 W., 9th May 1911.  
" 703 W., 3rd June 1911.

Paragraph 19 of notes to G.O. 1356 W., 30th September 1912.

seems to amount to a virtual modification of paragraph 4 of G.O. No. 355, Marine, dated 10th November 1910, paragraph 4 of G.O. No. 611 W., dated 9th May 1911 and paragraph 3 of G.O. No. 703 W., dated 3rd June 1911. If this is not the case paragraph 2 of the first draft may require alteration.

#### Draft Order.

" G.O. No. 355, Marine, dated 10th November 1910.  
" G.O. No. 1369 W., dated 14th December 1910.  
" G.O. No. 611 W., dated 9th May 1911.  
" G.O. No. 703 W., dated 3rd June 1911.  
" G.O. No. 1356 W., dated 30th September 1912.  
" G.O. No. 1443 W., dated 11th October 1912.

" In G.O. No. 1356 W., dated 30th September 1912 read above, the Government  
" passed an estimate for the investigation and survey of the Cochin backwater, bar  
" and littoral in connection with the proposed improvements to the Cochin port. The  
" Government now proceed to communicate to the Cochin Darbar their views on two  
" important points raised by the Diwan of Cochin in his letter ref. on C. No. 420 of  
" 86, dated the 24th October 1911, which forms an enclosure to the letter from the

" Resident in Travancore and Cochin, dated the 27th January 1912, read in the  
" Government Order quoted above. These relate to (1) the liability of the Cochin  
" Darbar to undertake measures for the protection of the Vypeen foreshore, receiving  
" from Government one-third of the cost of the works to be carried out, and (2) the  
" rights of the Cochin Darbar to carry out improvements to the Cochin port with a  
" view to convert it into a ship harbour.

" 2. As regards the protective measures for the prevention of erosion of the fore-  
" shore at Vypeen, the Government observe from paragraph 7 (1) of the Diwan's  
" letter above referred to that the Darbar is of the opinion that it may legitimately  
" seek the assistance of the Paramount Power for the protection of its territory against  
" erosion by the Arabian Sea. His Excellency the Governor in Council regrets that  
" he cannot accept this view. The Government are concerned with the erosion of the  
" Cochin coast inasmuch as it affects the British port of Cochin, but the Darbar is also  
" concerned with that portion of the erosion, to the extent to which the Cochin State  
" suffers loss of land and land revenues. The Darbar's interest further extends to the  
" welfare of the Cochin port in that it gets a share of the customs revenue collected  
" there. Although it is not quite easy to put into exact figures the value of these  
" respective interests, the Government will be prepared, when the time comes, to  
" discuss the question of a reasonable apportionment of the cost of the measures  
" taken with this limited object. Erosion which does not endanger the backwater  
" and therefore does not affect the port of Cochin is a matter which does not concern  
" this Government.

" His Excellency in Council cannot also entertain the suggestion of the Darbar  
" that the Government should hand over to the Darbar the port of Cochin, in order  
" that the Darbar may re-imburse itself from the income of the port for the cost of  
" anti-erosion measures along the coast of Cochin.

" 3. With reference to the question of the improvements to the port of Cochin,  
" the Resident is requested to convey to the Cochin Darbar the thanks of Govern-  
" ment for the Darbar's Chief Engineer's report on the subject. The subject has,  
" however, been already engaging the Government's attention on a representation  
" from the Cochin Chamber of Commerce. The Cochin Darbar should also be  
" informed that the Cochin port, whether improved or not, will remain entirely  
" British and that its improvement is a matter which will be kept altogether in the  
" hands of the British Government."

V.S.M.—6-11-12.

S.H.S.—9-11-12.

#### Second Draft Order.

Read—the following—

G.O. No. 1356 W., dated 30th September 1912.

#### II

From the Superintending Engineer, IV Circle, dated 6th September 1912,  
No. 842 W./611-P.

Order—Recorded.

V.S.M.—6-11-12.

Chief Secretary through—

Revenue  
Public Works } u.o.  
Marine

S.H.S.—9-11-12.

PUBLIC WORKS DEPARTMENT.

Under Secretary—

Orders on the file referred to in this department's note, dated 8th May 1912,  
have been passed in G.O. No. 1356 W., dated 30th September 1912. In this  
Government Order sanction was accorded to an estimate of Rs. 25,000 towards the  
cost of the special establishment and plant required for the investigation and survey  
of the Cochin backwater in connection with the proposed improvements to the Cochin  
harbour.

2. In regard to the question of the incidence of the cost of measures against erosion referred to in the Superintending Engineer's letter attention is solicited to paragraph 9 of Honourable Member's note, dated 24th September 1912, on page 19 of the notes printed with G.O. No. 1356 W., dated 30th September 1912. An extract of this portion of the note has been sent to Political on 17th October 1912 for necessary action. For the disposal of this file, Political may be requested to furnish a copy of their order on the Honourable Member's note referred to above.

T.S.R.—15-11-12.

W. G. MOLESWORTH—16-11-12.

POLITICAL DEPARTMENT.

A draft order on the lines of the Hon'ble Sir Harold Stuart's note, dated 24th September 1912, on page 19 of the notes to G.O. No. 1356 W., dated 30th September 1912, was sent to the Public Works Department and Marine a few days ago for acceptance. This file may await the issue of that order.

A.J.J.—19-11-12.

V.S.M.—19-11-12.

S.H.S.—20-11-12.

REVENUE DEPARTMENT.

Deputy Secretary—

The two drafts may, it is submitted, be accepted in Revenue.

T.S.R.—13-11-12.

V. A. ANANTARAMA AIYAR—14-11-12.

T. E. MOIR—15-11-12.

PUBLIC WORKS DEPARTMENT.

Under Secretary—

The two drafts may, it is submitted, be accepted and the file passed on to Marine.

B.R.—20-11-12.

Accepted in Public Works Department.

W.G.M.—23-11-12.

C. A. SMITH—23-11-12.

MARINE DEPARTMENT.

Under Secretary—

The question of the incidence of the cost of protective measures to be adopted against sea-erosion in Cochin is under re-consideration in a separate file and it will take some time before final orders can be passed in the matter.

2. The two drafts may, it is submitted, be accepted and the file returned to Political.

R.V.S.—27-11-12.

M.V.V.—27-11-12.

Deputy Secretary—

In the third sentence in paragraph 2 of the proposed draft, I would add the word "only" between "are" and "concerned."

I would convert "inasmuch" (line 4) into "only so far."

A.J.C.

Otherwise the draft may be accepted in the Marine Department.

It is observed that the tenor of the draft implies that the Government has practically agreed to withdraw G.O. No. 355 so far as the apportionment of costs of preventing erosion is concerned. It seems also to admit that that Government Order and any modification of it we may now make refer only to permanent protective works, and not to the "piecemeal" annual conservancy works, such as were sanctioned in G.O. No. 703 W., dated 3rd June 1911, and No. 611 W., dated 9th May 1911.

C. S. ANANTARAMA AIYAR—2-12-12.

Chief Secretary—

The reply regarding erosion measures is in substance non-committal, and I see no objection to making it. I am not sure however that I would at present, i.e., until further inquiry has been made into the principles on which the incidence of cost of these measures should be fixed, refer explicitly to the grounds upon which Cochin should pay her share, viz.—

(a) That she suffers loss of land revenue; we don't know yet I think whether this is not negligible. Mr. Smith states as regards Vypeen that Cochin's interests on this score "are practically of no importance compared with their interests in the present harbour."

(b) That her interest extends to the welfare of the Cochin port in that she gets a share of the customs revenue collected there. Does this justify us in levying from her what are in effect harbour maintenance charges? I am inquiring into this point is another file at present in Marine.

I should be inclined briefly to state that in due course the question of incidence will be settled, without at present entering into argument. This will leave our hands freer when the time for settlement comes.

A. J. CURGENVEN—3-12-12.

This is a matter of first class importance. The note on which the draft is based is not that of the Honourable Member in charge of the Department who has not seen the file at all. The issues involved are far too large to be summarily disposed of and the file will have to be circulated.

The first thing to be done is to print the current file completely. Seeing that the question will probably go to the Government of India and possibly to arbitration, a large number of copies should be struck in such a form that they can be hereafter bound in a collected volume on this subject. The notes should also be printed, an extract of Sir Harold Stuart's note (on which the draft is based but which is no in the note file) being included.

A.G.C.—11-12-12.

Under Secretary—

Submitted that the file may be returned to the Political Department for the directions of the Chief Secretary being carried out. The file is theirs and their draft came to us for acceptance.

M.V.V.—11-12-12.

C.S.A.—11-12-12.

B

MARINE DEPARTMENT.

Proceedings of the Public Works Department, No. 1356 W., dated 30th September 1912.

Under Secretary—

Submitted that the receipt of copy of notes to the above Proceedings may be awaited. Meanwhile it is submitted that the Public Works Department may be requested u.o. to return the papers about the Cochin harbour put up in the file closed by the Government Order read above. They are required for examining the questions about (1) reclamation in the backwaters and (2) erosion.

P.G.—3-10-12.

M. S. MASCARENHAS—5-10-12.

## PUBLIC WORKS DEPARTMENT.

Under Secretary—

A printed copy of the notes to the above Proceedings is attached to the current file.

2. The linked file which contains the papers required by Marine may be returned to that department, u.o.

M.G.—11-10-12.

G. D. PLUMMER—11-10-12.

W. G. MOLDSWORTH—11-10-12.

MARINE DEPARTMENT.

Is further action to be taken in Marine or Public Works Department?

Under Secretary—

M.S.M.—12-10-12.

Please see the Honourable Member's (Financial and Public Works Department) note, dated 24th September 1912 at pages 18-19 of the notes connected with G.O. No. 1356 W., dated 30th September 1912. Further action has to be taken in regard to addressing—

- (1) the Secretary of State,
- (2) the Cochin Darbar, and also as regards
- (3) the cost of measures against erosion.

2. As regards (1) attention is invited to paragraph 5 of the Honourable Member's note referred to above. It is submitted that Public Works Department will have to take action in the matter in the first instance.

3. As regards (2) the proposed letter to the Cochin Darbar will have to be issued in the Political Department. Item (3) above will be attended to on receipt of a fully printed \* copy of the current file (Public Works Department G.O. No. 1356 of 1912).

\* Public Works Department office asked by telephone to expedite printing of the Government Order and also reminded about the further action to be taken.

M.V.V.—17-10-12.

4. Meanwhile the draft endorsement communicating G.O. No. 1356 W., dated 30th September 1912 to the Presidency Port Officer may, it is submitted, issue. The Collector of Malabar has received a copy of the Public Works Department order direct from that department.

R.V.S.—16-10-12.

M.V.V.—17-10-12.

Yes.

M.S.M.—18-10-12.

[Issued as Endorsement No. 1220-1, dated 18th October 1912.]

Under Secretary—

Submitted that Public Works Department may be asked to furnish a fully printed copy of G.O. No. 1356 W., dated 30th September 1912 (current file), for further action being taken in this department.

R.V.S.—5-11-12.

Submitted that the following telephonic message may be sent to the Public Works Department:—

From—the Under Secretary, Marine Department.

To—the Under Secretary, Public Works Department.

"Will you kindly have a printed copy of G.O. No. 1356 W., dated 30th September 1912, sent to this department as soon as possible, as further action has to be taken in this department."

M.V.V.—5-11-12.

M.S.M.—11-11-12.

Please see the preceding notes. The question of reclamation in the Cochin backwaters has been referred to a local committee and no action seems to be required at present in the matter. It is understood that action is being taken in the Public Works Department in regard to item \* (1) in paragraph 1 of the notes above. Political has taken action separately regarding item † 2.

\* I.e., addressing the Secretary of State.

† Letter to Cochin Darbar.

2. The question of the incidence of the cost of protective measures to be adopted against sea erosion in Cochin is now submitted for orders. Reference in this connection is solicited to—

- (1) G.O. No. 355, Marine, dated 10th November 1910,
- (2) paragraph 3 of the Chief Engineer's note at page 7 of notes to G.O. No. 1356 W., dated 30th September 1912,
- (3) paragraphs 2 and 5 of the Under Secretary's notes, dated 16th December 1911 and 24th March 1912 at pages 3 and 10 respectively of the notes connected with G.O. No. 1356 W., dated 30th September 1912, and
- (4) the portion marked A in paragraph 9 of the Hon'ble Sir Harold Stuart's note, dated 24th September 1912, at page 19 of the notes in G.O. No. 1356 W., dated 30th September 1912.

The Honourable Member (Marine) has not seen these papers. Orders are solicited as to the lines on which G.O. No. 355, Marine, dated 10th November 1910, is to be modified. The further remarks of the Public Works Department may, perhaps, be invited with reference to Sir Harold Stuart's note, dated 24th September 1912, on page 19 of the notes to G.O. No. 1356 W., dated 30th September 1912.

Attention is in this connection invited to the constructive works proposed in the papers in the linked file. The works proposed in that case may perhaps proceed subject to any revised orders that may be issued as to apportionment of cost between the Cochin Darbar and the British Government as a result of the remarks of the Public Works Department Secretary (the Hon'ble Mr. C. A. Smith) in paragraph 3 of his note at page 7 of the notes to G.O. No. 1356 W., dated 30th September 1912. To delay the construction of those works until the question of apportionment of cost is reconsidered may perhaps cause some inconvenience. The works are proposed to be constructed by us in the first instance and not by the Cochin Darbar.

For orders.

M.V.V.—18-11-12.

Deputy Secretary—

The point we have now to decide is about the apportionment of the cost of protective works on the sea-coast affecting the Cochin Port.

2. In G.O. No. 355, Marine, dated 10th November 1910, we decided (1) how far we are interested in such works, (2) what share we will pay of the cost, and (3) who is to carry out the works. All these three points have now to be reconsidered.

3. The decision on the first point needs very little modification. The Cochin Darbar seem to think that it is the duty of the paramount power to protect their territory from erosion by the Arabian Sea. This view has been emphatically negatived in the note of Honourable Member on page 19 (paragraph 9) of the notes to G.O. No. 1356 W., dated 30th September 1912. Our interest is limited to the efficient maintenance of the entrance to the Cochin harbour. In G.O. No. 355, Marine, dated 10th November 1910, it was thought necessary to take action in two places—at Andikadavu and on the Vypeen foreshore from the harbour entrance to Cruz Milagre. In the notes to that G.O. it is not definitely stated that any immediate work is necessary at Andikadavu. But it was supposed that any serious erosion there would also affect the harbour. In page

G.O. 355, Marine, 10th November 1910.

See para. 7 (1) of the letter at page 11 of G.O. 1356 W., 30th September 1912.

Notes to G.O. No. 1356 W., dated 30th September 1912, the Chief Engineer states that it was at present quite unnecessary to carry out any protective works at Andikadavu for the safety of the harbour, but that the Government should pay any portion of the costs for improvements there. It is a point for consideration whether the terms of G.O. No. 355, Marine, dated 10th November 1910, may be altered so as to exclude Andikadavu altogether.

4. As to the second point, i.e., sharing the costs between the Government and the Darbar, the latter gets half the income\* from the port, and in addition has the advantage of protecting its coast and the cocoanut gardens along it. It was therefore thought that the Darbar should contribute more than half the cost of the protective works, and so a proportion of 2:1 was decided as proper. The Chief Engineer however, in page 7 of the notes to G.O. No. 1356 W., says that the Darbar's interests are almost entirely concerned with the harbour, and that their interest in cocoanut gardens may be regarded as of no importance. In fact the income to the Darbar from a narrow strip of  $1\frac{1}{2}$  miles in length may not be much; and it is only reasonable to divide the costs between the Darbar and the Government in the proportion of their interest in the harbour. It may therefore be considered whether the costs may not be divided equally between the Government and the Cochin Darbar.

5. It will not do for us even by implication to suggest that the interests of the Cochin Darbar in harbour improvement works are greater than ours. In fact, the question of modification of the interportal convention will become important in connection with the large scheme of the harbour improvement at Cochin (please *vide* page 6 of the notes to G.O. No. 383, Revenue, dated 12th February 1912) and the decision now made should not give any handle to the Darbar to press for a further share of the income from the port.

6. For the same reason it will be desirable to modify the terms of G.O. No. 355, Marine, dated 10th November 1910, so that it will be for this Government to carry out any works required for the protection of the harbour, and the Cochin Darbar will only have to pay its share of the expense. The Chief Engineer also says that the British Government should continue to carry out the works and not entrust them to Cochin. Paragraph 5 of the Government Order has again to be modified so as to make it clear that if the Cochin Darbar for their own benefit wish to take up a general scheme for the protection of their coast, they may do so on obtaining the previous approval of this Government, so as to guard against possible damage to the Cochin harbour.

7. The Darbar has raised another question as to the real scope of G.O. No. 355. It is said that protective works at Vypeen have been hitherto carried out entirely at the expense of the British Government and that therefore the estimates for Rs. 12,450 sanctioned subsequent to this Government Order should be borne entirely by us. It seems that the Government Order contemplated only special measure of protection, but it has been ruled by the Honourable Member in his note on page 3 of the notes to G.O. No. 611 W., dated 9th May 1911, that the Government Order refers to all kinds of works, whether new or repairs of old. The Cochin Darbar do not apparently accept this interpretation and demur to pay their share of these estimates. Another estimate for Rs. 3,125 is pending sanction in the linked file, and here again the question of recovering a portion of the cost from the Darbar needs consideration.

C. S. ANANTARAMA AIVAR—20-11-12.

How far are these anti-erosion measures necessary (a) to protect Cochin territory and revenue, and (b) to safeguard the port of Cochin?

Disturbed. Public Works Department's revised draft order was accepted and passed on. A.J.J.

2. As regards (a), Mr. Smith states (page 7 of notes to G.O. No. 1356 W., dated 30th September 1912) that the Darbar is interested in protecting the coast almost entirely because of their interest, direct or indirect, in the harbour. The inference from his remarks is that erosion is not likely to entail a serious loss either in territory or revenue.

3. (b) We have then to inquire what are the respective interests of the British Government and the Cochin Darbar in the harbour. So far as these measures are necessary to protect the harbour, they must, I think, be regarded as strictly harbour works. What agreement exists between the two parties regarding the agency for executing such works, and how is the expenditure met? Has Cochin any obligations in return for her share in the customs receipts? Please let me have information on these points, and put up a notes copy of G.O. No. 407, Political, dated 8th July 1905.

4. It is, I think, premature to decide what should be the incidence of cost of such measures if the projected improvements to the harbour are carried out.

A. J. CURGENVEN—24-11-12.

Under Secretary—

There appears to be no agreement at least of recent date between the British Government and the Cochin Darbar as to the agency for executing works connected with the Cochin Harbour or as to how the expenditure on such works is to be met. If any such agreement did exist that would have been cited in the discussions that took place in connection with the improvements to Cochin harbour which resulted in the issue of G.O. No. 1356 W., dated 30th September 1912. In fact the policy has been not to admit any claim on the part of the Cochin Darbar to the Port of Cochin and to participate in the improvements to that port—*vide* Sir Harold Stuart's note, dated 24th September 1912 on page 19 of the notes to G.O. No. 1356 W., dated 30th September 1912 and particularly the last but one sentence of that note in which the Honourable Member says that "I might also give a hint to the Raja that the port will remain a British port and that its improvement is a matter which would be kept entirely in the hands of the British Government."

2. As regards the question of obligations of Cochin in return for her share in the customs receipts, attention is invited to the correspondence relating to the Interportal Trade Convention summarised on pages 3-5 of the notes in G.O. No. 407, Political, dated 8th July 1905 and to the extracts quoted in paragraph of the Revenue department note, dated 27th June 1910 at page 3 of notes to G.O. No. 551, Revenue, dated 1st March 1911. It will be seen therefrom that "our agreement to pay 50 per cent. of our customs collections to the State (Cochin) was in return for the State's giving up the levy of customs duty on all British Indian products at all ports and land frontiers and adopting British Indian rates of duty on all other articles, plus concessions regarding salt and tobacco." Please see also the correspondence and orders in G.O. No. 551, Revenue, dated 1st March 1911 and also to the notes attached to G.O. No. 2274, Revenue, dated 25th July 1911—especially to the Hon'ble Mr. Cardew's note, dated 22nd July 1911 on page 5 of the notes to that Government Order.

M.V.V.—5-12-12.

From the Interportal agreement, an abstract of which is given in the notes to G.O. No. 407, dated 8th July 1905, the Cochin Darbar is to get a moiety (one half) of the net customs revenue realised from the port. But there is no agreement available in the records about the charges for maintaining the harbour in good condition. The Cochin Darbar say that till now the annual maintenance charges have been entirely borne by the British Government.

C. S. ANANTARAMA AIVAR—6-12-12.

Deputy Secretary—

I cannot escape the conclusion that there is a weak case for requiring the Darbar to bear its share of the cost of these anti-erosion measures, so far as they are necessary for the security of the British Port of Cochin.

